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A Multivariate Model of Hospital Ward Evaluation

by

Cheryl D. Kenny

Thesis submitted in fulfilment of the degree of Doctor of Philosophy

Department of Psychology
University of Surrey
May, 1983
A model is presented to describe the evaluation of hospital wards by nurses. The model is developed using the principles of facet theory and its family of multivariate statistics.

An environmental evaluation is taken as an assessment of the utility of a setting. It is proposed that to make an evaluation, people must rely on their conceptualisations of using the setting. The model is a description of peoples conceptions about interacting with an environment. It is tested by examining the structure of the evaluations that emerge from such interactions.

Three facets are proposed to describe the interaction between the nurses and the ward setting. The Referent facet describes the functions to be served by the environment; that is whether the activity being facilitated involves interaction with other people, the layout of the setting or the environmental services.

The second facet describes the activities. A distinction is made between the Type of Patient Care being provided, namely direct or indirect.

The third facet describes the Level at which the Interaction between the individual and the referent takes place. The four levels identified are observation, access, direct contact and preventing disturbances.

Together the facets form a three-way classification system to describe environmental interactions. To test the model, a ward evaluation questionnaire is developed with each item containing an element from each of the facets. The data from 1921 completed questionnaires are analysed using a smallest space analysis (SSA-1) and the cylindrex structure predicted by the model retrieved.

The model is used to draw implications for ward design, to develop a concise instrument for future ward evaluations, and to develop a system to illustrate the relationship between the evaluations and the physical characteristics of the wards.

The model is also used to provide empirical support for previous work, and evidence is presented to suggest that the ward evaluation model may provide the basis for a more general theory of environmental evaluation.
ACKNOWLEDGEMENTS

The data forming the basis of the study were collected on behalf of the Department of Health and Social Services by the Hospital Evaluation Research Unit at the University of Surrey. Appreciation is expressed for this sponsorship.

The project included the development of a computer programme for the retrieval and use of the data base by designers, a system documenting the physical characteristics of hospital wards, an evaluation questionnaire for hospital patients, and an evaluation of wards by nurses. My specific area of concern was the development of the nurses evaluation questionnaire and the collection of the data with that instrument.

Many of the theoretical ideas presented in this thesis were developed during the course of the project, but were formalised and tested at the conclusion of the DHSS work. I would like to thank the members of the team for their useful suggestions on the development of the questionnaire, with particular thanks to Margaret Veitch whose enthusiasm and help was invaluable.

Dr. David Canter, as well as directing the DHSS project, was also my supervisor. I would like to thank him for his many comments and criticisms which were so important to the clarification and refinement of the ideas presented in the work.

Many people were involved in the actual production of the document, for which I am most grateful. Particular thanks goes to Miriam Comber for her patience in proofreading the drafts and Janice Harben for typing the final version.

The creation of a piece of work such as a Ph.D. requires a tremendous amount of support and understanding from the people around you. There are several very special people I would like to thank. Firstly my children, Sean and Nicholas, for tolerating the mounds of paper they have had to live with over the years. Jennifer Brown for always having a willing ear at times of discouragement, and also for her many useful suggestions.

Finally a very special thank you to my husband, John Kenny. I would like to dedicate the thesis to John, without whose belief in me the work would never have been attempted and whose continuing love, help, and understanding (even of my spelling) has made the completion possible.
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Chapter 1
INTRODUCTION

This study focuses on the evaluation of new adult acute hospital wards by the nurses who work on these wards. It is based on data collected in the course of a project commissioned by the Architects Division of the Department of Health. For the main study reported here the data consists of questionnaires completed by 1921 nurses from 143 modern hospital wards.

The two main objectives of the present work are to contribute to the decision making process in designing hospital wards and to explore the psychological processes that are part of making an evaluation. Both these objectives lead to the necessity of formulating a model to describe nurses' evaluations of their ward designs.

1 THE THEORETICAL OBJECTIVE

The present work has as a major aim the development of a theoretical basis for ward evaluations. Stringer (1975), speaking on environmental research, maintains that 'it should attempt to throw new light on traditional and mainstream psychological issues'. Continuing, he states that 'generally this requires that studies should have a firm basis in psychological theory, or be actually developing a new one'.

Environmental evaluation studies have failed to respond to this theoretical requirement of research. The research area is one of the largest and oldest areas of environmental psychology (EDRA publication, 1982). For example Bechtel and Srivastava (1978) have identified over 1000 researchers who have conducted housing evaluations alone. Yet, as pointed out by Stokols (1978) in his review of the field, evaluation research is the most pragmatic area in the field. Marans and Spreckelmeyer (1981) also suggest few evaluation studies are based on well developed conceptual models. The lack of a theoretical basis for environmental evaluations stems from their applied objective; that is:

'to evaluate an existing building or aspects of it so as to provide information upon the effectiveness of the principles upon which it was based'

(Canter, 1975).

As indicated by Canter each piece of environmental evaluation research focuses on a specific building type. This has led to a vast collection of unrelated research findings about specific settings. An illustration of the uniqueness of such research is the Vol.12, No.4 edition of the journal of Environment and Behavior (Reizenstein and Zimring, 1980) dedicated solely to building evaluations. Each article reported in that edition is an unique study with no indication of being a part of a cumulative process of understanding.

A more theoretical approach to this area is maintained in the studies
which seek to identify common dimensions of meaning to the way people describe environments (as discussed in Canter, 1975). The instruments generally used in this type of study take the form of bi-polar adjectival scales. While these preference studies identify an evaluative dimension to the way people think about settings, isolating it as an independent orthogonal factor provides little insight into the significance of such a dimension. An attempt to bridge the gap between the strictly applied work and the purely academic has been the development of general evaluation scales such as Vielhauer-Kasmer's (1970) and Canter's (1968) general environmental satisfaction scales. However these general scales still leave unanswered the applied question of 'satisfactory for what'. Knowing that one building receives a higher overall satisfaction rating than another does not contribute to the design decision making.

The current research problem is one of developing an approach to evaluation which will provide the basis for a more general theory of building evaluation. In addition the approach must be responsive to the detailed aspects of the relationship between nursing care and ward design in order to respond to the applied objectives of the research.

2 THE APPLIED OBJECTIVE

The significance of the current project is highlighted by a policy currently being developed by the Department of Health and Social Services, the government department responsible for hospital construction. This policy is to develop standard plans to be used in the design of all adult acute hospitals in England. As discussed by the King's Fund Foundation (Baynes et al., 1969) standardisation constitutes a major change in the system utilised in the production of hospital buildings. Plans for a hospital have traditionally been generated at the Regional level of the National Health Service. While authorisation for the construction of projects such as hospitals, with a high capital expenditure, must come from the DHSS, the major contribution of the DHSS to the design itself is in the form of guidance.

The regional-based procedure for developing plans results in unique design solutions for each building, a process which requires vast expenditure in both time and money. In order to improve efficiency the DHSS intends to provide standard plans in the form of guidance, which will be modified by the Region to accommodate the unique problems posed by any particular design site. The three prototype standard plans developed by the DHSS are "Best Buy", "Harness" and the most recent design "Nucleus" (Stone, 1976).

At present building designs undergo a gradual process of modification and change. For example Stone (1976) documents the changes in ward design
since the Nuffield plan of 1955. Once standardised guidance is put into practice, the natural evolution of design ceases. Therefore the designers must be confident that the design that is being enshrined is appropriate. The basis of such informed design decision making is evaluation. As stated by the King's Fund Foundation (Baynes et al., 1969):

'Evaluation is an essential corollary of standardisation and the use of those modern building methods that are intended to reduce cost'

A commitment to the concept of building evaluation by the DHSS is suggested by its inclusion in Capricode (H.M.S.O., 1973). This DHSS document lays down the guidelines for the design process to be followed for Department of Health buildings. Evaluation is included as Stage 6 of the Stages of Planning. Unlike the other stages, however, no standard guidance has been offered as to how it should be carried out.

The policy of standardised hospital plans is in the developmental stage. There is still the opportunity to influence these standard plans by providing design-relevant information from the people who will use these buildings. One area of contribution is to examine the relationship between ward design and the provision of nursing care. This is one of the purposes of the present work.

There are several aspects to the applied objective. One is the production of a standard instrument for the evaluation of hospital wards. Of all the social sciences psychology has most often found the use of standard instruments helpful in applied work. To date such standard instruments have come mainly from clinical, educational, and occupational psychology. Yet the same reasons for their widespread use in these fields also make standard instruments useful instruments in environmental psychology. They provide the opportunity for obtaining a comparative assessment of individuals. They are cumulative, in that each use can increase the data base. They are relatively easy and inexpensive to administer once developed. A standard instrument for the evaluation of hospital wards, with a data base, will allow future wards to be evaluated efficiently and these assessments compared with those received by earlier designs. Thus one applied objective is to provide the field of design with an instrument which will allow easy access to information from the users.

The second applied objective is to provide current designers with the nurses' account of the relationship between ward design and nursing care. The reason for this information being of use to the design field relates to the origins of the modern ward design. All modern ward layouts are closely patterned on a plan developed by the Nuffield Provincial Hospital Trust in 1955 (Stone, 1976).
The Nuffield plan was based on what the designers thought nursing care ought to be, rather than what their research found it to be (Nuffield, 1953). To date there has been little research directed towards obtaining the nurses' account of providing nursing care in the modern ward context. Thus ward designs are becoming standardised without benefit from one of the most important ward users. In order to correct this deficiency, the present work presents what the nurses think constitutes nursing care in the ward and what they see as the pattern of activities. This interpretation is compared with those of the Nuffield team and with current writers on the theory of nursing.

The final applied objective relates to a general deficiency in the field of environmental psychology; the neglect of the physical attributes of settings. Environmental research has been mainly concerned with people's experiences, evaluations or behaviour patterns in given settings. There has been little attempt to link these experiences to design variables. The point is well illustrated by Stokols' (1978) review of over 500 articles and books which makes no reference to any work of this nature. A partial explanation for the neglect of the physical variables is given by Canter (1977) when he states:

"Taken in the abstract, independently of any conceptual framework, there is an infinity of ways of dividing up and measuring physical parameters. So researchers have either selected one which caught their fancy, with disappointing results, or given up because they were spoilt for choice."

The statement by Canter is reinforced by the research of Sears and Auld (1976). They found that dealing with individual physical variables provides no clear pattern of relationships between variations in design and variations in evaluations made about hospital wards.

An objective of the present work is to explore a method of identifying general environmental characteristics which relate to the evaluations received. The end product is to be a multiple classification or taxonomy of ward types based upon the nurses' evaluations of the wards.

All aspects of the objective to contribute to design decision making require that a coherent and systematic account of the experience of ward evaluation be made. For example according to Milcarek and Struening (1975) research instruments are the operational definition of the concepts under investigation. Therefore the development of an instrument to measure ward evaluations ought to be based upon a conceptual model of that experience. Similarly a description of nurses' experience of using the ward will have more utility if it not only describes what activities occur in that setting but also describes how the ward functions as an integrated whole in providing patient care. This requires a framework for describing the relationships between the components of patient care.
in the ward context. It is accomplished by developing a model to describe ward evaluations.

3 THE APPROACH TO MODEL DEVELOPMENT

The approach taken to develop a description or model of ward evaluation is Facet Theory (Guttman, 1965). This is a structural approach to theory construction. Unlike the structural interpretations of the general scales described previously, facet theory provides a guide to research design and the interpretation of data analysis. This approach provides a multiple classification system for describing a given phenomenon which is directly open to empirical verification.

There are two main reasons why the facet approach is appropriate for the present research. Firstly it provides the basis for describing a specific content area. In this instance it is the conceptualisations nurses use to describe and evaluate their ward environment. This allows the model to be responsive to the applied objectives described above. In addition the facet approach provides the basis for cumulative research information. The reason why the facet approach facilitates both the applied and theoretical objectives is that generality is sought in terms of the structure, not the content. As illustrated by Levy (1976), when the structure is common across contexts effective comparisons can be made. This provides a comparative basis for environmental evaluations in a range of different settings which will aid in the development of a general environmental evaluation model.

Facet theory provides a system for describing a given phenomenon. However the rationale as to why a particular phenomenon may be described in this manner must come from the substantive context. The development of a facet model of environmental evaluations requires a consideration of just what is involved in the psychological experience of making an evaluation.

4 THE SUBSTANTIVE BASIS OF THE MODEL

It can be taken that evaluation is an assessment of quality of a psychological object, in this instance, of a physical setting. This thesis attempts to describe the processes which underlie this experience. In order to understand these processes it is proposed that there are two basic issues to be clarified. The first concerns the criteria that people use to make the evaluations. The second issue concerns the basis of the evaluations; that is, how they are formed.

Most environmental research is based upon a dynamic or goal-oriented model of man (Building Performance Research Unit, 1972; Ittelson et al., 1974 and Canter, 1977). The assumptions upon which this work is based are that people have reasons for being in a setting; that is they have
certain objectives or purposes which they are trying to achieve within a setting, and that these purposes are the criteria used for evaluation. It is proposed that a person evaluates a setting in terms of the extent to which that setting facilitates the achievement of his purposes or goals.

A reasonable starting point of the present work is to assume that the purpose of nurses being in the ward context is to provide nursing care to patients. Following from this, it is argued that nurses assess the physical environment of the ward in terms of the extent to which it facilitates the activities involved in the provision of nursing care.

The second issue concerns the origins of the evaluations. The assumption of the present work is that the formulation of these evaluations are a part of the conceptualisations an individual develops about his use of a particular environment. Consequently a model to describe environmental evaluations is an account of both the content and the structure of the individual’s conceptualisations of using the physical environment.

5 CHARACTERISTICS OF THE MODEL

Ittelson et al. (1974) describe environmental experience as emergent. By this is meant that the experience is the result of the interaction between an aspect of the physical environment and a behavioural characteristic of the individual. In addition they maintain that this experience can not be obtained by considering either side in isolation. The proposed model of environmental evaluation attempts to incorporate this emergent quality of the experience of using the environment.

A part of the model construction is the proposal of basic conceptual units of the experience of environmental use. These units are labelled 'behavioural units' to emphasis that their origins lie in the actual use of the environment. In order to accommodate the emergent quality of the experience, each unit is defined as consisting of an attribute of a location together with a purposive activity associated with the attribute. For the ward context a behavioural unit consists of a specific characteristic of a part of the ward, together with a nursing activity that takes place there; for example the lighting at the nursing station together with nurses doing clerical work at the station. The prediction is that each behavioural unit will be the basis of one given evaluative statement.

The object of the model is to provide a parsimonious description of the variations between the different evaluations made. Because of their emergent quality this requires a description of the variation between the behavioural units. The facet approach is used to provide a structure for such a description, resulting in a system of multiple classification for
each of the behavioural units.

The initial rules or concepts to be used to describe each behavioural unit are derived from the environmental psychology literature. This provides a general model of people's conceptualisations of their environmental interactions. The specific model of ward evaluations is provided by previous literature and research on how the ward functions in providing care for the patient. This information is used to translate the general model into concepts and categories applicable to the ward context.

The empirical test of the model is a smallest space analysis (Lingoes, 1973) of the nurses' responses to the evaluative statements. A regional interpretation of the data analysis is used to determine whether the classification system proposed is valid. The successful retrieval of the structure which corresponds with the proposed classification confirms that the model of ward evaluation is a valid description of that environmental experience.

The rationale for the ward evaluation model is derived from the literature and research on nursing care in hospital wards. The successful retrieval of the predicted structure not only validates the model, but also illustrates a compatibility between the various sources of information about the functioning of hospital wards. This consensus in interpretation suggests that the model can be used to examine how nursing is carried out in the ward context and the implications this may have for the design of hospital wards. In addition the ward evaluation model is a refinement of a more general model of environmental evaluations derived from the literature of environmental psychology. The suggestion can be made that the model provides the first step in giving the pragmatic field of environmental evaluation a basis for more systematic cumulation of knowledge.

6 THE ORGANISATION OF THE THESIS

The thesis can be divided broadly into six general sections. The first section is the rationale for the research, discussed in Chapter 2 to 4. Reasons are presented for why the hospital ward/nursing care context is an appropriate context for environmental evaluation research. In addition an examination of previous environmental evaluations and of the more general field of Evaluation Research is given, which draws the conclusion that a theoretical account of the process of evaluation is a necessary component of evaluation research. A final aspect of the rationale for the approach adopted in the work is an examination of the psychological process of making an evaluation. It is proposed that a model of environmental evaluations will be a model of people's conceptual
systems for structuring the experiences of environmental interactions. The model is a structural account of environmental evaluations. The second section (Chapters 5 to 7) describes the development of the model. The basic unit of study which is consistent with the psychological process of evaluation is proposed and the general concepts or rules, taken from the environmental psychology literature, to describe the units are presented. The work uses the facet theory approach to research in order to facilitate the empirical testing of the proposed model. A discussion of the principles of facet theory and its accompanying analyses is presented. The facet approach requires that the model being developed be specified for a particular context. The final stage of the construction of the model is translating the general account of environmental evaluations into a model of ward evaluation using the existing literature on the functioning of the hospital ward.

Section three (Chapters 8 and 9) describes the development of the research instrument to be used in testing the model. Chapter 8 presents the iterative procedure adopted to construct the ward evaluation questionnaire and Chapter 9 describes the final testing of the instrument before the main survey is carried out. The necessity for empirically examining the instrument also provides the opportunity for a preliminary testing of the model of ward evaluation. The fourth section of the thesis describes the final testing of the model of ward evaluation. Chapter 10 describes the classification of the questionnaire items according to the proposed model and the interpretation of the data analysis. The smallest space analysis of the responses of the nurses confirms a cylindrex model of ward evaluation. Chapter 11 presents a brief summary of all the stages in the development and testing of the model.

The fifth section is a discussion of the implications of the model of ward evaluation. Chapter 12 discusses the implications of the model for the nature of nursing care and for current ward designs. Chapter 13 uses the model of ward evaluation to develop an additional model to describe the relationship between the evaluative and physical descriptors of hospital wards. Chapter 14 discusses the implications of the physical descriptors model for the design of future hospital wards.

The final section summarises the work and discusses the extent to which the applied and theoretical objectives of the work are achieved. Recommendations for future work are made and a discussion of the implications of the work for the field of environmental psychology is presented.

Chapter 2 describes the rationale for using the hospital ward/nursing care context for the development of a model of environmental evaluations.
A sufficient rationale for the study of the relationship between the designs of current adult acute hospital wards and the provision of nursing care can be simply that it is a naturally occurring behavioural system. In other words, nurses are present in hospital wards to provide patient care. As such the setting provides an interesting topic for environmental research. The ward contains a variety of diverse areas such as the bedrooms, the nursing station, the utility rooms and the recreation room; yet it has a readily identifiable physical boundary. Equally, nursing care involves a great range of activities such as observing patients, disposing of dirty materials, clerical tasks as well as the direct treatment of the patient. Yet this setting functions as a total system for providing nursing care to the patient.

However the relationship between ward design and nursing care is much closer than the mere fact that the nursing activities occur in the ward setting. The actual design of wards, both old and modern, enshrines what has been considered the appropriate method of providing medical care at that time. Until 1955 ward design followed the development of the health care delivery system, including the development of nursing as a profession. In that year, the Nuffield Ward Plan was published; this plan is a focal source for the present research.

1 THE NUFFIELD WARD

The Nuffield Provincial Hospital Trust published a book in 1955 containing a ward plan which was subsequently built (see Figure 2.1). The plan represented a radical departure from the type of ward design previously utilised and was a direct, conscious reversal of the trend in other institutional settings. Thus while buildings such as offices and schools were moving towards an open-plan environment, the Nuffield ward plan created a highly compartmentalised setting for patients to receive care.

The Nuffield ward plan became the prototype of all British adult acute wards built since 1955 (Stone, 1976; Bott, 1970). This was made possible by the nationalisation of the health service in 1946 which placed virtually all hospitals in the United Kingdom under the control of central government. By 1961 standard guidance was being produced by the DHSS in the form of Hospital Building Notes. These building notes have their origins in the Nuffield work and the evaluations of the hospitals built according to the Nuffield specifications (Bott, 1970).
The subsequent development of ward plans has been a process of refinement, with a variety of designs evolving through modifications and adjustments to this basic plan. The continued adherence to this basic plan is reflected in Table 2.1. The table presents a comparison between the levels of provision specified in current guidance recommendations (DHSS, 1976) and the levels in the two Nuffield wards for the major design innovations introduced by the Nuffield plan.

The Nuffield Plan was based upon systematically conducted behavioural research on the activities which occurred in hospital wards at that time (Nuffield, 1953; Nuffield, 1955). This work was used to formulate the design principles behind the plan and the most effective ways of implementing these principles. As indicated by Stone (1976) this was the first major piece of work on the general problem of hospital design since Florence Nightingale’s (1863) *Notes on hospitals*. Bott (1970) describes it as showing ‘an objective approach to ward requirements which was to set the pace in hospital design for many years’.
<table>
<thead>
<tr>
<th>Building Note 4 (Ward Units) 1976</th>
<th>Nuffield Plans Musgrave Park</th>
<th>Nuffield Plans Larkfield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>30 beds</td>
<td>40 beds</td>
</tr>
<tr>
<td>Single Bedrooms</td>
<td>20% of total bed no.s</td>
<td>20%</td>
</tr>
<tr>
<td>Bedspace</td>
<td>87 sq. ft.</td>
<td>75.3 sq.ft.</td>
</tr>
<tr>
<td>No. of beds in multi bedded areas</td>
<td>4-8, recommends 6</td>
<td>4 &amp; 6</td>
</tr>
<tr>
<td>Dayspace</td>
<td>to be provided central or peripheral (dependent on overall ward plan)</td>
<td>provided central</td>
</tr>
<tr>
<td>W.C's-ratio to each bed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.27</td>
<td>.30</td>
</tr>
<tr>
<td>Multi bedrm</td>
<td>.17</td>
<td>.25</td>
</tr>
<tr>
<td>Single bedrm</td>
<td>.67</td>
<td>.50</td>
</tr>
<tr>
<td>Treatment Rm.</td>
<td>to be provided central location</td>
<td>provided central</td>
</tr>
<tr>
<td>Clean Utility Room</td>
<td>to be provided adjacent to Tr.Rm. near staff base</td>
<td>provided adjacent to Tr. Rm., near staff base</td>
</tr>
<tr>
<td>Dirty Utility Room</td>
<td>to be provided adjacent to Tr.Rm. and C.U. Rm.</td>
<td>provided adjacent to Tr. Rm. and C.U.</td>
</tr>
<tr>
<td>Pantry</td>
<td>to be provided location dependent on type of service to be provided</td>
<td>provided central (light catering)</td>
</tr>
</tbody>
</table>
The historical development of ward designs indicates that the designing of the Nuffield plan represents a major break with tradition. Yet the principles behind this plan have remained virtually untested. This chapter argues for the need for systematic evaluation research to examine the relationship between present ward designs and current nursing practice. Section 2 describes the historical role of the hospital ward in the delivery of care. Section 3 presents the role of the nurse in this system of care. The design of the Nuffield plan and the research used to formulate the principles behind the plan are discussed in Section 4. Section 5 argues for the need for systematic evaluations of the wards based upon the Nuffield work.

2 THE ROLE OF THE WARD IN THE HEALTH CARE DELIVERY SYSTEM

The purpose of a medical building is to provide a setting where providers and receivers can be brought together. For patients receiving 'in-house' treatment the most significant setting for this contact is the hospital ward. Eardley and Wakefield (1973), Wilson-Barnett (1976) and Raphael (1969) have all demonstrated that when patients are asked to describe their experience of hospital, this experience is almost totally restricted to the activities and facilities which occur in the ward context. This suggests that events which occur for patients on the hospital ward have wider implications. Thus while very important medical treatment such as surgery occur away from the ward, the opinions and attitudes patients develop towards hospitalisation are based on their experience of the ward setting.

The role played by the hospital ward has changed over the years. Section 2.1 describes the ward's origins in the Poorhouse. Section 2.2 presents the changes in the role, when medicine became more advanced, as practiced in the Voluntary hospitals of the nineteenth century. The role of the modern ward is discussed in Section 2.3.

2.1 The Poorhouse

The precursor to the hospital ward was the poorhouse dormitory created by the Poor Law of 1601 (White, 1978). This was the first setting to provide treatment and care of the sick away from the patient's home. No special provision was made for the sick within them and tending the sick was the responsibility of the other inmates. The next two hundred years saw the gradual shift in the type of inmate from those who were destitute to people in need of medical care, with the setting taking on the characteristics of a hospital ward. At the turn of the eighteenth century complicated surgery was not possible and all medical help was restricted to the ward context. For the most part the role of wards was to provide care rather than treatment.
From writings of the time comes the impression that they were generally informal, relaxed places without the rigid routine that was to later characterise the hospital ward. For example White (1978) suggests one of the major responsibilities of the matron was to control the excessive drinking by the ward staff. Alkin (1771) and Howard (1791), authorities on hospital wards at that time, both discussed the provision of small wards with good circulation of air and provision of sitting rooms to aid convalescence. By the mid nineteenth century these institutions had taken on the status of long-stay infirmaries.

2.2 The Voluntary Hospital

The nineteenth century saw the growth of Voluntary Hospitals which were also based on charity but were supported by personal subscriptions from the middle and upper classes. These hospitals were selective in their choice of patient with emphasis on interesting medical problems with good prognosis, rather than long stay patients as characterised by the infirmaries. This time also saw major advances in medicine such as Lister's aseptic methods of dressing, Koch's discovery of bacteria and new developments in anaesthesia. These led to a vast increase in surgery. The wards became the setting for post-operative care characterised by total bed-rest.

The change in treatment necessitated a ward design that would allow maximum surveillance of the patients while they were in bed. At this time the most authoritative writer on ward design and function was Florence Nightingale. She considered the most important criteria for determining the number of beds and nurses on a ward were "ease of supervision and economy of attendance" (1863). Up until this time the average number of patients looked after by a sister and two nurses was twenty. She calculated that with adequate supplies of hot and cold water and lifts, this number could be increased to thirty-two. The result of these recommendations and the necessity for economy was the thirty-bedded open plan ward which still carries her name. The Nightingale ward was to remain the dominant ward design until the created of the Nuffield plan in 1955.

2.3 The Modern Hospital Context

The modern general hospital functions as an industrial complex. Green (1974), for example, describes twelve different major groups at work within a typical hospital, excluding the administration. Each of these has a distinct hierarchial organisation and areas of control. This has been necessary because the highly technical nature of medical care now given has resulted in providers being experts in only limited aspects of the care. As demonstrated by Rosengren and DeVault (1963) fragmentation
of care in terms of who provides it and where it occurs is present even in an obstetrical department where a very obvious common goal, child birth, is shared by those in the setting. Total medical care can no longer be brought to the patient, rather the patient is taken to the relevant departments.

The segregation of the different providers both in terms of skills and location is reflected in the plan developed by the Nuffield team. The early convalescent wards of the seventeen hundreds and the open plan wards of the next century were plans based upon the level of development of the medical profession. The Nuffield plan was not. This plan was based upon a theory of ward care that was contrary to the technology based treatment of other parts of the hospital. The theory was the outcome of the Nuffield Job Analysis study (1953) which was conducted to answer the question 'what is the proper task of the nurse'; a question formulated by the government Working Party on nurse recruitment and training. The Nuffield Job Analysis team concluded that all the patients' nursing requirements:

'originate in human needs which inevitably react upon one another ... and the best way to ensure that the effectiveness of the treatment is not discounted by these factors is surely to allow the patients' medical, emotional and physical needs in relation to nursing to be met by the same individual'

The intention of this approach was to shift the priority from technical care of the disease to basic care of the patient as a person. The ward planners responded directly to this proposal:

'during non-peak periods it was thought that the trained nurse would be able to supervise two units of eight patients. Eight and multiples of eight were therefore accepted as the basis for planning' (Nuffield, 1955).

2.4 Summary of the Role of the Ward

Historically the two major types of 'in house' care were the Infirmary wards which cared for long stay patients and, later the Voluntary hospitals with their emphasis on medical treatment. The Infirmary wards were designed as custodial settings while the Nightingale wards were intended to facilitate the more technically oriented care required in the Voluntary hospitals. The Nuffield design represented a break with tradition not only because it was intended to reflect the more restricted role of the modern ward setting in the provision of medical care but also because it was based upon what the designers thought the role of the nurse ought to be rather than what it actually was. The Nuffield research and design team produced a ward plan that was intended to encourage nurses to return to the more custodial based 'infirmary' form of nursing. However the nursing profession has developed along the lines of the care provided in the Voluntary hospital. In order to illustrate
the extent to which the Nuffield objectives are contrary to the orientation of nursing at that time (1955), it is necessary to describe the development of nursing as a profession.

3 THE ROLE OF THE NURSE IN THE DELIVERY OF CARE

Section 2 presents research evidence that indicates that the ward is the most important setting in creating the patients' image of what the hospital is like. Raphael's (1969) research also illustrates that within the ward setting, patients place most emphasis on the care they receive by the nurses. This is consistent with the role of the nurses as primary providers of care. The major portion of their work is contained within the ward setting, unlike doctors and paramedical staff.

Nurses have always been the primary providers of care. However the role played by the nurses in providing this care has evolved from an unpaid maid to a highly technical professional role. The major stages in this development are the role of the Poorhouse nurses (Section 3.1) and the implementation of formal training (Section 3.2). Section 3.3 discusses the orientation of nursing as a profession. It describes how this orientation is a result of the way the nursing profession developed.

3.1 The Poorhouse Nurses

The two primary responsibilities of the ward staff, that of providing basic care and maintenance, and implementing the treatment prescribed by doctors, have not changed since 'in-care' treatment began. For example, the responsibilities of the paid nurses in the poor house, as laid down by the 1848 Poor Law, were:

'To attend upon the sick in the sick laying-in wards and to administer to them all medicines and medical applications, according to the direction of the medical officer. To inform the medical officer of any defects which may be observed in the arrangements of the sick in the lying-in wards. To take care that a light is kept at night in the sick wards.'

(taken from White, 1978).

According to White (1978) these duties are no different from those of the pauper nurses of the eighteenth century. What had changed was who provided the care and the way these responsibilities were organised.

Until 1848 the major distinction between the patient and the provider in the poor house was that the patient was ill. The inmates who nursed the sick were known as pauper nurses and received no pay. Even when paid nurses were brought into this system, they were generally people who could find no other work and from the lowest social classes. The medical profession was very resistant to the idea of formal training for these nurses as the type of work required was mainly as ward maids. In both the poor house infirmaries and the voluntary hospitals, convalescent patients were still expected to help with the nursing duties. The level
of skill developed by the nurses was dependent upon the amount of training provided by the doctor. There was little contact between staff of different wards and no formal organisation which would allow staff promotion or movement between institutions.

3.2 Formal Training of Nurses
The low status given to the care of the sick had a major influence on how nursing developed as a profession. As previously indicated, the establishment of voluntary hospitals created the distinction between acute treatment and long stay care which still exists. The medical advances which made acute treatment possible also necessitated greater technical skills for the nurses providing care to such patients. As a consequence it was within the context of the voluntary hospital that formal nursing training began.

When Florence Nightingale began the first school of nursing in 1860 she intended recruitment to come from the upper-working class. In reality it attracted daughters of the upper-middle class Victorian family. The nursing hierarchy which existed prior to formal training such as it was was based on class distinctions, with the nurses in charge of the wards being of a higher social class than the nurses providing the direct care to the patients. To fit with this system, when these upper-middle class women finished their training they tended to replace the 'matron', which until then was not a nursing post. This meant the role of the trained nurse became one of administrator, with the core 'bedside care' still remaining in the hands of untrained or trainee staff.

The new matrons in turn set up training schools in their hospitals. In order to free the nursing profession from the stigma of ward maid these schools instituted a three year course with emphasis on the technical skills involved in acute nursing. As over one hundred years later this is still the length of training even with all the changes in the medical field, the necessity for that length of training can be questioned.

3.3 The Orientation of the Nursing Profession
Florence Nightingale saw doctors as providing only clinical treatment, with nurses providing the conditions congenial to ultimate recovery. Thus while being the clinical assistant of the doctor, the nurse also would be responsible for diet, environment, comfort, welfare and overall care of the patient (White, 1978). Yet because of the way the profession developed, advancement in the profession moved the nurse away from direct care of the patient. In addition because of the form of training provided, as suggested by White 1978, these trained nurses did not take the opportunity of expanding their profession in terms of the various aspects of care indicated by Miss Nightingale. Rather, the major
extension of their role was in terms of assistant to the doctors by the emphasis on acquiring more technical skills to take over the discarded routines of the doctor. This led to ambiguities as to whether the goal of nursing was one of care or, as with the medical profession, one of cure. Conflict still exists as to the priorities of these two basic responsibilities of the ward nurses; that of providing care or implementing the treatment prescribed by doctors (Nuffield, 1953; Roper, 1976).

3.4 Summary of the Role of the Nurse
Nursing has developed into a highly technical profession with a career structure. As will be described in Chapter 8, there are very few domestic activities which remain the responsibility of the ward nurses. The development of the nursing profession and the development of ward designs have occurred in synchrony. It is the break with this tradition that makes the Nuffield plan such an important development in the history of ward designs. Section 4 presents a detailed account of the development of this plan.

4 THE NUFFIELD WARD PLAN: ITS CHARACTERISTICS AND DESIGN PRINCIPLES
A list provided by the Architectural Division of the Department of Health for the contents of a well equipped modern ward contains 25 separate identifiable places and 6 different systems (e.g. piped medical gas system). (See Hospital Evaluation Research Unit, 1976, for a reproduction of the list.) This is very different from the ward design advocated by Florence Nightingale who maintained that given an open plan ward, bed lifts, and hot water, two nurses could look after 32 patients. Modern wards have become units with highly differentiated spaces, specially designed to accommodate specific nursing activities. The most important reference in terms of understanding why modern wards are as they are is the work of the Nuffield Trust (1953, 1955). Therefore, to describe current designs it is necessary to consider the characteristics of their prototype design and the rationale behind the Nuffield decisions. This work is unique not only because of its impact on modern ward design but also because the plan was formulated on the basis of systematically conducted behavioural research in the ward context. The research findings utilised in the development of the plan were mainly concerned with the activities carried out by nurses on acute wards.

This research on nursing activities had two major types of input to the ward plan. The Job Analysis (1953) of nursing activities was used to formulate the design objectives. In addition studies were carried out to answer specific design questions such as levels of provision (1955). The major innovations in the plan are presented in Table 2.2.
Table 2.2 The Design Innovations of the Nuffield Plan

1. The organisation of the ward into Nursing Units, i.e. the number of patients a trained nurse can look after with help.
2. The partitioning of the ward to create bedroom cubicles.
3. The placement of the ancillary rooms in the centre of the ward.
4. The provision of separate clean and dirty utility rooms.
5. The provision of a treatment room on the ward.
6. Increased provision of single bedrooms.
7. The placement of the single bedrooms to accommodate a wider range of patients needing this facility.
8. Increased provision of sanitary facilities.
9. The creation of a dayroom which is separate from the bedrooms.

The three major design objectives, which were to improve the status of basic nursing, to improve the efficiency of the nurses, and to place more emphasis on patient wellbeing, are discussed in the following subsections.

4.1 Improving the Status of Basic Nursing

This objective resulted in the greatest innovations in ward design. Emphasis on the basic care of the patient was a direct result of the findings of the Job Analysis (1953) a detailed observational study of nurses activities in the ward. In that study Basic Nursing was defined as:

'care required in the interests of comfort and well-being of the patient for the maintenance of health and the prevention of infection irrespective of the disease from which he is suffering' (1953).

The findings of the Job Analysis indicated that this group of activities was most vulnerable to ward characteristics. The amount of time nurses spent on these activities was affected by the dependency levels of the patients, the size of the ward, the quality and quantity of labour-saving equipment and the location of the sluice and bathrooms with respect of the rest of the ward. However the most significant results with respect to the development of the plan were concerned with the allocation of duties of the various groups of ward staff. The study found that 74% of all basic and technical nursing which took place was provided by students, while S.R.N.'s provided only 16%.

The general low regard for basic nursing is reflected in the fact that the group providing the next greatest amount of the care were orderlies. The previous discussion of the history of nursing suggested that the medical advances and the desire to make nursing a respectable profession in the latter part of the nineteenth century changed the goal of the trained nurse from Care to Administration. The Nuffield findings suggest that by 1953 this orientation had not changed. In their conclusions the
Trust suggested that the goal of the trained nurse should be to provide total patient care, including basic nursing activities. This led to a totally new ward organisation being proposed. The organisation included the provision of a ward secretary to relieve the sister of clerical tasks related to the administration of the ward, and in addition it increased the size of the administrative unit, and changed the role of the staff nurse from sister's deputy to being directly responsible for care of the patient. This was to be achieved by organising the administrative unit into Nursing Units, where the staff nurse could provide direct care. The form of ward organisation became known as Team Nursing. It was the decision to localise the area of responsibility of the staff nurse to well defined geographical areas of the ward which led to the particular design solutions intended to improve nursing efficiency. (See Section 4.2).

Emphasis on improving the status of Basic Nursing also led to the creation of a treatment room on the ward and influenced the distances that would be maintained between beds. Results of the Job Analysis indicated that Basic Nursing such as providing meals, grooming the patients and time of waking the patients were frequently interrupted or determined by Technical Nursing, that is 'tasks that are concerned with the treatment of the disease from which the patient is suffering'. It was therefore decided that all Technical Nursing should occur in the treatment room.

4.2 Improving Nursing Efficiency

The major innovation in the plan intended to improve nurse efficiency concerned the general layout of the ward to reduce time spent in travelling from one facility to another. In order to assess where this time would be most effectively saved, a study was conducted of sequential recordings of all the journeys on nurses tours of duty (Nuffield, 1955). A total of 27,327 journeys were recorded. Three different ward designs were included in this work, an open plan 26 bedded ward, a ward with two bed areas with 11 beds each, and the ancillary rooms between them, and a design with four 4 bedded rooms on one side of the ward and the ancillary rooms on the opposite wall. The results showed no difference between the designs either in the distance travelled or in the pattern of movement. What it did show was that the majority of trips were from bed to bed, confirming the Job Analysis results that specific nurses carried out specific activities for all the patients. The other major type of journey identified from the study was between the bed area and the ancillary rooms.

From this study it was concluded that greatest compactness occurred for
wards which had the beds parallel to the wall as opposed to the traditional design of placing the head of the bed against the wall. By increasing the width of the ward through placing the beds against partitions extending out from the peripheral walls the length was substantially reduced. In addition the ancillary rooms were placed in the middle of the ward, dividing it into two sides, each side containing two Nursing Units. This decision was based on the assumption that Team Nursing, with each nurse assigned to a small number of patients, would occur in these wards and therefore the longest journey would be from one end of the ward to the centre.

Success of this layout in terms of efficiency was totally dependent upon the "Team Nursing" form of ward organisation being used, as the journeys study illustrated that no improvement in travel time would be achieved if the traditional form of care-provision was maintained.

Improving the efficiency of the nurses also resulted in a general upgrading in the type and provision of equipment in the ancillary rooms, as this was found to be related to the amount of time available to spend with the patient. This was also influenced by the Job Analysis finding that cross infection in the ward was rarely caused by procedures at the bedside, but rather occurred in the preparation and disposal of materials. This resulted in the creation of separate clean and dirty utility rooms.

Specific pieces of research were also carried out to aid in the design decisions concerned with nursing efficiency. An experimental bed area was set up to photograph nursing procedures which were considered to be appropriate for the bed area. This information was used to determine the precise distances that would be maintained between beds. A study was conducted in one surgical ward which had a treatment room to determine whether it would be used and the number of patients it could handle. A similar project was carried out for clean and dirty utility rooms in five surgical wards. The frequency of use, the number of nurses using the facility at one time, and the peak hours of use obtained from this work were used to determine the size, the fittings and the locations in relation to each other of these facilities.

4.3 **Facilitating Patient Well-being**

Organising the ward such that each patient would be given all forms of care by a small team of nurses reflected the concern that patients should be cared for as people and not as diseases or conditions. The plan also incorporated a general upgrading of patient facilities. This included specially built day rooms and increased provision of sanitary facilities. The size and level of provision was the result of a study of dependency
levels to determine what would be needed if an early ambulation policy was implemented. A study was also conducted to determine the type of patients who would need single bedrooms. It was concluded that there were two major types: patients who needed close supervision and patients who needed to be isolated from others for either medical or social reasons. This resulted in single rooms being placed both near the Nursing Station and at the far end of the ward.

Another aspect of designing a ward for the 'whole patient' was the Trust's belief in the necessity of providing the patient with as much privacy and lack of disturbance as was possible in this type of setting. Throughout the report (1955) this was given as an additional reason for most of the design decisions. For example the inclusion of a treatment room would allow patients greater privacy when being treated than could be achieved at the bedside. The location of the day space away from the bed area was also intended to reduce disturbances, as was the provision of single bedrooms at the end of the ward for patients who may be disturbing other patients. The creation of small multi-bedrooms, besides improving compactness, was also seen as a way of reducing the disturbances caused to a patient from other people and parts of the ward. This emphasis on smaller bedrooms for greater privacy was not a result of the research, since activities concerned with the emotional needs of the patients were excluded by the Job Analysis. Rather, it was a socio-political decision. The reason, cited in the Nuffield Report, is the same reason for their creation in the first place. Their origins lie in America where it was felt necessary to make a distinction between paying patients and charity patients. It would not have been appropriate to provide a different quality of medical care. Therefore the paying patient bought dignity through being housed in smaller separate units. In other words privacy of the hospital patient has become equated with dignity, and it was felt that it would be unacceptable to the public at large to return to the open plan hospital ward.

4.4 Summary of the Characteristics and Design Principles of the Nuffield Plan

In summary, the creation of the Nuffield plan was a significant event in the historical development of British hospital wards for four important reasons. They are:

1. It represented a radical departure from the traditional open plan ward.
2. It became the prototype for later ward designs.
3. The results of systematically conducted behavioural research were used to formulate the principles behind the design.
4. Explicit statements of the design principles were made.
Because of its innovatory nature, the Nuffield plan was based upon assumptions regarding the interrelation between the design and the activities which occur in that setting. Yet no major attempt has been made to examine the validity of these assumptions. Section 5 raises several issues which suggest that such an examination is needed and argues that the most effective means of approaching these issues is through the evaluation of modern wards by the nurses working in these settings.

5 THE NEED FOR NURSES' EVALUATION OF MODERN WARD DESIGNS

Current ward designs come under various labels, such as Racetrack, Double Corridor, Single Corridor and Nucleus. However an examination of the 138 modern wards included in the present work illustrates that all incorporate the six basic design innovations developed by the Nuffield Trust. Variations between the designs are restricted to different interpretations of the Nuffield characteristics. Examples are the size of the ward and of the cubicles, whether the cubicles are rooms or open bays, the location of patient facilities and the location of the nursing station. The similarity between these designs and the Nuffield plan suggests that the principles upon which the Nuffield plan were based are generally accepted as appropriate. This is further reinforced by reference to Table 2.1. Yet there are several characteristics of the Nuffield research and design which suggest that a mismatch may be occurring between current ward design and present nursing practice.

The perpetuation of potentially inappropriate design principles is at least partly due to a lack of proper evaluation research directed towards examining the match between design and the activities a ward is intended to house. Research carried out on modern wards since the time of the Nuffield work has followed a similar pattern to ward plan development. These Design-in-Use studies (see King Edward's Fund, 1968 for review) have been single-case studies to assess whether the plan fulfils the design principles and whether the occupants are using the setting correctly. These studies are characterised by their informal research methods and their failure to question the principles upon which the designs have been based. To date there has only been one piece of systematic research conducted on current ward designs in Britain (Sears and Auld, 1976) which allows comparisons across design types and which examines the relationship between these designs and nursing care as it is currently being provided. However that study included only 12 modern wards. The main survey in the current work provides a comparison amongst 138 modern acute wards.

Three characteristics of the Nuffield work point to the need for
evaluation of wards developed from that plan. They are: the bedside oriented form of care promoted by the design (Section 5.1), the fragmented design produced (Section 5.2) and the definition of nursing care used to formulate the design principles (Section 5.3).

5.1 The Bedside Oriented Form of Care

One of the most fundamental objectives of the Nuffield team was to bring the qualified nurse into greater contact with the patient. The design solution to promote this was the creation of nursing units. This was based on the assumption that the important contacts which occur between nurses and their patients take place at the bedside. The historical evidence suggests that direct nursing has never been carried out, to any great extent, by trained nurses. The recently implemented Salmon Scale (Ministry of Health, 1966), which changed the structure of the nursing professional hierarchy, indicates that the trend of removing qualified nurses from the patient has been extended even further. The greatest expansion of the profession through this scale is for administrative positions above the ward level.

Roper (1976), a current writer on the theory of nursing maintains that the reason behind the continued movement away from the patient is due to the failure of ward nursing to expand beyond the common image of 'ministering angel at the bedside'. She contends that the custodial role is not adequate for the level of training received. Her suggestion is that nurses should be trained as counsellors to teach personal health and care to the patient. This would change the patient's responsibility for his health from the passive role established in the nineteenth century voluntary hospitals. For the nurses it would provide a very different solution to the problem recognised by the Nuffield team, that nursing care is focused on the treatment of diseases and not on the care of the total patient. While the Nuffield work emphasised the custodial care at the bedside, Roper advocates a form of a contact between nurse and patient which would reduce the emphasis on bedside care and would provide a more dynamic role for the nurses working on hospital wards.

The Salmon Scale and current writings on nursing theory (White 1978, Roper 1976, Abel-Smith, 1960) all suggest that the Nuffield solution to the practice of nursing may well have failed to accomplish its objective. This points to the necessity of examining the relationship between the designs based on this plan and nursing care as it is currently being practiced.
Two specific unanswered questions relating to their emphasis on bedside care are:

1. What is the focus of nursing care in modern wards?
   The Nuffield Job Analysis (1953) indicated that the qualified nurses working on wards had administrative responsibilities more as their focus than direct patient care. The Plan partitioned the ward into Nursing Units in order to encourage qualified staff to focus more directly on the patient. However it remains an empirical question as to just what the nurses themselves see as the focus of nursing care in modern wards.

2. What is the range and nature of the contacts between patients and nurses and where do these contacts take place?
   If the care given to the patients at the bedside is shown to be the predominant form of contact, then a design such as the Nuffield Plan would suffice. However, if nursing care involves contacts such as suggested by Roper, then wards based on the Nuffield Plan may be facilitating only a limited aspect of nursing care.

5.2 The Fragmented Modern Ward Design

Another concern with respect to the Nuffield work relates to the research used to formulate the basic design principles. The Job Analysis recorded which grades of nurse carried out particular activities but not where the activities occurred. It can be suggested that this failure to establish the relationship between the physical setting and nursing had a direct impact upon the type of plan produced. The emphasis in the Nuffield design was to correct the fragmentation of care in terms of who was providing it. In attempting to achieve this a design was created which provided fragmented Nursing Care in terms of where it took place. The studies which led to specific design decisions succeeded in more effectively incorporating the physical setting. However, with the exception of the journeys study, these areas were dealt with as discreet physical entities. Even the use of the results of the movement patterns of the nurses were restricted to movement between the bed area and the ancillary rooms. As has been suggested, modern wards have become units with highly differentiated spaces, specially designed to accommodate specific nursing activities. However the ward functions as one unit and only at this whole ward level does total nursing care take place.

Research is needed on the relationship between current nursing practice and modern ward plans. This research should not only provide information on how well these discreet areas facilitate the activities for which they were designed but also must illustrate how these areas function together.
to provide total nursing care.

Specific examples of empirical questions which demand treatment of the setting as an integrated system of care are:

1. Do nurses consider access to the bedside occurring from the ancillary rooms?
   The Nuffield Plan was particularly concerned with minimising the distance between the bed areas and ancillary rooms. Is this the most important journey for nurses?

2. Do compact, but partitioned wards reduce the perceived distances between nurses and patients?

3. What is the relationship between the bedside and the treatment room as areas where treatment occurs?

5.3 Limitation of the Operational Definition of Nursing Care used in the Nuffield Research

The final concern in relation to the Nuffield work is the impact that the Job Analysis operational definition of nursing care had on the final design produced. The richness of the general definition presented by this study is one of its unique features. More recent studies using observations of nurses on wards have restricted the problem to patterns of movement (see for example Lippert, 1971). The Nuffield team emphasised that Nursing Care could not be directly equated with efficiency. They defined Nursing Care as:

'\textit{those activities necessary to provide for the patient's physical, medical and emotional needs}'.

This ensured that a much wider range of activities were recorded than just movement patterns. However their method of data collection, direct observation, could not accommodate all the activities considered by the Trust to belong to their definition of Nursing Care. For example, they stated that observation of patients and supervision of untrained staff could not be directly observed.

The design emphasised those aspects of care which were specially highlighted by the study. Consequently the design emphasised access to, rather than observation of, patients by the creation of bedroom cubicles. In addition the authors of the Job Analysis explicitly stated that the activities concerned with the patients' emotional needs were excluded from the study because they could not be directly observed.

This lack of information on the activities related to patients' emotional needs led to the assumption that privacy and lack of disturbance were the patient's primary concern. The creation of separate dayrooms, separate treatment rooms and smaller bedrooms were all intended to facilitate this. Yet more recent research (Raphael, 1969; Sears and Auld, 1976; and Noble and Dixon, 1977) suggest that this may be an unwarranted assumption. Specific questions arising from the limited operational definitions of nursing care are:
Is observation an important activity for the nurses or has it been replaced by access as intended by the Nuffield work?

Are observation of patients and privacy mutually exclusive, i.e. does a ward plan exist which adequately facilitates both concerns?

What are the activities of the nurses that are necessary to provide for the patient's emotional needs?

The implication of these concerns is that direct observation is not the most appropriate method of investigating the relationship between ward design and the provision of nursing care. The very fact that the Nuffield Trust could identify activities they were unable to record supports this.

6 SUMMARY OF THE RELATIONSHIP BETWEEN WARD DESIGN AND NURSING CARE

The Nuffield Plan introduced a radical change in acute hospital ward design with all current ward designs being based upon this plan. Yet there has been no systematic research conducted to assess the success of the designs derived from the Nuffield prototype.

The major focus of the Nuffield work was to facilitate the activities of the nurses. It is therefore appropriate that current ward designs be investigated in terms of their ability to facilitate nursing care. However this restriction of the investigation to the relationship between ward design and nursing care does not assume that the nurses are the only users who should be taken into consideration. Section 1 provides information that indicates the ward is the focal place for a patient's experience in hospital. A complete assessment of the success of current designs would need to accommodate this patient experience. However a major objective of the work is to compare a large sample of current wards. For practical reasons only one user group could be accommodated.

The close link between design and nursing suggests the nurses are the most appropriate group upon which to focus.

Both historical and current evidence suggests that the form of care around which the Nuffield Plan was organised may not be consistent with current nursing practice. If this is true the present ward designs may be perpetuating a mismatch between the environment and the activities it is intended to house. Rather than proposing alternative designs based on other possible methods of providing care, as was done by the Nuffield Trust, it is more important to identify the relationship between current designs and current nursing practice in order to provide information for future designs.

As suggested by the Nuffield work, direct observation is not the most appropriate method for establishing this relationship, since observable activities do not constitute all aspects of care. Therefore the approach taken in the current study is to utilise the nurses own conceptual system
of the relationship between the ward setting and current nursing care. Thus information will be provided on ward designs in the form of the nurses evaluations. This will establish not only the nurses' assessments in quantifiable terms, but also the reasons behind the nurses' assessments.

One of the practical objectives of this research is to develop a research instrument for the evaluation of current ward designs. A further objective is to obtain from the information a statement of the congruence between modern ward designs and current nursing practice. Consequently this work has a very applied element to it. In this respect it can be considered a part of the large field of evaluation research. It is therefore useful to examine the aims, approaches and problems of the field as an aid to identifying the most appropriate approach to take for this research question. Chapter 3 discusses the issues involved in environmental evaluations and evaluation research.
Chapter 3
EVALUATION AS A RESEARCH FIELD

Chapter 2 describes the close relationship that has existed historically between ward design and nursing care. Indeed the major innovation in ward design in the past 100 years, the Nuffield Plan, was designed largely on the basis of research into nursing care. The design of the plan was in terms of what the research team thought nursing care ought to be rather than what it actually was. This break with tradition suggested there is a need for information on the effectiveness of the modern ward which evolved out of the Nuffield work.

The present research is an attempt to provide such information. The applied aspect of the present research places it in the category of environmental evaluations. This chapter describes the common characteristics and problems associated with research concerned with applied issues. The limitations of the approach are discussed and the need for a more theoretical basis is argued.

1 CHARACTERISTICS OF EVALUATION RESEARCH

Environmental evaluations make up a large part of environmental research. For example Bechtel and Srivastava (1978) identified over 1000 researchers who have conducted housing evaluations alone. In addition, environmental evaluations can be usefully described as part of a much larger area of work known as Evaluation Research. The publication of guides to this field such as the Handbook edited by Struening and Guttentag (1975), the book of readings by Caro (1971) and the recent establishment of a journal solely devoted to this topic, Evaluation Review, testifies to the growth of the field.

Evaluation research (Cronbach 1963) covers areas such as programming approaches (e.g. remedial reading), administrative unit (e.g. schools), individual practitioners (e.g. doctors) and recipients of services (e.g. patients or students).

While environmental evaluations have a more limited focus, the physical setting, these two areas of research share the same aims, approach, emphasis and problems. This is reflected in the definitions of these research areas.

Evaluation research is:

'a study whose aim is to evaluate the effectiveness of some treatment or plan' (Deming, 1975)

'the procedure by which programs are studied to ascertain their effectiveness in fulfilling goals' (Greenberg, 1968)

'a sincere, multidisciplinary interest in objectively assessing the consequences of planned social action' (Milocare and Struening, 1978)
Environmental Evaluation is:

- 'assessing the effectiveness of a designed environment for users' (Friedmann et al., 1978)
- 'the examination of the effectiveness for human users of occupied designed environment' (Zimring and Reizenstein, 1980, p429— a summary of the definitions used by Bechtel and Srivastava, 1978; Brill, 1974; Gutman and Westergaard, 1974; Ostrander and Connell, 1975; and Zeisel and Griffin, 1975)

The common aims, approaches, and emphases of these two areas of research will be illustrated in the following sections.

1.1 Aims

As implied by the definitions, both areas deal with applied problems. The research is intended to address and answer specific questions concerning the success of planned social projects and planned environments.

'Evaluation studies are generally preoccupied with providing answers to carefully formulated questions and not with testing hypotheses or with making predictions derived from theories' (Struening, 1975)

The function of such work is to 'assist decision-makers to make wise choices among future courses of action' (Weiss, 1975).

A distinctive characteristic arising from their applied orientation is that the focus tends to be on specific programs (Caro, 1971) or in the case of environmental evaluation, on a single type of designed setting (Zimring and Reizenstein, 1980). This can be contrasted against research directed toward social processes, for example crowding, social facilitation and achievement, which occur across settings and programs.

1.2 Approach

Researchers in both areas stress the importance of using the scientific method. For example Friedmann et al. (1978) emphasises the need for rigorous techniques, firmly grounded in the social sciences for the evaluations of buildings. Stake (1967), in reference to programme evaluations, notes that informal evaluation depends on casual observation, implicit goals, intuitive norms and subjective judgement. These are similar criticisms to those presented in Chapter 2 with regard to the Design and Use studies (King Edward's Fund, 1968) intended to evaluate current ward designs. Struening (1975) suggests that without this scientific approach such work can not be validly described as evaluation research. He defines the areas as:

'the application of scientific principles, methods and theories to identify, describe, conceptualise, measures, predict, change and control those factors or variables important to the development of effective human service delivery systems' (Struening, 1975)

The general concern for systematic scientific enquiry is reflected in the frequency with which issues such as instrument validity and reliability
are mentioned. For example the Handbook of Evaluation (1975) contains a chapter by Nunnally and Durham especially devoted to these issues. In addition a recent review of environmental evaluations (Zimring and Reizenstein, 1980) highlights the necessity of instruments for evaluating settings having these qualities.

1.3 Emphasis
Another common characteristic of these two areas of research is that they take the researcher to be the evaluator. For example Struening and Guttentag (1975), Weiss (1975) and Davis and Salasin (1975) in their descriptions of evaluation explicitly place the researcher in this role. The consequences of this is that the process of evaluation is taken to be the various stages involved in the formulation, conduction and utilisation of research. This places emphasis on such issues as sponsorship (Zimring and Reisenstein 1980), the political context in which evaluations occur (Weiss 1975), the relationship between the agency to be evaluated and the researcher (Nunnally and Wilson 1975), methodology (Friedmann et al., 1978; Nunnally and Wilson 1975; Campbell 1971; Trow 1971) and the communication of results (Davis and Salasin 1975; Friedmann et al., 1978 and Reizenstein 1980).

1.4 Summary of Characteristics of Evaluation Research
Studies in both fields of research have tended to focus on specific applied research questions. Their unique contribution is that they bring systematic research methods to areas of problem solving traditionally dealt with by administrators. This relatively new role for the researcher has lead to an emphasis on this role. The common problem of utilisation is also shared by these research fields and is discussed in Section 2.

2 THE COMMON PROBLEM OF UTILISATION
Evaluation research and environmental evaluations have as their primary objective the utilisation of results. As stated by Edwards et al. (1975):

'If it (an evaluation study) does not improve the basis for decisions about a program and its competitors, then it loses its distinctive character as evaluation research and becomes simply research.'

Yet articles reviewing the state of the art, Caro (1971) and Davis and Salsin (1975), not only provide lists of instances where evaluation results were not implemented but also lists of references each dealing with particular reasons why utilisation does not occur. The implementation of environmental evaluation findings can be seen as even more difficult. While projects can be redesigned and modified in the light of evidence, Friedmann et al. (1978) have remarked that 'it would be costly and difficult to undertake major structural alternations of
buildings in response to research studies. In recognition of this problem Markus (1969) has put forward the notion of 'feedforward', that is that the information required should be fed into future designs. This puts environmental findings in a very distant position from decision making. As indicated by Bechtel (1976), when this feedforward is adopted it is difficult to ascertain whether the design decisions have accommodated the information beyond the gross level of 'to build or not to build' a particular project.

2.1 The Time Element in Utilisation
The problems concerning the utilisation of results occur with respect to the immediate application of specific findings. Both Weiss (1972) and Ciarlo (1974) indicate that effective utilisation becomes more apparent if monitored over a sufficiently extended period. In addition Zimring and Reizenstein (1980) suggest that the time element in implementation is related to the nature of the research. Research directed towards answering questions specific to a given project or design are intended for immediate implementation. Utilisation of such information, as indicated above, frequently does not occur. At the other end of the time continuum is research which develops what Zimring and Reizenstein (1980) refer to as heuristics. An example of this is Weisman's as yet unpublished work on development of a model of built-environment cognition. Evaluation work of this nature is intended not only to respond to specific questions, but also to formulate questions in such a way as to provide generalisability to other situations. Cialdini (180) describes social research which responds to both short and long term applications as 'full cycle social psychology'.

2.2 The Pragmatic Approach to Evaluation Research
There is a failure in much of the evaluation research, on both social projects and environments, to consider the long term implementation as part of the research objectives. This, it can be suggested, is the cause of much of the disquiet arising in these fields of research. For example Zimring and Reizenstein (1980) indicate that much of the building evaluations are rudimentary and inconclusive. Craik and Zube (1976) note the lack of coordination of environmental research concerning different environmental domains. Friedmann et al. (1978) state that the theory and applications in environmental evaluations are too frequently dealt with as separate issues and suggest that design evaluations should be used to define theory, which in turn can be utilised in subsequent appraisals.

This concern for the lack of cumulative knowledge is also apparent in evaluation research literature in general. For example Struening (1975) stresses that if this field is to become a mature discipline, evaluators
must take more interest in the theoretical sources of their applied work. Simon (1969) points out that without an adequate conceptual framework the gathering of more information may confuse rather than clarify. Twain (1975) proposes that the construction of an adequate theory, whilst being difficult in the applied context, is essential to ensure that future research will be a logical development from previous work. From a slightly different perspective, Lehman (1975) and Ciadini (1980) suggest that since in general evaluators are social scientists, failure to test basic theories in the field is a missed opportunity. The failure to accommodate the possibility of long term applications for evaluation findings results from the characteristics of this type of research. This is illustrated in the following sections.

2.2.1 Limited Aims
Evaluation studies tend to focus on a specific project or setting rather than on social and psychological processes that generalise to other situations (Altman 1975, Weiss 1975, Kenny and Canter 1981).

2.2.2 Emphasis on the Activities of the Researcher
The researcher is considered the evaluator. Taking this perspective the one process which generalises across contexts is the process of research. This results in theory construction being directed towards the description of the relationship between the various stages of research from conceptualisation to utilisation. Examples are Aronson and Sherwoods (1967) 'impact model' which describes how service is related to intermediate and long term goals, Friedmann et al.'s (1978) 'structure-process' model for building evaluations and Keys and Wener's (1980) 'Four-Phase Intervention' model for building evaluations.

2.2.3 Time Constraints
Evaluation studies are frequently carried out under time constraints. For example Suchman (1969) describes the primary function of an evaluation as to 'appraise comprehensively a practical activity to meet a deadline'. A consequence of this, as pointed out by Struening and Guttentag (1975), is that researchers are often forced to use measures developed in different contexts, since time (and resources) do not allow for the development of new measurement instruments. They further suggest that frequently these measures are not appropriate for the demands of the study. A clear example of this in the environmental literature is a study conducted by Trites et al. (1970) to provide a comparative assessment of three different ward designs. One of the instruments was a questionnaire to measure tension, anxiety, psychomatic disturbances and fatigue. No statement is provided to indicate why these measures were appropriate for the comparison of wards designs and, as would be
expected, when the results of this survey were analysed the findings were completely inconclusive; no clear pattern could be found. Concern to ensure that inappropriate use of previously established instruments does not occur frequently is reflected in the general emphasis placed on testing the relevance, validity, and reliability of the instruments. While it is not intended to imply that these criteria for instrument construction are not important, it must be noted that empirical tests are not a substitute for a theoretical basis for identifying and defining the constructs appropriate to a given research problem. As pointed out by Milcarek and Struening (1975) measurement concerns the operational definitions of constructs, and as such it is a further step in the classification of the subject matter.

2.3 Summary of Problems of Utilisation

Implementation of results according to Edwards et al. (1975) is the major criterion for assessing the success of an evaluation study. Yet the literature suggests that implementation of results concerned with specific issues frequently does not occur. In addition the literature also indicates that this type of research rarely is oriented towards theoretical proposals which may have long term significance. The concerns and limitations described are those expressed by people who are attempting to guide researchers in their evaluation work. The following section provides illustrations of the consequences of these limitations in environmental evaluations.

3 CHARACTERISTICS OF ENVIRONMENTAL EVALUATIONS

The consequences of research being project-based, being oriented towards the activities of the researcher and having time constraints are readily identifiable from environmental evaluation studies. Section 3.1 describes the characteristics of project specific evaluation studies. Section 3.2 discusses the use of the Semantic Differential approach to evaluation which is intended to provide generalisability to this research area.

3.1 Project Specific Evaluations

In 1980 a special issue of the journal Environment and Behavior (vol 12, No. 4) was published, containing articles solely on the topic of Post-Occupancy Evaluations. The intention was to document the current state of the art. The descriptions of the questionnaire development in the five articles reporting findings are suggestive of the researchers' attitudes toward formulating research questions and constructing instruments and also their attitudes toward the respondents. The descriptions are:

Devlin-Housing for the Elderly: 'A questionnaire was developed'
Wener and Olsen - Innovative Correctional Environment: A User Assessment: 'Attitudinal data were gathered through closed-ended questionnaires.'

Kaplan - Citizen Participation in the Design and Evaluation of a Park: 'the questionnaire included both open-ended and scaled items.'

Kantrowitz and Nordhaus - The Impact of Post-Occupancy Evaluation Research: 'The survey obtained data on planning and design issues as well as demographic and attitudinal information.'

Farrenkopf and Roth - The University Faculty Office as an Environment: 'A structured interview was conducted ... consisting of in-depth open-ended questions, an eleven-point satisfaction rating scale and an eight-item environmental priorities rank-order list.'

None of the five articles provides any indication that instrument criteria such as validity and reliability were assessed for the questionnaires. The article by Devlin is the only one to provide some account of the theoretical orientation of the instrument although the translation into questionnaire items is not documented. The utilisation of the respondents' constructs in these user evaluations is only evident in the office study by Farrenkopf and Roth. In general there is little evidence to suggest these studies are necessarily dealing with issues that the users consider relevant, which represent a logical growth from previous work or that provide a substantive or methodological basis for future research.

3.2 The Semantic Differential Approach

The lack of a systematic approach evident in the above mentioned work is not characteristic of earlier environmental evaluations such as those of Heshberger 1972, Vielhauer-Kasmer 1970, Collins 1969, Craik 1968 and Canter 1968. These investigators sought to develop general measures of environmental quality using a technique developed in a quite different context, namely Osgood et al.'s (1957) Semantic Differential for the measurement of meaning. The extent of usage of these bi-polar adjectival scales has led Bechtel (1976) to describe them as 'a kind of universal measure of environmental quality'. However the authors of these techniques (in particular Canter, 1975, 1977) in comparing these instruments point to several limitations. The purpose of these scales is to identify common dimensions of environmental quality. Yet Canter illustrates that these different measures do not produce the same structure, nor does one particular scale necessarily produce the same structure across different settings. Consequently Canter argues against there being a definitive set of dimensions to describe environmental quality. An additional problem arising from the use of these general scales is the growing evidence that treating them as being composed of independent dimensions may not be appropriate. For example Kuller (1973)
explores the relationship between his orthogonal dimensions derived from a general rating scale. Ladd (1976) in reviewing the literature on residential evaluations discusses the complexity and interdependency of attributes associated with these environments. Indeed Canter (1975) questions the psychological validity of the assumption that people's experience of the environment is best described in terms of independent dimensions. This is consistent with the theoretical proposals of Bruner (1957), Restle (1961) and Attneave (1962) on the structure of people's cognitions.

3.3 Summary of the Characteristics of Environmental Evaluations

Peterson's (1976) comment on this field 'heavy on words and empirical methods and light on theory and discipline' sums up the current state of the art. For example, in a review of the environmental evaluation literature Stokols (1978) notes the major accomplishments as being the development of environmental displays (simulations) and the effective sampling of different respondent groups. The major deficiency pointed out by Stokols is that the work in this area has been predominately atheoretical. Of the seven areas of environmental psychology reviewed by Stokols this is the only area criticised on this point.

This pragmatic approach is apparent in the instruments described in the Environment and Behavior review issue. The instruments are loosely based on what the researcher considers to be likely issues relevant to the specific setting. General measures such as the semantic differential scales and Perceived Environmental Quality Indices (PEQI's) have suffered from the same problem. As noted by Weinstein (1976) and Wohlwill (1976) there has been an over-emphasis on the construction of empirically derived models (i.e. factor analysis and multiple regression procedures) and too little attention paid to the development of theory. In addition there has been little attempt to make the instruments used in evaluations precise operational definitions of the constructs the researchers are intending to explore.

4 The Need for a Model of Environmental Evaluations

In environmental evaluations the 'assessments' or 'evaluations' of 'effectiveness' or 'quality' are predominantly supplied by the users of the settings. As noted by Craik and Zube (1976) people are being used as measuring instruments; the Hospital Evaluation Research Unit (1976) describes them as calibrated instruments.

The one common process across all environmental evaluations is the psychological process of evaluation. Indeed the semantic differential scales have demonstrated this. The predominant dimension common to all the measures is one of evaluation, that is how good or bad it is (Canter,
1975). These terms (evaluations, assessments, effectiveness, quality) have been loosely used to describe the processes taking place in the whole field of evaluation (see definitions in Section 1). However there has been little attempt to formulate a systematic account of these processes. This has resulted not only in a failure to provide a common ground for comparison across projects and settings (as noted by Craik and Zube, 1976) but also in a lack of conceptual framework for the construction of research instruments. Evaluation research is predominantly an applied field. However as stated by Lewin (one of the first initiators of this work):

'there is nothing so practical as a good theory'

(1951)

5 SUMMARY OF EVALUATION AS A RESEARCH FIELD

In summary, environmental evaluations make up a large part of environmental research. Additionally, they can be considered a part of an even larger research domain, namely that of Evaluation Research. These two fields of inquiry share common aims and approaches. Both are strongly oriented towards the applied end of the spectrum of research, they tend to focus on specific projects or environments, they are, in general, conducted under time constraints and they produce results suitable for immediate implementation.

The major criticism levelled against these areas of research is that they are, in general, atheoretical (Stokols, 1978; Wohlwill, 1976; Zimring and Reizenstein, 1980; Milcarek and Struening, 1975). One consequence of this is that each study tends to remain a discreet entity rather than providing a logical basis for future research. This atheoretical approach also fails to provide a clear statement of what the data collection procedures are intended to measure. As a result previous evaluation research has not provided an adequate description of the psychological processes involved. It is therefore proposed that the first requirement of the current work is to formulate a model to describe environmental evaluations. Chapter 4 describes the basis for construction of this model of environmental evaluations.
The Process of Evaluation - An Emergent Experience

One of the major objectives of the thesis is the development of a model to describe nurses' evaluations of modern hospital wards. However, one of the lessons apparent from the literature on environmental evaluations, discussed in Chapter 3, is that focusing on the specific setting has contributed to a non-theoretical approach to the research area. As stated in Chapter 3, the common process occurring across all settings and research projects in the field is the psychological process of evaluation. Consequently, the current work utilizes the findings and theoretical proposals from previous environmental work to formulate a general model of environmental evaluation.

The development of the model to describe environmental evaluations has three major stages: rationale formation, description, and prediction. This chapter provides a preliminary definition of what is meant by a model and describes the first stage of model development, namely specification of the rationale. The key processes to be described in order to develop a model of environmental evaluation are:

1. Purposes are taken as the fundamental criteria for evaluation. The individual initiates and directs actions towards achieving these purposes (Section 2).
2. The role of the physical environment is to facilitate purposes (Section 2).
3. Environmental evaluations are based upon the individual's use of the setting; they are behaviourally based (Section 3).
4. Evaluations of the physical environment are emergent, they express the interaction between the behavioural characteristics of the individual and attributes of the setting (Section 3).
5. This emergent experience cannot be obtained by considering either the individual or the setting separately, but must consider both as part of a single system (Section 3).
6. Environmental evaluation is defined as a statement of the extent to which the attributes of an environment facilitate the individual's activities directed towards the achievement of his purposes (Section 4).

Before describing the basis for the concepts to be used in the model of evaluation, a statement of what is meant by 'a model' is provided in Section 1.

1 Definition of Model

The use, in this work, of the term model represents a departure from the usual interpretation. The usual use of the term is exemplified by models of interpersonal perception such as the inference model (Sarbin et al., 1960), the social skills model (Argyle and Kendon, 1967) and Cook's (1971) two-channel model. Each of the above models states the components and processes involved in the psychological process. The models consist
of potential explanations of the process, but are not stated in terms such that they can be tested. In this respect they are more similar to the discussion of the process of evaluation presented later in this chapter, in that they provide the rationale for the approach taken to investigate a particular domain. However they remain assumptions about internal processes which are not available for empirical testing.

Model, as used in this work, is a description of the observations to be made, that is of the evaluations made by nurses about the wards on which they work. It seeks to explain the relationships between the evaluations. The following sub-sections present, in more detail, the content, properties and development of a model.

1.1 The Content of a Model
Kelly describes man as a categorising animal (Bannister and Fransella, 1971). He groups together events, people, objects etc. in order to provide a structure to his world. This description is supported by Rapoport (1977) who defines environmental cognition as a process of categorising the components of the environment. Rapoport describes cognitive categorisation as a set of rules whereby, through imposing a structure on the environment, an individual simplifies the environment to make it more predictable.

Milcarek and Struening (1975) propose that the same process takes place in research. Accordingly, the study of any phenomenon involves subdividing it in order to describe it. Concepts, they maintain, can be considered the rules for this subdivision. The object is to group together into categories components of the phenomenon on the basis of 'meaningful similarities'. Therefore, a model is taken to be those concepts or rules used to subdivide the phenomenon, together with the categories they generate.

1.2 The Predictive Component of a Model
The purpose of a model is to describe a phenomenon. By assigning the components of that phenomenon to categories according to rules, predictions (either implicit or explicit) are being made. The predictions are that the categories will differentiate between components and, that the components assigned to a particular category are empirically found to occur in that category.

For example Rapoport (1977) proposes that Scale is a meaningful rule for classifying people's cognitions of the environment. His categories are: houses, residential areas, neighbourhood and city. If the viability of this concept were to be tested it would require that the environmental components (e.g. building, facilities, bridges etc) be assigned to one of
these four categories.
The concept Scale would be demonstrated if people order the buildings, etc. in terms of the environmental levels. The retrieval of the categories requires that the continuum be broken into four separate levels. The final prediction is that the researcher assigns the environmental components to the correct category. In other words that people see the levels of the environment as composed of the same components as those predicted.

All the above predictions concern the relationships between the environmental components. For example, two houses may be seen as being more similar in scale (the residential area) to each other than to the local church (the neighbourhood). In addition the two houses can be considered more similar to the church than to the municipal buildings (the city). Therefore the purpose of a model is to predict the relationships that exist between the components which make up a given phenomenon in order to describe that phenomenon.

1.3 The Purpose of a Model to describe Nurses' Evaluations of Modern Wards

Chapter 3 gives two main reasons for developing a model of environmental evaluations. One is that the model will have the potential of providing a theoretical basis for generalising across settings and research studies. The other is that it will provide a conceptual basis for the construction of the research instrument.

A further reason relates to the general finding of environmental evaluation studies, namely that people have a range of different ways in which they evaluate a given setting. For example Sears and Auld (1976) demonstrate this to be the case for nurses' evaluation of hospital wards. A model of evaluation is needed in order to describe the relationships that exist between the various evaluations. The phenomenon is taken to be the total system of evaluations made. The constituents of that phenomenon, to be categorised in terms of their similarities, are the specific evaluation statements.

This emphasis on the importance of a systematic descriptive stage of the research is consistent with recent developments in social psychology. Forgas (1979a), in summarising the 'new wave' in social psychology, characterised it by the choice of its subject matter, naturally occurring phenomena, and its increased emphasis on the descriptive stage of the research process. In connection with this emphasis he states:

'the first step towards an understanding of such a new range of phenomena is concerned with categorisation, the analysis of similarities and dissimilarities between the elements - in other words, the development of initial taxonomies.'

The present study concerns nurses' evaluations of their wards in terms of
the provision of nursing care. As described in Chapter 2, patient care involves a complex system of delivery. For example, the Nuffield Job Analysis (1953) identified over 100 different nursing activities involved in providing care. This leads to the expectation that the relationship between nurses' evaluations will also be complex. In order to describe the experience and also to use the evaluations as a systematic basis for examining the physical variations in wards in terms of nursing care; a systematic account of the phenomenon is needed.

1.4 The Stages of Development

There are three major stages in developing such a model:

- **Rationale Formation** - examining the phenomenon in order to generate concepts or rules which are consistent with the characteristics of the phenomenon.

- **Identification of the Concepts** - this includes identifying the basic unit of study (the components) and the concepts to describe them. (Chapter 5).

- **Predictions of the Relationships between the Components** - this requires not only predicting the relationship between the categories, but also the relationship between the different concepts. (Chapter 6).

The description of a model, given above, specifies that the concepts will group together the components on the basis of meaningful similarities. The term 'meaningful similarities' refers to a key preliminary stage in developing a model, that is rationale formation. For example, Forgas (1979b), in objecting to laboratory based social psychology, is concerned that naturally occurring phenomena become arbitrarily partitioned to fit the requirements of the experimental situation. This concern for forced or arbitrary classification of subject matter is also expressed by Milcarek and Struening (1975) with reference to evaluation research. The formation of concepts to describe environmental evaluations and the identification of the 'unit of study' requires a detailed account of the psychological processes involved. The account includes both a description of the process of evaluation as a human activity (Section 2) and a proposal about the basis upon which evaluations are formed (Section 3).

2 THE PROCESS OF EVALUATION

The key processes to be described are:

- Purposes are taken as the fundamental criteria for evaluation. The individual initiates and directs actions towards achieving these purposes.

- The role of the physical environment is to facilitate purposes.

The definitions of evaluation research and environmental evaluations presented in Chapter 3 indicate that there is some consensus as to what evaluation means; 'the assessment of the effectiveness or quality of an
object (e.g. a social programme or a setting). However such general definitions do not provide sufficient information to contribute to the development of a model of environmental evaluations which is intended as the basis for instrument development. The limited utility of such general descriptions is also pointed out by Peterson (1976) with reference to indices for the measurement of environmental quality. He argues that terms such as 'environmental quality' need to be defined in 'operational terms' in order for the measurements to be validly described as measures of quality. The first stage in formulating or identifying concepts to be used in the model is to describe what is meant by the psychological process of evaluation. The key to providing a more detailed account of the process is the model of man being utilised (either explicitly or implicitly) (Section 2.1) and the implications this has on the possible role played by the environment with respect to the people who use it (Section 2.2). These proposals provide the initial definition of environmental evaluations.

2.2 Model of Man

Environmental evaluation studies have as their common basis a goal-oriented, or dynamic, model of man. For example, the Building Performance Research Unit, 1972; Sear and Auld, 1976; Ittelson et al. 1974, Stokols, 1977; Friedmann et al., 1978, all explicitly state this as their position. The goal-oriented approach to explaining human activities is not unique to environmental research. Hall and Lindzey (1957) state in their review of personality theories:

'Most personality theorists seem to conceive of man as a purposive creature but even where this is not taken for granted it does not seem to be a matter of hot dispute'.

Such an approach assumes that the individual initiates and directs actions towards ends that will eventually be satisfying to the individual. These fundamental organising principles are referred to as 'purposes'. The most appropriate definition for purpose, as it is being used in the context of evaluation, is Rozeboom's (1970) as a 'cognitive conception of a valued but not-yet-existent state of affairs'.

Taking Rozeboom's definition of purpose as a present representation of some possible future condition, it follows, as proposed by the BPRU, 1972: 'that if they (people) had no concept of their state when their goals were achieved then there would be little directed impetus towards achieving them. It must also therefore be possible for people to estimate at what position they are in relation to their goals. Statement of this position is a statement of satisfaction'.

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As the historical review of Chapter 2 shows the reason for a nurse being found working in a given ward is to provide care and comfort to the patients. Therefore the provision of nursing care is taken as the primary purpose that nurses associate with the ward setting. If patient care is the primary purpose it will be possible for the nurses to state the extent to which they are satisfied with the provision of this care.

2.2 The Role of the Environment

Purposes of the individual are of primary importance to the individual. They not only initiate and direct his behaviour but also are the basic principles used by the individual to organise and describe his world. For example Canter (1977) points out that, when people are asked to describe a place, their description is not restricted to a statement of physical characteristics, but is also a statement about what the particular setting is for. In their reviews of the ways people describe settings, Canter (1975) and Hershberger (1972) illustrate that in fact the dominant way people have of describing a place, is in terms of evaluations, or as the BPRU call it 'satisfactoriness'. In other words people describe a setting in terms of how good or bad it is for specific experiences and activities. A nurse describes a hospital ward in terms of providing care in that ward.

Working towards achieving a purpose does not occur in a vacuum, but is associated with external objects, such as other people, events, activities or settings. Itelson et al. (1974) describe these as 'appropriate goal objects'. Research may be directed towards identifying the objects which are relevant to a purpose or, as in this instance, identifying the purposes of nurses associated with an object, namely the physical environment of the ward.

Specifying purposes as the directives for behaviour requires that the relevance of external objects to the individual is not conceived as deterministic. Rather the relevance of the object to the individual's purpose is in terms of its utility or facilitative capacity with respect to the purpose. As is discussed in Section 3.1.3 purposes are not being regarded as initiating pre-programmed series of actions. If they were, external objects would have no impact on these actions. Since a range of behaviour can be directed towards achieving a purpose, the individual can choose activities which are most advantageous to the particular circumstances in which he finds himself. However this does not change the purpose and, as suggested by the BPRU (1972), the individual can judge which activities contribute most to achieving the purpose. An example by Sears and Auld (1976) is, having or not having a vacuum cleaner does not change the purpose 'to clean the house', but does effect the way and the
ease with which this can be accomplished.

The significance of an object is its facilitation function with respect to purposes. Therefore, qualities or goodness or badness are not inherent in the objects, rather they are attributed to the object by people.

Bentham (1859) defines utility as:

>'that property in any object whereby it tends to produce benefit, advantage, pleasure, good, or happiness or to prevent the happening of mischief, pain, evil or unhappiness to the party whose interest is considered'.

The necessity for people using qualitative assessments, such as utility or facilitation, as pointed out by Sears and Auld (1976), occurs when people are confronted with complex objects which differ on more than one dimension. The example quoted is the value of water to a man dying of thirst. Assuming water is perceived as 'good' then a cupful would be chosen over a drop of water. Such a quantitative statement is not possible with complex multidimensional objects. The relative worth of such objects to the individual must therefore be assessed in terms of their ability to facilitate the purposes of the individual. Therefore, we define Evaluation as:

a subjective assessment of the goodness of an object based upon the individual's perception of the degree to which it facilitates the purposes the individual associates with that object.

2.3 Summary of the Process of Evaluation

The model of man adopted in this thesis specifies the 'purposes' of the individual as the initiators and directors of his actions. Following from this, the role placed by the physical environment is proposed as being one of facilitating the purposes. Therefore people evaluate an environment in terms of the extent to which it facilitates purposes.

By clearly linking environmental evaluations to the achievement of purposes, terms such as environmental quality or effectiveness can be more clearly defined. They appear as different labels for a statement of the extent to which the setting facilitates the individual in achieving his purposes and goals. Placing the achievement of purposes as the criterion against which settings are evaluated also helps to explain the differences reported by Canter (1975) in the structure of the various semantic differential scales used in environmental evaluations. These bi-polar adjectival scales do not specify the criteria for evaluation. It can be expected that the purposes for being in one given setting, such as a hospital ward, will be different from the purposes associated with another setting, for example a recreational centre. The failure to clearly link the evaluations to the purposes of the respondent has
resulted in the necessity of a purely empirical basis for identifying the
structure of environmental evaluations and for illustrating the
differences between settings.
Describing evaluations in terms of the individual's purposes implies that
the individual utilises a cognitive representation or conceptual system
which links his purposes to that environment and provides the basis for
the evaluations. Thus a further stage in formulating the concepts
relevant to a model of environmental evaluations is to examine the basis
upon which the assessments are formed. Section 3 discusses these issues.

3 DIRECT EXPERIENCE AS THE BASIS OF ENVIRONMENTAL EVALUATIONS

The key processes to be described are:

- Environmental evaluations are based upon the individual's use of the
  setting; they are behaviourally based.

- Evaluations of the physical environment are emergent, they express the
  interaction between the behavioural characteristics of the individual
  and the attributes of the setting.

- This emergent experience can not be obtained by considering either the
  individual or the setting separately.

The literature in environmental psychology has tended to treat the study
of people's evaluations of settings and their conceptualisations of
settings as quite different research areas. For example, hazard
perception, mental maps of cities, neighbourhood images are all
considered part of environmental cognition (see Ittelson, 1973).
Emphasis in this area is on the structure of people's conceptual systems
used to describe their environment.

Evaluation research however, has as its focus issues or concerns. For
example, what are the major issues people raise with respect to their
satisfaction with housing? Yet to make a statement about the
effectiveness or quality of a setting, people must rely on their
perception or interpretation of that setting, that is on their conceptual
system. A model to describe environmental evaluations is a model of
people's conceptualisations.

It is proposed that the object of an evaluation study is to provide some
quantitative measure of the extent to which a setting facilitates
people's purposes. In this instance it is the extent to which modern
wards facilitate nurses in the provision of care to the patients.
Implicit in the statement is the assumption that evaluations are based
upon the individual's direct experience of using a setting. This
assumption must be common to all evaluation work which has building Users
as respondents. Yet the literature on environmental evaluations has
failed to utilise the individual's conceptualisations of the direct
experience in order to provide a description of environmental
evaluations.
The basic premise of the present work is that nurses' evaluations of the wards on which they work is a direct reflection of their experience of providing nursing care in that setting. The problem is one of characterising this a manner that is consistent with the nurses' conceptions of the experience. Ittelson et al. (1974) propose that when people are evaluating or interpreting an object the resulting percepts are emergent, that is that:

"they express the interaction between the properties of the object, place or event being perceived and the behavioural characteristics of the perceiver".

As implied by the term emergent, evaluations are the result of the interaction between the person and the place and, as suggested by Ittelson et al., this interaction may give rise to an experience which can not be obtained by considering either side in isolation. Ittelson et al.'s description of evaluations as emergent suggests that the basic unit of study, which will not distort the experience, needs to include both behavioural characteristics of the evaluator and properties of the setting, together with an account of the interactions between them. In order to define the concepts or rules to be used to classify this experience into meaningful categories (Chapter 5), it is necessary to examine in more detail what is meant by 'behavioural characteristics' and 'properties' of the setting. Section 3.1 proposes that purposive behaviour is the most relevant activity to be used in describing environmental evaluations and describes how purposive behaviours may be related to each other. Section 3.2 discusses what is meant by attributes of a setting, stressing that evaluations are a subjective experience and therefore the attributes of the setting that are relevant are the 'perceived attributes'.

3.1 Purposive Behaviour

In adopting Ittelson et al.'s description of evaluations as emergent it is being proposed that evaluations are formulated as the individual carries out activities in the setting. In this way behaviour can be considered an experiment, as suggested by Miller, Galanter and Pribram (1960) and Kelly (1970).

The relative success the individual has in carrying out his activities forms the basis for his assessments of the utility of the setting in facilitating the activities. Evaluation is defined (Section 2.2) as a statement of the extent to which an object facilitates the purposes of the individual. However, interaction does not occur between the individual's 'cognitive conceptions of a valued but not-yet-existent state of affair's (i.e. a purpose) and the object or setting.
between the individual and the environment occurs at the level where the 
individual is carrying out activities directed towards achieving his 
purposes. It is the nature and structure of these purposeful actions 
which needs to be defined in order to develop a model of environmental 
evaluations based upon the individual's direct experience of a setting. 
The first consideration is the level at which actions become purposive.

3.1.1 The Level of Purposive Behaviour
Rosenblueth et al. (1943) argue that all behaviour is purposive. 
However, as pointed out by Sears and Auld, these authors appear to have 
confused purpose (function) with purpose (intention). A more productive 
approach is that described by Tolman (1932) as a molar approach, where 
rather than analysing behaviour in separate series of muscle contractions 
he considers it more profitable to conceive of it in terms of goal-
oriented acts. Lewis (1943) makes that same point by his stand that 
psychological phenomena must be explained in psychological terms. As 
Wright and Barker (1950) in their elaboration of Lewin's viewpoint out, 
the individual:

'does not sweat or salivate, nor does he often bend 
his knees walking, manipulate his tongue in talking, 
move his eyeballs in reading, or bend at the waist in 
sitting down. He walks, talks, reads or sits down, 
leaving his glandular and motor apparatus to take 
care of the sweating, salivating, bending, 
manipulating and all such molecular units of 
behaviour which, as molecular, are lost to the person 
in what he actually does'.

It is behaviour at the level at which the individual actually experiences 
it that is of interest here.

A further point suggested by Wright and Barker is that an individual 
experiences a whole range of purposive behaviours. Thus a further 
specification of this aspect of the environmental interaction concerns 
the relationship between the activities. Activities gain their 
significance in terms of the purposes that initiate and direct them. It 
is the relationship between a person's purposes that determine the 
pattern of relationships between his activities. Section 3.1.2 proposes 
a structure to describe purposes.

3.1.2 The Structure of Purposes
It has been suggested thus far that people may have more than one purpose 
which they associate with a particular evaluation object. Therefore they 
will make a range of qualitatively different evaluations of that object 
depending on which purpose is being referred to. A further assumption 
proposed by Sears and Auld (1976) is that purposes are not independent of 
each other. Their argument for a hierarchical model of purposes is as 
follows: 

'behaviour itself is organised in a hierarchical way,
and units of behaviour may be defined at any level of complexity and integration. Likewise purposes, the antecedent cognitive representations of behaviour, may be examined at any convenient level. That is to say that there are high-level, long term purposes and low-level, immediate purposes. The low-level specific purposes are defined only as they are required in the sequence of behaviour serving the superordinate purpose. The cognitive representation of the higher order purpose does not comprise a long inflexible chain of very specific purposes.

The hierarchical structure of purposes, proposed by Sears and Auld, is very similar to Miller, Galanter and Pribram's (1960) conceptualisations of plans which control the order in which a sequence of operations is to be performed. The present research specifies 'the provision of nursing care' as the general purpose to be explored in relation to ward design. This purpose is only accomplished by a range of specific purposes such as treatment of patients, clerical work and movement of equipment. A hierarchical organisation of these more specific purposes can also be expected. For example, the preparation of the treatment trolley is a lower level purpose serving the purpose of treating the patient. However, as suggested by Sears and Auld, the relationship between the purposes is not a long inflexible chain. For example the preparation of the trolley is not expected to be subordinate to observing patients from the nursing station. What is being suggested is a hierarchical network of purposes directed towards the more general 'provision of care'. Because they are all subordinate to the same purpose they are related to each other.

Ladd (1976), in reviewing residential evaluations, points to the 'complex network' of relationships which exist between the various issues of concern to the respondents. It is proposed that one way to facilitate the identification of the structure of this 'complex network' is to make a distinction between the different levels of purposes they are referring to. This distinction is equally applicable to the activities directed towards achieving purposes, in that purposive behaviour in an integral part of the hierarchy. As discussed in the following section, the relationship that exists between purposes and purposive behaviour helps to illustrate why evaluations are most effectively described as emergent.

3.1.3 **Purposive Behaviour as an Integral Part of the Hierarchy of Purposes**

Purposive behaviour is an integral part of the hierarchy of purposes in that 'any purpose defines the goal of behaviour at the next level down the hierarchy' (Sears and Auld, 1976). For example 'giving treatment to the patient' defines what is the objective of the 'preparation of the treatment trolley'. However this does not imply that future events are to be taken as causes of behaviour, but rather it is people's beliefs
about the future which regulate purposive behaviour. As stated by H.A. Simon (1968):

'Purposeful behaviour is oriented towards achieving some desired future state of affairs. It is not the future state of affairs, of course, that produces the behaviour but the intention or motive to realize this state of affairs. An intention, if it is to be causally efficacious for behaviour must reside in the central nervous system of the actor prior to or at the time of action'.

Simon's interpretation not only emphasises that man, as a goal-oriented animal, is not totally dependent upon outside determining factors but also that he is not preprogrammed to carry out a series of actions dictated by internal mechanisms.

This has two important consequences. Firstly, as pointed out previously, it suggested that the setting will have an influence upon the activities. People have a range of activities which can be directed towards achieving a purpose; the individual can choose activities which are most advantageous to the particular circumstances in which he finds himself. A setting will be more helpful for some of the activities than for others. However the influence of the setting is not one of initiating or directing behaviour (as described in Section 2.2 and also supported by Rapoport, 1977). It is the individual's purposes or 'cognitive conceptions of a valued but not-yet-existent state of affairs' (Rozeboom, 1970) which motivate and direct behaviour. For example, even in a prison the intention 'not to escape' must come from the prisoner. Though the setting may make the achievement of the alternative intention 'to escape' improbable, it does not make it impossible. It may however encourage the first intention or suggest strategies other than 'tunnelling out', such as 'gaining inside help', to achieve the second intention. Thus the influence of the setting is in terms of the extent to which it facilitates the activities set in motion by the purposes.

A second consequence of the goal-oriented model of man is that it suggests that the individual perceives the potential achievement of a goal in the given context. In other words his experience of carrying out the activity is not in isolation, but rather he experiences the activity and the setting as a total system, directed towards satisfying the individual's purpose(s) for being in the setting. It is this emergent experience that forms the basis of the individual's evaluation of that setting.

3.1.4 Summary of Purposive Behaviour

Evaluation is comprised of a series of associations of processes. At the top are primary purposes which are 'cognitive conceptions of a valued but not-yet-existent state of affairs'. They provide the goals which direct
current behaviour. The primary purposes may give rise to lower level purposes which are also important to the individual, because they lead to the more primary purposes. The individual carries out actions which are directed towards achieving the purposes, that is, purposive behaviour. The behaviour occurs within a given setting, therefore a person's evaluations of the setting are based upon the individual's experience of satisfying purposes through the behaviour/setting system.

Ittelson et al.'s (1974) description of evaluations as emergent specifies 'behavioural characteristics' of the perceiver as one component of environmental interaction. It is proposed here that purposive behaviour is the most appropriate 'behavioural characteristic' to be included if evaluations are to be viewed as part of the goal-oriented activities of human beings. In addition, it is proposed that the concept, or rule, which partitions purposive behaviours into meaningful categories is the distinction between the levels of the purpose hierarchy to which they relate. The other component of the behaviour/setting system as proposed by Ittelson et al. is the 'attributes of the environment being perceived'. Section 3.2 discusses what is meant by attributes and what is the most appropriate way of characterising environmental attributes when they are considered as aspects of the perceiver's conceptual system.

3.2 Attributes of the Environment

Ittelson et al.'s description of evaluation as emergent specifies that people are interacting with properties or attributes of the environment. Assigning events, people, objects, etc. to categories according to their similarities on attributes is the basic means by which people make sense out of their world. Attributes are characteristics of objects which allow the objects to be described. For example Nunnally and Wilson (1975) define measurement as consisting 'of rules for assigning numbers to objects to represent quantities of attributes'. As they point out, objects, people, environments, etc. are not measured (a quantitative description); rather it is the attributes (e.g. height, weight etc.) that are measured. Sears and Auld (1976) maintain that one of the significant advances in the development of theories of choice such as Arrow's (1958) was the recognition that people's preferences do not depend upon the object per se but on their attributes. Description necessitates the utilisation of attributes and this issue is recognised in environmental evaluation work. Section 3.2.1 proposes the BPRU's (1972) 'environmental system' as the attributes of the environment which people experience.

3.2.1 The Environmental System as The Perceived Attributes

Bechtel (1975), Daniel (1976) and Brush (1976) have all identified different attributes of a given setting that are found to be relevant to
peoples activities in that setting. It is proposed here that when people evaluate a setting they are in fact assessing the utility of various attributes of that setting. As indicated by the term, people are attributing characteristics to the setting. These characteristics are not inherent in the object or setting. This indicates that the users or respondents not only have to specify the purposes they are trying to achieve to provide an unambiguous evaluation, but also the attributes they are associating with given purposes. As cautioned by Sears and Auld (1976) people do not necessarily 'discriminate the environment into the sort of convenient categories that designers tend to use when they are thinking about design problems'.

The issue is also raised by the Building Performance Research Unit (BPRU, 1972) in their model of the building as a system. The BPRU describes the characteristics inherent in the setting as the building system and distinguish it from the environmental system. The building system gives rise to the environmental system through providing structure, fabric, service and contents of the building. It is proposed by the BPRU that it is the environmental system that is experienced by the people using the building. They further specify that the environmental system can be categorised into two subsystems. One is the Physical environment 'those aspects of the environmental system directly perceived as heat, light, sound, texture and smell'. The other subsystem is the Spatial environment, 'those aspects of the environment related to the dimensional and geometrical properties of single spaces (such as size and shape) and to the spatial relationships between them'.

Similar distinctions have been proposed by Canter (1969) and Bechtel (1976). Support for these proposals is provided by a study by Brooks (1978) who asked users to state their likes and dislikes with respect to their offices. The major groups of architectural attributes were: heating, ventilation, air conditioning, lighting (the physical subsystem) and layout of the office, adequate space or room in the offices, position with respect to other offices, location of the office in the building (the spatial environment).

Therefore it is proposed that when people evaluate a setting they are characterising it in terms of the environmental system as presented by the BPRU; that is, it is the attributes of the environmental system that people experience and consequently evaluate. It is further proposed that people will distinguish between the attributes in terms of the environmental subsystems to which the attributes belong.
3.3 **Summary of Direct Experience as the Basis of Environmental Evaluations**

The process of environmental evaluation is described as emergent; that is, it is based upon the individual's experience of using the setting. It is proposed that the two constituents are purposive activities of the individual and the perceived attributes of the setting. Further it is proposed that it is the interaction between these two domains, which leads the individual to make his particular evaluative statements about the setting.

4 **Summary of the Process of Evaluation—An Emergent Experience**

Purposes are proposed as the criteria against which evaluations of an environment are made. Purposes initiate and direct behaviour. Following this, the role played by the physical environment is one of facilitating purposes.

A further proposal made is that environmental evaluations are based upon the individual's experience of the setting. The two domains that are proposed as involved in that experience are purposive behaviour and the perceived attributes of the setting. Thus the process being proposed is that:

'People evaluate the attributes of an environment in terms of the extent to which they facilitate the activities directed towards the achievement of their purposes'.

This definition suggests that the basic unit of study (component) will contain all these characteristics and that meaningful concepts used to describe the components will not arbitrarily partition them in a manner inconsistent with this emergent quality. Chapter 5 describes the basic unit of study and proposes the concepts to be used to describe the phenomenon of environmental evaluation.
Chapter 5
THE COMPONENTS OF A MODEL OF ENVIRONMENTAL EVALUATION

Chapter 4 discusses the psychological processes involved in making an environmental evaluation. The proposals and assumptions made about the process are not the model in that they cannot be tested. Rather, they are the rationale for the particular model to be developed. The conclusion drawn from Chapter 4 is that a model of environmental evaluation will be a model of people's conceptual systems for structuring the experience of environmental interaction.

Chapter 5 presents the initial construction of the model of environmental evaluations. The objective is to produce a model which is consistent with the process of evaluation as described in Chapter 4. Section 1 presents the unit of study which is used as the basic component of people's cognitions of the environment. Section 2 proposes the concepts to be used to structure this design-related experience.

1 THE BEHAVIOURAL UNIT AS THE BASIC UNIT OF STUDY

The evaluation of a setting is not a single statement of its utility or quality. People have a range of evaluations which, as indicated by Bechtel (1976), are qualitatively different. To develop a model to account for the differences requires a description of the variations between the conceptual units upon which the evaluations are based. The first step in the development is the identification of the basic unit upon which a particular evaluation is based.

According to Forgas (1979b) one of the most difficult aspects of studying naturally occurring phenomena in psychology is the identification of the basic unit of study. As noted in Chapter 4, both Forgas and Milcarek and Struening (1975) express the concern that research often partitions the subject matter into forced or arbitrary classifications which are not consistent with the way phenomena occur in the real world.

Ittelson et al.'s (1974) description of evaluations as emergent specifies that the interaction between the individual and the environment may give rise to an experience which cannot be obtained by considering either side in isolation. This description suggests that the basic unit which will not distort the experience will need to include both behavioural characteristics of the evaluator and properties of the setting, together with an account of the interactions between them.

Such an 'emergent' basic unit is not apparent in environmental evaluations. As discussed previously the Semantic Differential approach excludes the criteria (the purposes) for the evaluation. More specific studies, such as Sears and Auld's (1976) evaluation of hospital wards and
Farrenkopf and Roth's (1980) study of offices, include both activities and characteristics of the setting, but not as one basic unit. For example Farrenkopf and Roth generate what they consider are eight important environmental dimensions for buildings:

- access to people and resources, privacy and quiet (i.e. activities and goals of the person)
- space, location, aesthetics, heating, ventilation, air conditioning, lighting, equipment and windows (i.e. characteristics of the setting)

These separate dimensions leave room for considerable qualitative variation in the evaluations. For example:

'access to people'-from where?
"space"-for what activity?
'heating and ventilation'-of what area?

The method adopted to identify the basic emergent unit of study is to consider where qualitative variations in evaluations might arise. Sections 1.1 and 1.2 describe the variations in the characteristics of the setting and the activities. Section 1.3 discusses the possible variations due to the relationship between these two domains. Section 1.4 defines Behavioural Unit and Section 1.5 compares it with other constructs used to describe actions in their physical context.

1.1 Characteristics of the Setting

There are two broad characteristics of settings which may result in qualitatively different evaluations. They are the different identifiable locations within a setting and the different attributes of each location that the individual is evaluating. They are discussed in physical terms. However the individual evaluates his 'perceived environment'. For example the individual may perceive two apparently separate spaces as just one location. Such information can come only from the user. The object of the initial description is to identify the potential areas of qualitative variations between evaluations.

1.1.1 Locations within a Setting

In Chapter 2 the Nuffield design is described. The innovations in the design include increasing the provision of facilities for patients, such as the dayroom and sanitary facilities. Increased provision of technical areas is also part of the design, including the provision of separate clean and dirty utility rooms and the creation of a treatment room. In addition the main bed area was partitioned to form smaller bedroom units. Thus rather than being a large undifferentiated space, the modern ward has become a highly partitioned setting with clearly identifiable locations within the ward area. Therefore one requirement of the basic unit is that it distinguishes between these locations.
1.1.2 Attributes of Locations

Chapter 4 specifies two broad categories of attributes of settings, the physical and spatial subsystems of the environmental system. Each of these subsystems contain specific attributes which will contribute to evaluation variations. For example the quality of the lighting in a setting may be considered adequate but not the heating; both are part of the physical subsystem. Also the position of a particular facility may be considered convenient but the layout of that facility inadequate.

An additional potential variation is that the users may associate particular attributes with specific locations within the setting. For example an employer may consider the position of the offices of his employees important to his own activities, such as supervision, but not the actual layout. Environmental evaluation may vary in terms of both the location being referred to and the attribute of that location being evaluated. A further source of variation is the criteria used to evaluate the attributes, the purposive activities.

1.2 Purposive Activities as a Source of Variation in Evaluations

The discussion of the process of evaluation in Chapter 4 proposes that people use the achievement of purposes as the criterion against which they evaluate a setting. As indicated, people have a range of purposes they associate with a given setting and consequently a range of evaluations. Chapter 4 also specifies that the assessments are concerned with the ease with which the individual can carry out the activities directed towards achieving purposes. Different activities will result in different evaluations. For example Chapter 2 suggests the modern ward layout may facilitate the direct treatment of the patient but not the observation of the patient.

1.3 The Relationship between the Activities and the Setting

A final source of potential variation in evaluations concerns which activities are appropriate as criteria for evaluating a particular attribute of a location. Firstly, some activities may not occur in a particular location. For example, patients are not treated in the utility rooms.

Secondly, an activity may be relevant to only some of the attributes of the locations. For example, gaining access to a facility may be a relevant criterion for the assessment of its position within a setting, but not for the actual layout of the location. A third aspect is that the same activity may be relevant to more than one attribute of a given location. For example clerical work may be related to both the layout of the work space and the lighting of that space.

A final source of variation is that more than one activity may be
appropriate criteria for evaluating an attribute of a location. For example, the lighting at the patient's bedside can be evaluated in terms of providing treatment to the patient or in terms of the disturbance it causes to other patients.

1.4 Definition of a Behavioural Unit
Qualitative variations in evaluations may result from the characteristics of the setting, the activities which occur within that setting, together with the relationship that exists between the two domains. Therefore it is concluded that the basic unit of study must specify an attribute of a location together with a specific activity associated with the attribute. The unit is referred to as a Behavioural Unit. It is proposed that each behavioural unit will generate a unique evaluation statement. Therefore, an evaluation is:

'the extent to which an attribute of a location facilitates an individual in carrying out a specific purposive activity.'

1.5 The Behavioural Unit Compared with Other Units of Study
The 'behavioural unit' as a unit of study shares common characteristics with other 'units' used to place people's activities in the physical context. However, while it is similar to other constructs used in environmental and social psychological research, it does vary from these on some important aspects. The three most similar constructs are Barker's behavior setting, Canter's Place and Forgas' social episodes.

These three units of study are defined as:

**Behavior Setting (Barker, 1968)**
'a discrete behavior entity with unequivocal temporal-spatial coordinates...it is an extra-individual phenomenon; it has unique characteristics that persist when the participants change.'

**Place (Canter, 1977)**
'the result of relationships between actions, conceptions and physical attributes.'

**Social Episodes (Forgas, 1979b)**
'relatively complex representations of interactions, which at the same time constitute part of the local culture, have a potential normative influence on behaviour and whose meaning is subjective.'

The most immediate difference between a behavioural unit and the three constructs defined above is the size of the unit. Barker and Canter are describing a unit with a range of activities occurring within it and Forgas does not restrict the activities to one particular locale. The behavioural unit can be considered a lower level of description which may form the basic constituents of these larger units.

The behavioural unit can be distinguished from a social episode not only in that it 'situates' behaviour, but also the behaviour that is part of it can be either social or solitary (e.g. studying alone). One
characteristic that it does share with social episodes, as defined above, is that it is subjective. The variations presented previously are described as potential sources of variation. Behavioural units are considered the basic units of people's conceptualisations of design-related experience. In this respect it differs from Canter's use of the term Place. Place includes the relationship between activities, conceptions and physical attributes. A behavioural unit is part of a person's conceptions of the relationship between activities and settings.

In being a description of a subjective experience, it differs most from Barker's behavior setting. A behavior setting is a description of a setting, a part of which is the directly observable standing patterns of behaviour. A behavioural unit is part of an experience and can potentially accommodate both directly observable and subjective activities.

1.6 Summary of the Behavioural Unit as the Basic Unit of Study
A proposal of Chapter 4 is that evaluations are emergent. This emergent property is generally not apparent in the units of study in evaluation research. The proposal is that people, when conceptualising the experience, supply the missing constituents to make them emergent. Therefore the procedure adopted to identify this emergent unit of people's conceptual systems is to consider the possible sources of variations in environmental evaluations. It is proposed that the unit contains:

an attribute of a location together with a particular purposive activity the individual associates with that attribute.

The unit is proposed as the basic unit of people's environmental conceptualisation. To emphasis that the experience is based upon direct environmental interaction it is labelled a behavioural unit. It is considered to be the basic unit upon which a given evaluation is based.

In Chapter 4, cognition is described as a process of categorisation necessary to simplify the world and make it understandable. People's conceptual systems of their design-related experience of a setting have the potential of incorporating an enormous number of specific behavioural units. From the description of cognitions it can be supposed that people structure the specific 'behavioural unit' encounters in order to obtain a coherent account of a setting. That is, they categorise them into groups.

An example of categorisation by a researcher is Barker's (1968) categorisation of behavior settings. He identified 884 behavior settings in a small town over the period of one year. However he found it
possible to reduce these down to 198 genotypes; that is 'classes of
behaviour-in-environment units' (Forgas, 1979b). Evidence from the environmental literature indicates that all people
classify specific environmental experiences into taxonomic categories
according to rules. A major stage in developing the model is the
proposal of the concepts or rules to describe how the categorisation may
take place. The criterion for selecting a given concept is that it is
consistent with the emergent property of the experience. The proposed
concepts, derived from the literature, are presented in Section 2.

2 THE PROPOSED CONCEPTS FOR CLASSIFYING ENVIRONMENTAL INTERACTIONS

Spencer (1973) proposes that:

'A possible basis for a theory (of Environmental Psychology) lies in the organised patterns of
cognitions which are gradually built up by human interaction with the environment.'

Adopting Spencer's approach, it is suggested that a model to describe
environmental evaluations includes a model to characterise these
'organised patterns of cognition'. Section 1 presents the behavioural
unit as the basic unit of people's environmental cognitions. In the
summary of that section it is proposed that people will impose a
structure upon the units in order to obtain a coherent experience of the
setting.

According to Kelly (1955), Ittelson et al. (1974) and Rapoport (1977)
conceptual organisation of the world occurs through a process of
categorisation. Events, people, experiences etc. are grouped together on
the basis of similarities with respect to given properties. Therefore it
is appropriate to characterise people's design-related experience in a
similar fashion.

Through an examination of the environmental literature Section 2 proposes
three concepts to be used to classify the behavioural units which make up
a person's design-related experience. The concepts describe the
attributes of a building, the activities associated with the attributes
and the nature of the interaction between them.

Section 2.1 describes the function of the attributes of a building and
proposes a concept or rule for distinguishing between different design
experiences in terms of the functions served. The concept is referred to
as the Referent. Section 2.2 classifies design-related activities
according to the hierarchy of purposes presented in Chapter 4. The
activities associated with the primary purpose of a setting are referred
to as Front Stage activities. Those activities necessary to the
achievement of the primary activities are referred to as Back Stage
activities. Section 2.3 proposes that distinctions between
environmental interactions can be made in terms of the subjective distance between the individual and the aspect of the environment with which he is interacting. Each of the three concepts or rules are different ways in which a behavioural unit can be described.

2.1 The Functions of the Environmental System

Interaction or similar terms are frequently used to describe the relationship between people and their environments. For example:

'we interact with the environment over time and over space. These interactions are related to social and personal goals. Our interaction with the environment is always part of interaction with others.' (Canter, 1975)

'Human behaviour is not a response to but an interaction with the environment.' (Lee, 1971)

'Aspects of environmental quality...intrinsically involve the interplay between the human observer and the environment.' (Craik and Zube, 1976)

The transactional approach to this relationship is stated by Ittelson et al. (1974) as a: 'View of the person as a goal-oriented cognitive organism, influencing and being influenced by the total environmental process of which he is a part.'

As suggested by these definitions the person is not taken as an observer of the environment, but rather as a participant part of it. Environments not only 'situate' activities, they facilitate activities. The person experiences the activity and the setting as a total system directed towards satisfying his purposes. For example thermal comfort is not just dependent upon the ambient temperature, but also the amount of clothing worn by the individual and the type of activity he is engaged in (Griffiths, 1975). Yet the term 'interaction' as a description of the relationship remains an elusive one. For example Ittelson et al. (1974) propose six different human responses to the environment which they consider central to the man/environment interaction. Yet they are responses, not interactions.

Interaction, as used in the above quotations, is intended to illustrate that the environment does make a contribution to the achievement of purposes. However the term 'emergent' suggests it is not possible to partition out how much contribution it does make. A more fruitful approach is to identify similarities and differences between the physical attributes of a setting in terms of the form their facilitative role might take. For example Murray (1951) suggests:

'situations are susceptible to classification in terms of the different kind of effect which they exert (or may exert) on the subject, that is in terms of their significance to his well-being.'

While Murray is referring primarily to the social environment, it is equally applicable to the attributes of the physical environment. Chapter 4 specifies the BPRU's (1972) spatial and physical subsystems as
the attributes to be classified. The BPRU further proposes that the type of impact of the two systems is different, with their relevance being dependent upon what goals and activities the individual is trying to achieve. Canter (1970), in his description of a building, also suggests that the distinction between different attributes is most effectively illustrated through examining their functions. Three building functions are identifiable from the literature. The functions are: as a filter, a facilitator of interactions with other people and as a place to be used by the individual. Each of the functions are described below.

2.1.1 The Building as a Filter: the Physical Subsystem
The first function Canter (1970) specifies concerns what the BPRU call the physical system, such as the lighting and the heating. Canter describes the role of the environmental services of a building as a filter. They modify the external environment to provide an environment that will be congenial to the activities which occur within the building. For example, the lighting system may be related to clerical work while the heating system may contribute to thermal comfort. Support for the proposal that people recognise this function is given by Farrenkopf and Roth (1980). In their study of offices, they asked people to list issues of importance to them. The list includes heating, ventilation, air conditioning and lighting. Similar findings are obtained for schools (BPRU, 1972) and hospital wards (Sears and Auld, 1976).

2.1.2 The Building as a Facilitator of Social Interaction: The Spatial Subsystem
The BPRU associate the spatial subsystem, that is the layout of spaces and the relationship between them, with two broad categories of activities. One is the interactions between people in the setting. Recent publications in social psychology such as Forgas (1979b), Argyle et al. (1981) and Bickman (1980) suggest the role played by the physical environment in facilitating the social environment is becoming more widely recognised. These authors explicitly include the physical setting as part of the definition of the social situation. In environmental research this function remains one of the most frequently explored. An example is the extensive literature that exists on spatial regulation, territoriality and propinquity (as reviewed by Canter and Kenny, 1975). People are social animals and, as noted by Canter and Kenny, most manipulations of the environment are explainable in social terms. Indeed the current author found no building evaluation study which did not contain reference to interactions between people. Craik and Zube (1976) have noted that this is equally applicable to outdoor sites such as
recreational areas and parks.

2.1.3 The Building as a Place to be Used: The Spatial Subsystem

Another influence of the relative location of spaces and the layout within spaces, proposed by the BPRU, is the individual's actual use of the setting. One aspect of this role, as suggested by Rapoport (1977) in his discussion of urban design, is as an aid to orientation. In his discussion he refers to such work as Lynch (1960) and Appleyard (1969) who investigated people's movement through a city. In the context of a building, orientation is also relevant. For example both Pastalan et al. (1973) and Lawton (1979) stress the importance of environmental cues to aid the elderly in negotiating their environments.

Another function served by the spatial subsystem, which is documented in the literature, is to provide access. For example Rivlin and Wolfe (1979) criticise institutional settings for children in terms of the inaccessibility of many of the facilities provided. Mazis and Canter (1979) also stress the importance of the relative positioning of facilities in children's institutions. The BPRU (1972) find that one of the criteria that teachers use to evaluate their school building is the ease with which they can gain access to other parts of the school from their classrooms.

The attribute of the setting being evaluated in terms of orientation and access may be: the general layout of the building, the relative position of particular spaces or the means of access between spaces, such as doors and corridors.

A further way in which an individual uses the environment is infrequently described as such because it is so commonplace. The spatial environment not only facilitates social interaction, orientation and access, but also the direct use of facilities and spaces. For example the layout of an office contributes to the ease with which an individual can study, write papers and carry out clerical work (Farrenkopf and Roth, 1980) as well as contributing to the interactions with other people. Another example of this is the use of sanitary facilities, a solitary activity (Kira, 1970 and Sears and Auld, 1976). The general neglect of this aspect of environmental interactions is most apparent in institutional settings. Rivlin and Wolfe (1979) argue that, both in the design and administration of therapeutic environments, abnormal environments are created because this personal environmental interaction is discouraged. They suggest the emphasis on social interaction and the continual grouping together of clients is atypical of the life people normally lead.

2.1.4 The Environmental Referent

It is being proposed that one way of classifying environmental attributes
is in terms of the functions they serve. The BPRU (1972) proposes three
general functions of a building: one performed by the physical subsystem
and two by the spatial subsystem. The three functions are most readily
identifiable by the Referent with which the individual is interacting.
For example the level of thermal comfort that a person experiences is the
result of the interactions between his activities and dress and the
functioning of the heating system. The social environment concerns the
interactions between an individual and other people. The use of a
setting involves the interaction between the individual and locations.
Therefore it is proposed that the Referent of the interaction is an
appropriate concept to be used in classifying design-related experience
in terms of the attributes of the setting. The three categories are:
- Other People
- Environmental Services
- Locations

An environmental attribute is one component of a behavioural unit. The
other component is the purposive activity of the individual. The concept
to be used to classify activities is described below.

2.2 The Structure of Purposive Behaviour

Chapter 4 specifies purposive behaviour as the relevant behavioural
classifier to be described in relation to evaluation. A further
proposal is that the purposive activities are a part of the hierarchical
structure of purposes. The hierarchical structure proposed by Sears and
Auld (1976) has not been empirically tested and remains only a possible
theoretical construct. In considering it as a meaningful way of
describing activities, its psychological viability requires examination
as well as the identification of a way of describing activities which
will articulate the structure.

2.2.1 Hierarchy as a Psychological Structure

Perhaps the most well known use of hierarchy is Miller, Galanter and
Pribram's (1960) description of people's conceptual systems as a
'hierarchy of levels of representation'. Their objective is to describe
the structural features of behaviour. They emphasis that the cognitive
system consists of various plans; a plan being;

'any hierarchical process in the organism that can
control the order in which a sequence of operations
is to be performed.'

The basic unit of their analysis is the TOTE unit (test, operate, test,
exit). This is a behavioural episode which implements, tests, modifies
and executes one level of a plan. When a TOTE is completed, according to
these authors, the individual can move on to a superordinate purpose (for
example opening a door to enter a room).
This structure is very similar to that proposed in Chapter 4 for purposes and purposive behaviour. The major difference is that Miller et al. appear to be suggesting that a lower level TOTE must always precede a higher level behavioural episode. In the present work the significance of a purposive act lies with the position it occupies in the hierarchy of purposes. A lower level purposive act does not necessarily temporally precede an activity higher in the hierarchy in order to facilitate it. This will be illustrated through a discussion of Bott's work (1970) presented in Chapter 7.

An important characteristic of the Miller et al. work, which is shared by Kelly (1970), is that conceptual systems are viewed not just as products of experience; but also plans for future actions. The present work has as its focus 'evaluations' as an outcome of conceptualisations. Consequently more emphasis is placed on the formation of the conceptualisations than on their use as plans for action beyond the action of evaluation. However a part of the significance of the work lies with the assumption that these conceptualisations are directives for action. People act upon their world as they perceive it. The empirical questions posed in Chapter 2 about the relationships between nursing care and ward design and also the implication of the work presented in Chapter 12 are stated in terms of the nurses' use of the ward as implied by the model of evaluation. Therefore it is implicitly accepted that conceptualisations are both formed through experience and also are directives or plans for future activities.

Miller et al. describe the hierarchical structure of behaviour as axiomatic. A similar stance can be found in other areas of psychology. For example Altman and Taylor (1973), Lewin (1948), Rokeach (1968) and Leary (1957) all propose such a structure to personality. The peripheral layers of personality contain specific facts which, they suggest, are usually superficial, while the core contains general attitudes such as self-image.

Altman and Taylor (1973) use this structure to describe the relationship between personality and friendship formation. They suggest that as friendship develops the self disclosure proceeds from the peripheral to the more central areas of a person's personality. While knowledge of the peripheral facts provides clues about the person, it is knowledge of the central issues that provides the most understanding of an individual and his actions.

A more empirical basis for a hierarchical structure is provided by research concerned with purposes; although in relations to a different issue, the meaning of 'wellbeing'. Levy and Guttman (1975) conducted
research in order to clarify the ambiguities in the term. While previous literature suggests it is a meaningful concept, in that people can be described as being relatively high or low on such a dimension, there is no clear statement of what 'wellbeing' means or what aspects of life contribute to it. Using the facet approach they demonstrate that 'happiness' is seen by people as being the primary or centre-most objective of a person's life. In addition the analysis indicates that 'happiness' is facilitated by success in a range of aspects of life such as family, health, security and education. More relevant to the current discussion is the finding that objectives or purposes of what Levy and Guttman call the 'primary environment' such as a good family life are more highly related to happiness than are objectives of the 'secondary environment' such as housing, income and education. They propose that the secondary environment acts as a resource for the primary environment; that is, housing, income etc. facilitate a good family life which in turn contributes to the individual's overall happiness.

The above examples suggest that hierarchy is a structure which is meaningful for the description of people's conceptualisations. In order to use the structure as a way of classifying design-related activities a rule for assigning activities to different levels must be established. It is proposed that activities be assigned to levels in terms of their relationship to the overall purpose of the setting.

2.2.2 Front Stage and Back Stage Activities

The present study has as its focus the primary providers of patient care in the ward context, nurses. A clear hierarchical distinction is suggested by the literature for this type of behaviour/setting system; that is, for a system whose overall purpose is to provide a service to other people. It is the distinction between front stage and back stage (Goffman, 1961). For example Sime and Sime (1979), in studying an 'open plan' forensic unit, find a clear distinction between staff and patient areas. Lecompte (1972) finds a similar pattern for doctors, nurses and therapists in a hospital setting. Canter (1972) also identifies patient and staff areas in childrens' hospital wards. Using smallest space analysis on the staff's evaluations of the parts of the ward he demonstrates that nurses make a distinction between the bed and play spaces and the offices and preparation areas. Steele (1973) suggests this is a distinction applicable to all buildings. Rapoport (1977) applies it to the home and suggests these areas can, in part, be identified in terms of tidiness. For example the utility room is generally not kept as tidy as the living room.
Most of the above authors make the front stage/back stage distinction in terms of locations. However, the results from both Canter (1972) and Sime and Sime (1979) suggest the distinction is actually between activities. Canter's smallest space analysis of nurses' evaluations shows one important location which belongs to both the patient area and the staff area, the nursing station. The Nuffield team (1955) point out that the nursing station has traditionally served two functions: as a vantage point for the observation of patients (a front stage activity) and as a desk for clerical work (a back stage activity). Sime and Sime (1979) also identify an office area where staff interview patients (front stage) as well as writing reports etc. (i.e. back stage). These studies demonstrate that back and front stage activities; that is, those activities which facilitate more focal activities as well as the focal activities, are not necessarily spatially separated. Therefore it is proposed that the levels of the purpose hierarchy in a service type of setting be distinguished in terms of Front Stage and Back Stage activities.

The classification of design-related experience into front and back stage activities is quite separate from the classification in terms of the Referent (Section 2.1). For example, nurses communicate with both patients (front stage) and other staff (back stage). In both instances the referent is Other People. The Environmental System is equally applicable to front stage activities (e.g. lighting for the treatment of patients) and back stage activities (e.g. lighting for clerical work). Also as illustrated by the work of Canter (1972) a Location (e.g. the nursing station) may relate to both types of activities.

The final concept is concerned with classifying the interactions that take place between the individual and the environment.

2.3 Psychological Levels of Interaction

Rapoport (1977) proposes that one of the predominate ways people classify referents in their environment is in terms of what he calls 'subjective distances'. For example in describing cognitive maps he suggests that:

>'if places are placed in different categories, they may appear further (away from each other) than if they are placed in the same category.'

Evidence exists at the urban scale, at the level of interpersonal distancing and at the level of building use that subjective distancing is a relevant way of further classifying people's conceptions of their direct experience of the environment. At the urban scale distancing is usually expressed in terms of levels of the environment. At the personal space level 'subjective distancing' is described in terms of different
levels of preferred contacts. At the level of the use of a building it is distinguished in terms of different activities.

2.3.1 **Levels of the Urban Environment**

Kaplan (1970) states that the purpose of cognising the physical environment is to locate the person in time and space. Following from this Rapoport (1977) proposes *scale* as a major concept used to orientate people in the urban environment. He proposes the referents with which the individual interacts are categorised into different levels of the environment. For example he describes locational attributes (e.g. areas, buildings, structures such as bridges and paths) and non-locational attributes (e.g. people) as being conceptually organised into a hierarchical structure. Canter (1977) also describes people's conceptions of the environment in terms of a hierarchical structure.

The position of a given environmental referent in the hierarchy is determined by its relationship (both physically and socially) to other referents. A study by Baird et al. (1972) illustrates this. They asked people to design an ideal town by arranging sixteen facilities in a space. The clusters of buildings obtained are produced in a hierarchy, nested one within another. Figure 5.1 gives an illustration of the types of levels formed through the process of classification in terms of perceived similarities.

**Figure 5.1 Illustration of a Hierarchical Structure of the Urban Environment (taken from Baird et al.; 1972)**

<table>
<thead>
<tr>
<th>Level 4</th>
<th>Town</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level 3</th>
<th>Neighbourhood</th>
<th>Not Neighbourhood</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Community Services</td>
<td>Commercial Areas</td>
</tr>
<tr>
<td></td>
<td>Hospital</td>
<td>Municipal buildings</td>
</tr>
<tr>
<td></td>
<td>Residential</td>
<td>Entertainment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level 2</th>
</tr>
</thead>
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<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Level 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level 1</th>
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<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
For example the police station is construed as most similar to the fire station and town hall (the municipal buildings of level 1). At the next level the municipal buildings are grouped together with the hospital to form a Community Services area, identifiable from the Commercial area. At the third level these two groups (Community Services and Commercial) are combined to form the 'Outside Neighbourhood' level of the town. Thus by comparing environmental elements in terms of their relative similarities, different levels of the environment are identifiable.

2.3.2 Interpersonal Distances

Levels of interaction can also be applied to activities and conceptions at a much smaller scale. Research on spatial regulation suggests that interaction or communication between people is regulated in terms of preferred levels of contact or privacy. The most obvious example of this is Hall's (1966) concept of interpersonal distances. He suggests there are actually different zones of space around a person. The zones within which another may enter will depend upon the level of contact the person is prepared to have with the other person. The four zones he distinguishes are: intimate distance, personal distance, social distance and public distance. While cultural differences occur as to the size of these zones (Watson and Graves, 1966), the research conducted on spatial behaviour demonstrates that there are socially shared norms concerning interpersonal distancing (see Canter and Kenny, 1975 for a review of the field).

Canter and Kenny (1975) emphasise the fact that physical distancing is just one aspect of regulating social interaction (i.e. subjective distancing). They propose that the explanation of this behaviour lies with the individual's preferred level of privacy; privacy being defined as:

'an optimum balance, or at least the freedom to achieve that balance, between information which comes to a person and that which he puts out.'

The individual has a range of qualitatively different activities which he can use to achieve the desired level of privacy. Examples are: tone of voice, eye contact, spatial positioning as well as distance, topic of conversation and, as illustrated by Altman (1971), use of the physical environment. The levels of these activities can be adjusted to create the subjective distance the individual prefers. For example the close proximity of strangers in a lift may reduce both the amount of eye contact and the volume of speech.

2.3.3 Levels of Interactions in Buildings

Environments can be described in terms of the levels of interaction they
facilitate. Perhaps the best known is Osmond's (1957) distinction between 'sociopedal' and 'sociofugal' spaces. Sociopedal spaces encourage more social interaction (e.g. living rooms) while sociofugal spaces tend to keep people separated (e.g. airports). Osmond (1957), Ittelson et al. (1970) and Sommer (1969) have all introduced environmental changes in psychiatric hospitals in order to make them more sociopedal. However Sommer and Osmond caution that such patients should not be forced into continual social interaction and should have a place to withdraw to and be alone. Rivlin and Wolfe (1979) also emphasis that people need both a private level of interaction (i.e. no disturbances from other people) and a social level.

Rivlin and Wolfe (1979) also promote what might be described as an 'exploration' level of environmental interactions in therapeutic settings for children. This is illustrated by work by Tars and Appleby (1973) who observed the activities of a young boy both in an institutional setting and at home. The boy engaged in more social interaction in the therapeutic setting. However, the range of new experiences and explorations are much less than those available in his home setting. Rivlin and Wolfe describe this level of environmental interaction in terms of freedom of access. This relates back to Canter and Kenny's notion of freedom of choice in the level of interaction a person engages in. Privacy and solitude, social interaction and exploration can each be considered as a different preferred level of interaction.

The strength of the concept of levels of interaction is reflected not only by the modifications of psychiatric hospitals to encourage particular levels, but also in its impact on the creation of new designs. The Nuffield Plan (see Chapter 2) incorporated a deliberate decision to facilitate a particular level of interaction; that of direct contact between patients and nurses. In order to achieve this, access to the patients was improved by reducing the physical distance between patients' bedrooms and the nurses' areas. An additional result of creating a more compact design was that the more distant form of interaction (observation of the patients) was made more difficult due to partitioning. The Nuffield design decisions suggest the level at which interaction takes place is an important part of design-related experience.

2.3.4 Summary of Levels of Interaction

The third concept proposed to describe people's design-related experience is the level at which the interaction between the individual and the referent takes place. Evidence is provided that people construe the referents of their environment in terms of the referent's subjective
Research on people's cognitions of the urban environment indicates that people order their environmental referents into levels of the environment. The ordering is through a process of classification based on similarities between the referents. Research on social interactions also shows that scale is applicable within this context. People order their preferred level of social contact in terms of greater or less subjective distancing between themselves and others.

Writers concerned with building design emphasise the importance of providing an environment which will facilitate social interactions. However they also indicate that direct contact between people is just one level of interaction which occurs within a building. The clearest distinction between interactions at the building level are those identified by the Nuffield team (1955) and used in their design; direct contact, access and observation. It is proposed that it is at this scale of interaction that distinctions can be made which will relate to people's evaluations of a building. It is further proposed that the levels are identifiable from the individual's goals and activities.

The studies of interpersonal distancing and the levels specified by the Nuffield work have referred to only one type of referent, other people. However Rapoport (1977), in describing the levels of the urban environment, includes both people and the physical environment as referents. In addition in his review of residential evaluations Rapoport (1977) combines levels of the environment with a distinction between social and physical referents in order to illustrate the particular issues important to people's residential satisfaction. Examples are:

<table>
<thead>
<tr>
<th>Physical</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing maintainence</td>
<td>privacy</td>
</tr>
<tr>
<td>Neighbourhood freedom from industrial nuisance</td>
<td>good for children</td>
</tr>
<tr>
<td>City topography (e.g. hills)</td>
<td>status and prestige</td>
</tr>
</tbody>
</table>

Therefore it is proposed that levels of interaction can be used to further define design-related experience and that the levels are applicable to all environmental referents.

2.4 Summary of the Proposed Concepts to Classify Environmental Interaction

The objective of Section 2 is to specify the concepts or rules to be used to describe the experience of environmental interaction. The criteria for the inclusion of a particular concept are that it be consistent with the emergent quality of evaluations and incorporates the components
specified as part of this experience in Section 1.

Three concepts are proposed to classify the behavioural units. The first is the classification of the environmental attributes according to the facilitative role they play. Evidence suggests that the type of role is dependent upon the given activity of the individual. It is proposed that the role is most readily identifiable from the Referent with which the person is interacting. The three proposed referents are: other people, locations and environmental services.

The second proposed concept is concerned with the classification of activities in terms of the levels of the purpose hierarchy. The distinction proposed for classifying activities in this manner is that of Front Stage and Back Stage. The front stage activities are those which involve the primary purpose of a given behaviour/setting system. The back stage activities are specified as those which do not directly involve the primary purpose but are necessary supports to it.

The final proposed concept specifies the level at which interactions between the referent and the person take place. The levels are graded as more to less distant. At the scale of the building the levels are identifiable from the activities of the individual. For example, observation is considered a more distant form of interaction than direct contact with the referent.

All three concepts are specified as ways of describing people's experience of using an environment. This gives a three-way classification system for comparing the similarities between the various behavioural units.

3. SUMMARY OF CHAPTER 5: THE COMPONENTS OF THE MODEL

Chapter 5 describes the second stage of the development of the model. The basic unit of study is specified and the concepts or rules for classifying design-related experience are proposed.

Chapter 4 describes evaluations as emergent. Therefore the basic unit of study must incorporate both purposive behaviour and an attribute of the setting. Through considering the potential sources of variations between evaluations the unit is specified as consisting of an attribute of a location, together with a specific activity associated with the attribute. It is proposed that each behavioural unit forms the basis of one particular evaluative statement.

As noted, there is the potential of an enormous number of behavioural units relevant to the experience of a given setting. From the previous discussion of people's conceptions of their world, it is assumed that
people will structure their experience of the behavioural units. A major way in which the world is structured is through the process of cognitive categorisation, with people grouping elements of their experience into categories on the basis of similarities (Rapoport, 1977). The purpose of categorisation is to simplify the world and make it more comprehensible. Therefore it is assumed that people will simplify their experience of the behavioural units by creating general classes or 'genotypes' of behavioural units.

In considering what these genotypes might consist of and how they may be related, the approach adopted is to examine the environmental literature to identify possible ways in which people might classify their design-related experience. Three such concepts are identified and proposed as the rules to be used in classifying the behavioural units. They are:
- the Referent of the individual's interactions
- the Type of purposive activity
- the Level of Interaction

These specifications produce a 3-way classification for describing behavioural units. Each of the concepts represents a set of hypotheses about the relationships between the evaluative statements which go to make the evaluation of a setting. In order to empirically test the hypotheses they need to be stated in precise terms that are consistent with the analysis to be used. The approach adopted to aid in the specification and testing of the hypotheses is Facet Theory. Chapter 6 describes Facet Theory, why it is appropriate for the current research problem and the types of hypotheses generated from the approach.
Chapter 6

MAKING THE MODEL OF ENVIRONMENTAL EVALUATION PREDICTIVE

Three states in model development are stated in Chapter 4. The first stage, the clarification of the rationale for the approach taken, is presented in Chapter 4. Chapter 5 describes the second stage; that is, the specification of the basic unit of study and the proposal of the concepts to be used to describe people's interactions in relation to environmental evaluations. Chapter 6 describes the third stage, a specification of the types of hypotheses generated for the relationships between the behavioural units.

The development of a model which is open to direct empirical testing requires that the form of analysis to be used is an integral part of the development. As stated by Guttman (1977):

'A theory that is not stated in terms of the data analysis to be used cannot be tested'.

As will be illustrated, the hypotheses in the model described in Chapter 5, are stated in terms of regional interpretations. This provides the opportunity of using a form of analysis (smallest space analysis) which is part of an approach developed to facilitate both the systematic construction and the testing of substantive models. The approach is called Facet Theory and is based on the work of Louis Guttman and his associates (a review of the approach is given in Shye, 1978).

The major reasons for using the facet approach are that the properties of the analysis are consistent with the characteristics of the research problem, the interpretation of the data is straightforward and it allows a precise specification of the hypotheses to be tested. Section 1 describes the requirements of the research question in relation to the properties of analytic techniques and the problems of interpretation. Section 2 describes facet theory and how it is used to construct and formalise research hypotheses. Section 3 describes the preliminary application of the facet approach to the model of environmental evaluation.

1 THE CHARACTERISTICS OF THE RESEARCH PROBLEM

Runkel and McGrath (1972) describe the research process as a series of choice points. Decisions taken at the early stages define and restrict the choices available in the later stages. The selection of a particular form of analysis is restricted by the requirements of the research objectives. The present objective is to describe the relationship between the evaluative statements made by nurses about their wards. Two aspects of the objective are that the description will not arbitrarily partition the phenomenon of the total evaluation of a setting and the description will accommodate the emergent quality of that experience.
The requirements of the analysis are:

1. It will accommodate the potentially multidimensional nature of the experience.
2. It will articulate the relationships between the evaluations in a manner consistent with the concepts used to categorise the evaluations.
3. It will allow the entire phenomenon to be described as a unity.

Each of the requirements are discussed in the following subsections.

1.1 A Multidimensional Problem
Chapter 4 proposes that people, in cognising their design-related experience, will simplify it by imposing a structure. This objective of parsimony is also incorporated into a range of analytic techniques commonly described as 'data reduction' techniques (Eber, 1975). Eber states:

'These techniques are used when the researcher has a larger number of observations than he can easily interpret ... The task is to reduce this complexity to a more easily conceptualised pattern: it is not primarily a matter of statistical inference or proof'.

It is this type of analytic technique which is appropriate for describing environmental evaluations. (However, as discussed in Section 2, it is no longer necessary to assume their major contribution is parsimony. That section illustrates that hypothesis testing can also be used at the descriptive stage of a research project).

A common characteristic of data reduction techniques is that they are multidimensional. Section 1.1.1 describes why this is a necessary requirement. Section 1.1.2 discusses the analytic advantages of multidimensional techniques and Section 1.1.3 suggests some of the problems in using these techniques.

1.1.1 Ward Evaluation: A Multivariate Problem
The provision of nursing care is specified as the overall purpose to be used as the criterion against which the nurses' evaluations are to be made. The Nuffield Job Analysis (1953) identified over one hundred observable activities of nurses which may be considered a part of this care. The diversity of the activities (such as ordering supplies, talking with relatives, grooming patients, treatment, supervising untrained staff) suggests that the nurses' interactions with the setting will be quite different for the various activities and may result in quite different assessments of the ward. As the evaluations are taken to be based upon these interactions, it will be unlikely that the various evaluations can be adequately described by a single underlying dimension. Indeed Sears and Auld (1976) in their evaluation study of hospital wards find a multidimensional solution necessary to adequately describe the
patterns of relationships between the evaluations. Therefore the
technique to be used must be capable of dealing with a multivariate
problem.

1.1.2 Advantages of Multivariate Techniques
Eber (1975) describes the purpose of analytic procedures as being the
identification of lawfulness, that is, whether or not the empirical
observations conform to the predictions of the theory. In this instance
it is whether or not the empirical similarities and differences between
the evaluations can be explained in terms of the concepts specified to
describe these relationships. Eber advocates the use of multivariate
techniques because they reduce the:

'chance that lawful relationships which exist will
have been missed by failure of representation in the
data set'.

Also as stated by Guttman (1977):

'a problem that is multivariate (3 or more variables)
cannot be studied properly by univariate or bivariate
techniques'.

In addition, as pointed out by Runkel and McGrath (1972) multivariate
analyses are designed to represent the patterns of relationships in the
smallest acceptable dimensionality. If the structure is, in reality,
unidimensional the techniques will represent it as such.

1.1.3 Problems in the Use of Multivariate Techniques
The major concern with using multivariate techniques is expressed by Eber
(1975) as 'garbage in, garbage out'. This succinct statement has two
aspects to it. Firstly, as he suggests, the techniques are complex and
the investigator can easily become removed from his data. Lingoes (1979)
echoes this in his statement that:

'if an investigator is unable to interpret the
coefficients or measures used before the analysis, a
mathematical transformation ... is not going to be of
much help after the analysis'.

A second concern is that they can become a substitute for substantive
thinking about the problem (see for example, the criticisms raised in
Chapter 3 with respect to Semantic Differential Scales). While such use
is usually described as 'hypothesis generating' (Humphreys, 1962);
researchers are infrequently prepared to consider their work as
preliminary. Non-theoretical approaches tend to lead to further non-
theoretical work with, as indicated in Chapter 3, little resultant
cumulative knowledge.

The exploratory use of multivariate analyses also raises problems with
the research instrument. As stated by Milcarek and Struening (1975)
'measurement concerns the operational definitions of constructs.' The
'post facto' derivation of the constructs raises questions about the
validity of the instrument. For example Nunnally and Durham (1975) indicate that for many of the instruments developed in psychology predictive validity and content validity are not meaningful. They suggest that 'construct validity' is a more important criterion for instruments which are to be used to establish functional relations among variables. The three major aspects of the process of this validation, which they propose, are:

1. Specifying the domain of observables for each of the constructs.
2. Determining the relations among observables for each construct.
3. Determining the relations among constructs (i.e. the relations between the observables of all the constructs).

If Steps 2 and 3 (the relations) are as predicted, then construct validity can be assumed. These steps to establishing the construct validity of a research instrument are, in fact, the same procedures involved in the Facet approach to research design and hypothesis testing (see Section 2).

1.1.4 Summary of the Multivariate Requirement
In summary, the characteristics of the research problem suggest that it is a multivariate problem. Multivariate analyses increase the chances that lawful relationships will be illustrated. The problems associated with these analyses are in terms of how they are used. They are not a substitute for a substantive model. Used as such creates problems of interpretation and raises questions about the validity of the research instrument. A further requirement of the analysis is that it will not restrict the type of relationships which can be examined.

1.2 The Articulation of the Relationships
All data reduction techniques make certain demands upon the data. Factor Analysis, the best known of these, requires the assumption that the relationships between the observations are best represented in a linear form. However there is sufficient evidence to suggest that such an assumption is not appropriate for all relationships. (Lingoes, 1979 and Shye, 1978; summarise many of the studies which have illustrated this). An example is Shepard and Carroll's (1966) description of their analysis of similarities of perceived colour. They adopted the approach recommended by Lingoes (1979) of inspecting the measures prior to analysis for patterns of relations. They state:

"Even in the original, unordered set of profiles ... a hint of the existence of such interdependencies could be gleaned from the absence of whole classes of possible patterns ... The standard method of linear factor analysis ... however, is unable to take full advantage of these strong interdependencies for they are also strongly nonlinear. An analysis of these same 23 profiles into principal components, for example, yielded three significant dimensions instead of the single one recovered ... here!"
Forgas (1979b) suggests that the appropriateness of linear representations of data is even less so for the description of cognitions and perceptions of complex social events. This may also apply to environmental evaluations. The evaluation model specifies a 3-way classification of each of the observations (evaluation statements). Factor analysing the observations into orthogonal dimensions will not illustrate whether or not the categories specified by each concept actually belong to that concept, or what the relationships between the concepts are. In other words, the hypotheses generated in Chapter 5 could not be tested. A more appropriate analytic technique for this type of problem is one of the nonmetric techniques. Forgas (1979a) recommends the use of multidimensional scaling procedures (MDS) because of their advantages over metric multivariate techniques due to their less stringent demands upon the data. Smallest Space Analysis is one of these techniques. Section 1.2.1 describes common MDS characteristics and Section 1.2.2 presents the advantages in using the MDS procedures.

1.2.1 Common Characteristics of Multidimensional Scaling Techniques

A large number of multidimensional scaling techniques (MDS) are now in current use (see for example Shepard, 1962; Kruskal 1964, Young and Torgerson 1967; Lingoes 1973, McGee 1968 and Carroll and Chang 1970). These analyses produce spatial representations of the data and all share a common assumption for their use, as stated by Forgas (1979a):

'The central assumption underlying the psychological use of MDS techniques is that psychological distance or similarity (between concepts, constructs, persons, traits, social episodes, national stereotypes, etc.) can be represented and analysed in terms of euclidean distance formulations'.

The primary criterion of the techniques is monotonicity, that is:

'that the rank order of dissimilarities among pairs of stimuli or actions should agree with the rank order of distances among the points ... in the final configuration'. (Runkel and McGrath 1972)

The distinction between MDS and factor analysis is that factor analysis deals with the absolute differences while MDS operates on the rank order of the differences. This gives MDS several advantages over the metric techniques.

1.2.2 Advantages of Multidimensional Scaling Techniques

One of the primary advantages of relaxing the criterion to 'rank order' is parsimony, a basic objective of research. As stated by Runkel and McGrath (1972):

'The purpose of inquiry is to search out and present some unifying organization among disparate objects or events-not necessarily a very simple organization but an order or a pattern that is at least simpler than the total set of objects or events ... This goal of finding our concepts that simplify our understanding of experience is commonly called the principle of parsimony'.

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The more explanatory power a concept has the greater its utility. MDS techniques require fewer dimensions to represent the pattern of relationships than metric techniques. This tends to lead to the identification of properties of a more general nature than obtain from metric analysis, as illustrated by the example by Shepard and Carroll (1966) given above. A similar comparison between MDS and Factor analysis is illustrated by Guttman (1965) for intelligence tests (reported in Shye 1978).

A second important use of MDS is as an:

'analysis for the discovery of previously unknown structure, and hence the achievement of new scientific insight. I still regard .. (this) ... as of possibly the greatest potential importance'.

(Shepard, 1974)

Examples of areas where this has occurred are: social episodes (Forgas, 1978), person perception (Mueller, 1974), personality (Rosenberg and Sedlak, 1972) and stereotypes (Funk et al., 1976). However much of the work with MDS remains exploratory and hypothesis generating rather than hypothesis testing. There is evidence to suggest that the techniques have been around a sufficient length of time for this 'discovery' to be converted to the identification of recurring structures (examples of such evidence are provided in Borg, 1977, 1981; Lingoes, 1979; and Shye, 1978). Appendix 3 provides a description of the basic structures that have been identified with facet design and analysis.

A third advantage of MDS techniques is that there are guides available for the interpretation of the results. For factor analysis the meaning of a given factor is intuitively derived from the factor loadings by contrasting the extremes (highest positive and highest negative loadings). Such a form of interpretation ignores all other observations that lie between the extremes. This is inconsistent with the specifications of the current model. For example the Levels of Interaction rule produces at least one intermediate category on the continuum of more to less psychological distance.

Early in the development of multidimensional scaling techniques Lingoes (1966) stated the need for:

'theoretical guides and interpretive aids for both specifying the kind of solution desired and for helping us look at multidimensional spaces'

Four such guides for interpreting MDS representations can be identified. A detailed account of three (intuitive labelling, external labelling and internal labelling) can be found in Forgas (1979a). All three aids are limited to post facto data interpretation. Forgas makes this clear in his statement that:
'In its psychological uses, MDS is unique among descriptive statistical techniques in that we do not know before embarking on a study what the substantive dimensions defining a stimulus space are likely to be, since these are implicit in the subjects' judgements and are not provided by the experimenter in the form of preselected scales. For this reason, it is nearly always important to come to terms with the substantive meaning of the solutions generated. In effect, interpretation normally means the identification and labelling of the dimensions defining the stimulus space'.

According to Nunnally and Durham (1975) such approaches ignore the first stage in determining construct validity; that of specifying the observables for each construct. While this is not uncommon, according to Nunnally and Durham, it does mean that such work remains exploratory. In addition the guides presented by Forgas (1979a) are used for the interpretation of dimensions (i.e. linear ordering) and as a consequence do not articulate non-linear relationships.

The fourth guide to interpretation is Facet Theory. It has its advantage over the others in that it provides a predictive rather than a purely descriptive basis for the interpretation and provides a structural approach that will illustrate both linear and non-linear relationships. Facet Theory is further discussed in Section 2.

1.2.3 Summary of the Articulation of Relationships

In summary, the current model is stated such that metric multidimensional techniques are not appropriate for the testing of the proposed relations between the evaluations. Eber (1975) argues for techniques that reduce the 'chance that lawful relationships which exist will have been missed by failure of representation in the data set'. MDS techniques have an advantage over the metric techniques in that they have the capacity to illustrate relationships which are non-linear. In addition the techniques allow greater parsimony in explanation, promote new ways of looking at research questions and have guides for the interpretation of data. A further requirement of the analysis to be used to represent the evaluation of a setting is that it can describe the phenomenon as a unity.

1.3 Evaluation of a Setting as a Unitary Phenomenon

In Chapter 4 a model is specified as a description of a phenomenon. The phenomenon to be described is the environmental evaluation of a setting. This section discusses the analytical requirements of treating this as a unitary phenomenon. Section 1.3.1 presents the rationale for describing ward evaluations as an unity. Section 1.3.2 describes the types of classification that occur in cognitive systems. Section 1.3.3 discusses the mode of interpreting MDS space as it relates to the holistic account of evaluation and the structure of cognition.
1.3.1 The Rationale for Describing the Evaluation of Wards as a Unity

It is proposed that the description of a phenomenon involves the categorisation of the components of the phenomenon according to rules. In the present work the components are specified as behavioural units. Each evaluative statement concerns the experience of one given behavioural unit.

The rationale for the proposal that the total evaluation of a setting can be described as one phenomenon lies with the hierarchical network of purposes as described in Chapter 4. The primary purpose of nurses being in a ward is specified as the provision of nursing care. This cannot be accomplished by one activity. An activity is directed towards the achievement of a lower level purpose. The achievement of the lower level purposes is a necessary prerequisite to achieving the primary purpose of total patient care. Because they are all subordinate to the same purpose, it is argued, the lower level purposes are related to each other. Nursing care can be described as an integrated system of purposive activities. As the achievement of purposes is specified as the criterion for evaluation, it follows that the evaluative statements will be related to each other.

The evaluation of a setting is more than a list of discrete evaluations. It is also the relationships between them. Consequently a model of the evaluation of a setting includes both an account of the experience within each behavioural unit and the relationship between the units. Only by identifying the conflicts and compatabilities people experience between their various environmental interactions, is it possible to understand the quantitative differences between the evaluations.

The description of the evaluation of a setting as an unity is a description of an integrated system of evaluations. The system has as its basis people's conceptualisations of the setting. The form of interpretation should be consistent with the way people structure their cognitions.

1.3.2 The Structure of Cognitions

An objective of the present work is to predict and illustrate a structure to nurses' evaluations in a manner that is consistent with the way the nurses structure their experiences. In reviewing the literature on social and clinical judgements Bieri et al. (1966) also emphasise the necessity of describing the 'processes which intervene between a given stimulus array and the final judgement which is produced'. The intervening processes are, according to Bieri et al., the ways in which the individual makes sense of the cues within his cognitive system of meaning. That is, the ways an individual categorise people, events,
objects etc. in terms of their likeness or differences in relation to other objects. A basic question posed by Bieri et al. is 'how best to represent the operation of this structure in a way that will aid our understanding of what occurs?'

There are two schools of thought as to how people cognitively classify their world. Bruner (1957) and Restle (1961), using set theory, maintain it is a categorical process; with stimuli being assigned to discrete categories. The advantage of this approach is that it can accommodate qualitatively discrete stimuli (nominal scaling). The alternative approach, best known by the work of Kelly (1955) and Osgood et al. (1957), is the dimensional interpretation. This approach emphasises that classification is relational; that is that classification is a matter of degree. People or events are ordered along a continuum (ordinal or ratio scaling).

Restle (1961) maintains that:

'the set-theoretical and dimensional models are logically incompatible and lead to entirely different approaches to theoretical problems'.

However Attneave (1962) suggests that there is an over-emphasis on the 'a priori' mathematical models for representing cognitive structures, rather than considering the actual nature of people's conceptualisations. According to Attneave both these types of classification occur in the process of cognition. He states:

'The question of whether this analytical process may better be conceived in terms of psychophysical dimensions or in terms of discrete classes of elements is difficult, important, and unresolved. Both continuous and discrete variables seem to exist subjectively; in certain contexts, one formulation seems the more appropriate; in other contexts, the other. It would appear that neither is potentially reducible to the other'.

Bieri et al. (1966) also accept that these alternative forms of classification may occur simultaneously in people's conceptual systems. This possibility requires a form of interpretation which can accommodate both types of schemes in order to describe ward evaluation as an integrated system.

1.3.3 The Interpretation of MDS

There are two predominant ways of interpreting MDS spatial configurations. They are: by dimensions (Forgas, 1979a) or by regions (Lingoes, 1979). Dimensional interpretations provide directional information for the identification of concepts. They do not, however, specify the categories into which the observations are assigned by each concept. The description of a phenomenon requires the specification of the relationships between the components. The relationships are determined by the similarities and differences between observations in
terms of their category membership. Dimensional interpretations do not illustrate the categories and therefore lack the precision to provide a systematic classification scheme. Yet as stated by Forgas (1977) one of the primary advantages of MDS techniques is their capacity to articulate taxonomies. Lingoes (1979) provides an explanation for why dimensional interpretations are frequently used with MDS techniques. He states:

'Much of this practice is a carry-over from factor analysis training and lore (bordering on mythology). Indeed, the habit seems so deeply ingrained and pervasive that it is very difficult for students with even a modicum of exposure to this "discipline" to shift gears and address other features of the configuration'.

An alternative form of interpreting a MDS space is by regions. That is, the space is partitioned into regions, each region being a category. The relationship between the regions corresponds to the relationship between the categories. This allows a more precise illustration of the empirical relationships between the observations and, as a consequence, a more precise description of the total phenomenon.

In addition Attneave (1962) points out that the two approaches to the description of cognitions can be reconciled by representing classes of objects as regions within a multidimensional cognitive space. That is, even though objects may be ordered along a continuum people perceive them as discrete classes. The dimensional quality is illustrated by the ordering of the regions in the space. This interpretation allows both qualitative classification schemes (nominal scaling) and quantitative schemes (ordinal scaling) to be accommodated within one definitional system for describing cognitive systems.

1.3.3 Summary of the Description of Evaluation as a Unity

A requirement of the analysis to be used is that it has the ability to illustrate the evaluation of a setting as an integrated system. This, it is argued, is dependent upon the form of interpretation used. The form of interpretation which best fits the requirement is the partitioning of the MDS space into regions.

1.4 Summary of the Characteristics of the Research

The choice of a particular form of analysis and interpretation is dependent upon prior decisions taken in the research project. The way the problem is formulated restricts the choice. The requirements of the analysis are: that it will accommodate the multidimensional character of evaluation, that it will illustrate patterns of relationships which are not necessarily linear and that the interpretation will allow the domain to be described as a unity.

These requirements restrict the choice to the Multidimensional Scaling techniques. Smallest Space Analysis (Lingoes, 1973) is selected from
within the group because of the accompanying guide to interpretation, Facet Theory. The strength of facet theory lies in the fact that it is not a 'post facto' guide. Rather it is a 'metatheory' which can be used for formulating and testing research hypotheses. In this respect it brings prediction into an area of psychological research which has traditionally been descriptive. Section 2 summarises the major principles of facet theory.

2 FACET THEORY

Facet theory provides the basis for constructing and testing an integrated description of a given conceptual domain. In this way it can be described as a metatheory. It provides a structural approach for defining phenomena which allows researchers to build up, elaborate and test their conceptual accounts. In presenting the need for such an approach Guttman (1977b) states:

'R.A. Fisher showed how statistical inference must be based on experimental design. How can this type of thinking be carried over to more general data analysis for which mathematical statisticians have no inferential answers yet ...? Why should social surveys and mental tests have their content items constructed without the same care and formalization that goes into the design of the population sample to which they are administered? And why should not the data analysis be conducted according to such a design of content?'

The basic logic of Facet Theory is the systematic classification of observations. The problem with most theories, according to Guttman (1976), is that their most fundamental kinds of concepts have not been sufficiently systematised to allow the articulation of the relationships between them. As he suggestes, exclusive classification of variables (i.e. variable x belongs to concept X, variable z to concept Z etc.) precludes the establishment of relationships between the two theoretical concepts. This need not be the case, as stated by McGrath (1967):

'most aggregates of objects-be they concepts, events, or pieces of data-have more than one property upon which they can fruitfully be classified. Furthermore, those relevant properties are seldom highly, much less perfectly, correlated with one another. Thus, there is a need for classification in terms of multiple properties'.

Facet theory systematises the generation of hypotheses. 'Facet design is intended to help make hypotheses transparent, which also facilitates reliable and correct design and execution of the empirical observations' (Guttman, 1977). To aid in this, the concepts and hypotheses are stated in terms of the analysis, Smallest Space Analysis (SSA).

The three separate parts of the facet approach are: the defining of the phenomenon known as the 'definitional system', the demonstration that the definition is reflected in an aspect of the empirical domain and a rationale for the correspondence between the definitional and empirical
domains. Each of these are discussed.

2.1 The Definitional System

The 'definitional system' is arrived at through a process of classifying the observations. The concepts or rules used to classify the observations are known as facets and the categories into which the observations are classified are referred to as elements. A unique combination of elements is called a structuple. The classification provides hypotheses about the relationship between the observations using the principle of contiguity. A formal statement of the predictions of a 'correspondence between the definitional system and an aspect of the empirical structure' is provided by the Mapping Sentence.

Facets

A facet is a rule for classifying the observations which make up a phenomenon. As Facet Theory is based upon a precise and formal input logic which allows the definitional system to be stated is terms of the analysis the technical definition of a facet, as defined by Canter (1977b) is:

'any set playing the role of a component set of a Cartesian space, this being called a facet of the space'.

The requirements for applying a facet classification are that:

- each facet proposed must be applicable to all the observations specified as being part of the domain of observations.
- the classification of an observation by one facet should put no constraints on its classification within another.

Payne et al. (1976) provide an illustration of the second requirement.

'If two dichotomus facets of male/female; motherhood/not motherhood are taken, they are not logically independent since males can not be mothers'.

Example of facets are:

For the description of intelligence tests (Guttman, 1965)

- The language of presentation
- The kind of ability required

For the description of political involvement (Levy, 1979)

- areas of involvement
- levels of involvement

For the description of soldiers' evaluation of their officers (Shapira and Zvulun, 1979)

- grade of the officer to be evaluated
- areas of responsibilities evaluated upon
- the level of specificity of these area

Elements

The categories into which the observations are placed according to a facet rule are referred to as 'elements'. White and Mitchell (1976) define the elements of a facet as:
'The different values on the points that logically and completely describe all the variations on the dimension'.

These elements are not observations (e.g. items of a questionnaire) but are the raw material from which the observations are defined.

The requirements for the elements are that:
- every observation must be classified by an element from each facet.
- the elements are mutually exclusive, each observation can be classified into only one element of a given facet.

Examples of elements are:

For classifying areas of responsibilities for officers (Shapira and Zevulun, 1979)
- Professional
- Disciplinary
- Interpersonal

For classifying the language of presentation in intelligence tests (Guttman, 1965)
- verbal
- digital
- figural

For the classification of the country being referred to in a study of reimmigration to Israel (Elizur and Shye, 1976)
- host country
- Israel in the future
- Israel in the past

Structuples
Observations are defined in terms of one element from all the specified facets. An unique combination of facet elements is known as a 'structuple'.

The Principle of Contiguity
The relationship between the observations is determined by the principle of contiguity. Canter et al. (1980) state this as follows:

'The most fundamental principle used in applying a facet design to a research problem is that of contiguity i.e., the more similar observations are in terms of how they are defined the more closely they will be related empirically'.

Basically observations which are assigned to the same element(s) are predicted to be more similar than observations which are assigned to different elements. The most similar observations will be those assigned to the same structuple.

Facet Notation
The precise specification of the predicted relationships between observations is aided by the use of a notation system. Facets are represented by letters (A, B, C, etc.) and elements by numbers. If the elements of a facet can be ordered as more or less of a continuum, the numbers should reflect this order. For example one observation may be represented by \( A_2B_1C_2 \). This observation will be conceptually more
similar to an observation having a \( A_1B_1C_2 \) classification than one with an \( A_1B_1C_1 \) combination of elements. It shares two common elements with the first and one common element with the second observation.

**Regional Hypotheses**

An observation can be located within the entire domain under study by reference to the elements to which it is assigned. The most systematic approach to interpreting the empirical configuration of the observations in the SSA space is by identifying the regions of the space that correspond to the elements. Hence the hypotheses generated from a facet design are stated in terms of the elements and are known as 'regional hypotheses' (Shapira and Zvulun, 1979). These authors divide the types of hypotheses into two classes.

**First Order Hypotheses**

'These ... (are) about the existence of contiguity regions according to the elements of each facet'

There are two aspects to the first order hypotheses, they are:
- that the facet or rule used to generate the elements is valid.
- that all the elements are valid, identifiable categories of that facet.

**Second Order Hypotheses**

'These ... (are) about the existence of order among the contiguity regions according to the specifications made on the facets'

There are two basic types of relationships between a facet's elements which can be predicted, they are:

**Unordered relationships** The elements are qualitatively different with a nominal classification being appropriate as no order is being implied. An example of an unordered facet is the Language of Presentation in intelligence tests (Guttman 1965). The elements (verbal, digital and figural) are all different kinds of presentations.

**Ordered relationships** The elements can be ordered by the facet along an underlying continuum (an ordinal classification). An example of an ordered facet is Types of Protest Acts (taken from a study of Levy (1978) on attitudes towards protest). The elements are: demanding acts, obstructive acts and physically damaging acts. The elements can be ordered along the continuum of increasing intrusion. This type of facet is known as a simply ordered facet.

**Roles of Facets**

The relationships between the facets are determined by the roles they play in structuring the space. These roles, in turn, are partly determined by the relationship between the elements and are, therefore,
part of the hypotheses to be tested. An unordered facet can play a polar role only. A simply ordered facet can play either an axial or modulating role (Guttman, 1977b). The prediction of the role played by an ordered facet is derived from the substantive model. These roles will be elaborated in Chapter 7 in relation to the literature on nursing care in the ward setting.

The Mapping Sentence

The purpose of the classification system is to predict the structure of people's responses to a given domain. A formal statement of this prediction is provided by a mapping sentence. Shye (1978) defines this as:

'A verbal statement of the domain and of the range of a mapping including connectives between facets as in ordinary language'.

Three types of facets are specified in the mapping sentence, they are:

**The population facet**. It describes the population being studied.

**The response facet**. It describes the set of responses which it is possible to make. A requirement of the observations to be included in a domain is that they have a response facet common to them all, i.e. a common range. Canter et al. (1980) take this to mean:

'that there is a common direction to the answers of all the questions which make up that domain and that this common direction has the same meaning for each question'.

**The definitional facets**. They are used to define the domain of concern. The mapping sentence states the facets and their elements (1st order hypotheses) together with verbal connectives expressing the relationship between the facets (2nd order hypotheses).

A mapping sentence provides a summary of the predictions about the responses of a given population of people to a particular domain or phenomenon. It is an explicit statement of the facets, their elements and the relationships between the facets; the validity of which is to be tested.

In summary a phenomenon is described by the relationships between its components (observations). The relationships are predicted from the elements or categories the components are assigned for each facet. The facet approach is based upon Fisher's experimental design. This is reflected in the similarity between the facet approach to making predictions and Nunnally and Durham's (1975) description of the procedures to be followed in establishing construct validity for a
research instrument. The major difference is that Nunnally and Durham assign each observation to only one construct, while the facet approach utilises a multiple assignment technique. Therefore the facet procedure is stated in terms of elements or categories rather than observations. However the basic stages are the same. According to Nunnally and Durham they are:

1. 'Outlining the domain of observables of a construct'
   In facet terms this is the prediction of the categories or elements to which observations are assigned by the rule or facet (a 1st order hypotheses).

2. Establishing 'the relations between observables for a construct'
   In facet terms this is the prediction of the relationship between the elements, to which the observables are assigned, for each facet (i.e. ordered or unordered facets, a 2nd order hypotheses).

3. Establishing 'the relations between the constructs'
   This is a prediction of the roles played by the facets in defining the total domain (a 2nd order hypotheses).

The predictions are based upon the principle of contiguity; that is the more similar observations are in terms of their facet elements the more similar they will be empirically. These predictions are stated by the Mapping Sentence.

A mapping sentence is not, however, a theory. According to Guttman (1976):

'The concept of a mapping sentence merely generalizes R.A. Fisher's design of experiments to the design of any observations...Such an enlarged design defines the content of the observations, and thus can serve as a basis for stating and testing an hypothesis or theory'.

Guttman continues:

'as a theory can be defined...as an hypothesis, with a rationale, of a correspondence linking a definitional system—or design—for a universe of observations with an aspect of the empirical distribution of those observations'.

The definitional system is just part of a theory. A further part is the aspect of the empirical domain to which it refers. Section 2.2 briefly describes the facet interpretation of the empirical domain.

2.2 The Empirical Domain

The empirical domain is represented by measures of similarity between the observations. In the present work it is the correlation coefficients between the questionnaire items in terms of the nurses' responses to them. The analysis, Smallest Space Analysis (SSA), represents the observations in a space such that the higher the correlation, the closer the observations are in the space. (A more detailed account of this
analysis and its interpretation is given in Chapter 9). The major aspects of the facet interpretation are:

- Observations are represented as points in the space.
- Facets are the rules for partitioning the space.
- Elements are represented by regions into which the space is partitioned.

**The Principle of Contiguity**

The spatial location of the regions is predicted from the relationship between the elements. For example if an element is hypothesised as being more similar to one other element of a facet than to the other elements of that facet, the region that it occupies should be adjacent to only that one region. An example is Levy's (1978) Types of Protest Acts facet. The regions are ordered:

    demand-obstruction-damage

Demand and damage are not adjacent because they are less similar to each other than to the intermediate act of 'obstruction'.

**Structures**

Facet theory is a structural approach to the design and testing of models. Taken together the facets and the element regions form structures. These structures are predictable from the role played by each of the facets in defining the total domain. Examples are the simplex, circumplex, radex, duplex and cylindrex (these are described and illustrated in Appendix 3).

According to the facet approach generality across contexts is in terms of similarities in these structure not in terms of content (Levy, 1976). This is considered by Lingoes (1979) to be one of the advantages of this type of interpretation for MDS. Dimensional interpretations, according to Lingoes, create the problem of uniqueness of findings.

The regional form of interpretation also helps to solve a basic difficulty in using MDS analyses. Each of the structures have a specified number of dimensions needed for their retrieval. This solves what Forgas (1979a) considers one of the major problems in using MDS, that is the number of dimensions to use. Dimensionality is a compromise between parsimony and 'best fit'. Without a theoretical guide, determining the optimal solution is difficult.

In summary the facet interpretation of the empirical distribution of observations is in terms of regions, not dimensions. The retrieval of regions demonstrates the existence of the elements. The spatial location of the regions illustrates the relationships between the elements. The relationships between the facets are illustrated by the types of structure produced. The structure is the test of the validity of the
entire description of a given phenomenon. The third part of the facet approach is the rationale for the correspondence between the definitions and the empirical evidence.

2.3 The Rationale
The rationale is the substantive knowledge behind the proposed facets, elements and structures. Facet theory is a structural approach to facilitate the construction and testing of conceptual models. It is not an atheoretical substitute for conceptual work. While the rationale is not stated in the Mapping Sentence, without it the mapping sentence cannot be constructed. (Section 3.2 further describes the concept of a rationale in relation to the model of ward evaluation.)

2.4 Summary of the Facet Theory approach to Research
The identification of parsimonious explanations of phenomena has, in general, been an exploratory activity (see for example Forgas' 1979a review of the uses of MDS). However as stated by McGrath (1967):

'psychologists could profit by relying more heavily than we have on our a priori concepts as a basis for the input logic by which we structure our concepts and our data-gathering operations'.

To utilise the notions an investigator has about a given research problem requires, according to McGrath, that these conceptions are made 'systematic and operational'. This is the same request as that made by Milcarek and Struening (1975) with respect to evaluation research. They state:

'Measurement .. concerns the operational definition of constructs and their specification as behavioural or outcome criteria. It is essentially, a further step in the classification, or categorization, of subject matter ... Sound conceptualization helps to assure that relevant measurement domains are comprehensively described'.

A further requirement for making effective use of these conceptions is:

'That we must build into our methodology one or more methods for systematically assessing, hence modifying, our input logic on the basis of empirical evidence'. (McGrath, 1967)

Facet theory is one available aid to model development which facilitates the requirements given above. It provides a structural approach to the construction and testing of a researcher's interpretations of a phenomenon. The three parts to the approach are the specification of the definitional system, the aspects of the empirical distribution which allow the testing of the system and the rationale for the proposed match between the definitions and the empirical evidence. Section 3 describes the initial application of the facet approach to the model of environmental evaluation.

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3 THE APPLICATION OF FACET DESIGN TO THE MODEL OF ENVIRONMENTAL EVALUATION

The facet approach fits the model of environmental evaluations quite well because each of the concepts specified in Chapter 5 may be treated as a facet. There are two benefits from adopting the facet approach. Firstly it encourages a more thorough look at the problem. The model can be refined to accommodate more than just the classification by the concepts. Facet design necessitates the identification of the relationships between the categories (elements) and between the concepts (facets). Secondly without such a guide to the types of regions to be found in the SSA space, it would be difficult to demonstrate whether or not the model is retrievable from the space.

Facet theory provides a precise and formal specification of a definitional system for a particular domain of concern. The model of environmental evaluation cannot be completely stated without reference to a given context (for example the nursing care/ward setting). Consequently the empirical domain can not be specified. However a preliminary account of the definitional system can be given (Section 3.1) and the role of the rationale discussed (Section 3.2).

3.1 The Definitional System for Environmental Evaluations

The terms used in the facet approach can be applied to the model of evaluation. This facilitates the further refinement of the model. The order within each facet is proposed and a preliminary mapping sentence presented.

3.1.1 The Facet Terms applied to the Model of Evaluation

The observations are the responses of the nurses to the evaluative items, each based upon the experience of one behavioural unit.

The structuples are the genotypes, the general classes of behavioural units which are predicted to be construed in a very similar manner when used as a basis for evaluation. Ittelson et al. (1974) criticise Barker's description of his genotypes of behaviour settings because it fails to illustrate the relationships between different genotypes. The relationships between the behavioural unit genotypes (to be referred to as structuples) is a primary objective of this work. The relationships are predicted from the classification of the behavioural units by the facets.

The facets are the three concepts proposed in Chapter 5 as ways of describing design-related experience. Each facet will be used to classify all the observations into elements (categories).
3.1.2 **The Types of Facets**
As specified in Section 2.2, a further refinement of the definitional system is the specification of the relationship between the elements of a facet. The type of relationship between the elements of each of the three facets can be hypothesised from their general description in Chapter 5.

**Levels of Interaction Facet**
Evidence from the urban environment, interpersonal distancing and for the use of buildings suggests people order their environmental referents in terms of the subjective distance between the referent and themselves. Therefore it is predicted that the Levels of Interaction will be an ordered facet. The region occupied by the items specifying the closest level of contact is predicted to be furthest from the region containing the items concerned with the most distant level of interaction.

**Levels of Purposive Activities**
The two elements that are provisionally specified are identifiable by whether the activity directly relates to the primary purpose of the setting (front stage) or whether it is a support to the more primary purpose (back stage). According to Sears and Auld's (1976) hierarchical structure of purposes the relationship between the two elements is ordered. The order is in terms of how central the activities are to the primary purpose.

**The Referent of the Interaction**
The three elements of this facet are specified in accordance with the BPRU's (1972) and Canter's (1970) functions of a building. They are: Other People, Locations and Environmental Services. Each represents a different kind of referent; that is they are qualitatively different. The Referent facet is therefore hypothesised as an unordered facet. In terms of the analysis, the elements are predicted to be equally related and the regions will all be adjacent (forming a circular pattern).

Taken together the three facets are to be used to define the domain of environmental evaluations.

3.1.3 **The Mapping Sentence for Environmental Evaluations**
While the relationship to be expected amongst the facets is not elaborated, a tentative mapping sentence for environmental evaluation items based on the experience of environmental interactions is:
MAPPING SENTENCE FOR ENVIRONMENTAL EVALUATION

A person (p) evaluates his setting in terms of the extent to which it facilitates his

<table>
<thead>
<tr>
<th>Facet A</th>
<th>Facet B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels of Interaction</td>
<td>Referent</td>
</tr>
<tr>
<td>Distant</td>
<td>$B_1$ People</td>
</tr>
<tr>
<td>Close</td>
<td>$B_2$ Locations</td>
</tr>
<tr>
<td>Interaction with</td>
<td>$B_3$ Environmental Services</td>
</tr>
</tbody>
</table>

With this referent being associated with

<table>
<thead>
<tr>
<th>Facet C</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centrality of</td>
<td>Helps a great deal</td>
</tr>
<tr>
<td>Primary</td>
<td>TO</td>
</tr>
<tr>
<td>Secondary</td>
<td>Makes it very difficult</td>
</tr>
<tr>
<td>activities by stating whether it</td>
<td></td>
</tr>
</tbody>
</table>

to achieve purposes.

3.2 The Rationale for the Model of Environmental Evaluations

The rationale is the substantive theory behind the proposed facets, elements and structures. In the current work the rationale includes the definition of the process of evaluation and the specification of how it relates to direct experience (Chapter 4); the evidence from other areas of environmental literature for the proposed facets (Chapter 5) and the evidence from research on nursing activities used to refine the model to the specific context (Chapter 7). Therefore the definition of a model, as specified in Chapter 4, should be expanded to accommodate all the stages: the rationale, the specified definitional system, the hypotheses and the empirical evidence. Defined as such the thesis becomes the model of evaluation. However for clarity 'model' is being used as the definitional system for describing environmental evaluations.

A problem, in relation to the rationale, that has not (and will not) be adequately resolved is the treatment of the individual. The model is developed on the basis of the individual; that is, that an individual will respond as if he has a cognitive structure as represented by the model. However in the analysis the respondents are dealt with as a group. Comparison between identifiable groups of nurses (e.g. by grade, shift and type of patient being cared for) are made for the types of comments they made about nursing in the ward context (Chapter 8) and for the structure produced (Appendix 4). However the different groups are
still aggregates of individuals. Forgas (1979a) has also encountered this problem. He states:

'In its most common application MDS is used to represent the cognitive structure of a group of subjects, not individuals. The structure derived can be viewed as the best possible representation of the cognitive structure of a hypothetical model subject, representing a group as a whole'.

An individual nurse may only have experience of limited aspects of the interaction with the setting. This cannot be retrieved from the form of data collection (questionnaires) and the analysis being used. It is therefore necessary to take the position of Forgas, that it is 'a hypothetical model subject representing a group as a whole'.

3.3 Summary of the Application of Facet theory to the Model of Evaluation

It is concluded that the use of facet theory is an appropriate method for elaborating the model of environmental evaluation. In addition the facet approach states the hypotheses to be tested in terms of the analysis to be used. This makes the testing of the hypotheses unambiguous. The preliminary hypotheses are presented and areas requiring further elaboration identified. The rationale for the final specifications is derived from the literature on nursing care and will be discussed in the following chapter.

4 SUMMARY OF CHAPTER 6, MAKING THE MODEL PREDICTIVE

Chapter 6 describes the third stage in model development, making the model of environmental evaluation predictive. This requires that the model be stated in such a way that its validity can be empirically tested.

The predictions or hypotheses to be generated concern the relationships between the evaluative statements. The proposal is that the relationships are a part of people's cognitive structuring of their design-related experience. Consequently the predictions are predictions about the relationships between the 'behavioural units' as defined by the three concepts presented in Chapter 5.

The form of analysis to be used to test the hypotheses must be capable of demonstrating the types of relationships predicted. It is proposed that the relationships are multidimensional and not necessarily linear. For this reason multidimensional scaling techniques are assessed as most appropriate for the research problem. The choice of smallest space (SSA) from within this set of MDS techniques is based upon two requirements of the model. They are that the model will describe the phenomenon of environmental evaluation as an holistic event and that the description can be tested.
SSA's utility lies with the fact that it is part of a package, the facet approach, for the systematic design and testing of investigator's conceptualisations of research problems. The facet approach is consistent with the objectives of the research. In addition it requires, and provides a method for, elaborating the model beyond just the classification by the concepts. Facet design necessitates the identification of the relationships between the categories and between the concepts.

By stating the proposals about the relationships between the behavioural units in facet terms, they become hypotheses which can be empirically tested. The three concepts proposed in Chapter 5 are the facets or rules for classifying the evaluative statements (observations), each of which is based on a behavioural unit. The categories into which the observations are classified by the facets are called elements.

In order to provide clarity to the hypotheses to be tested the facet approach states the hypotheses in terms of the categories or elements for each facet separately. The hypotheses are tested through a regional interpretation of SSA. The responses to the evaluative statements are represented as points in the space. The more similar two responses are, the closer they will be in the space. The facets or rules are used to partition the space into regions corresponding to the elements. It is the existence of and the relationship between these contiguity regions which provide the test of the definitional system.

The facet approach to research design provides a basis for constructing an account of a phenomenon. The approach necessitates a thorough description of the phenomenon and provides a systematic basis for approaching this account. In addition the facet interpretation of the analysis puts the account to the test. Therefore, it is considered that the model of environmental evaluation will benefit from being described and tested in facet terms. Chapter 7 completes the faceted description of the model by focusing on the research findings and literature concerning the provision of nursing care in the acute ward context.
Chapter 7
THE MODEL APPLIED TO THE WARD CONTEXT

Chapters 4 to 6 describe the development of the general model of environmental evaluation. Chapter 4 proposes that evaluations are based on people's experience of interacting with the setting when carrying out goal-oriented activities. Chapter 5 specifies the basic unit of environmental experience, the 'behavioural unit', and proposes the three general concepts to describe environmental experience. Chapter 6 presents the facet approach to model construction which is used to develop a predictive model of ward evaluation.

The objectives of Chapter 7 are two-fold. One is to apply the three general concepts, generated in Chapter 5, to the ward context. This involves the classification of the issues and findings of previous ward-based research according to the three facets. A basic premise of the present work is that it is the experience of the nurses actually working on adult acute hospital wards which must be used as the basis for the environmental evaluations they are to make. The purpose of this chapter is to provide as rich a description of ward experience as possible by accommodating a wide range of potentially relevant research. The object is to facilitate the classification of the 'behavioural units' elicited from the nurses, which is presented in Chapter 9. The comprehensive definition of nursing care proposed by the Nuffield team (1953) is used to define the domain of concern; that is:

'those activities necessary to provide for the physical, medical and emotional needs of the patient'

A second objective of the chapter is to elaborate the model of ward evaluation in order to generate testable hypotheses about the relationships between the various evaluative statements. This involves the specification of the elements or categories for each facet and the proposal of the role each facet will play in the description of ward evaluation. Such specifications provide the predictions about the structure of the empirical data.

The literature is organised in terms of its relevance for each of the classifying facets. Section 1 describes the literature in terms of the facet which distinguishes between activities on the basis of the hierarchical structure of purposes. Section 2 discusses the literature relevant to the Referent facet and Section 3 describes the ward literature in terms of the Levels of Interaction Facet. Section 4 presents the proposed cylindrical structure of the definitional system being applied to ward evaluations.
Chapter 5 proposes that a relevant way of describing the activities involved in ward nursing is in terms of the hierarchy of purposes. As indicated in Chapter 4, the distinction between the hierarchical levels of purposes is not in terms of importance. The lower level purposes gain their significance through being instrumental in achieving the higher level purposes. Rather, the distinction is in terms of the focus of concern. Therefore, to use the hierarchical structure as a way of categorising the goals and activities, it is necessary to identify those which are the central focus of nursing in a ward. Section 1.1 illustrates the distinction between the two elements of the facet. Section 1.2 describes the proposed role of the patients' activities in the nurses' conceptions. Section 1.3 details the hypotheses derived from the structure of the Type of Care facet.

1.1 The Focus of Nursing Care

Literature on nursing in the ward context tends to simply specify what is considered to be the central focus of nursing care. In general there is a consensus of opinion that the central focus of nursing is the interaction between the nurse and the patient. For example, the first clear specification of the role of the ward nurse, stated by the Poor Law Board in 1848, is:

'to attend upon the sick in the sick laying-in wards and to administer to them all medicines and medical applications, according to the direction of the medical officer' (taken from White, 1978).

The definition of the Nuffield team also directly focuses on the patient. Their definition is:

'those activities necessary to provide for the physical, medical and emotional needs of the patient' (1953)

Roper (1976), in her essay on improving the status of nursing, again focuses on the range of interactions between patients and nurses. Research studies also emphasize the contact with patients. For example, Trites et al. (1970) demonstrate that radial designed wards reduce the time nurses spend in travelling through the ward as compared with linear shaped wards. Trites et al. suggest the major significance of this finding is that travel time is negatively correlated with the amount of time nurses spend with the patient. In radial wards, which require less travelling, the nurses spend more time at the patient's bedside.

Sears and Auld (1976) use an empirical approach to determining the focus of nursing care. The assumption of their work is that the focal issues will be those which make the greatest contribution towards the overall evaluation of ward design. Using a step-wise regression, they identify visual contact between patients and nurses, amount of treatment space
around the bed and the general decor of the ward as the focal issues for qualified nurses. It can be suggested that the first two issues are specific instances of the general focus of 'interaction between the nurses and patient'. Therefore, it is proposed that the focus of nursing care, as indicated by previous work, includes activities concerned with the direct care of the patient.

A further concern is what activities do not directly involve the patient. Bott (1970) provides the clearest hierarchical distinction between nursing activities in terms of whether they involve the patients. The distinction is derived from a study which is a replication of the Nuffield Job Analysis. The major difference between the two pieces of research is that the Bott study records both what activities are taking place and where they occur. In describing the results, Bott utilises a classification system for activities which structures them in terms of the cycle of events. The cycle consists of five phases:

- **Read** (e.g. being given an instruction or receiving a call from a patient)
- **Prepare** (e.g. organising supplies and equipment)
- **Do** (The actual procedure, e.g. at the bedside, in the treatment room, bathroom or W.C.)
- **Disposal** (e.g. activities in the sluice or dirty utility room)
- **Record** (e.g. documenting the administering of drugs)

The central focus of the cycle is specified by Bott as those activities in the 'Do' phase. They are the activities which directly involve the nurse with the patient. As illustrated by the examples given for this phase, direct care activities extend beyond just treatment at the bedside. The other four phases gain their significance by the role they play in facilitating this central phase.

The structure proposed by Bott is consistent with the theoretical specification of a hierarchy of purposes. A clear distinction is made between nursing activities which directly involve the patient and those that do not, but which occur in order to facilitate the former.

The classification, according to the cycle of events, illustrates that a secondary activity need not necessarily precede the primary activity. The 'disposal' and 'record' phases occur after the 'do' phase but are not part of the primary purpose of direct care. This illustrates the basic difference between the hierarchial structure being proposed and that used by Miller, Galanter and Pribram (1960) to structure behaviour. Miller et al. emphasis the sequence of events, while the present interpretation places an activity in the hierarchy according to the level of the purpose to which it relates.

It is proposed that all the activities the nurses carry out as a part of
their experience of the ward can be classified by this concept. The facet is labelled as 'Type of Care' (C) and the elements as 'Direct Care' (C₁) and 'Indirect Care' (C₂).

1.2 The Role of the Patient's Experience

The Bott classification provides a structure for describing nursing care. However it provides only limited examples of the potential activities occurring in the ward. As such, it ignores an important issue concerning the activities which may be part of Direct Care, the role of the patients' goals and activities.

The Nuffield definition specifies nursing care as including those activities necessary to provide for the physical, medical and emotional needs of the patients. A distinction between Direct and Indirect care activities can be readily made for the physical and medical needs. For example, running the bath water and cleaning the bath (Indirect care C₂) both facilitate the physical need of being given a bath (Direct care C₁). The preparation of the treatment trolley and disposing of dirty dressings and supplies (C₂) are necessary for the giving of medical treatment (C₁). However the Nuffield work excludes those activities of the nurses which deal with the emotional state of the patient. The Bott study also fails to accommodate this aspect of nursing care.

By definition the nursing activities directed towards the patients' emotional needs are part of the central focus of nursing activities. For example, Sears and Auld (1976) find that visual contact between the nurses and the patients is important to the patients' well-being. In addition they find visual contact includes both the patients being able to see the nurses and the ease with which the nurses can observe the patients.

A further source of activities relating to patient well-being can also be identified. Research directly concerned with patients provides a range of goals and activities related to emotional needs which occur independently of the nurses. For example, Cartwright (1964) finds that the most frequent contact for a patient is with other patients. This contact includes carrying out recreational activities together, chatting to relieve the boredom and providing reassurance and encouragement to other patients.

Raphael (1969), in her survey study of over 2000 patients in 19 general hospitals, also finds the social atmosphere of the ward is an important issue for patients. The concerns identified include a space for patients to sit and chat within the main ward area as well as a dayroom for recreational activities. Further examples of patients goals and activities documented by Raphael are patient privacy, the use of the sanitary facilities and the disturbances caused by noise, the heating
The issue at stake is whether or not the experiences of the patients can validly be considered a part of the nurses' experience of nursing care. Research which solely concerns nurses tends to use observational methods, consequently they do not address the problem. Examples are Nuffield, 1953; Trites et al., 1970 and Lippert, 1971. Patient issues are identified by Sears and Auld (1976) with their general ward user questionnaire. However there is no indication in that work as to who initially provided the issues, patients and/or nurses.

More direct evidence that nurses share the patients' concerns is provided by Raphael's (1965) comparison of issues for patients and staff. Her work compares the responses of staff and patients to the question 'what would you most like to see changed in the hospital'. In general the patients' responses are most concerned with the social atmosphere of the ward, while the staff (doctors, nurses, administrators and committee members) emphasise the physical environment. However, when compared on specific suggestions Raphael finds the patients' and nurses' lists of concerns are very similar.

The evidence to support the proposal that nurses are aware of the patients needs and the various ways they can be satisfied is limited. However this is due more to a lack of research on the issue rather than evidence to contradict the suggestion. In addition one of the stated goals of both ward designers (Nuffield, 1955; Noakes, 1971; Stone, 1976) and of providers (Stacey, 1977; Roper, 1976; White, 1978) is to reverse the trend of patients as passive receivers of treatment by promoting independent patient activities. Therefore, it is considered appropriate that research concerned with patient activities and experience be included in the classification in order to provide a full range of ward experiences.

1.3 **Hypotheses concerning the Type of Care Facet**

Several hypotheses can be generated, from the previous discussion, about the evaluations to be made by the nurses. Chapter 5 specifies that people will make a distinction between activities in terms of the hierarchical level of the purposes with which the activities are associated. Hypothesis 1 is:

A distinction will be made between activities in terms of the hierarchical structure of purposes. In facet terms the prediction is that the facet is an ordered facet; ordering activities in terms of the degree to which they are the central focus of Nursing Care.

The hierarchical distinction, of primary and secondary purposes of the setting, is further defined in Chapter 5 as Front Stage and Back Stage
activities in service settings. In the ward context this is most clearly illustrated by the Type of Care being referred to. Hypothesis 2 is:

Nurses will distinguish between activities in terms of whether the activities concern Direct (C1) or Indirect (C2) care as defined by the Bott (1970) study. In facet terms the Type of Care facet will partition the empirical distribution of responses in the SSA space into two regions; one containing evaluations referring to Direct care and the other region containing responses to items requiring evaluations of the ward in terms of Indirect care.

Chapter 2 raises the question as to what nurses see as their primary purpose in the ward context; administration or care of the patients. Hypothesis 3 is:

Nurses will have as their central focus the Direct care of the patient (C1). In facet terms the prediction concerns the role that the facet will play in structuring the total empirical domain.

An ordered facet can play two roles, axial or modulating. The exact role to be played by an ordered facet is dependent upon its relationship with the other facets. Consequently the role will be discussed in Section 2.3.

A further question from Chapter 2 is what are the nursing activities necessary to provide for the emotional needs of the patients; an excluded category in the Nuffield research. Sears and Auld (1976) demonstrate that visual contact is an important activity with respect to the emotional needs of the patient. Hypothesis 4 is:

The observation of patients will be a part of the Direct care of the patient (C1).

A final hypothesis tentatively proposed is that the experiences of the patients will be a part of the conceptualisations of the nurses. Hypothesis 5 is:

Patients' activities and experiences will be specified by nurses as criteria they use in evaluating ward designs.

In summary the Type of Care is proposed as a facet or rule which will be used by nurses to structure their evaluations of modern ward designs. The two elements are Direct (C1) and Indirect (C2) Patient Care. The facet is hypothesised as ordered with the Direct care activities being the central focus for ward nurses.

2 THE REFERENT FACET (B)

The general model of Chapter 5 proposes there are qualitative differences in an individual's design-related experience which can be used to distinguish between behavioural units. The differences are identified by the aspect of the environment with which the individual is interacting. The classification is taken directly from the BPRU's (1972) model of the building system and Canter's (1970) function of a building. The three types of referent are: People (B1), Locations (B2) and Environmental
Services (B^).
In Chapter 6 the Referent facet is hypothesised to be an unordered facet, as the difference between the Referents is one of kind rather than ordering on a continuum. Chapter 6 also specifies that the Referent facet will play a polar role in structuring the empirical domain.

Section 2 describes the ward literature as it pertains to each of the three Referents, illustrates the polar role played by an unordered facet and proposes a radex hypothesis to describe the relationship between the Referent and Type of Care facets. Each Referent is presented under the Environmental Subsystem to which it relates.

2.1 The Physical Subsystem: The Environmental Services

The physical subsystem refers to the role of the building as a filter. As previously stated, much of the research directed towards nursing activities in the ward is observational and, as a consequence, the experience relevant to the physical subsystem is excluded. Therefore, it is more useful to examine the research concerning the patients' experience. Raphael's (1969) study of patients' experience in hospital identifies the heating, ventilation and lighting in the wards as sources of complaint for the patients. Sears and Auld (1976) also include these three systems in their ward evaluation questionnaire. Both pieces of research emphasise that the physical subsystem Referent (i.e. Environmental Services (B^) is relevant to Direct Care as defined in Section 1. The three specific referents are heating, ventilation and lighting.

The Nuffield team (1955) incorporates Indirect care in the functions served by the physical subsystem, particularly the lighting. For example, they state that the lighting at the nursing station must be suitable for clerical tasks, as well as emphasising that the ancillary rooms be well lit. However, they specify Direct Care as the activities most relevant to the lighting at the bedside. The bedside activities include giving treatment to patients, patients reading in bed and preventing the bedside lighting from disturbing other patients.

Noise is not classified as an environmental issue even though it is a source of complaint in the patient studies. The reason for this is Cartwright's (1964) finding that the most distressing noise is that generated by very ill patients. Therefore it is considered a negative aspect of the interaction between people and is discussed in Section 2.2.2.

In summary, previous work suggests that the Environmental Services element is applicable to both Direct and Indirect patient care. The
specific referents of this element identifiable from research in the ward context are heating, ventilation and lighting.

2.2 The Spatial Subsystem

The spatial subsystem refers to the layout of spaces within a building and the relationship between them. The activities which are specified as relating to this spatial subsystem are interaction between People (B1) and the direct use of the building (B2).

Chapter 6 states one of the requirements of using the facet approach is that an observation can be assigned to only one element of a given facet. Clear examples of each Referent can be identified in previous research. For example, the use of the sanitary facilities is an obvious example of interaction with a Location (B2). Nurses talking to and reassuring patients has as its referent Other People (B1). However, for many of the findings, the distinction is a matter of emphasis, in that most ward activities involve other people.

The work of Raphael (1969), on the influence of the physical environment on the social atmosphere of the ward, is used to provide the criterion for distinguishing between the two Referents which relate to the spatial system of the building. As with Cartwright (1964), Raphael's work indicates that patients use fellow patients to relieve the boredom of being in hospital and as a source of reassurance and encouragement. In addition, she finds that patients differ in how they think the setting can most readily facilitate this. Some patients prefer to remain in the main area of the ward. These patients request a place for patients to sit and chat rather than being confined to the chairs next to the beds. For this group, emphasis is placed upon the interactions with other patients.

Other patients are found to be more concerned about having a separate dayroom where they can have tea, entertain visitors, talk and watch television. However, as indicated by Raphael, the major concern for a dayroom is to allow these patients access to an environment that is different from that of the main ward area. For this group of patients the focus of their environmental interaction is the dayroom itself. A further clarification of the distinction can be made by considering how the patients view the various parts of the ward. Raphael's research indicates that the patients see the multi-bedded areas and circulation space as 'the ward', the home base for their stay in hospital. On the basis of this, the distinction between interaction with a Location (B2) and interaction with Other People (B1) to be used in the classification is as follows: If the behavioural unit, even if it implies involvement with other people, contains an identifiable location outside the main ward area, the Referent will be Locations (B2); if not, the Referent is
Other People ($B_1$).

### 2.2.1 Use of the Buildings: the Location Referent ($B_2$)

The use of the sanitary facilities can be readily assigned to the Location category. It is almost totally a solitary event, with the sanitary facilities being clearly separated from the general ward area. In addition, Nuffield (1953), Nuffield (1955) and Bott (1970) all describe research concerned with the interactions of both the patients and nurses with Locations. Examples are the studies of early ambulation to determine the levels of provision of sanitary facilities and dayrooms, the classification of patient types to establish the number and locations of single bedrooms in the ward and the identification of the need for separate treatment rooms away from the bed area. All of these research projects are concerned with Location referents for the Direct Care of the patient.

The above studies also include Locations for Indirect Care such as the pantry, the clean utility room, preparation room, the dirty utility room, the disposal room, the storage facilities, the nursing station and office. All are specified as necessary for the nurses to carry out nursing care efficiently.

### 2.2.2 Interaction between People ($B_3$)

Interactions with Other People, which may be relevant to the nurses' experience, can be divided into three types: contact between patients, nurse/patient contacts and communication between staff members.

**Patient/Other Patient Interactions:** The discussion of activities which involve interactions between people has, thus far, been restricted to contacts between patients. This reflects the emphasis it is given in the literature. Coser 1958, Cartwright 1964, Noble and Dixon 1977, Sears and Auld 1976 as well as Raphael 1969 all consider other patients to be important emotional supports to the patient. For example, when Cartwright and Raphael asked patients the size of bedrooms they prefer only a small minority specified single bedrooms.

However all of the above studies point out that contact between patients is not always beneficial. Although mentioned far less frequently, some patients are concerned about the lack of privacy within the wards, particularly when having discussions with visitors or staff at the bedside and when receiving treatment. Another aspect of lack of privacy for the hospital patient is the intrusion of noise. Raphael's research identifies noise from equipment and staff. However the source of noise which is most frequently quoted in the literature as being very disturbing to patients is the noise from other patients. Cartwright's interviews indicate that some of the noise is generated through
thoughtlessness, such as having the television on too loud. But the most serious complaints concern the noise from distressed or very ill patients. It is this noise that is most disturbing to patients.

**Nurse/Patient Interactions:** Both Cartwright and Raphael find that the most important people in the ward to the patients are the nurses. The interviews conducted by Cartwright suggest that patients find chats with the nurses reassuring, although patients are very reluctant to ask for such contact with the nurses.

Sears and Auld's (1976) research suggests that patients also obtain reassurance from a less direct form of contact with the nurses. As discussed in Section 1, their research shows that two of the contributions to the patients' satisfaction with the ward are the ability of the nurses to observe patients easily and the patients being able to see the nurses. The informal interviews conducted by Noble and Dixon (1977) also indicate that just knowing a nurse is available if needed is a source of comfort to the patient.

The most obvious form of contact between nurses and their patients is the direct treatment provided by the nurses. Both the Nuffield Job Analysis (1953) and the Bott research (1970) focus on the provision of basic and technical treatment as the central concern of nursing care. While it may be argued as done by Roper (1976), that care should be expanded beyond the bedside situation, bedside care is a form of contact which is expected to form a part of the experience of nursing in a hospital ward.

**Nurse/Nurse Interactions:** A final type of contact which can be proposed as a part of the ward experience is the communication between staff members. The research of Coser (1958) illustrates that institutions with good communication between different types of staff are more patient-oriented than those with poor communication channels.

A specific instance of the effects of poor communication is provided by Rosengren and DeVault (1963). They describe an obstetric unit, where staff communications are hampered by physical segregation, as providing little personal care to the patients. The Nuffield research emphasises that two important aspects of administering the ward are passing on information to other staff members and supervising trainee staff. Bott (1970) identifies the receiving of instructions as the first stage in the cycle of nursing activities. Therefore, it can be proposed the communication between staff members will form a part of the nurses' experience of the ward.

In summary, the literature suggests there are three types of interactions with Other People which may be relevant to the nurses' experience of the ward system; patient/patient contacts, nurse/patient contacts and
communication amongst staff.

2.2.3 Summary of the Functions of the Spatial Subsystem

Chapter 5 specifies two functions served by the spatial subsystem; facilitating interactions with other people and facilitating the direct use of the building. In the ward setting the distinction between these two Referents of the interactions is a matter of emphasis. Ward behavioural units are classified as interaction with a Location if a part of the ward, other than the main corridor and bed areas, is part of that behavioural unit. Examples are the use of the sanitary facilities, dayrooms and single bedrooms for patients and the nurses' use of the utility rooms and nursing station. Behavioural units to be classified by the 'Other People' element include social interactions that occur in the main ward areas. These interactions occur between patients, between staff and between patients and staff.

2.3 Hypotheses Generated about the Referent Facet

The three elements proposed for the Referent facet are derived from the BPRU's (1972) discussion of the ways in which an individual experiences his environment. It is proposed that any one behavioural unit will involve the individual in interactions with the Environmental Services, specific Locations within the ward or with Other People. Hypothesis 1 is

Nurses will distinguish between evaluative statements in terms of the Referent of their environmental interactions. The referents include the social environment (Other People), the spatial environment (Locations) and the physical environment (Environmental Services). In facet terms the SSA space will be partitioned by the Referent facet into three regions, each region containing evaluative items which refer to one of the three referents.

The difference between the experience of interacting with each of the three referents is qualitative in nature. Therefore, there is no reason to assume that any two will be more related to each other than to the third element. Consequently it is proposed that the three elements will be equally related to each other. Hypothesis 2 is:

The Referent facet is an unordered facet. All three element regions will be adjacent to each other.

The proposed qualitative relationship between the elements defines the predicted role to be played by the Referent facet in producing the total structure of environmental evaluations. Facet roles are defined in the facet literature in terms of the analysis to be used, a spatial representation of the relationships amongst the observations. (Appendix 3 gives a detailed account of the roles and provides examples of structures from previous literature). There is only one role specified for a qualitative or unordered facet. This is a Polar role which is defined as 'each element of the facet corresponding to a different direction of the SSA space, emanating from a common origin' (Guttman,
Spatially, element regions will be equidistant from each other, with each region resembling a wedge of a pie as in Diagram 1 of Figure 7.1.

2.4 The Relationship between the Referent Facet (B) and the Type of Care Facet (C): A Matrix Hypotheses

As indicated in Section 1 the role of the Type of Care (C) facet, an ordered facet, cannot be determined without reference to the other facets. An ordered facet can play one of two roles, an axial role where its order is unrelated to another facet or a modulating role where it serves to further define the polar facet (Guttman, 1977b).

Referring back to the proposed content of each of the Referent elements, a further clarification of the content can be made by specifying the Type of Care to which it refers. Interaction with Other People (B1) can be further defined by specifying whether it involves patients, such as giving treatment to patients (C1), or just nurses as in the giving and receiving of instructions (C2). A similar distinction can be made for Locations (B2) with sanitary facilities, dayrooms and treatment rooms being used by patients (C1), while the utility rooms, storage facilities and pantry are staff-only Locations (C2). An example from the Environmental Services (B3) is the lighting. The lighting at the bedside is necessary for the treatment of patients (C1) while the lighting at the nursing station is used for clerical work (C2).

Therefore it is proposed that the Type of Care (C) facet plays a modulating role with respect to the Referent (B) facet. A modulating role is 'a simply ordered facet with an "absolute" origin, this origin being common to that of a polar facet' (Guttman, 1977b). The regions of the space formed by the elements of a modulating facet are concentric circles emanating from the origin, as in Diagram 2 Figure 7.1.

The definition of the Type of Care facet, presented in Section 1, specifies that Direct Care (C1) is more focal to nursing care than Indirect Care (C2). Therefore it is proposed that the C1 element will occupy the centremost region of the space. This is a similar rationale to that of Levy and Guttman (1975) in their study of well-being. They specify and demonstrate that the primary environment, such as family life, is more closely related to the overall purpose of happiness than are income and education, which are aspects of the secondary environment. In the analysis, happiness occupies the centremost region of the space. The primary environment is in an adjacent, concentric region, with the region of the secondary environment being peripheral in the space.

Taken together the 2 by 3 classification by the Type of Care and Referent
facets produces a two dimensional structure known as the radex (Guttman, 1954). It is the same structure as demonstrated by Levy and Guttman (1975) for the relationship between the areas of life facet and the levels of purposes related to personal well-being. The radex structure gives a spatial representation of a relationship between a qualitative classification and a quantitative classification scheme and is illustrated in Diagram 3 of Figure 7.3. The radex structure is consistent with the proposal of Attneave (1962) that regional interpretations allow both nominal classifications and ordinal classifications to be used in the description of cognitive systems.

Figure 7.1 The Spatial Representation of the Roles of Facets Producing a Radex Structure

Diagram 1
A Polar Facet

Diagram 2
A Modulating Facet

Diagram 3
The Radex Structure

3 THE LEVELS OF INTERACTION FACET (A)

The third facet Chapter 5 proposes, as a meaningful rule for classifying environmental interactions, is the level at which the interaction occurs. It concerns the experience of the subjective distance between the Referent and the individual and is ordered from more to less distant. Chapter 5 provides evidence that the level of interaction distinction is relevant to a wide range of experiences, including urban cognition, interpersonal distancing and the use of a building. At the environmental level involved in the use of a building the different levels are most readily identified from the activity of the individual. Therefore, an inspection of the various activities in the ward is used to identify the elements or categories for the Level of Interaction facet.

Research in the ward context emphasises the interaction between people. It is with respect to this referent that the distinctions between levels of interactions are most apparent. Therefore, activities related to the social referent are used to establish the levels into which the facet can
be divided.
The range of activities involving the interactions between people includes communication between staff members, direct care and treatment of patients, access to patients, patient privacy, noise disturbance, observation of patients, patients' recreational activities and conversations between nurses and patients.

Chapter 6 proposes that social contacts can be ordered from more to less distant. The facet is expected to be simply ordered, with the elements showing an increase in the levels of interactions. The clearest example of how the elements may be ordered is provided by the policy decisions behind the Nuffield ward plan (1955). The major emphasis of the policies was to facilitate the direct care and treatment of the patient. The team were aware that the partitioned wards would not provide the level of patient surveillance afforded by the open wards previously built. However, they felt that this was justified by the fact that the greater compactness achieved in the plan would facilitate easy access to the patient.

The Nuffield decision suggests a distinction can be made between the more remote level of interaction implied by visually observing another person and the level of interaction suggested by movement toward that person. In addition, the design team felt that a layout which provided easy access to patients would lead to more direct contact with the patient. Support for the assumption is provided by Trites et al.'s (1970) finding that reduced travel time results in nurses spending more time at the bedside of the patient. Direct care and contact between nurses and patients suggests a third level of interaction can be distinguished which is subjectively closer to the individual than access. In addition, a fourth level can be proposed. This occurs when the level of involvement exceeds the preferred level of the individual. Examples are a lack of privacy and also disturbances caused by the noise of other people. As indicated in Chapter 2, one purpose of partitioning the bedrooms in the Nuffield plan was to reduce the incidence of this level of interaction.

The four levels of the experience of interaction with other people discernable from the Nuffield work are: Observation of (A₁), Access to (A₂), Direct Contact with (A₃) and Privacy and Lack of Disturbance from (A₄) other people, with the sequence illustrating an increment in the amount of interaction involved. Each level will be discussed in terms of the activities which can be assigned to it.

3.1 Observation (A₁)
The Observation element is proposed as the most remote level of interaction that occurs within a ward. While being distant, both Sears
and Auld (1976) and Cartwright (1964) indicate the importance of the activity to the patients' well-being. Sears and Auld demonstrate that the ease with which visual contact can be maintained between patients and nurses contributes most to the patients' overall assessment of the ward design. The Referent of this level of interaction is Other People (B₁).

The questionnaire by Sears and Auld (1976) also includes items about the ability of patients to see the nursing station. According to the criterion used to distinguish between the People (B₁) and Location (B₂) referents, behavioural units containing reference to the nursing station are to be classified as Locations. Therefore Observation (A₁) is applicable to Locations. There is no evidence to suggest that this level will describe the experience of any of the Environmental Services (B₃) as described in the literature.

3.2 Access to (A₂)

The Nuffield plan was designed to improve the Access level of interaction, both in terms of access to patients and access to ancillary facilities, through the placement of the ancillary facilities in the centre of the ward. The major concern of the Bott study (1970) is also with Access, emphasising where the Indirect Care facilities should be placed in order to facilitate Direct Care activities. The importance given this activity is reflected in the number of studies designed to provide recommendations to improve access both through design and nurse procedures (Trites et al., 1970; Thompson, 1959; Lippert, 1971; Nuffield, 1955 and Bott 1970). The evidence suggests the Access level is relevant to both People and Locations, but no rationale can be put forward to propose the experience of Environmental Services can be described as belonging to this level.

3.3 Contact with (A₃)

In identifying the levels of interaction from the Nuffield research 'Contact with' is characterised by the direct treatment of the patients at the bedside (B₁).

The Direct Contact level of interaction is also relevant to behavioural units containing Locations. The Nuffield research of 1955 concentrated on the frequency of actual use of ancillary facilities by the nurses. Direct Use can be equated with Direct Contact with other people as both imply close contact with the referent and both are removed from public view (the treatment at the bedside by curtains and the use of locations by being separate rooms).

Direct Use can also be used to classify some of the issues relating to the lighting in the ward (B₃). The lighting at the bedside for patients' use (Raphael, 1969) and for the treatment of patients (Nuffield, 1955)
and also the lighting at the nursing station for clerical work (Nuffield, 1955) can all be classified as an aspect of Direct Use.

3.4 Disturbances

Disturbances caused by other people (B₁), either by lack of privacy from others or excessive noise, is used to identify the closest level of interaction within the ward. The level is also relevant to the Location referent (B₂) in that privacy within the sanitary facilities is an issue raised by patients (Raphael, 1969). In addition the Nuffield research (1955) identified the need to provide single bedrooms away from the main area of beds in order to isolate patients who are causing disturbances. Three Environmental Services (B₃) are also sources of disturbance to the patients in Raphael's study; they are heating, ventilation and the lighting at night.

3.5 Hypotheses Generated from the Levels of Interaction Facet

Four levels of interaction with Other People can be identified from the Nuffield work. Hypothesis 1 is:

The range of potential contacts between patients and nurses are defined by the four elements. In facet terms all interactions with other people can be classified by this facet.

The four proposed levels can also be applied to the Location referent; with greatest support being provided for the 'Access to' (A₂), 'Use of' (A₃), and 'Prevention of Disturbances within' (A₄) elements with respect to Locations.

In ordering the experience of the environmental systems, evidence suggests that lighting can be classified both as a source of 'Disturbance' (A₄) and also as a facility to be 'Directly Used' (A₃). The other environmental systems suggested by Raphael's research (heating and ventilation) are mentioned in terms of complaints from the patients. Therefore they are classified as belonging to the element concerned with Disturbances (A₄). The one major issue which can not be assigned to any one category with confidence is the social atmosphere of the ward. Patients sitting and chatting is a more open activity than receiving treatment behind curtains, a 'Contact with' (A₃) activity. However it is also more intimate than moving from the ancillary room to the bed area 'Access to' (A₂). With this limitation Hypothesis 2 is:

nurses will distinguish between evaluative statements in terms of the levels of interaction implied by the specified activities. In facet terms the Level of Interaction will partition the SSA space into four regions. Each region will contain items which refer to behavioural units occurring at one level of interaction.

It is proposed that environmental experiences, as represented by the behavioural units, can be graded in terms of the level of interaction.
they indicate. Hypothesis 3 is:

Nurses will construe the observation of patients as being more similar to access to patients than to the direct contact with the patient. The least similar levels of interactions are observation and the prevention of disturbances. In facet terms the hypothesis is that this facet is simply ordered. The four regions will order across the SSA space from Observation, Access, Contact/Use to Prevention of Disturbances.

As stated previously, an ordered facet can play either an axial role or a modulating role in the total structure of environmental experience. The condition for a facet playing an axial role is that its order is unrelated to another facet (Guttman, 1977b). It is proposed that the Levels of Interaction facet plays such a role.

The axial role of the Levels of Interaction facet is most clearly illustrated by the sanitary facilities. By their very label they can be identified as Locations (B2) and further defined as Direct Care (C1) because they are a patient facility. However the complaints associated with these facilities (Raphael, 1969) such as lack of availability, convenience, cleanliness and privacy, suggest that the patients' interactions with these facilities incorporate a range of experiences such as Access to (A2), Use of (A3) and a Lack of Privacy within (A4). Consequently the specific activity must be known to classify these facilities by the Levels of Interaction facet. Hypothesis 4 is:

Nurses will order the evaluative items according to the Levels of Interaction facet independently of the Referent or Type of Care referred to. In facet terms this facet will play an axial role in structuring the empirical distribution of responses.

4 THE CYLINDREX MODEL OF WARD EVALUATION

The final objective of Chapter 7 is to propose the total structure which will empirically demonstrate the validity of the model of ward evaluation. The total structure is determined by the relationships that exist between the three facets as defined by the role each facet is to play.

The purpose of specifying the total structure is to make the hypotheses generated from the definitional system as transparent as possible (Guttman, 1977). Without knowing the shape of regions and their expected location in the space produced by a facet, it would be difficult to test whether, indeed, the predictions are correct. The substantive content, taken from the ward literature, is used to predict the roles which the facets appear to play in the total structure. Together the three facets of the general model and their elements, as defined in terms of the ward context, provide the model. It is a model to describe the nurses' evaluations of wards in terms of their experience of interacting with
the setting in providing nursing care. The ward evaluation model can be stated by the following Mapping Sentence:

A nurse(η) evaluates the ward on which she works by stating the extent to which it facilitates:

Facet A

Levels of Interaction

- A₁ Observation of
- A₂ Access to
- A₃ Contact with/Use of
- A₄ Prevention of Disturbances from

Facet B

Referent

- B₁ People
- B₂ Locations
- B₃ Environmental Services

Facet C

Type of Care

- C₁ Direct
- C₂ Indirect

as these referents relate to Patient Care by

Range

- Helps a great deal
- Makes it very difficult

stating whether it

TO
to provide this care.

The role or relationship between the facets is expressed by the verbal connectives between the facets in the Mapping Sentence. The prepositions which connect the Levels of Interaction facet with the Referent of that interaction have been retained within the elements of the Levels of Interaction facet to facilitate meaning, for example observation of and access to. They imply the axial role of this facet in that they do not suggest that the Levels of Interaction facet further defines the Referent, but rather simply state the Referent is the object of the various levels of interaction.

The connectives between the Referent facet and the Type of Care imply that the Care facet further defines the Referent, that is it modulates a polar facet.

The structure predicted from a three faceted definition, with each facet playing a different role, is the cylindrex. The polar facet (Referent) and the modulating facet (Type of Care) form a radex. The axial facet
(Levels of Interaction) partitions the space such that the radex is sliced into a number of radices (equal to the number of elements of the axial facet). This structure requires three dimensions to illustrate it in the space. Figure 7.2 illustrates the proposed cylindrex structure of nurses evaluations of their wards.

Figure 7.2 A Diagramatic Representation of the Model of Ward Evaluations

The cylindrex structure is not unique to the ward evaluation model. Levy (1979) demonstrates that political involvement can be described by a cylindrex structure and Shapira and Zvulun (1979) use the same structure to describe soliders' evaluations of their officers.

5 SUMMARY OF THE MODEL APPLIED TO THE WARD CONTEXT
Chapter 4 defines a model as a description of a phenomenon obtained by identifying the relationships between the components of the phenomenon. It is achieved through a process of categorising the components in terms of their similarities and differences as defined by concepts or rules.
A reason for using the facet approach in the research is that it facilitates a description of environmental evaluation which retains the emergent quality of the phenomenon. Each evaluation item is predicted to be based upon one behavioural unit which incorporates both an attribute of the setting and a specific purposive activity of the individual. One objective of Chapter 7 is to identify the behavioural units which will be, potentially, relevant to the nurses' experience of providing care in the ward setting. The behavioural units are obtained from previous literature in the ward context.

The retention of the emergent quality of evaluations is accomplished through a system of multiple classification. Each behavioural unit is classified into categories or elements according to the rules or facets specified in Chapter 5.

A second objective of the chapter is to identify the elements of each facet as they relate to the ward/nursing care system. The assignment of the behavioural units to the elements provides predictions about the relative similarities between the units. For example, by applying the principal of contiguity it can be proposed that the evaluations of use of the dayroom and the sanitary facilities will be more highly related to each other, in that they share the same elements of all three facets \((A_3B_2C_1)\), than the relationship between either of them and, for example, the lighting for clerical work \((A_3B_3C_2)\). In this way the category membership of each behavioural unit can be used to predict its relative relationship with all other behavioural units in the domain.

The third objective is the prediction of the role played by each facet in structuring the total domain. The three different roles that are proposed (axial, polar and modulating) lead to the prediction that the model of ward evaluation will be represented by a cylindrex structure of the empirical distribution of the observations.

Chapter 9 describes how the classification derived from previous literature is used to classify given items of the ward evaluation questionnaire and also the initial testing of the proposed model. However, as argued in Chapter 4, the model is to be based upon the nurses' actual experience of environmental interaction. Therefore it is necessary to obtain the range and content of this experience from the nurses actually working on adult acute hospital wards. Chapter 8 describes the stages in the development of the evaluation questionnaire needed to ensure it is a clear reflection of this actual experience.
Chapter 8
THE DEVELOPMENT OF THE RESEARCH INSTRUMENT

Chapter 7 presents the proposed cylindrical model of ward evaluation as represented by the mapping sentence. The model includes the specification of the elements of each facet and the hypothesised role played by each of the facets. The proposals are derived from the types of behavioural units identifiable from previous research in the ward context. These behavioural units are not the observations. The instrument to be developed is a questionnaire, the behaviour to be observed is the responses generated by the questions and instructions of that questionnaire.

Chapter 8 describes the development of the questionnaire to be used to obtain the nurses' evaluations of the wards. The development involves a series of stages, each stage is a further refinement of the instrument. Section 1 presents the research requirements of the instrument. The following sections describe how the requirements are met. Stage 1 is the identification of the activities involved in nursing care. Stage 2 establishes the boundaries for the population, the content, and the responses to be used. Stage 3 identifies a method for removing ambiguities in the measures. Stage 4 is the development and testing of questions based upon behavioural units. Stage 5 is the construction of an instrument which is a concise coverage of the research domain, with questions sufficiently precise to be classified according to the model of ward evaluation.

1 RESEARCH REQUIREMENTS

The purpose of the instrument is to measure the nurses' evaluations of the wards on which they work. The assessments are to be used to test the validity of the proposed model and to provide a means for comparing the different ward designs in terms of their ability to facilitate nursing care. The requirements of the instrument are that it is consistent with the research objectives (Section 1.1) and it meets the requirements of instrument construction (Section 1.2). A description of the instrument is provided in Section 1.3.

1.1 Research Objectives

The two research objectives specifically related to the development of the instrument are that it is based upon the conceptualisations of the nurses actually working on adult acute hospital wards and that it provides quantifiable information.

A strong criticism which may be levelled against the way facet theory is frequently used is that a pre-conceived framework is imposed on people's experience without adequately exploring the content and structure of
people's own conceptual systems. Forgas (1979) makes a similar point in his plea for research approaches which do not arbitrarily partition naturally occurring phenomena. Merely by abiding by the facet requirements of logically independent facets and mutually exclusive elements does not guarantee that the naturally occurring boundaries of a phenomenon are being used. For example Levy (1978a) proposes a model of nurses' evaluation of wards which meets the above requirements, but excludes the majority of 'behavioural unit' experiences in order to achieve this.

Chapter 7 presents behavioural units which are potentially appropriate as the basis of nurses' evaluations. However they are based upon the conceptualisations of patients (e.g. Raphael, 1969), designers (Nuffield, 1955) researchers (the classification of observed activities, e.g. Nuffield, 1953) as well as the conceptualisations of nurses. The present work focuses on the conceptualisations of nurses. The sources of the information for the content of the experience must be the nurses themselves. Consequently, for the development of the instrument the appropriate behavioural units are identified before they are classified by the facets.

The second objective is that the instrument provides quantifiable information. 'Hypotheses must be tested with respect to standards that are external to the measurement process per se' (Nunnally and Wilson, 1976). Quantification of the measurements, according to these authors provides:

- objectivity; theories are testable to the extent that there are unambiguous procedures for documenting events;
- the utilisation of mathematical analyses; many hypotheses can not be tested without mathematical aids;
- finer comparisons than personal judgements give.

The instrument for measuring nurses' evaluations of their wards is the operational definition of the model. The results are to be used to test the validity of the model and to allow comparisons to be made across a large sample of ward types. These research objectives require that the responses be stated in quantifiable terms. The instrument most suited to the research objectives is the self-completion questionnaire.

1.2 Requirements of Research Instruments

The two basic requirements of a research instrument are that it is:

- reliable (i.e. that the measurements it generates will give the same values in repeated independent measurements).
- valid (this concerns the goodness of the correspondence or mapping between the concepts and the operational definitions of those concepts, Runkel and McGrath, 1972).
The literature on questionnaire development points to several concerns which may influence the degree to which the two requirements are met. The concerns are:

1. that the instrument is developed to suit the particular aims of the study (Hoinville et al., 1978).
   In Chapter 3 it is suggested that much of the evaluation research 'borrows' instruments from other work. This, according to Weiss (1975), raises problems with the validity of such use. It is proposed that an evaluation is only meaningful and valid if it is based on the purposes the individual associates with that setting. The aim of the current questionniare is to measure nurses' evaluations of wards in terms of the achievement of nursing care.

2. that the instrument uses the language of the respondents (Runkel and McGrath, 1972; Hoinville et al., 1978; Anastasi, 1968; Oppenheim, 1966).
   Nursing is a profession and as such has its own phraseology for describing nursing care and parts of the ward. To reduce the possibility of misinterpretation the evaluations should be stated in the language used by the nurses.

3. that it is restricted to memorable events (Hoinville et al., 1978).
   Chapter 7 presents a range of behavioural units that occur within the ward, not all of which are necessarily meaningful to the nurses. The instrument is to contain only those specified by the nurses.

4. that the questions are stated at the level of understanding of the respondents (Hoinville et al., 1978). The Nuffield Job Analysis (1953) demonstrates that there are a range of possible levels for describing activities involved in nursing care. A requirement of the instrument is that it presents the activities, and the parts of the ward, at the level at which the nurses associate them together.

5. that the questions are precise and unambiguous (Runkel and McGrath, 1972; Anastasi, 1968; Hoinville et al., 1978; Oppenheim, 1966).
   Chapter 5 presents the possible sources of variations between different evaluative statements. The questionnaire is to be completed by a large number of nurses. To ensure that each question has the same meaning for all the respondents the sources of variation must be identified.
6. that the instrument is a concise statement of the research domain
Runkel and McGrath (1972) suggest one of the greatest threats to reliability is instrument decay; that is, the respondents lose interest and consequently give less thoughtful responses to the later questions.

7. that the instrument will not incorporate a constant error of response sets by the ordering of the questions (Runkel and McGrath, 1972).
This can be best checked by comparing two different versions of the instrument, each using a different ordering sequence.

The above concerns are taken into consideration in the construction of the research instrument.

1.3 The Instrument
The instrument used in the main survey is a self-completion questionnaire (Appendix 1, Section 1.2). It is designed to be suitable for use in a postal survey. The procedure for the administration of the survey is given in Appendix 1, Section 1.4. The questionnaire is presented as a booklet containing instructions for completion, demographic questions and the evaluative questions. The respondents are identified by the hospital and ward in which they work, their professional grade, the shift they work and the type of patient being cared for.

Each of the evaluative questions contain one behavioural unit (an attribute of a location together with a specific activity). The range of possible responses is specified by a 7-point scale ranging from 'helps a great deal' to 'makes it very difficult' to provide care. Each question requires that the respondent evaluate the attribute in terms of the extent to which it facilitates the given activity. The questionnaire is formulated to allow direct punching of the responses on to the computer.

1.4 Summary of the Requirements of the Research Instrument
The requirements of the instrument are that it is based upon the conceptualisations of the nurses, it will produce quantifiable information and that it meets the requirements of a concise and precise measuring instrument. The construction of the instrument involves an iterative procedure of interviews, questionnaire completion and interviews around the questionnaire. Table 8.1 presents the stages of data collection in the process.

There are six stages in the development of the questionnaire; Chapter 8 describes five of the stages. Each stage represents a further refinement and specification of the instrument to be used as the operational definition of the model of evaluation. Stage 1 is the gathering of information from nurses through the use of interviews.
Table 8.1 Stages of Data Collection

<table>
<thead>
<tr>
<th>DEVELOPMENT</th>
<th>Interviews</th>
<th>Pilot 1</th>
<th>Pilot 2</th>
<th>Pilot 3</th>
<th>Main Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Hospitals</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Number of Wards</td>
<td>10 (6-old) (4-new)</td>
<td>28 (20-old) (8-new)</td>
<td>42 (17-old) (25-new)</td>
<td>144 (all new)</td>
<td></td>
</tr>
<tr>
<td>Number of Nurses</td>
<td>30</td>
<td>121</td>
<td>276</td>
<td>473 (409 ward nurses)</td>
<td></td>
</tr>
<tr>
<td>+ 25 open-ended questionnaires</td>
<td>+ 23 interviews</td>
<td>+ 47 interviews</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2 STAGE 1 OF THE INSTRUMENT DEVELOPMENT

The starting point of development is to obtain accounts, from nurses actually working on hospital wards, of their experiences. Objectives: to identify the activities nurses associate with the physical characteristics of hospital wards (Step 1) and to compare this range of activities with those obtained from previous research (Step 2).

2.1 Step 1: The Identification of Activities

Data Collection Procedure: Taped interviews with groups of nurses are used. The initial interviews included 30 nurses and were conducted in hospital seminar rooms, using four different interviewers. Glaser and Strauss (1967), Chandler (1954), Weiss (1975) and Hoinville et al. (1978) all recommend interviews as the initial source of information to be included in a questionnaire. The functions which can be served by interviews, that are relevant to the instrument development, are that they provide the general framework and the language of the respondents and indicate the level at which events are construed by the respondents.

Group interviews are recommended by Weiss (1975) when the information sought is consensus of opinions and not about personal details of the individual. Hoinville et al. (1978) suggest that group interviews are particularly informative because of the interactive discussions that usually quite independently of prompting by the interviewer. Chandler (1954) recommends not mixing different professional groups in
interviews as his work indicates the more senior staff dominate the discussion while the junior staff are less prepared to present their opinions. Consequently, the qualified and unqualified nurses were interviewed separately.

The interviewers were directed to encourage the nurses to talk freely between themselves. The interviews were taped in order to prevent interrupting the conversation to take down information. No attempt was made, at this point, to have the nurses specify all the components of a behavioural unit; it being the range of experience that was sought, not the details. The interviewers asked questions to promote conversation and focus the discussion on activities related to the physical environment. The same protocol was used by all four interviewers. The questions posed are as follows:

- What is it about a ward design that makes a ward work well?
- How would you compare the different ward designs on which you have worked?
- How do the various areas in the ward relate to its functioning?
- What is the difference between a good ward design and a bad ward design?

The interviews lasted about one hour. Five group interviews were conducted, encompassing a total of 30 nurses.

Analysis: Content analysis of the transcripts is used to organise the information. Each interviewer analysed her own interviews. Each mention of an activity was recorded, and when possible, the part of the ward associated with it.

Results: The content analysis of the transcripts identifies 77 specific goals and activities specified as part of nursing care in acute wards. The activities are grouped into 12 general categories listed in Table 8.2. (A detailed list of the 77 activities is provided in Appendix 1, Section 1.1, 3rd page).

Table 8.2 Major Activity Groups specified in the Group Interviews with Nurses

<table>
<thead>
<tr>
<th>Nurse</th>
<th>Patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General nursing efficiency</td>
<td>1. Environmental disturbances</td>
</tr>
<tr>
<td>2. Direct treatment of the patient</td>
<td>2. Environmental comfort</td>
</tr>
<tr>
<td>3. Communication</td>
<td>3. Activities of ambulant patients</td>
</tr>
<tr>
<td>4. Movement/access</td>
<td>4. General comfort</td>
</tr>
<tr>
<td>5. Storage of supplies and equipment</td>
<td>5. Patient privacy</td>
</tr>
<tr>
<td>6. Staff privacy</td>
<td></td>
</tr>
<tr>
<td>7. Staff comfort</td>
<td></td>
</tr>
</tbody>
</table>

Discussion: No difficulty was encountered in generating discussions about ward design in terms of the provision of nursing care. In general nurses
have strong opinions about the appropriateness of various designs.

One of the issues identified from the literature review of Chapter 7 is whether or not patient well being, including their activities and goals, can be considered a part of the nurses' experience of the ward. As can be seen from Table 8.2 a substantial portion of the comments are concerned with aspects of patient well-being. Both the extent and detail of the patient-directed comments suggest that nurses have sufficient knowledge of the patients' experience to include it as a part of the definition of nursing care. This is not to assume that the nurses' interpretation is precisely the same as the experience of the patients but that it is sufficiently important to the nurses to include it as a part of the domain.

2.2 Step 2 Comparison with Previous Research

The content analysis identifies 77 unique ward activities that nurses associate with the physical environment. The range is compared with those obtained from two previous pieces of research with similar objectives.

Comparison with Sears and Auld's (1976) Ward Evaluation Questionnaire

Sears and Auld's instrument is based on interviews with nurses, patients, doctors and visitors. The comparison of that questionnaire with the comments of the current interviews indicates that the only aspects of their questionnaire not identified by the present work are those which do not relate to specific activities (such as the height of the ceiling, the number of beds and the size of the windows). There are nine such questions. Table 8.3 contains the twelve general categories with the number of specific activities grouped under each heading for the current study and that of Sears and Auld. In all categories except 'Disturbances to Patients', the number of specific activities identified exceeds that of Sears and Auld.

Table 8.3 General Categories of Activities for Current Work and Sears and Auld's (1976) General Ward Questionnaire

<table>
<thead>
<tr>
<th>For Nurses</th>
<th>Current Work</th>
<th>Sears &amp; Auld</th>
<th>For Patients</th>
<th>Current Work</th>
<th>Sears &amp; Auld</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gen. nursing efficiency</td>
<td>7</td>
<td>4</td>
<td>Disturbances</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Direct care &amp; treatment</td>
<td>11</td>
<td>2</td>
<td>Environmental comfort</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Communication</td>
<td>8</td>
<td>3</td>
<td>Activities for ambulant patient</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Movement/Access</td>
<td>7</td>
<td>3</td>
<td>General comfort</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Storage</td>
<td>6</td>
<td>2</td>
<td>Privacy</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Private discussions</td>
<td>4</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comfort</td>
<td>3</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

120
Comparison with the Nuffield Job Analysis (1953): An Observational Study

The Nuffield Job Analysis sought to obtain the full range of observable nursing activities. As previously stated, it does not cover observation, with the exception of single bedrooms which require nurses to enter in order to observe patients. In addition it includes no activities of the patients. The nursing activities are classified as Basic Nursing, Technical Nursing, Administration and Domestic. The content of the interviews in the present work is compared with each of these general categories.

**Domestic:** None of the eight categories of domestic tasks are identified in the current work. A possible reason is that nurses no longer have responsibility for this range of activities.

**Basic Nursing:** This classification in the Nuffield Job Analysis includes nineteen different categories of activities, with each being further sub-divided into highly specific tasks. The Nuffield classification is a far more detailed breakdown than that obtained in the current work. However if the Nuffield breakdown is considered at a more general level, (such as 'treatment and care at the bedside', which covered nineteen specific tasks) then only five of the detailed activities were not identified by the nurses in the present study. The activities are sister's rounds, giving baths, distributing food, cleaning screens and preparing and giving hot water bottles.

**Technical Nursing:** Of the twenty-five specific tasks concerned with technical nursing identified by Nuffield eight did not emerge in the present interviews. These are: attending to medical students, charting, weighing patients, attending out-patients in the ward and four activities concerned with checking medicines and drugs.

**Administration:** As compared to the Nuffield study, this is the least well represented 'nursing' category in the present work; eight of the nineteen activities, being excluded. They are: four activities concerned with writing, reading and listening to case histories and reports, checking ward stores, accompanying medical rounds, private study and waiting time. However the current work does identify requests for interview rooms and offices which may accommodate these activities.

**Discussion of Step 2** The comparison with Sears and Auld's questionnaire indicates that the interviews cover all the activities identified in that research. The comparison with the Nuffield Job Analysis indicates that most of the general groups of activities have been covered, although not at the same level of detail.
2.3 Conclusions Drawn from Stage 1 of the Instrument Development

The objective of Stage 1 is to identify the range of ward activities associated with the physical setting by the ward nurses. Group interviews have been used for this purpose. 77 unique activities are identified, including both nurse and patient activities.

The frequency with which nurses include patient activities and well-being suggests that these issues can not be excluded from the nurses conceptualisations of their design-related experience.

The comparison of the range of activities with those of previous work provides confidence that a comprehensive coverage is achieved. The major difference between the verbally reported activities and those of the Nuffield observational study centres on the level of specificity. Hoinville et al. (1981) recommend that the level to be used in a questionnaire should be that identifiable from the initial interviews. In addition, the level of specificity obtained is very similar to that of Sears and Auld's questionnaire. Therefore it is not considered necessary to obtain more detailed descriptions of the ward activities.

The interviews are also used to provide the phraseology for the ward evaluation questionnaire. A 51 item questionnaire was constructed using verbatim comments from the interviews.

3 STAGE 2: THE SPECIFICATION OF THE BOUNDARIES OF THE RESEARCH DOMAIN

Chapter 6 describes a Mapping Sentence as a summary statement of the hypothesised correspondence between a definitional system and an aspect of the empirical distribution of the observations. A precise statement of the correspondence includes the specification of the boundaries of three domains: the population domain (Step 1), the content domain (Step 2) and the response domain (Step 3). The second stage of development is the identification of these three domains.

3.1 Step 1 Specification of the Population of Nurses for which the Questionnaire will be appropriate

The intention is to develop an instrument that is applicable to all nurses working on adult acute hospital wards.

Objective of Step 1: to establish whether the range of activities obtained from the interviews is applicable to all professional grades of ward nurses, nurses working on both day and night shifts and nurses working in medical, surgical and orthopaedic wards. (Children's wards and intensive care units are excluded, as the type of nursing in these wards is very specialised.)

Data Collection Procedure: The sources of information are the initial group interviews (discussed in Stage 1) and open-ended questionnaires distributed to 25 nurse tutors to compare the issues deemed important for each of the three patient types. Five questions were asked in the
What are the characteristics of a good ward design?
What are the characteristics of a bad ward design?
What are the special requirements of a ward design for:
- orthopaedic patients?
- medical patients?
- surgical patients?

The nurses were asked to write as many comments as possible.

**Analysis:** The activities and issues specified by each group were identified from the interviews and questionnaires. A content comparison of the activities was made between:

- Qualified nurses (sister, staff nurse, State Registered Nurses (SRN's), and State Enrolled nurses (SEN's) and unqualified nurses (student SRN's, pupil SEN's and Auxiliary nurses).
- Day shift and night shift nurses.
- Issues of importance for the care of medical, surgical and orthopaedic patients.

**Results:** Distinctions can be identified for the three broad classifications of nurses presented above. The major differences between qualified and unqualified nurses are that the unqualified nurses emphasise the potential disturbances of ward operations to patients, while the qualified nurses specify more activities associated with the administration of the ward and give more specific activities associated with the ward design.

The differences for the Shifts are that the night shift refer to a more restricted range of activities and place greater emphasis on the call system and the potential disturbance to patients at night.

The open ended questionnaires indicate that the actual categories of activities for each speciality are essentially the same, differences being only a matter of emphasis.

**Conclusions of Step 1: The Specification of the Population Domain**

The conclusion drawn from the comparison of the issues raised by the different groups of nurses is that a standard questionnaire can be used for all groups, but that the validity of combining the responses of the different nurse types needs to be tested. The hypothesis is that the proposed definitional system will be applicable to all ward nurses. Confirmation of the hypothesis is provided by comparative analyses presented in Appendix 4.

3.2 **Step 2: The Specification of the Boundary of the Content Domain**

A part of the theoretical specification is that the activities be restricted to those which the nurses consider relevant to the physical environment. This restriction is imposed by the protocol used in the interviews. The protocol questions emphasised the ward design in order
that the discussions were concerned with design-related experiences.

A further limitation on the range of goals and activities imposed by the requirements of the research topic is that they take place within the ward or with respect to the ward (e.g. the location of the ward with respect to access to other facilities within the hospital).

Objective of Step 2: To identify the range of activities, locations and issues associated with the ward unit.

Data Collection Procedure: Responses to the 1st pilot questionnaire provide the information. The questionnaire was completed by 120 nurses working in 10 wards, 4 wards from a new hospital and 6 wards from an old hospital.

Analysis: The range of locations and activities appropriate to the physical entity 'the ward unit' is determined by the inspection of the pattern of correlations between the questionnaire items. The inspection includes the identification of the items which have low correlations with other items, and also a smallest space analysis (SSA) of the responses to illustrate the relationships amongst all the items.

Results: Correlation coefficients were calculated between the 51 items of the 120 completed questionnaires. Only twenty of the fifty-one questions have a correlation coefficient of 0.50 or higher with other questions. Nineteen of the remaining bear little or no relationship to other questions. Fifteen of the questions with low correlations contain a common theme of reference to outside influences, or to locations peripheral to the ward. Peripheral locations include the rest of the hospital, other departments, staff's own facilities, waiting areas for relatives and sanitary facilities. Outside influences include lighting, lighting at night, sunlight, noise, heating, view and telephones. Added to this list are the two questions concerned with ventilation, which, while having a correlation coefficient between them of .59, have very low correlations with other questions. Questions concerned with unauthorised persons, either in the ward or having access to either medical supplies or special equipment, are also virtually unrelated to each other or to any other questions. The inspection suggests that the questionnaire covers too wide a range of items not directly concerned with the ward itself.

This is confirmed by a two-dimensional smallest space analysis carried out on the data (Figure 8.1). The analysis gives a spatial representation of the relationships amongst all the variables. It converts the rank order of the correlations into spatial distances. The more closely related are two variables the nearer they are in the space.
The questions concerned with activities and locations within the ward form a relatively tight, undifferentiated region of the space while the questions identified as relating to activities, influences or locations outside the ward are dispersed throughout the rest of the space.

Conclusions of Step 2: Specification of the Content Domain While it is accepted that the ward represents just a part of a total system, (i.e. the hospital), this research is concerned solely with the design of the ward unit. Therefore the boundary for the inclusion of items is redefined to encompass only those issues which are of importance to nursing activities within the ward. Consequently the items concerned with the impact of the environmental systems such as lighting and heating are retained, as are questions concerned with use of the telephone. Questions relating to other parts of the hospital such as departments and waiting areas are excluded. The revisions are intended to place greater emphasis on the activities of the nurses and patients within the ward unit.

Figure 8.1 Two dimensional SSA of the Responses to the 1st Pilot Questionnaire

3.3 Step 3: Specification of the Response Domain

The third type of boundary to be specified in the construction of a questionnaire is the range of possible outcomes to be recorded. As stated in Chapter 6, all the items of a given domain must have a common range. In other words the possible responses must not only be ordered but must be ordered in the same sense. The existence of a common range can not be determined empirically. As stated by Brown (1980):

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Common range is a specification, not a hypothesis; i.e. one cannot measure if two items have a common range a priori nor empirically measure it via a statistical analysis, it is a substantive or theoretical problem.

Chapter 4 specifies the common range of the items to be included in the questionnaire. In that chapter, evaluation is defined as a statement of the extent to which an attribute of a setting facilitates the achievement of a purpose. The common range is the degree to which the environment plays this facilitative role.

The Number of Scale Units. The literature on questionnaire development and analysis does not specify the most appropriate number of scale units to be used. For example Martin et al. (1974) compare the results of principal components analysis on the same data using different scale units (ranging from 2 to 9 intervals) and find no appreciable differences in structure. However one of the advantages of quantification is that it allows a finer detail for comparison. It is an objective of the present work to compare different ward designs on the evaluations they receive, and a range of response categories is necessary to facilitate the comparisons.

Therefore the strategy of Oppenheim (1966) is adopted. He proposes that the response categories must help the respondent in his decision. Verbal descriptions can be found to label a 7-point scale which distinguishes between each category. Therefore a 7-point scale is used, the labels range from 'helps a great deal' to 'makes it very difficult'.

The Format of the Responses. Hoinville et al. (1978) recommend that the format of the responses be in the style of Osgood's semantic differential scale (Osgood et al., 1957) as it is easy for the respondents to use and allows a compact questionnaire design. It is a diagrammatic format, with the intervals indicated spatially from left to right.

This format is used in the main survey. The intervals are labelled at the top of each page and the intervals for each item are given a number to allow direct computer recording from the questionnaires.

3.4 Summary of Stage 2: The Specification of the Research Domain

The objectives of the 2nd Stage in the instrument development are to identify the boundaries of the research domain. This includes the population, the content, and the response domains. The comparison of the content of the interviews and open-ended questionnaires indicates that a standard instrument can be used for all groups of ward nurses. Therefore the population is defined as all nurses working on adult acute hospital wards.

The analysis of the responses to the 1st pilot indicates that many of the items included are not part of the range of activities directly related
to 'the ward unit' as a physical entity. Therefore the range is restricted, according to the interpretation of the SSA, to ward activities.

The response domain is specified as a 7-point scale ranging from 'helps a great deal' to 'makes it very difficult' to provide care. Having established the boundaries of the research domain, the next stage of development is the identification of ambiguous items. Stage 3 describes the process.

4 STAGE 3: THE IDENTIFICATION OF AMBIGUITIES IN THE QUESTIONS

One of the major requirements of a standard instrument, to be used by a large number of people, is clarity. Ambiguous questions are the most frequently mentioned threat to instrument reliability (see introduction to this chapter). Interviews are essential to define the boundaries of the research and to ensure that the content is expressed in a language which is familiar to the respondent. However, comments expressed in this context, whilst being meaningful to each respondent, are not necessarily sufficiently complete to carry the same meaning for all the respondents.

Objectives: To identify ambiguous items in the 1st pilot questionnaire (Step 1) and propose a method for clarifying the meaning of the items (Step 2).

4.1 Step 1: Ambiguities in the Questionnaire

Data Collection Procedures: The 120 completed questionnaires from the 1st pilot and group interviews with 23 nurses who completed the 1st pilot questionnaire are used. The groups of nurses were asked to describe what each question meant to them.

Analysis: Ambiguities are identified by the inspection of the correlations between the 51 items. The content analysis of the interviews are used to explain the sources of the ambiguities.

Results: The Correlation between the Items. Four groups of highly related questions (using the criterion of a correlation of 0.5 or higher) are identifiable. They are: use of space, observation and access to patients, movement and access to facilities, and patient independence and ward appearance. The groupings suggest that the classification by the 12 general categories, developed in the specification of the research domain, is not the most appropriate system for classifying ward activities. For example, the correlations show no distinction is made between the observation of patients and access to patients, while 'access' to patients and 'access' to facilities are quite different. In addition, the correlations appear to suggest inappropriate group memberships, such as bedside care of patients being highly correlated with storage of supplies and equipment.
Results: The Content Analysis of the Interviews

The analysis of the replies identifies seven questions which are considered to be inappropriate in that the nurses do not carry out the activities or the activity happens too rarely to justify its inclusion in the questionnaire. Twenty-two of the questions have alternative explanations for their meaning and, therefore, are considered too general. The remaining twenty-two questions all have a common meaning to the nurses interviewed and are considered appropriate as activities against which to evaluate ward design.

Conclusions from Step 1

The conclusion drawn from the interviews is that the questions included in the first pilot are too general. For example the grouping together of Storage and Bedside Care is a result of the use of the term 'space', without reference to where in the ward and/or for what purpose. The ambiguities result from the fact that each item does not incorporate all the components of one behavioural unit.

4.2 Step 2: The Method used to locate the Ambiguities in each Question

One of the uses of facet theory, as pointed out by Runkel and McGrath (1972), is in the construction of questionnaire items. In order to identify the ambiguities in the questions a faceted way of thinking is applied to each question.

Method

Each of the 51 questions from the first pilot are examined to identify the elements which make up the questions. From the examination it is possible to group the elements into sets or facets*. Four such facets are identified. They are:

- Location - e.g. the whole ward, the bedspace, the nursing station
- Attribute of the location - e.g. layout, position, lighting
- People - e.g. nurse or patient
- Goals/activities - e.g. privacy or observation

Examination of the questions reveals that only 20 of the 51 questions refer to a (location), 26 contain an (attribute), 33 make specific reference to a (goal/activity) and 14 specify the (people) being considered.

Discussion: The exclusion of any one of the above facets requires the respondents to supply their own element for a specific question, and

*Facet' as used in this context does not imply its technical definition of 'a Cartesian set', in that these facets are not conceptually distinct. That is, not all activities occur in all parts of the ward nor do patients and nurses carry out the same activities. Therefore they are not the theoretical facets proposed by the model. Rather they are simply being used to produce clear and unambiguous questions.
therefore, results in a range of alternative interpretations as to the meaning of the question. In order to correct this source of ambiguity, each question in the second pilot questionnaire contains the same format of:

How well does an (attribute) of a (location) help (people) to carry out their (goals/activities).

That is, each item is an evaluative question based on one behavioural unit.

4.3 Summary of Stage 3: The Identification of Ambiguities in the Questions

The correlations between the items of the 1st pilot questionnaire suggest ambiguities in the items. The ambiguities are identified from interviews with nurses about the meaning of each of the questionnaire items. To remove the ambiguities a standard format for each item is proposed. Stage 4 describes the construction of the 2nd pilot using this format.

5 STAGE 4: THE CONSTRUCTION OF CLEAR QUESTIONNAIRE ITEMS

Objectives: To develop a set of questionnaire items based on the behavioural units (Step 1) and to test the clarity of the items (Step 2).

5.1 Step 1: The Construction of Items

Sources of Information: All the elements of each of the four facets, as identified from all the interviews and open-ended questionnaires, provide the basic source of information. They include 20 Attributes, 28 Locations, 8 types of People and 77 different Goals and Activities. (A complete list is provided in Appendix 1, Section 1.1).

Method: The Restriction of the Content Domain The range of experiences obtained from the interviews, even when restricted to those most relevant to the physical entity of the ward, is extensive. A test of the utility of the faceted method of item construction for this range of experience cannot be accommodated within one instrument. In addition, the comments on the 1st pilot indicate that many of the previous questions need to be expanded into several questions. For example, questions need to distinguish between patients' activities at the bedside and in the whole ward. Another example is the necessity to differentiate between patients gaining the attention of the staff via the patient/nurse call system and through visual contact. To accommodate the increased permutations without increasing the size of the questionnaire beyond practicable limits the items included do not completely cover the content domain as defined in Stage 2.

The range of elements is restricted in the following manner:

Attributes: Fixtures such as furniture or curtains are excluded as they are not architectural features. 8 attributes are retained.

Locations: These are restricted to the whole ward, the nursing
station and the bedside. They are the three major places referred to in the interviews.

People: No distinction between types of patients is made.

Goals/Activities: 47 of the 77 activities are included. Criteria for exclusion are that the activity relates to locations that have also be excluded (8), they are redundant (18) or that they are not applicable for all the nurses (4).

Method: The Construction of the Items 144 questions were generated from the restricted range of elements. Each of the questions contains an element from each of the four facets. The major categories of items are:

- Environmental attributes of the ward and the bedspace
- The position of the nursing station for access and observation
- The layout of the bedspace for treatment, general patient comfort and patient privacy
- The layout of the ward for observation, movement, storage, patient recreation and private discussions for staff

Discussion: The objective is to construct unambiguous items. The proposal is that the inclusion of an element of each of the four facets will accommodate the meaningful qualitative differences between the evaluative items.

5.2 Step 2 Testing the Format of the Items

Objective: To determine whether the four-faceted format produces items with a common meaning to all respondents.

Source of Information: The information is obtained from the interviews with 47 nurses who completed the 2nd pilot questionnaire. In the interviews each item was described in terms of what it meant to the nurses. The comments were recorded by the interviewer.

Analysis: All comments for each item are compared.

Results: Ambiguities were identified by the nurses. However the ambiguities are not caused by the lack of information. There are two sources; inappropriate combinations of elements (described in Stage 5) and the level at which the activities are stated. 22 questions were criticised for the generality of the activities.

5.3 Conclusion of Stage 4:

The objectives of Stage 4 are to identify and correct ambiguities in the items caused by insufficient information. A four-faceted format is applied to each item. The comments obtained about the items from nurses who completed the questionnaire provide the criteria for assessing the success of the format. The comments indicate that the inclusion of an element from each facet provides sufficient information to make meaningful distinctions between items. Therefore the structure is retained in the following versions of the questionnaire. However, ambiguities still exist as a result of inappropriate combinations of elements and the level at which some of the activities are stated. The
correction of these problems is described in Stage 5.

6 STAGE 5: REFINEMENT OF THE DOMAIN

The concern of Stage 5 is to produce an instrument which is both appropriate and concise. This requires that the items be meaningful, but not redundant.

**Objectives:** To identify items with inappropriate combinations of elements (Step 1), to meaningfully reduce the items to be used (Step 2) and to construct an instrument which is sufficiently precise to be classified by the model of ward evaluation (Step 3).

6.1 **Step 1: The Identification of Inappropriate Element Combinations**

The original interviews do not provide sufficient information to ensure that, when the facet design is applied to the items, the combinations will always be valid. Therefore an examination of their validity is required.

**Source of Information:** The interviews with 47 nurses who completed the 2nd pilot questionnaire also provide the source of information for this objective.

**Method:** The nurses were asked to state whether the activity given in each item is associated with the correct attribute and location.

**Results:** The interviews identified 27 combinations which were considered by the nurses to be inappropriate.

Nine concern the general use of the term 'layout of the ward' when referring to quite specific aspects of care. Examples are clerical work, elimination of cross infection, treatment of patients and the storage of supplies and equipment.

Five items have inappropriate uses of the term 'layout of the bedspace'. For example observation and access to patients is related to the layout of the ward and the position of the nursing station, not to the layout of the bedspace.

The remaining items are considered by the nurses to be inappropriate because they refer to the comfort of the nurses; for example, thermal comfort.

**Discussion:** The concern about the generality of the activities (Stage 2) is not caused by the level at which they are stated, rather it is caused by the activities being combined with an over-generalised description of the physical setting. The most important comments taken from the interviews for the modification of the instrument are:

- the activities should be more clearly linked with the particular part of the ward in which they occur.
- that certain aspects of the ward have been over-represented (such as the layout of the ward and bedspace).
- that many of the questions can be corrected by changing one element (for example access to patients is from the staff base while...
observation of the patients is with respect to the entire ward layout).

6.2 **Step 2: Reduction of the Number of Items without reducing the Range of the Content Domain**

The construction of items using the four-faceted format (Stage 3) necessitated restricting the range specified as appropriate for the evaluation of ward design in Stage 2. To incorporate those behavioural units back into the questionnaire, a meaningful reduction of the 144 items is required.

**Source of Information:** The 276 completed 2nd pilot questionnaires are the source of information.

**Analysis:** A factor analysis with varimax rotation on the responses to the 99 non-redundant questions is used to reduce the number of items.

**Results:** The analysis identifies items which, while appearing to measure different aspects of the ward's functioning, are not differentiated by the nurses. In addition it helps to clarify the meaning of some of the questions. Results from the analysis, which have been incorporated into the 3rd questionnaire are:

- Access to and storage of supplies and equipment loaded on the same factor.
- Heating and ventilation questions are not differentiated.
- Appearance is interpreted as social atmosphere (loaded with items such as patients sitting and chatting).
- Private discussions for staff do not load on the same factor as private discussions for patients.
- Storage and access to sterile supplies is a separate factor from other aspects of storage (the interviews indicate this takes place in the treatment room).
- The disturbance of patients from the lighting at night is distinguished from lighting for nursing activities.

**Discussion:** The analysis provides the basis for reducing the number of items without restricting the range of the content domain. This makes it possible to include behavioural units previously excluded. These refinements are incorporated into the 3rd version of the instrument.

6.3 **Step 3: The Construction of the 3rd Pilot Questionnaire**

**Objective:** To produce an instrument based upon the conceptualisations of the nurses. The requirements of the instrument are that it is concise and contains precise and appropriate items for the evaluation of the physical environment of modern acute hospital wards.

**Sources of Information:** Results from the factor analysis of the 2nd pilot, the 47 interviews conducted around the 2nd pilot and the original interviews are used.

**Method:** Criteria for the Inclusion of Items 52 new or revised items are included. They are items:
-which link an activity with the particular location within which it occurs (e.g. treatment room, utility rooms, dayspace, single bedrooms and storage areas).

-which give greater details about the type of storage.

-on the use of the telephone.

-on the lighting at night to accommodate the full range of comments from the original interviews.

-which combine activities that the factor analysis indicates are construed as the same.

95 items from the 2nd pilot are excluded because they:

-are duplications or are redundant (according to the factor analysis).

-are too general or refer to activities that rarely occur.

-have inappropriate combinations of elements.

35 items from the 2nd pilot are retained in their original form as the interviews around the 2nd pilot indicate they are appropriate and unambiguous.

Results: The 3rd Pilot Questionnaire The instrument includes questions to specify the hospital and ward on which the respondent works and precoded categories for professional grade, shift and type of patient.

The instrument contains 87 evaluative items. The items are grouped under the particular activity to which they refer. The responses are specified as a 7-point scale of the extent to which the setting facilitates the activities. The questionnaire is designed to be self-completing and directly coded into the computer.

6.4 Summary of Stage 5: The Refinement of the Domain

Stage 5 provides a description of the methods used to identify ambiguous items, caused by inappropriate element combinations. Redundant items are also identified using a factor analysis of the nurses' responses to the second pilot questionnaire. Based on the above analyses the 3rd pilot questionnaire is developed.

7 SUMMARY OF CHAPTER 8: THE DEVELOPMENT OF THE RESEARCH INSTRUMENT

The development of the instrument involves six stages. This chapter describes five of the stages, with each stage representing a further refinement of the questionnaire. Stage 1 is the initial gathering of information about nursing care in the ward through the use of interviews. Stage 2 defines the boundaries of the research domain. Stage 3 is focused on the problem of ambiguous items and Stage 4 is the testing of the facet format for the construction of unambiguous items. Stage 5 is the further refinement of the questions to ensure their appropriateness. This stage also includes the construction of an instrument which is a concise statement of the content domain as defined in Stage 2.

The advantages of the questionnaire method of gathering information are
that the information obtained is quantifiable and it allows a large number of respondents to be incorporated into a study. However, its disadvantage, according to Runkel and McGrath (1972), lies with the time and effort involved in its construction. The problem is illustrated by the number of stages in the construction of the current ward evaluation instrument.

The stages are necessitated by the requirements of the instrument that are described in Section 1. A primary requirement, from the point of view of the research objectives, is that the instrument is based upon the conceptualisations of the nurses. This requires that the model, as defined in facet terms, be applied to the content of the conceptual systems, not as the basis for generating the content.

Additional requirements are what Hoinville et al. (1978) describe as the characteristics of a 'good instrument'. These characteristics are the seven requirements presented in Section 1.2. The original interviews are used to provide the content, language and level of understanding to be contained in the questionnaire. However the information from the interviews is not sufficiently complete to translate directly into unambiguous items. The inclusion of Stages 3 and 4 are for the sole purpose of developing a method of generating, from the interviews, clear unambiguous questions (pilot questionnaire 2). The 3rd version of the instrument is the first to both contain the total content domain and also use the facet format for the construction of items.

The final stage of development is the testing of the questionnaire before the main survey is carried out. The necessity for empirically examining the instrument also provides the opportunity for the preliminary testing of the model of evaluation. Chapter 9 describes the testing of the instrument and model.
Chapter 9

THE REFINEMENT OF THE INSTRUMENT AND THE MODEL OF WARD EVALUATION

Chapter 8 describes the initial stages of the instrument development. It documents the steps involved in defining the range of experience to be covered, the clarification of the content within this range and the further refinement necessary to make a clear and concise instrument for the evaluation of wards. Chapter 9 presents the initial test of the model of ward evaluation, the final test of the clarity and appropriateness of the items and the construction of the instrument to be used in the main survey.

Section 1 presents the classification of the 3rd pilot questionnaire items according to the model of Chapter 7. Section 2 describes the analysis and form of interpretation to be used. The demonstration of the cylindrical structure of the empirical distribution of the items is given in Section 3. Section 4 identifies and describes the modifications required in the light of the empirical evidence and Section 5 describes the construction of the instrument which is used in the main survey.

1 THE CLASSIFICATION OF ITEMS ACCORDING TO THE MODEL OF WARD EVALUATION

The description of the development of the research instrument in Chapter 8 emphasises the requirement that the questionnaire be based upon the experience of the nurses. The questionnaire has been developed independently of the proposed model of evaluation to ensure this. The behavioural units in the instrument include only those specified by the nurses.

One objective of the present stage in instrument development is the initial test of the correspondence between the proposed model of evaluation and the empirical observations obtained from the use of the instrument. This requires that each of the 87 items be classified according to the three proposed facets as are described in Chapter 5 and are applied to the ward context in Chapter 7. Section 1 describes the classification.

1.1 The Range of the Content Domain

Chapter 7 describes the behavioural units that are identifiable from previous research in the ward context. All the proposed behavioural units are identifiable from the interviews and are present in the 3rd questionnaire. Additional items, taken from the interviews, but not referred to in previous work are:

- the supervision of staff
- a place for private consultations between staff members
- the use of the telephones
- the patient/nurse call system
- the provision of sanitary facilities for staff
- the storage of patient's personal belongings
They are also included in the questionnaire. Together the items of the questionnaire form the content domain to be classified.

1.2 The Classification by each Facet

Each item is classified by each of the three facets.

Levels of Interaction-Facet A: Table 9.1 is a summary of the items together with the specification of the elements to which the items are assigned. Only tentative classifications by the facet are made for several items. The issues covered by these items are:

- The Social Atmosphere: Chapter 7 suggests no clear distinction can be made for these items. They are tentatively classified as 'Access' (A2).
- Use of the Telephone: It is classified as 'Use/Contact' (A3).
- Storage of Patients' Belongings: It is assigned to the 'Use/Contact' element (A3).
- Contact between Patients and Nurses via the Call System: It is classified as 'Access' (A2).

Table 9.1 Classification by the Levels of Interaction Facet

<table>
<thead>
<tr>
<th>Observation (A1)</th>
<th>Access to (A2)</th>
<th>Contact with/Use of (A3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>observing patients</td>
<td>access to people</td>
<td>treatment of patients</td>
</tr>
<tr>
<td>supervising staff</td>
<td>access to patient facilities</td>
<td>patient storage</td>
</tr>
<tr>
<td>patients seeing staff</td>
<td>access to ancillary facilities</td>
<td>use of patient facilities</td>
</tr>
<tr>
<td></td>
<td>co-ordinating staff activities</td>
<td>use of ancillary rooms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lighting for treatment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lighting for patients</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lighting for clerical work</td>
</tr>
</tbody>
</table>

Table 9.1 con't Classification by the Level of Interaction Facet

Disturbance (A4)

- patient privacy
- private discussions for staff
- privacy in the sanitary facilities
- noise disturbance
- disturbance from lighting at night
- disturbance from the heating and ventilation systems

The Referent-Facet B: Table 9.2 is a summary of the classification of the items according to the Referent to which they refer. Tentative classifications only can be given to the items which refer to fixtures in the ward as they do not indicate where in the ward the activities related to these fixtures occur. These items include:

- The patient/nurse call system
- Use of the telephone
- Storage of patients' belongings
All three are tentatively classified as referring to Other People (B₁).

Table 9.2 Classification by the Referent Facet

<table>
<thead>
<tr>
<th>Other People (B₁)</th>
<th>Locations (B₂)</th>
<th>Environmental Services (B₃)</th>
</tr>
</thead>
<tbody>
<tr>
<td>observing</td>
<td>observing from staff base</td>
<td>heating/ventilation</td>
</tr>
<tr>
<td>reaching</td>
<td></td>
<td></td>
</tr>
<tr>
<td>talking to patients</td>
<td>access to: patient facilities</td>
<td></td>
</tr>
<tr>
<td>treating</td>
<td>-ancillary facilities</td>
<td></td>
</tr>
<tr>
<td>privacy</td>
<td>use of:</td>
<td></td>
</tr>
<tr>
<td>noise disturbance</td>
<td>-patient facilities</td>
<td></td>
</tr>
<tr>
<td>private discussions</td>
<td>-ancillary facilities</td>
<td></td>
</tr>
<tr>
<td>supervising staff</td>
<td>privacy in sanitary facilities</td>
<td></td>
</tr>
<tr>
<td>coordinating staff</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Type of Care—Facet C: Table 9.3 is the classification of the items according to whether they refer to Direct or Indirect care. Both the storage of patients' belongings and the call system questions are classified as a part of Direct care (C₁), while the use of the telephone by the nurses is considered to be an Indirect care activity (C₂).

Table 9.3 Classification by the Type of Care

<table>
<thead>
<tr>
<th>Direct Care (C₁)</th>
<th>Indirect Care (C₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>observing</td>
<td>supervising staff</td>
</tr>
<tr>
<td>reaching</td>
<td>coordinating staff</td>
</tr>
<tr>
<td>talking to patients</td>
<td>social atmosphere for staff</td>
</tr>
<tr>
<td>treating</td>
<td>private discussions between staff</td>
</tr>
<tr>
<td>private discussions with patients</td>
<td>access to ancillary facilities</td>
</tr>
<tr>
<td>patients talking to each other</td>
<td>use of ancillary facilities</td>
</tr>
<tr>
<td>recreational activities</td>
<td>lighting for clerical work</td>
</tr>
<tr>
<td>access to dayroom</td>
<td>thermal comfort for staff</td>
</tr>
<tr>
<td>access to sanitary facilities</td>
<td></td>
</tr>
<tr>
<td>use of dayroom</td>
<td></td>
</tr>
<tr>
<td>use of sanitary facilities</td>
<td></td>
</tr>
<tr>
<td>patient privacy</td>
<td></td>
</tr>
<tr>
<td>thermal comfort</td>
<td></td>
</tr>
<tr>
<td>disturbance-lighting at night</td>
<td></td>
</tr>
<tr>
<td>lighting for treatment</td>
<td></td>
</tr>
</tbody>
</table>

The Three-Way Classification of the Questionnaire Items

Table 9.4 provides a summary of the model to be tested against the empirical analysis. Table 9.5 provides the structure membership for each of the 87 items, together with the numbers representing the items in the analysis.
No questions exist for six of the twenty-four potential structuples. Four are logically predicted. Chapter 7 provides no evidence to suggest that items referring to the Environmental Services (B_2) may also belong to either the levels 'Observation' (A_1) or 'Access' (A_2). Rather they appear to be relevant to 'Use' (A_3), for example lighting for clerical work, and as sources of disturbances to the patients (A_4). In addition no behavioural units are identified from the interviews for the structuples A_1B_2C_2 (supervision of staff from the staff base) and A_4B_2C_2 (preventing disturbances to staff in locations). The 3-way classification is the model of ward evaluation to be tested by the regional interpretation of smallest space analysis (SSA).

Table 9.4 Theoretical Classification of Pilot Three

<table>
<thead>
<tr>
<th>B_1</th>
<th>A_1</th>
<th>A_2</th>
<th>A_3</th>
<th>A_4</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEOPLE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIRECT</td>
<td>C_1</td>
<td>observation in the ward</td>
<td>treatment at the bed</td>
<td>patient privacy</td>
</tr>
<tr>
<td>INDIRECT</td>
<td>C_2</td>
<td>supervision of staff</td>
<td>movement of supplies</td>
<td>use of telephone</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B_2</th>
<th>A_1</th>
<th>A_2</th>
<th>A_3</th>
<th>A_4</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIRECT</td>
<td>C_1</td>
<td>observation from nursing stat</td>
<td>access to patient facilities</td>
<td>use of ancillary facilities</td>
</tr>
<tr>
<td>INDIRECT</td>
<td>C_2</td>
<td>access to ancillary facilities</td>
<td>use of ancillary facilities</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B_3</th>
<th>A_1</th>
<th>A_2</th>
<th>A_3</th>
<th>A_4</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIRECT</td>
<td>C_1</td>
<td>lighting for treatment</td>
<td>disturbance from lighting at night</td>
<td>heat/vent.</td>
</tr>
<tr>
<td>INDIRECT</td>
<td>C_2</td>
<td>lighting for clerical work</td>
<td>disturbance from lighting at night for clerical work</td>
<td></td>
</tr>
</tbody>
</table>
Table 9.5 Classification of the 87 Items in Pilot Three

<table>
<thead>
<tr>
<th>A₁ OBSERVATION</th>
<th>A₂ ACCESS TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation of and access to patients in the ward (1, 2, 5)</td>
<td>Patients chatting (25)</td>
</tr>
<tr>
<td>Observation of patients in the multibedrooms (57)</td>
<td>Patients chatting with nurses (20)</td>
</tr>
<tr>
<td>Supervision of trainee staff (7)</td>
<td>Companionship (21)</td>
</tr>
<tr>
<td>Students observing treatment (8)</td>
<td>Recreational Activities (22)</td>
</tr>
<tr>
<td>Movement of supplies (3, 15)</td>
<td>Atmosphere for patients (27, 28)</td>
</tr>
<tr>
<td>Co-coordinating staff activities (4, 6)</td>
<td>Nurses responding to call system (72, 73)</td>
</tr>
<tr>
<td>Access to Dayroom (47)</td>
<td>Access to Sanitary Facilities (49)</td>
</tr>
<tr>
<td>Access to Treatment Room (9, 52)</td>
<td>Access to storage facilities (10-14)</td>
</tr>
<tr>
<td>Access to Dirty Utility and clean utility rms. (48, 51)</td>
<td></td>
</tr>
</tbody>
</table>
Table 9.5 (cont'd) Classification of the 87 items in Pilot Three

<table>
<thead>
<tr>
<th>B1</th>
<th>A3 USE OF/CONTACT WITH</th>
<th>A4 LACK OF DISTURBANCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTHER PEOPLE</td>
<td>Storage of patients' belongings (23,36)</td>
<td>Patient privacy</td>
</tr>
<tr>
<td></td>
<td>Treatment at the Bedside (28,29,30,31)</td>
<td>Private discussions with patients</td>
</tr>
<tr>
<td></td>
<td>Patients' use of the call system (35,71)</td>
<td>Noise Disturbance (18,26,32,33,34)</td>
</tr>
<tr>
<td></td>
<td>Use of the telephone (70)</td>
<td>Private discussions for staff (16,17)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Private use of telephone (69)</td>
</tr>
<tr>
<td>LOCATIONS</td>
<td>Use of sanitary fac. (62)</td>
<td>Personal activities in the sanitary fac.</td>
</tr>
<tr>
<td></td>
<td>Use of Dayroom (63)</td>
<td>Privacy in the sanitary fac. (50,62)</td>
</tr>
<tr>
<td></td>
<td>Use of Treatment Rm (64-66)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Storage fac. (37-46)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of Dirty Utility (59)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Clean Utility (60)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Pantry (61)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Office (64)</td>
<td></td>
</tr>
<tr>
<td>SERVICES</td>
<td>Lighting for treatment (79)</td>
<td>Disturbance from lighting at night for treatment</td>
</tr>
<tr>
<td></td>
<td>Lighting for patient comfort (81)</td>
<td>(83,86,87)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heating and Ventilation for patient comfort</td>
</tr>
<tr>
<td></td>
<td>Lighting in ward for clerical work and finding</td>
<td>(74,75)</td>
</tr>
<tr>
<td>ENVIRONMENTAL</td>
<td>supplies (77,78)</td>
<td>Disturbance from lighting at night for clerical</td>
</tr>
<tr>
<td></td>
<td>Lighting for working efficiently (80)</td>
<td>work and finding supplies (82,84,85)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heating and Ventilation for nurses comfort</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(76)</td>
</tr>
</tbody>
</table>
Section 1 describes the model as applied to the questionnaire items of pilot 3. The questionnaire, classified in this manner, is the operational definition of the model. The observations are the responses of nurses to the questionnaire. Smallest space analysis (SSA) is the analysis used to represent the empirical relationships between the items (Section 2.1). A regional interpretation of the empirical distribution is used to test the validity of the proposed model (Section 2.2).

### 2.1 Smallest Space Analysis

The analysis used to test the proposed relationships is smallest space analysis for symmetrical matrices (SSA-1). It is one of the non-metric multi-dimensional scaling techniques from the Guttman-Lingoes series (Lingoes, 1973). SSA provides a geometrical representation of the relationships amongst all the observations included in the analysis; that is, it represents a matrix of correlations in a spatial array. Any matrix of real numbers can be analysed by SSA provided that the values make sense as measures of similarity or dissimilarity.

The observations, in this instance questionnaire items, are points in the space, arranged such that the rank order of magnitude of the correlations is inversely related to the rank order of the distances between the points in the space. Thus, the more highly correlated are any two variables, the closer they will be together in the space.

A stress measure, the coefficient of alienation, describes the goodness of fit between the rank orders of the correlation matrix and the spatial distances. It provides an indication of the number of dimensions to be used to express the relationships. A perfect fit would have a coefficient of alienation (COA) of .00. Shapira and Zvulun (1979) propose .15 as an acceptable level of fit. Bloombaum (1970) suggests that the number of dimensions to use should be that nearest .15 when the next higher dimensionality does not provide an appreciable increase in the goodness of fit. However, Runkel and McGrath (1972) and Guttman (1979) emphasis parsimony. They suggest the lowest dimensionality in which the data can be interpreted should be used. In the present work the SSA is interpreted in terms of facet theory. The proposed model predicts a three-dimensional structure. Consequently a 3-D solution is used.

The analysis is based upon product moment correlations and uses a semi-weak monotonicity extension as it can not be assumed that the same range of response will be utilised for all questions.
Chapter 6 describes the regional interpretation of the distribution of observations in a SSA space according to the facet theory principles. A summary of that discussion is as follows:

In the interpretation, facets are the rules for partitioning the space and the elements are the regions into which the space is partitioned. Lingoes (1977) states:

'partitions must yield a contiguous subspace i.e. a region having a continuous boundary of whatever shape which does not intersect a boundary of another region for any given partitioning'.

Facet theory is expressed in terms of regional hypotheses. Shapira and Zvulun (1979) distinguish between first and second order regional hypotheses. First order hypotheses are concerned with whether or not an element can be retrieved from the space. They predict that all the observations specified as belonging to an element will occupy the same region of the space and that, while the region shares boundaries with other element regions, it is discreet from them. The second order hypotheses are concerned with the relationship amongst the element regions. These hypotheses are based upon the principle of contiguity; the elements of a facet predicted to be most similar will share a common boundary.

There are two basic types of partitioning which can be predicted in relation to a facet's elements; the simplex and the circumplex. As discussed in Chapter 6, the relationship between elements of a facet predict the role the facet will play in the overall structure of the domain. (Detailed discussion of the basic partitionings and roles to be played by facets is provided in Appendix 3, together with examples from the literature of these structures). The model proposed in Chapter 7 predicts that the relationship amongst the elements of each facet and the role to be played by each of the three facets will produce a cylindrical structure to the nurses evaluations of hospital wards.

Section 3 presents the test of the model using SSA and regional interpretations.

3 THE CORRESPONDENCE BETWEEN THE MODEL AND THE EMPIRICAL STRUCTURE OF THE OBSERVATIONS

The observations used to test the model are the responses to the 87 itemmed questionnaire by 309 nurses. The sample covers 25 modern wards. The three-dimensional SSA of the responses produces a coefficient of alienation of .20. While the fit does not meet the criterion of .15 set by Shapira and Zvulun (1979), the model can still be retrieved.

The model hypothesises that the three proposed facets will form a three
dimensional cylindrical structure. Within the model the Level of Interaction facet will play an axial role ordering the four radices. The radices will be formed by the Type of Care facet modulating the Referent facet. The Referent is predicted to be a polar facet in that the elements are qualitatively different.

3.1 The Levels of Interaction Facet

Figure 9.1 is the distribution of the 87 questionnaire items on projections 1 & 2 of the 3-dimensional SSA-1. The numbers correspond to the item numbers given in Table 9.5. (The analysis was carried out prior to reprogramming; the rectangular solution is replaced by a square plot in the final test of the model presented in Chapter 10).

Figure 9.2 is the same plot partitioned into regions according to the Levels of Interaction facet. While 20 items do not appear in the region they are assigned (the circled numbers), the four element regions are identifiable. They are ordered as predicted from Observation (A_1), Access (A_2), Contact/Use (A_3) to Preventing Disturbances (A_4).

The axial role of facet A is more clearly illustrated in Figure 9.3. This is the same plot with the items also classified according to the Referent facet (B). The figure presents the 3-D cylindrical structure formed by the axial facet ordering the four radices as represented by facet B. The overlap of the element regions caused by the particular angle of the projection accommodates 6 of the 20 misplaced items into their correct regions.

Figure 9.1 Distribution of the 87 Items from Pilot 3 on Projection 1 X 2 of the 3-D SSA
Figure 9.2 Projection 1 & 2 Partitioned by Facet A: Levels of Interaction

Figure 9.3 Projection 1 & 2 Partitioned by Facets A and B: Levels of Interaction and Referent
3.2 The Referent Facet

Figure 9.4 is the distribution of the questionnaire items on projection 2 & 3. Figure 9.5 is the same plot with the three elements of the Referent facet (B) indicated. It supports the prediction that the three elements: People ($B_1$), Locations ($B_2$) and Environmental Services ($B_3$) are qualitatively different and therefore equally related to each other, forming a polar facet.

Figure 9.4 Distribution of 3rd Pilot items on Projection 2 & 3 of the 3-D SSA

Figure 9.5 Projection 2 & 3 Partitioned by Facet B: Referent
3.3 Type of Care Facet

The model predicts that the Referents of the interaction (the elements of facet B) can be further distinguished from each other by whether they indicate Direct (C\text{\textsuperscript{1}}) or Indirect (C\text{\textsuperscript{2}}) care of the patient. The hypothesis is that the items referring to Direct care will form a circular region around the origin of facet B (the point where all three elements meet), with the C\text{\textsuperscript{2}} items of Indirect care forming an adjacent region further from the origin.

Figure 9.6 is the 2 & 3 projection partitioned by facets B and C. The figure suggests there is some support for the Type of Care distinction for Locations (B\text{\textsuperscript{2}}) and Environmental Services (B\text{\textsuperscript{3}}), with the majority of items concerned with Direct care (C\text{\textsuperscript{1}}) near the centre and Indirect care (C\text{\textsuperscript{2}}) items lying near the periphery. However the figure also suggests that nurses make no distinction between Direct and Indirect care when it involves interaction with other people (B\text{\textsuperscript{1}}).

Figure 9.6 Projection 2 & 3 Partitioned by Facets B and C: Referent and Type of Care

The precise area of no distinction between Direct and Indirect care, for (B\text{\textsuperscript{1}}) activities, can be more clearly specified by reference to Figures 9.7 to 9.10. Each of these figures are of the same 2 & 3 projection.
However each figure contains items for only one of the four facet A elements depicted. The least distinction occurs for the items classified as \( A_2 \) 'Access' (Figure 9.8). This suggests that nurses do not distinguish between the social environment for patients and the social environment for staff.

Figure 9.7 Projection 2 & 3 Partitioned by facets B and C for Observation items (A_1)

Figure 9.8 Projection 2 & 3 Partitioned by facets B and C for Access items (A_2)
Figure 9.9 Projection 2 & 3 Partitioned by facets B and C for Contact/Use items ($A_3$)

Figure 9.10 Projection 2 & 3 Partitioned by facets B and C for Lack of Disturbance items ($A_4$)
3.4 The Structure of Ward Evaluations

All three facets play the role predicted by the model of ward evaluation. The Type of Care facet modulates the Referent facet. This produces the radex structure as represented in Figure 9.6. The Levels of Interaction facet orders the responses to the items to produce four distinct radices (Figure 9.3). Taken together; the axial role of the Levels of Interaction, the polar role of the Referent and the modulating role of the Type of Care facet produce the cylindrex structure. This structure provides the empirical support for the interpretation of ward evaluation developed in Chapters 4 and 5 and summarised in the Mapping Sentence of Chapter 7.

While the general structure is supported, the empirical evidence also indicates that modifications with respect to specific items are required. Section 4 describes the types of modifications indicated by the analysis.

4 Modifications to the Classification and to the Items

The analysis and interpretation of the 3rd pilot is part of the development both of the model and of the instrument. This is possible because of the approach used by facet theory to establish the relationships between the items. Canter et al. (1980) state:

'The predictions of relationships between observations are not derived independently of other aspects of the research problem, rather they are a result of the definitional system applied to the entire domain under investigation.'

It is the ability of the structure to describe the total domain that is of prime importance, not the relationship between individual observations. This is reflected in the regional interpretation of the analysis. The prediction of where a point (representing an observation) will lie in the space is derived from the elements of each of the facets to which it is assigned. McGrath (1967) describes this as one of the advantages of the facet approach to research design and analysis. It provides a method 'for systematically assessing, hence modifying, our input logic on the basis of empirical evidence' (McGrath, 1967). Levy (1976) demonstrates this advantage in a study of 'satisfaction with life'. The analysis demonstrates that elements of one of the facets can not be retrieved from the space. This information is used as the basis for the modifications of her model.

Section 3 demonstrates the general cylindrical structure proposed for ward evaluations can be retrieved from the empirical distribution of the items. However not all the items appear in the regions predicted by the facets. For some items, this demonstrates that the model, derived from previous literature, is not consistent with the nurses interpretations.
and, therefore, the classifications need modification. For other items the misplacement is the result of inappropriately constructed questions or questions which have more than one possible interpretation. These items require modification to be used in the main survey. The changes required are discussed in terms of each of the facets.

4.1 **Levels of Interaction: Facet A**

14 items do not occur in the predicted element regions of the SSA space. Observation $A_1$: The analysis of the 2nd pilot illustrates that the nurses consider observing, reaching, and supervising people to all imply the same level of interaction, that of $A_1$ Observation (as discussed in Chapter 8). The current analysis suggests that co-ordinating activities with other staff is also construed as belonging to this level.

Access $A_2$: Chapter 7 raises the issue of the most appropriate classification for the items concerned with the social atmosphere of the ward. The analysis demonstrates that these questions do occur in the 'Access' region of the space. This confirms the proposal that the level of interaction implied by items about companionship and patients sitting and chatting are construed by the nurses as more distant than the direct treatment of the patients. The social atmosphere appears to be equated with having access to a dayroom, as suggested by Raphael, 1969 (as discussed in Chapter 7).

An additional occupant of $A_2$, not predicted by previous research, is the evaluations of the experience of the heating and ventilation services. (These were originally classified as sources of disturbance ($A_4$) in accordance with the patients' complaints identified by Raphael, 1969). The results of the current analysis suggest that the 'atmosphere' of the ward can be described as having three qualitatively different components: companionship, access to the dayroom and the heating and ventilation services. Some support for the suggestion is provided by the finding of Sears and Auld (1976) that both the social and environmental atmosphere of the ward are important contributors to the unqualified nurses' overall evaluations of the ward. Therefore heating and ventilation are reclassified as relating to $A_2$.

A further item which occurs in the $A_2$ region, although not predicted as such, is 'observation of patients in single bedrooms'. This is the result of inappropriate element combinations. For the final questionnaire the activity is changed to 'access to' and classified as $A_2$. The change is consistent with the Nuffield (1953) conclusion that observation of these patients requires entry into the single bedrooms.
Use/Contact A3: The SSA indicates that access to the sanitary facilities occurs in the A3 'use of' region of the space. This may suggest that the facility implies greater exclusion and privacy than do the other locations specified in the questionnaire. Therefore it appears appropriate to specify 'access to' the sanitary facilities as an A3 level of interaction.

The item concerned with 'patients recreational activities in the ward' occurs in A3 rather than A2 as predicted. This is the result of inappropriate elements. Recreational activities appear to indicate organised activities that occur in the dayroom. Therefore the item is replaced by one on the use of the dayroom (A3) and one about patients moving about the ward, an A2 item.

Prevention of Disturbances A4: Two items occur in A4 which are not predicted. They are the storage of unused furniture and the storage of gas cylinders. The location of the storage of unused furniture in the Disturbance category is consistent with the original interviews. Nurses express the view that extra furniture in the ward is a problem, and frequently results in the furniture being stored in ancillary rooms and sanitary facilities. It is therefore reclassified as A4, an object of disturbance to the staff. The question on gas cylinders is removed as comments on the questionnaire indicate that they are no longer needed in modern wards with piped supplies at the bedside.

Several ambiguous items, in relation to the Levels of Interaction facet, are eliminated from the final questionnaire. They include: a private place to treat patients, students observing different types of treatment, and the settling in of new patients. A group of items for which there is no logical explanation for their location in the space are those concerned with the layout of the treatment room. They occur in A2 'access to' rather than A3 'use of'. Consequently the original classification is retained.

4.2 The Referent: Facet B

Only a tentative classification of the items referring to fixtures was made; that of Other People (B1). However the analysis places the use of the patient/nurse call system and the use of the telephone in the Environmental Services (B3) region. A partial explanation for this is the inclusion of an item which is not part of the specified domain. It is concerned with the layout within the nursing office. This room is shared by all wards on a floor and is not a part of any one ward (Nuffield, 1955). The inclusion of the question results in the creation of a more general element for B3; that of outside influences. The analysis places the fixture items closer to the Locations region than to Other People.
Therefore it is proposed that classifying the items concerned with the use of the patient/nurse call system and the use of the telephone as $B_2$ is more appropriate. Also when used by the nurses only, both of these fixtures are located at the staff base. In the final questionnaire the items about the telephone are reworded to contain an assessment of the position and layout of the staff base for access and use of the telephone.

4.3 The Type of Care: Facet C

The only reclassification necessary for the Type of Care facet is the social atmosphere for nurses from Indirect care to Direct care as discussed in Section 3.3. Figure 9.8 clearly shows that no distinction is made between patients and nurses with respect of the atmosphere. This suggests that nurses do not consider 'a good social atmosphere' as relevant to themselves.

4.4 Summary of the Modifications

The location of items in regions of the SSA space demonstrates whether the correspondence between the predicted classification and the empirical distribution is achieved. In addition the location can be used as an aid to understanding why the correspondence does not occur for some observations. The two sources of error are the original classification of the items (the model) and ambiguities or inappropriately constructed items. In the light of the above analysis the model will be modified before the final test (Chapter 10) and the inappropriate items corrected or excluded. Section 5 describes the construction of the questionnaire to be used in the main survey.

5 THE CONSTRUCTION OF THE FINAL QUESTIONNAIRE

Chapter 8 describes the characteristics of a good questionnaire suggested by the literature on instrument development. The first four requirements (that the instrument is suited to the particular research problem, it is stated in the language and level of understanding of the respondents and is restricted to memorable events) are described in Chapter 8. The three remaining requirements are relevant to all stages of the development. The alterations to the questionnaire, in response to these requirements, are described.

5.1 Requirement 5: that the items are precise and unambiguous

The modifications which respond to this requirement are:

- clearer specification of activities related to the layout within the ancillary facilities.
- The inclusion of items about the layout of the staff base for clerical work and use of the telephone.
- altering elements within items to make them more appropriate, as discussed in Section 4.
-the exclusion of items which can not be made unambiguous (e.g. the settling in of new patients).

5.2 Requirement 6: that the instrument is a concise statement of the research domain

Modifications in response to this requirement include both the exclusion of items on the basis of the analysis and inclusion of items identified in the interviews but absent from previous versions of the instrument. The modifications are:

- the exclusion of all questions concerned with the 'access to' the different supplies and equipment. This is necessary to reduce the overall size of the questionnaire.
- the inclusion of questions about the layout of the multi-bedrooms, both for patients and nurses.
- the inclusion of items on the position of single bedrooms for both the segregation of disturbing patients and concerning the feeling of isolation created by the position of these facilities.
- the inclusion of four questions about access to and from the ward and other parts of the hospital.
- the addition of questions concerning the layout of the nursing office (these questions are not included in the analysis of the main questionnaire).

5.3 Requirement 7: that the instrument will not incorporate a constant error of response sets by the ordering of the questions

The 3rd Pilot instrument groups the questions according to the activity to which they refer. To ensure that the structure, obtained from the analysis of these items, is not due to the order in which they are presented the items in the final instrument are grouped according to the locations stated in the behavioural units, not the activities.

5.4 The Characteristics of the Final Instrument

The questionnaire consists of instructions for completion, demographic questions to identify the ward being evaluated, characteristics of the evaluator and 97 evaluative items.

Each evaluative item is based on a given behavioural unit obtained from the nurses. The response obtained for each item is a statement of the extent to which an attribute of a location within the ward helps to facilitate a particular activity involved in the provision of nursing care.

The range of possible responses are 7 intervals, ranging from 'helps a great deal' to makes it very difficult'. The intervals are numbered for direct computer input. The instrument is designed to be self-completing and usable for a postal survey. A copy of the questionnaire is provided in Appendix 1, Section 1.2.
Chapter 9 describes the final stage of instrument development. The 87 items of the 3rd Pilot are classified according to the model as described in Chapter 7. The test of the correspondence is provided by a smallest space analysis of the responses to the questionnaire by 309 nurses. The regional interpretation of the analysis demonstrates that the structure of nurses' evaluations is consistent with that proposed by the model of ward evaluation; that is, the cylindrical structure.

The SSA analysis is also used to identify items which do not provide the predicted correspondence and to explain the reasons for this. The errors result from both ambiguous or inappropriate items and also incorrect classification. The final instrument is constructed in response to the analysis in order to correct the items. Chapter 10 presents the reclassification of the items in the light of the empirical evidence and describes the final test of the model of ward evaluations.
Chapter 10

VERIFICATION OF THE MODEL

Chapter 9 presents empirical evidence to support the model of ward evaluation as developed from the literature on environmental research (Chapter 5) and from the literature on the design and functioning of hospital wards (Chapter 7). All three facets of the cylindrex structure are retrieved. The empirical demonstration of the model, in Chapter 9, is used as an initial test of the model and as the final test of the clarity and appropriateness of the questionnaire items. The lack of correspondence between the classification and the empirical structure, for several questions, requires modifications to both the classification and to the actual questions. The questionnaire is revised on the basis of that analysis.

Chapter 10 presents the repeated test of the model based upon previous research and empirical evidence. The data base includes 1921 nurses working on 144 modern wards in 23 hospitals in England. The sample of wards provided for the testing of the model is restricted to medical and surgical wards. Section 1.4 of Appendix 1 documents the procedure used to administer the survey. Appendix 2 provides a description of the sample, including the representativeness of the sample of wards and the response rate of the nurses. Appendix 4 presents the comparative analyses of the different nurse groups. The comparative analyses demonstrate, as questioned in Chapter 8, that the nurses are a sufficiently homogeneous population to allow their responses to be combined to test the model.

Section 1 presents the classification of the items according to the revised model. The empirical structure of the responses of the nurses is given in Section 2. Section 3 presents the pattern of correlations corresponding to the spatial structure. The reliability and validity of the instrument is discussed in Section 4.

1 Classification of the Items according to the Model

The questionnaire consists of 97 evaluative items, 93 of which are included in the analysis. (The four questions concerning the layout of the nursing office are excluded).

The classification of the items is based upon the model as applied to the ward context in Chapter 7 and modified on the basis of the analysis of pilot 3 (Chapter 9). The model to be tested is represented by the following Mapping Sentence:
A nurse(n) evaluates the ward on which she works by stating the extent to which it facilitates:

**Facet A**

**Levels of Interaction**

- $A_1$ Observation of
- $A_2$ Access to
- $A_3$ Contact with/Use of
- $A_4$ Prevention of Disturbances from

**Facet B**

**Referent**

- $B_1$ People
- $B_2$ Locations
- $B_3$ Environmental Services

**Facet C**

**Type of Care**

as these referents relate to

- $C_1$ Direct Patient Care by
- $C_2$ Indirect

**Range**

- Helps a great deal
- TO
- Makes it very difficult

Table 10.1 provides a summary of the model as modified by the analysis of pilot 3. Two structuples are logically excluded ($A_1B_2C_1$ and $A_1B_3C_2$). No evidence is found to suggest that the experience of the Environment Services ($B_3$) occurs at the Observation ($A_1$) level of interaction.

Table 10.2 illustrates the structuples (combination of elements) to which each item is assigned, together with the number representing each item in the analysis. (Items underlined are reclassified in the light of the empirical evidence of Chapter 9. The starred items are new questions).

The only problem which arises in classifying the new items is with respect to the questions about access to and from the ward for the Referent ($B$) and the Type of Care ($C$) facets. The location element ($B_2$) of the Referent facet only deals with specific facilities within the ward. Consequently the questions about access to other parts of the hospital are tentatively classified as belonging to the ($B_1$) element, as they deal with the ward in more general terms. All the questions are classified as Direct Care ($C_1$) except for the one question which specifically refers to nurses only.
Table 10.1 Summary of the Ward Evaluation Model

<table>
<thead>
<tr>
<th></th>
<th>A₁</th>
<th>A₂</th>
<th>A₃</th>
<th>A₄</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVATION</td>
<td>ACCESS TO</td>
<td>USE/CONTACT</td>
<td>LACK OF DISTURBANCE</td>
</tr>
<tr>
<td><strong>B₁ OTHER PEOPLE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C₁ DIRECT</strong></td>
<td>observation in the ward</td>
<td>atmosphere</td>
<td>treatment at bedside</td>
<td>patient privacy</td>
</tr>
<tr>
<td><strong>C₂ INDIRECT</strong></td>
<td>supervision of staff</td>
<td>movement of supplies</td>
<td>convenient layout of multi-bedrms</td>
<td>staff privacy</td>
</tr>
<tr>
<td><strong>B₂ LOCATIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C₁ DIRECT</strong></td>
<td>observation from nursing stat.</td>
<td>Call system access to patient facilities</td>
<td>use of patient facilities</td>
<td>privacy in sanitary facilities</td>
</tr>
<tr>
<td><strong>C₂ INDIRECT</strong></td>
<td>Position of Staff Base for access to telephone</td>
<td>Call system access to ancillary facilities</td>
<td>use of ancillary facilities</td>
<td>storage of unused furniture</td>
</tr>
<tr>
<td><strong>B₃ ENVIRON. SERVICES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C₁ DIRECT</strong></td>
<td>heating &amp; ventilation for patient comfort</td>
<td>lighting for treatment</td>
<td>disturbance from lighting at night</td>
<td></td>
</tr>
<tr>
<td><strong>C₂ INDIRECT</strong></td>
<td>heating &amp; ventilation for staff comfort</td>
<td>lighting for clerical work</td>
<td>disturbance from lighting at night for clerical work</td>
<td></td>
</tr>
</tbody>
</table>
### Table 10.2: Classification of the 93 Items in the Main Survey

<table>
<thead>
<tr>
<th>A₁</th>
<th>A₂</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OBSERVATION</strong></td>
<td><strong>ACCESS TO</strong></td>
</tr>
<tr>
<td>Observation of and access to patients in the ward (1,5)</td>
<td>Patients chatting (16,17) Ward Atmosphere (14,15,19)</td>
</tr>
<tr>
<td>Observation of patients in the multibedrooms (48)</td>
<td>*Position of Ward for: -people to find it (20) -patients to visit other parts of hospital (23) -nurses to take patients to other depts. (21) Patients Active (18)</td>
</tr>
<tr>
<td>Ensuring safety on the Ward (2)</td>
<td>Movement of supplies (3)</td>
</tr>
<tr>
<td>*Position of Ward for: -people to find it (20) -patients to visit other parts of hospital (23) -nurses to take patients to other depts. (21) Patients Active (18)</td>
<td></td>
</tr>
<tr>
<td>Supervision of trainee staff (6)</td>
<td>*Position of ward for: nurses' access to dining facilities (22)</td>
</tr>
<tr>
<td>Nurses co-ordinating their activities (4)</td>
<td></td>
</tr>
<tr>
<td>Observation of and access to patients from the nursing station (43,46)</td>
<td>Access to Dayroom (76,77) Position Single Bedrms (68,69)</td>
</tr>
<tr>
<td>Patients seeing N.S. (47)</td>
<td>Access to Treatment (53) Pat. use call system (32,80)</td>
</tr>
<tr>
<td>Patients gaining attention (44)</td>
<td>Nurse-use call system (60,82) -use telephone (52)</td>
</tr>
<tr>
<td>Position of Staff Base for access to telephone (45)</td>
<td>Access-parts of ward (7) Access to Dirty Utility (57,58) clean utility rms. (59) Pantry</td>
</tr>
<tr>
<td>Heating &amp; Ventilation for Patient Comfort (83,84)</td>
<td></td>
</tr>
<tr>
<td>Heating &amp; Ventilation for Staff Comfort (85)</td>
<td></td>
</tr>
</tbody>
</table>
Table 10.2 contd. Classification of the 93 Items in the Main Survey

<table>
<thead>
<tr>
<th></th>
<th>A₃</th>
<th>A₄</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USE OF/CONTACT WITH</strong></td>
<td></td>
<td><strong>LACK OF DISTURBANCES</strong></td>
</tr>
<tr>
<td><strong>B₁ OTHER PEOPLE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C₁ DIRECT</td>
<td>Storage of patients' belongings (12,33)</td>
<td>Patient privacy in ward, in multi-bedrooms and at bedside (29,31,34,68)</td>
</tr>
<tr>
<td></td>
<td>Treatment at the Bedside (24,25,26,27)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Atmosphere in multibedrm (63,64)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*nurses chatting to pat. in bedrooms (67)</td>
<td></td>
</tr>
<tr>
<td>C₂ INDIRECT</td>
<td>*Layout of multibedrooms for nurses to work efficiently (65)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Private discussions for staff (8,9)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Private use of telephone (10)</td>
<td></td>
</tr>
<tr>
<td><strong>B₂ LOCATIONS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C₁ DIRECT</td>
<td>Use of sanitary fac. (75)</td>
<td>*Position of Single bedrm to segregate disturbing patients (70)</td>
</tr>
<tr>
<td></td>
<td>Access to san. fac. (71)</td>
<td>Privacy in the sanitary fac.</td>
</tr>
<tr>
<td></td>
<td>Use of Dayroom (78,79)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of Treatment Rm (54,55,56)</td>
<td></td>
</tr>
<tr>
<td>C₂ INDIRECT</td>
<td>Storage fac. (36-42)</td>
<td>Storage of Unused Furniture (35)</td>
</tr>
<tr>
<td></td>
<td>Access-staff san.fac. (73)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of Dirty Utility (60)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Clean Utility (61)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Pantry (62)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Clerical work (49-52)</td>
<td></td>
</tr>
<tr>
<td><strong>B₃ SERVICES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C₁ DIRECT</td>
<td>Lighting for treatment (88)</td>
<td>Disturbance from lighting at night for treatment (90,92,93)</td>
</tr>
<tr>
<td><strong>ENVIRONMENTAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C₂ INDIRECT</td>
<td>Lighting in ward for clerical work and finding supplies (87)</td>
<td>Disturbance from lighting at night for clerical work and finding supplies (89,91)</td>
</tr>
</tbody>
</table>

159
2 THE ANALYSIS AND INTERPRETATION

Smallest space analysis is used to test the model of ward evaluation. The data analysed are the responses of the 1921 nurses to the 93 evaluative items. A three dimensional solution is used; obtaining a coefficient of alienation of .18. The interpretation of the distribution of items in the space is in terms of the identification and location of the contiguity regions representing each element of each facet.

2.1 The Levels of Interaction Facet (A)

Figure 10.1 is the printout of projection 1 & 2 of the three dimensional SSA solution. Figure 10.2 is the same projection with the items classified according to the Levels of Interaction facet (see Table 10.2). Applying Lingoes' (1977) principal of partitioning, that the boundary of an element should not intersect another element; all 93 items occur within the boundaries of the Facet A element to which they are assigned. The diagram illustrates that 'Levels of Interaction' is a simply ordered facet, with the order preceding from A₁ (Observation), A₂ (Access to), A₃ (Contact with/Use of) through to A₄ (Lack of Disturbance).

Figure 10.1 Distribution of the 93 Items in the Main Survey on projection 1 & 2 for a 3-D SSA Solution

Coefficient of Alienation=.18
Figure 10.3 is the same projection with the elements of Facet B (Referent) also presented. The diagram illustrates the projection is at a slight angle. This clearly shows the axial role played by the Levels of Interaction facet and the polar role played by the Referent facet.

Figure 10.2 **Projection 1 & 2 Partitioned by Facet A:**

**Levels of Interaction**

**Figure 10.3** **Projection 1 & 2 Partitioned by Facets A and B:**

**Levels of Interaction and Referent**
2.2 The Referent Facet (B)

Figure 10.4 is the printout for projection 2 & 3 of the 3-dimensional solution. Figure 10.5 is the same projection with the elements of the Referent facet (B₁ People, B₂ Locations and B₃ Environmental Services) partitioning the space. The projection illustrates the polar role played by the Referent facet. The misplaced items are circled. A partial explanation for their location is that the elements of the axial facet (A) are not perfectly aligned on the projection, as illustrated in Figure 10.6. Therefore, to more clearly illustrate the regions corresponding to the three elements of the Referent facet, each of the radices (elements of facet A) are plotted separately on the projection (Figures 10.7 to 10.10). These figures illustrate a clear distinction between the element regions for the Referent facet.

2.3 The Type of Care Facet (C)

The regions corresponding to the two Type of Care elements are also identifiable from Figures 10.7 and 10.10. The figures illustrate that the Type of Care, direct or indirect, further defines the Referent as represented by the modulating role of the Care facet. The misfits that occur are all with respect to the Type of Care facet. All questions concerned with the treatment room occur in the region of Indirect care (see Figure 10.9). The storage of patients belongings is also construed as indirect care. This suggests nurses have more control over these personal belongings than patients. Nurses working in the ward (questions 3 and 7) and in the multi-bedrooms (question 65) occur in the direct care (C₁) region rather than being indirect care (C₂) activities as predicted.

2.4 The Cylindrex Structure of Ward Evaluation

The prediction is made that the phenomenon of ward evaluation can be described by classifying the evaluation items, by the three facets, into the specified elements. The above analysis and interpretation confirms the predictions of the model of ward evaluation by the retrieval of the cylindrex structure.

The Referent of the environmental interaction, as a qualitative facet, plays a polar role in describing the total structure. The Type of Care facet further defines the Referent by specifying whether it is concerned with direct or indirect patient care. Together these two facets produce the radex structure. The Levels of Interaction facet describes the level at which interactions with the Referent takes place. This is an axial facet which orders the other two facets such that four radices are produced. Taken together the structure retrieved from the SSA space is a cylindrex.
Figure 10.4  Distribution of the 93 Items in the Main Survey on Projection 2 & 3 of the 3-D SSA Solution
Figure 10.5 Projection 2 & 3 Partitioned by Facet B: Referent

Figure 10.6 Projection 2 & 3: Regions Occupied by Each of the Facet A Elements
Figure 10.7 Projection 2 & 3 Partitioned by Facets B and C for Observation items (A₁)

Figure 10.8 Projection 2 & 3 Partitioned by Facets B and C for Access items (A₂)
Figure 10.9 Projection 2 & 3 Partitioned by Facets B and C for Contact 
/Use items (A3)

Figure 10.10 Projection 2 & 3 Partitioned by Facets B and C for Lack of Disturbance' (A4)

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3 THE PATTERNS OF CORRELATIONS

Bloombaum (1970) states one of the advantages of using smallest space analysis is that the output can be directly checked against the input (correlation matrix). The roles played by the facets, as displayed by the spatial array, should be consistent with the patterns of correlations. (Illustrations of the corresponding patterns of correlations are described in Appendix 3.) The purpose of Section 3 is to check the relationship between the demonstrated role of each facet and the pattern of correlations.

In order to provide a direct illustration of the relationships, the patterns of correlations and the roles of the facets are compared for a sample of items. Each item represents one of the structuples (see Table 10.3). The 22 exemplars were submitted to a SSA. Figure 10.11 illustrates the cylindrex structure can be retrieved with the exemplars, which confirms the facet roles. The only question which is misplaced is Q6 (supervision of staff) which, when all elements of Facet A are taken together, occurs in (C1) Direct care rather than the Indirect care (C2) region of the radex. The following subsections describe the patterns of correlation for each facet.

Figure 10.11 Projections 1 & 2 and 2 & 3 of a 3-D SSA for the 22 Structuple Exemplar Questions
### Table 10.3: 22 Questions: Each representing a Structuple of the Three-Faceted Model

<table>
<thead>
<tr>
<th>Structuples</th>
<th>Question Numbers</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B C 1</td>
<td>5</td>
<td>How well does the general design and layout of this ward help nurses to observe patients easily?</td>
</tr>
<tr>
<td>A B C 2</td>
<td>6</td>
<td>How well does the general design and layout of this ward help nurses to supervise unqualified staff?</td>
</tr>
<tr>
<td>A B C 3</td>
<td>44</td>
<td>How good is the position in the ward of the staff base in helping patients to gain the attention of the staff?</td>
</tr>
<tr>
<td>A B C 4</td>
<td>45</td>
<td>How good is the position in the ward of the staff base in helping for easy access to the telephone?</td>
</tr>
<tr>
<td>A B C 5</td>
<td>16</td>
<td>How well does the general design and layout of this ward help nurses to have frequent chats with patients?</td>
</tr>
<tr>
<td>A B C 6</td>
<td>20</td>
<td>How well does the location of the ward help people to find it easily when entering the hospital?</td>
</tr>
<tr>
<td>A B C 7</td>
<td>76</td>
<td>How good is the position of the dayspace(s) in the ward in helping patients to gain easy access to it?</td>
</tr>
<tr>
<td>A B C 8</td>
<td>58</td>
<td>How good is the position of the dirty utility room for nurses to gain easy access to it?</td>
</tr>
<tr>
<td>A B C 9</td>
<td>84</td>
<td>How well does the heating/ventilation on the ward in general help patients to feel comfortable?</td>
</tr>
<tr>
<td>A B C 10</td>
<td>85</td>
<td>How well does the heating/ventilation of the ward help nurses to work efficiently?</td>
</tr>
<tr>
<td>A B C 11</td>
<td>26</td>
<td>How well does the layout of the bedspace help nurses to give treatment to the patients?</td>
</tr>
<tr>
<td>A B C 12</td>
<td>12</td>
<td>How well does the general design and layout of the ward help patients to store their personal belongings?</td>
</tr>
<tr>
<td>A B C 13</td>
<td>78</td>
<td>How good is the layout within the dayspace(s) for patients to feel comfortable in it?</td>
</tr>
<tr>
<td>A B C 14</td>
<td>61</td>
<td>How good is the layout within the clean utility room for nurses to prepare for the treatment of patients?</td>
</tr>
<tr>
<td>A B C 15</td>
<td>88</td>
<td>How well does the lighting at the bedside help nurses to treat patients efficiently?</td>
</tr>
<tr>
<td>A B C 16</td>
<td>86</td>
<td>How well does the lighting on the ward help nurses to find supplies easily?</td>
</tr>
<tr>
<td>A B C 17</td>
<td>30</td>
<td>How well does the layout of the bedspace help patients to rest undisturbed by noise from other parts of the ward?</td>
</tr>
<tr>
<td>A B C 18</td>
<td>9</td>
<td>How well does the general design and layout of this ward help nurses to have private discussions with relatives?</td>
</tr>
<tr>
<td>A B C 19</td>
<td>72</td>
<td>How good is the position of the sanitary facilities in terms of patients privacy?</td>
</tr>
<tr>
<td>A B C 20</td>
<td>35</td>
<td>How well do the storage facilities provided on this ward help staff to store unused furniture easily?</td>
</tr>
<tr>
<td>A B C 21</td>
<td>90</td>
<td>How well does the lighting at night on the ward in general avoid disturbing patients?</td>
</tr>
<tr>
<td>A B C 22</td>
<td>89</td>
<td>How well does the lighting at night on the ward help nurses to carry out their work efficiently?</td>
</tr>
</tbody>
</table>

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3.1 Facet A: Levels of Interaction
Facet A is a simply ordered facet playing an axial role in the total structure. The pattern of correlations which will produce a simple partitioning is:

<table>
<thead>
<tr>
<th></th>
<th>A₁</th>
<th>A₂</th>
<th>A₃</th>
<th>A₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>A₁</td>
<td>high</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A₂</td>
<td></td>
<td>lower</td>
<td>high</td>
<td></td>
</tr>
<tr>
<td>A₃</td>
<td></td>
<td></td>
<td>lowe</td>
<td>r lower</td>
</tr>
</tbody>
</table>

Table 10.4 contains the correlations between the exemplar items ordered to illustrate the patterns of correlations for facet A for each of the six BC structuples. Only one cell reverses the expected trend of lowering the correlations further from the diagonal (for B₁C₂ - the correlation between A₁ and A₄).

Table 10.4 Correlations between Elements of Facet A

<table>
<thead>
<tr>
<th>B₁C₁</th>
<th>A₁</th>
<th>A₂</th>
<th>A₃</th>
<th>A₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>A₂</td>
<td>16</td>
<td>5</td>
<td>16</td>
<td>26</td>
</tr>
<tr>
<td>A₃</td>
<td>26</td>
<td>23</td>
<td>.29</td>
<td></td>
</tr>
<tr>
<td>A₄</td>
<td>30</td>
<td>.04</td>
<td>.11</td>
<td>.33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B₂C₂</th>
<th>A₁</th>
<th>A₂</th>
<th>A₃</th>
<th>A₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>A₂</td>
<td>20</td>
<td>.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A₃</td>
<td>12</td>
<td>.07</td>
<td>.19</td>
<td></td>
</tr>
<tr>
<td>A₄</td>
<td>9</td>
<td>.15</td>
<td>.14</td>
<td>.26</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B₂C₁</th>
<th>A₁</th>
<th>A₂</th>
<th>A₃</th>
<th>A₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>A₂</td>
<td>76</td>
<td>.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A₃</td>
<td>78</td>
<td>.22</td>
<td>.46</td>
<td></td>
</tr>
<tr>
<td>A₄</td>
<td>72</td>
<td>.17</td>
<td>.25</td>
<td>.30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B₃C₂</th>
<th>A₁</th>
<th>A₂</th>
<th>A₃</th>
<th>A₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>A₂</td>
<td>58</td>
<td>.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A₃</td>
<td>61</td>
<td>.22</td>
<td>.42</td>
<td></td>
</tr>
<tr>
<td>A₄</td>
<td>35</td>
<td>.17</td>
<td>.17</td>
<td>.22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B₃C₁</th>
<th>A₁</th>
<th>A₂</th>
<th>A₃</th>
<th>A₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>A₂</td>
<td>84</td>
<td>.31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A₃</td>
<td>88</td>
<td>.20</td>
<td>.29</td>
<td></td>
</tr>
<tr>
<td>A₄</td>
<td>90</td>
<td>.29</td>
<td>.23</td>
<td>.34</td>
</tr>
</tbody>
</table>
3.2 **Facet B: Referent**

The Referent facet expresses differences of a qualitative nature. Therefore the three elements (People, Locations and Environmental Services) are expected to be equally related to each other. Table 10.5 contains the correlations between the three B element exemplars in each AC structuple. The table illustrates that the three elements are not equally correlated in each of the AC structuples. However, it also shows that there are no consistently higher cells across the 6 structuples, with each combination having the highest correlation an equal number of items. The average correlations across all 6 structuples are: $B_1, B_2 = .22$; $B_2, B_3 = .21$; $B_1, B_3 = .20$. This suggests the B elements, when considered as as part of the entire structure, are virtually equally related.

<table>
<thead>
<tr>
<th>Table 10.5 Correlations between Elements of Facet B</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A_2C_1$</td>
</tr>
<tr>
<td>$B_1$ 76 $B_2$ 16 $B_3$ 84 $B_2$ 76 $B_3$ 84</td>
</tr>
<tr>
<td>$B_2$ 76 $B_3$ 84 .25 .20 .27</td>
</tr>
<tr>
<td>$A_3C_1$</td>
</tr>
<tr>
<td>$B_1$ 26 $B_2$ 78 $B_3$ 88 $B_2$ 78 $B_3$ 88</td>
</tr>
<tr>
<td>$B_2$ 78 $B_3$ 88 .26 .32 .25</td>
</tr>
<tr>
<td>$A_4C_1$</td>
</tr>
<tr>
<td>$B_1$ 30 $B_2$ 72 $B_3$ 90 $B_2$ 72 $B_3$ 90</td>
</tr>
<tr>
<td>$B_2$ 72 $B_3$ 90 .26 .22</td>
</tr>
<tr>
<td>$A_2C_2$</td>
</tr>
<tr>
<td>$B_1$ 20 $B_2$ 58 $B_3$ 85 $B_2$ 58 $B_3$ 85</td>
</tr>
<tr>
<td>$B_2$ 58 $B_3$ 85 .17 .21</td>
</tr>
<tr>
<td>$A_3C_2$</td>
</tr>
<tr>
<td>$B_1$ 12 $B_2$ 61 $B_3$ 86 $B_2$ 61 $B_3$ 86</td>
</tr>
<tr>
<td>$B_2$ 61 $B_3$ 86 .21 .16 .22</td>
</tr>
<tr>
<td>$A_4C_2$</td>
</tr>
<tr>
<td>$B_1$ 9  $B_2$ 35 $B_3$ 89 $B_2$ 35 $B_3$ 89</td>
</tr>
<tr>
<td>$B_2$ 35 $B_3$ 89 .20 .10 .13</td>
</tr>
</tbody>
</table>
3.3 **Facet C: Type of Care**

The geometric representation of the data illustrates that the Type of Care facet is a modulating facet which further defines the Referent facet. The pattern of correlations which would produce this partitioning is identifiable from the correlations between the elements of the polar facet, in this instance the Referent facet (B). A modulating facet will give higher correlations between the items representing the elements of the polar facet if the items also belong to the centremost element of the modulating facet, i.e. Direct Care (C1). Returning to Table 10.5, the correlations between the B elements are higher for the C1 structuples than for the corresponding C2 structuples for eight out of the nine possibilities. The difference for the ninth cell is only .01.

3.4 **Summary of the Pattern of Correlations**

The patterns of correlations between the exemplar items demonstrate that the roles played by the three facets in structuring the domain are consistent with the relationships which exist between the items.

4 **The Reliability and Validity of the Instrument**

One of the stated objectives of the work is that the measurement instrument will be useable both in addressing theoretical questions and also applied questions. The theoretical function to be served is the testing of the model of ward evaluation. One applied objective is that the information obtained via the instrument will contribute to the decision making in the design of future ward plans. A further applied function is that the instrument will be available for use in evaluating future plans, with the information collected at the present stage forming a data base against which other wards can be compared.

In the review of evaluation research of Chapter 3 the point is made that measurement instruments used in applied research must comply with certain requirements. Two of the major requirements of the instruments are that they can be reliably and validly used for the purposes proposed. Section 4 discusses the extent to which the present questionnaire meets these requirements.

4.1 **Reliability**

Reliability is concerned with the attribute of consistency, that is, measurements by the same instrument at different points in time should be the same provided the psychological object has not changed. For example Nunnally and Durham (1975) state:

'Reliability concerns the extent to which measurements are repeatable - by the same individual using different measures of the same attribute or by different persons using the same measure of an attribute'.
Chapter 8 states that one of the major concerns in the construction of an instrument is that the characteristics of the instrument, such as the way the items are written, will not introduce measurement error and, consequently, reduce the level of reliability. The pilot procedure used in the development of the evaluation instrument is directed towards correcting the potential threats to reliability. For example, a facet format for each item is used to give unambiguous and meaningful statements. The items are stated in the language nurses use to describe their ward experience. The instructions for completing the questionnaire were also piloted to ensure clarity and the scoring procedure was made as explicit as possible. In addition the instrument is tailored to a particular situation, the evaluation of modern wards by nurses. According to Runkel and McGrath (1972) this emphasis on standardisation rather than generalisation tends to produce more reliable instruments.

Nunnally and Durham (1975) argue that all applied evaluation research should include an estimate of the reliability of the instruments being used. They recommend the use of Cronbach's Coefficient Alpha, a measure of the internal consistency of the items, as an appropriate test of reliability. The size of the alpha coefficient is based upon the average correlation among items and the number of items. Alpha Coefficients are used to test the internal consistency of the ward evaluation questionnaire.

According to Nunnally and Durham (1975) the alpha coefficient can replace the necessity of administering two different forms of the instrument in order to obtain an estimate of reliability. They state:

'This is particularly so if the test instructions are easily understood and there is little subjectivity of scoring. If coefficient alpha for a particular test is compared with the correlations between alternative forms and at least 300 persons are studied, the two coefficients typically are very close'.

Tests of internal consistency imply homogeneity of content and unidimensionality of the measure (Runkel and McGrath, 1972). The only items which have been defined as homogeneous in the ward evaluation questionnaire are those which have the same structuple membership; that is, those classified the same way by each of the three facets. Consequently alpha coefficients are calculated between the items within each structuple. (Twelve of the twenty one structuples meet the procedural requirement, of containing three or more items). The alpha coefficients are given in Table 10.6.

Nunnally and Durham (1975) suggest that coefficients of .50 or .60 are sufficient for basic research. However they suggest that for applied
work, where decisions are made with respect to specific test scores, a reliability of at least .90 should be sought. The range of alpha scores obtained for the structuple items lie between these two extremes. This suggests that the questionnaire provides a reliable test of the theoretical model of evaluation.

Nunnally and Durham's recommendation of .90 for applied use is referring to the use of the scores obtained by an individual for example an intelligence test. The evaluative scores to be used in relation to the physical characteristics of wards are the average scores across all nurses within a ward. Because they are not scores from individual nurses, the level of reliability, as suggested by the coefficient alphas, is considered sufficiently high to allow the use of the instrument in the applied context.

An alternative to internal consistency as a measure of reliability is what Runkel and McGrath (1972) call 'consistency'. By this they are referring to the repeatability or predictability of order relationships between items rather than the repeatability of absolute values.

This characteristic of 'consistency' is demonstrated for the evaluation questionnaire. A very similar structure to the inter-relationships between the items is achieved for the 3rd pilot and the version of the questionnaire used in the main survey. Yet the third pilot and the main survey use different nurses working in adult acute hospital wards. In addition the order of the items is different for the two versions. In the 3rd pilot the items are grouped under common activities, while in the main survey the items are organised under Locations.

In summary the instrument is demonstrated to have relatively high levels of internal consistency between items of the same structuple, as measured by Cronbach's coefficient alpha. In addition the same pattern of relationships between items has been demonstrated for two different versions of the instrument. Therefore it is concluded that the instrument can be reliably used for the purposes intended.

### 4.2 Validity

Section 4.1 suggests that the acceptable level of reliability of an instrument is dependent upon the function it is to serve. Instrument validity is also related to the uses to which the instrument is to be put. According to Nunnally and Durham (1975) it is the validity of using an instrument for a particular purpose that is to be assessed, not the instrument per se. The two major purposes of the evaluation instrument are to test the model of evaluation and to distinguish between wards of varying designs.
The validity of the use of the instrument as the empirical test of the model of evaluation is referred to as its construct validity. This type

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<tr>
<td>OTHER</td>
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<td>INDIRECT</td>
<td>USE/CONTACT</td>
<td>LACK OF DISTURBANCE</td>
</tr>
<tr>
<td>PEOPLE</td>
<td>3 items</td>
<td>8 items</td>
<td>7 items</td>
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<td>Alpha=.75</td>
<td>Alpha=.82</td>
<td>Alpha=.83</td>
<td>Alpha=.86</td>
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<td>LOCATIONS</td>
<td>4 items</td>
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<td>Alpha=.80</td>
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<td>SERVICES</td>
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<td>Alpha=.97</td>
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</table>
of validity is concerned with whether or not an instrument is a valid measure of the constructs under study. In order to assess this, according to Cronbach and Meehl (1955), the meaning of the constructs must generate specific testable hypotheses, confirming or disconfirming the validity of the constructs. They suggest:

"The investigation of a test's construct validity is not essentially different from the general scientific procedures for developing and confirming theories".

Chapter 6 points out that a very similar series of steps is used by the facet approach to hypothesis generation as is proposed by Nunnally and Durham (1975) in establishing construct validity. As described in that chapter, the steps include generating hypotheses about the relationships between different observables, between observables and constructs (facets) and between different constructs.

In addition both the facet approach to model construction and the estimate of construct validity require empirical evidence that the hypotheses are correct. For example Cronbach and Meehl (1955) suggest that while construct validity can seldom be expressed in the form of a single coefficient, correlations are generally used as evidence of this validity. Likewise it is the pattern of correlations that are predicted in the facet approach. It is the confirmation of the predicted order of the correlations which is the empirical evidence of the validity of the model.

Cronbach and Meehl also point out that a theory is not first 'proved' and then the test validated or conversely. Rather if the predictions and results are in harmony, then both are confirmed. It is only when there is a mismatch that further information is required to determine which is faulty, the theory or the test.

The hypotheses generated in the model of ward evaluation are confirmed. Therefore it is concluded that the questionnaire for the evaluation of wards by nurses can validly be used as an empirical test of the model of ward evaluations.

4.3 Summary of Reliability and Validity

In summary, any instrument to be used as a measurement tool must produce measures that are repeatable. In addition evidence must be provided that the instrument measures what it purports to measure. It is concluded that the questionnaire for the evaluation of modern wards has obtained an acceptable level of both reliability and validity for the uses it is intended to serve.
The objective of Chapter 10 is to describe the empirical testing of the model of ward evaluation. Section 1 presents the definitional system as summarised by the Mapping Sentence. Each item of the questionnaire is assigned to a particular structuple of the Mapping Sentence according to the theoretical interpretations of Chapter 7 and the empirical evidence of Chapter 9. Section 2 presents the smallest space analysis used to test the model. The regional interpretation of the analysis confirms the cylindrex hypotheses about the structure of evaluations.

The facet predictions about particular structures are predictions about the expected patterns of correlations amongst the items. Section 3 describes an analysis of exemplar items which illustrates that the pattern of correlations are consistent with the cylindrex hypotheses.

Section 4 discusses the reliability and validity of the questionnaire used to test the model. The confirmation of the model, the consistency between the two versions of the questionnaire and the size of the alpha coefficients all suggest that the questionnaire is a reliable and valid measure of nurses' evaluations of modern wards.

The current work has both theoretical and applied objectives. Chapter 10 describes the accomplishment of the specific theoretical objective; the verification of the model to describe environmental evaluations in the hospital ward/nursing care context. The final chapter discusses the potential for the model being a basis for a more general model of environmental evaluations.

The model presented in Chapter 10 also provides the basis for accomplishing the applied objective of providing design-relevant information on the relationship between ward design and nursing care. As stated in Chapter 1, there are three specific applied aspects to the contribution. One is providing an account of the nurses' conceptualisations of providing care in the modern ward. The model provides this account. The design implications of the model are discussed in Chapter 12. Another aspect is to develop a method for linking the evaluative descriptions of the wards with the physical characteristics of the wards. Chapters 13 and 14 discuss the efforts made in achieving this objective. The final applied objective is the development of a standard instrument which will be available for the evaluation of future ward plans. The work presented in the current chapter illustrates that this objective has been achieved.
As described in Chapter 2, there has been a reluctance to utilise the experience of the users of buildings in order to assess the success of the design. A partial explanation for this is the cost and expertise required to construct, distribute and analyse a questionnaire such as that developed in the current work. However the analysis of the 22 exemplar structuple questions, presented in Section 3 of the chapter, demonstrates that a standard instrument for the evaluation of acute hospital wards by nurses can be produced with only 22 questions. The items provide examples from the full range of the nurses' experience of providing care in the modern ward context in a concise and clear manner. In addition the similarity between the structure of the 3rd pilot, the final survey and the exemplar questions indicates that the model is stable. This suggests the questionnaire can be of use in future ward evaluations without the necessity of retesting the structure.

Further research will be necessary to establish the range of applicability of the content which is, at present, specific to the nurse/modern acute ward context. However the stability of the model, even when the data is reduced to structuple exemplars, suggests that User Evaluation can be made an integral part of the design process, with standard guidance being provided for the construction and analysis of the instrument by the design team.

The development of the Ward Evaluation Model is the central focus of the dissertation. Therefore before turning to the remaining applied and theoretical objectives of the work, it is of use to summarise the development of the model. Chapter 11 provides this summary.
A primary objective of the present research has been to develop a model to describe environmental evaluations. The successful retrieval of the predicted structure, as presented in Chapter 10, confirms that the objective has been achieved. The remaining chapters consider some of the possible consequences of the model for the ward context and discuss the wider implications for the field of environmental evaluation. Because of the novelty and complexity of the model it may be of value at this stage to summarise the model before discussing its implications. The present chapter presents a summary of the development of the model of ward evaluations.

Such a model has not been previously proposed. Therefore it is important that it be constructed in such a manner as to make it directly open to empirically testing. The satisfaction of this requirement is made possible through the use of the facet theory approach to model development. Facet theory is a metatheory for elaborating models.

There are several reasons why facet theory is particularly suited to the content area of environmental evaluations. As argued in Chapter 4 the evaluation of a setting can not be achieved with one variable. A range of assessments can be made depending on what aspect of the setting is being evaluated and what criterion is being used to make the assessment. Facet theory and its accompanying analysis provide a parsimonious solution for handling multivariate problems. In addition, previous evidence (Sears and Auld, 1976) suggests that an adequate description of ward evaluations will require a multidimensional solution. This requirement is also readily handled by the facet approach. A final characteristic of facet theory which makes it particularly useful is that models produced with it are integrated. The model of ward evaluations does not merely indicate which evaluations 'go together'. Rather the facet approach provides a structure for identifying the relationships between all the evaluations made about the ward. As pointed out in Chapter 6 the integrated nature of the model not only provides a more thorough account of this aspect of environmental experience but also is more consistent with the way nurses use the ward environment in order to provide nursing care.
Guttman, one of the originators of the facet approach, defines a theory as:

"An hypothesis of a correspondence between a definitional system for a universe of observations and an aspect of the empirical structure of those observations together with a rationale for such an hypothesis." (taken from Shye, 1978)

Chapter 6 describes how each of the three components of the definition, namely the definitional system, the empirical structure and the rationale, represent a stage in the construction of a model. Each of the three stages are summarised for the model of ward evaluation. Section 1 presents a brief summary of the rationale for the model. Section 2 summarises the definitional system and Section 3 is a summary of the empirical test of the model.

1 THE RATIONALE

As previously stated facet theory is a metatheory for elaborating a model. However, the basis of the model must come from the substantive area. The rationale for the correspondence between the model of ward evaluation and the interpretation of the SSA space is derived from the field of environmental psychology.

The presentation of the rationale for the model of environmental evaluations consists of providing an account of the processes involved in formulating an evaluation and the identification of the constituent components necessary to describe that experience.

1.1 The Process

Chapter 4 presents the description of the process of making an evaluation. The description is based upon a goal-oriented model of man; that is, it is the individual's purposes for being in the setting that determine his behaviour in that setting. The physical environment may help or hinder the achievement of the purposes but it does not initiate nor direct the activities which attempt to achieve the purposes. Therefore the proposal is made that the psychological process of making an environmental evaluation consists of an assessment of the extent to which a setting facilitates the individual in achieving his purposes. In this instance it is the nurses' assessments of the extent to which the physical environment of modern hospital wards facilitates the provision of nursing care.

The second process to be specified in order to provide the substantive basis for an evaluation model concerns the origins of the evaluations. Chapter 4 suggests that the formulation of the evaluations occurs through using the environment and, therefore, a model of evaluation is an account of the experience of use. This account consists of both the content and the structure of the individual's conceptualisations of using the
1.2 The Constituent Components

Ittelson et al. (1974) describe environmental experience as emergent. By this is meant that it is the result of the interaction between an aspect of the physical environment and a behavioural characteristic of the individual. In addition they maintain that this experience can not be obtained by considering either side in isolation. The proposed general model presented in Chapter 5 attempts to incorporate the emergent quality of the experience of using the environment.

A part of the model construction is the proposal of the basic conceptual units of the experience of environmental use. These units are labelled 'behavioural units' to emphasise that their origins lie in the actual use of the environment. In order to accommodate the emergent quality of the experience, each unit is defined as consisting of an attribute of a location together with a purposive activity associated with the attribute. The prediction is that each behavioural unit is the basis for one given evaluative statement.

1.3 The General Model of Environmental Interaction

The model consists of a classification system for the various behavioural units. The assumption is that the more conceptually similar are any two behavioural units, the more similar will be the evaluations which are based on these units. The concepts or facets used to classify the behavioural units are obtained from the environmental psychology literature.

Each of the three facets describe one of the aspects of environmental interaction as defined by Ittelson et al.; that is the behavioural characteristics, aspects of the physical environment or the interaction between them.

The behavioural characteristic part of the behavioural unit is specified as the purposive activity the individual is carrying out. The activities are categorised according to whether or not they are part of the primary function of the setting. In service settings such as hospital wards the distinction is between front stage and back stage activities.

The aspect of the physical environment is described by the function that it serves. According to the BPRU (1972) the functions are most clearly illustrated by the referent of the individual's interactions. The environment may facilitate interactions with other people or the direct use of the setting. Alternatively it may effect the comfort of the individual due to the environmental services, for example the heating system. Thus the second facet used to describe each of the behavioural
units is the referent of the interaction. The final facet provides a description of the interaction between the individual and the referent. The environmental literature suggests that people distinguish between various environmental interactions in terms of the psychological distance implied by the interaction. Consequently this facet describes the interactions in terms of the level at which they occur. The levels vary from more to less distant. Together the three facets provide a three-way classification system for describing people's conceptualisations of their environmental interactions.

1.4 The Rationale for the Model of Ward Evaluations
The rationale for the specific model of ward evaluations is provided by previous literature and research on how a ward functions in providing care for the patient. This information is used to translate the general model into facets and elements applicable to the ward context.

A wide range of sources are used to elaborate the model. They include designers' ideas about how wards function (Nuffield, 1955), results of observational studies in wards (Lippert, 1971, Trites et al., 1970 and Bott, 1970), surveys of patients' opinions (Raphael, 1969 and Cartwright, 1964) and general ward design evaluations (Sears and Auld, 1976). The Mapping Sentence reproduced in Section 2 represents the predictions from the literature about the structure and content of the evaluations to be made by nurses concerning their hospital wards.

2 The Definitional System
As described in Chapter 6 the definitional system is a classification system for a specific content area. In this instance the content area is the evaluation of modern wards by nurses working on those wards. The conceptual dimensions used to classify the domain of concern are termed facets. The elements of the facets are the categories into which the evaluation statements are classified. To test the model it must be elaborated by specifying the expected relationships between elements of a facet and between facets themselves. The predicted relationships within and amongst facets may be formally stated in a mapping sentence. As presented in Chapter 7 the Mapping Sentence for the domain of evaluative statements is as follows:
A nurse evaluates her ward in terms of the extent to which it facilitates:

<table>
<thead>
<tr>
<th>Level of Interaction</th>
<th>Referent</th>
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<tbody>
<tr>
<td>observation of</td>
<td>people</td>
</tr>
<tr>
<td>access to</td>
<td>locations</td>
</tr>
<tr>
<td>use of/contact with</td>
<td>environmental services</td>
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<tr>
<td>prevent disturbances</td>
<td></td>
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<td>from</td>
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**Type of Care**

- Direct
- Indirect

in order to provide patient care

by stating that it helps a great deal
helps a little
neither helps or hinders
does not help but helps a little
makes it slightly difficult
makes it difficult
makes it very difficult
to provide that care.

3 THE EMPIRICAL STRUCTURE OF THE OBSERVATIONS

The facet approach requires that a model or theory must be directly testable. The mapping sentence is a statement of the expected structure of the empirical observations. Therefore, the testing of the model requires data. Chapters 8 and 9 describe the construction of the questionnaire used to collect the evidence. The content of the questionnaire was obtained from the nurses working in hospital wards, not from the model. In this way the instrument is used to test both the structure and the content of the model of ward evaluation. The 1921 responses collected with the instrument were analysed by a smallest space analysis.

The hypotheses about the pattern of relationships are tested through a regional interpretation of the space of a smallest space analysis. The prediction that a given facet does classify the items into the specified elements is verified if the items that are assigned to the same element are found to be located in the same region of the space.

The predicted relationships between and amongst facets are tested by the spatial location of the regions. The prediction about the Referent facet is that the three elements will be qualitatively different and therefore the three regions will be equidistant from each other around a centrepoint.

The Type of Care facet is expected to further define the Referent by specifying whether or not it is concerned with the direct care of the patient. The direct care items are to occupy a circular region around the centerpoint of the Referent facet, with the Indirect care items
located in an adjacent region further from the centre. The final prediction is that the regions corresponding to the elements of the Levels of Interaction facet will be qualitatively different; that is they will be ordered across the SSA space from most to least distant.

Chapter 10 presents the facet interpretation of a three-dimensional smallest space analysis of the responses to the questionnaire. The interpretation confirms the predicted correspondence between the definitional system used to describe the evaluative statements and the empirical structure of the relationships between these statements. The spatial structure produced by the model is known as a cylindrex (Guttman, 1977b).

4 CONCLUSIONS OF CHAPTER 11
Chapter 11 provides a summary of the development of the ward evaluation model through the use of Facet Theory. The chapter is divided into three sections corresponding to the three stages of model development. One stage is the specification of the classification system to be used to describe the various evaluation statements. Another stage is the empirical test of the validity of that classification system. The confirmed correspondence between these two stages validates the model. The remaining stage is the rationale for why such a correspondence should occur. The rationale for the present model is derived from the literature and research on nursing care in hospital wards. The successful retrieval of the predicted structure not only validates the model, but also illustrates a compatibility between the various sources of information about the functioning of hospital wards. This consensus of interpretation suggests that the model can be used to examine how nursing is carried out in the ward context and the implications this may have for the design of hospital wards. Chapter 12 describes some of these implications.
Chapter 12
IMPLICATIONS OF THE MODEL FOR THE NATURE
OF CURRENT NURSING PRACTICE AND WARD DESIGN

Chapter 11 presents a summary of the construction and successful testing of the model of environmental evaluations. Chapter 12 considers some of the implications that can be drawn from the model.

In Chapter 3 it is argued that a piece of research should have both immediate and long term applications. The immediate applications are taken to be those conclusions directly concerning the specific context of the research. Chapter 12 focuses on the immediate application of the work. The evaluation model is tailored to the evaluation of modern hospital wards by the nurses working in these wards. The basis of the model is the organisation of the provision of nursing care in the ward. Consequently, the structure and content of the model can be used to examine the nature of current practice in the ward context. In addition, suggestions are made about the congruence between current nursing practice and the designs of modern wards.

A description of the ward context is presented in Chapter 2. That discussion presents the development of the Nuffield ward plan (1955) as the focal event in the history of ward design. The plan represented a radical departure from the traditional open plan ward and was to become the prototype for all modern British wards. The plan was formulated on the basis of systematic research on nursing in the ward context. However, the plan was based upon what the Nuffield team thought nursing care ought to be rather than how they found it to be provided. Design changes were implemented based upon these assumptions about the nature of nursing care. The present chapter examines these assumptions in the light of the successful retrieval of the three-faceted model of nursing care.

The significance of the content and structure of each facet often can only be described in terms of its relationship to another facet. In addition the practice of nursing and ward design, as has been argued throughout the thesis, are part of one system of delivering care. However, for clarity of description, each facet is dealt with separately, with the distinction made between its implications for nursing practice and for design. Section 1 discusses the organisation of nursing care as indicated by the Type of Care facet. Section 2 explores the range of activities which make up nursing care as illustrated by the Level of Interaction facet. Section 2 also points to the design compromises
indicated by this facet. In Section 3 the Referent facet is used to illustrate the qualitative richness of the nurses conceptualisations. In addition that section describes how the Referent facet can contribute to the design process when it is considered in conjunction with the Level of Interaction facet.

1 TYPE OF CARE: FACET (C)

The analysis demonstrates that the Type of Care facet has two identifiable elements; Direct (C₁) and Indirect (C₂) care. The facet is ordered and plays a modulating role. The prediction that Direct Care will occupy the central region of the space is confirmed.

1.1 Implications of the Type of Care facet for Current Nursing Practice

The work demonstrates that nursing care has two distinct components; direct and indirect patient care. In addition, direct care is not just one aspect of care. Rather, it is literally central to the care provided in the ward, with this core of direct patient care operating at all levels of interactions. These conclusions, which are drawn from the facet approach, help to clarify certain issues in the nursing literature. They also suggest that some writers on this subject may have inappropriate interpretations of the role of the ward nurse. Each issue is discussed in turn.

1.1.1 The Organisation of Care: The Distinction between Elements

There are two predominant ways of structuring nursing activities according to the literature. The Nuffield research (1953) organised it in terms of separate procedures. Their classification distinguished between basic care of the patient and technical treatment given to the patient. The alternative categorisation of nursing activities is that of Bott (1970). His research describes activities in terms of their position in the sequence of any given procedure.

The Nuffield scheme emphasised the discreetness of the procedures. In fact a major aspect of the design generated from that work was the attempt to completely separate basic and technical nursing care. In contrast the Bott scheme emphasises the integrated nature of nursing activities. It classifies activities according to their position in the sequence of a procedure. For example, the preparation of the treatment trolley and the preparation of the drugs tray both belong to the same stage.

The Bott scheme prescribes the stage directly involving the patient as the central focus of nursing in the ward. The preparation, disposal and recording stages are considered necessary, but peripheral to this direct care. The ward design corresponding to the Bott scheme places the
patients' facilities such as the bedrooms, treatment room and dayrooms at the centre of the ward, with the utility rooms and offices on the periphery.

Both the Bott and Nuffield research are observational studies, with the categorisation imposed upon the activities by the researchers. The present work provides an opportunity for comparing these schemes with the structure of the nurses' own conceptualisations of their work. The retrieval of the two elements of the Type of Care facet demonstrates that nurses see their activities as an integrated system of care with Indirect care activities, such as preparation and disposal, necessary in order to facilitate Direct care of the patients. This classification is similar to that proposed by Bott and is quite different from thinking about nursing care as a series of discreet procedures. It makes it possible to see how the different procedures combine together to provide total nursing care in the ward context. In addition it situates activities; that is, the classification is based on both what the activity is and where it takes place. It is a much more integrated picture of the use of the ward than is provided by the Nuffield classification.

1.1.2 Patient Care as the Central Focus of Nursing

A second characteristic of nursing care, according to the facet interpretation, is that the direct care of the patients is not simply an aspect of care but is central to the provision of nursing care in the acute ward.

This interpretation of the nurses' conceptualisations about nursing care is quite different from that of current writers on nursing such as Abel-Smith, 1960; Roper, 1976 and White, 1978. All these writers criticise the structure of the nursing profession. Their concern is that the structure emphasises administrative abilities rather than the caring abilities of the nurses. An example they quote is the Salmon Scale of promotion (Ministry of Health, 1966), which has increased the trend of moving qualified nurses away from the patient.

The structure of the Type of Care facet, both for the total sample of nurses and for the qualified nurses alone (Appendix 4; Section 1), is contrary to the interpretations of the writers discussed above. According to the definitional system used in the present work, all the nurses view Direct care of the patient as the focus of their responsibilities. Indirect care activities, including administrative tasks, such as clerical work and co-ordinating activities, are more peripheral.

The difference in interpretation indicates the necessity for more data on the issue. One useful piece of research would be a repetition of the
Nuffield observational study of 1953. It would identify whether there has actually been a change in the amount of time spent on the various nursing activities. According to work done in American hospitals by Trites et al. (1970) there has been a shift of emphasis. They find that in the more compact modern wards, nurses spend more time directly with the patients. A similar study in British hospitals would demonstrate whether or not the Nuffield scheme, including both their proposed change in the style of nursing and in ward plans, has achieved the objective of increasing the contact between nurse and patient.

Research on the nurses' own views about their role in the ward care delivery system is also needed to clarify the issue of the focus of ward nursing. Time spend on an activity does not necessarily mean it is viewed as of central importance. For example, cooking and cleaning up takes longer than actually eating a meal; yet the consumption of the food is the primary purpose of the sequence of activities. Likewise there may be a difference between what the nurses view as the central focus of care and the frequency with which these activities are carried out. It can be expected that the difference will be particularly apparent for qualified nurses, who have a wider range of responsibilities than unqualified nurses. For example, supervising and training student nurses, coordinating the activities of all the staff and clerical work are the responsibilities of the more senior staff.

At present the administrative activities are all considered part of the system of ward care and according to the model, are seen as facilitating the direct care of the patient. Research on the nature of nursing care in the hospital ward is needed to verify the structure and determine if all nursing activities fit into this system. Such research may have direct implications for the provision of nursing care in the ward. For example, if activities do not fit into this structure perhaps they should not be the responsibility of nurses. Possible examples are clerical work being done by ward clerks and supplies being replenished by the supplies department without the necessity for stocktaking by the nurses.

1.1.3 The Range of Direct Care Activities

Florence Nightingale advocated a much wider range of responsibilities for ward nurses than current writers on the nursing profession suggest actually happens (White, 1978). Present writers such as Roper and White maintain that nursing in acute wards is a "custodial" role, focussing on the treatment of bedridden patients. The current work can not support this assertion.

The model demonstrates that, while bedside care is part of the core area of the nurses' perceptions of the use of the ward, a range of other
activities are also included in this region. For example chatting to and reassuring patients, observing and having easy access to patients, as well as preventing disturbances to the patients are all construed as direct patient care. Thus while nurses may not as yet see themselves as teachers or counsellors, as proposed by Roper (1976), the range of activities are not adequately described by the term 'custodial care'. Greater recognition of the range of nursing activities should be given both in the training of student nurses and by the designers of the wards that are to house them.

There is a further characteristic of the model that suggests nurses have a more dynamic image of their role than that of ministering angel. The content of the original interviews with the nurses, used as the basis for the model, contains facilities and activities of the patients which do not include the nurse. Examples are the dayroom for patients who want to leave the ward, and also spaces within the ward for those patients who prefer to visit with other patients within the ward. Another is the concern that mobile patients have access to other parts of the hospital. This emphasis on patient independence represents a change in emphasis since the last century, when patients were dealt with as passive receivers of treatment (White, 1978). The inclusion of patient facilities is consistent with the concern, expressed by medical sociologists such as Stacey (1977) and by the Nuffield team, that an essential part of care is encouraging patients to become active and independent as soon as possible.

The range of direct care activities and the inclusion of patients' own activities in this care suggest both that a rather impoverished picture is being presented by White (1978) and Roper (1976) of the role of current nursing in acute wards. Further research on the nature of nursing is needed to update the nursing literature.

1.1.4 Summary of the Implications of the Type of Care facet for Current Nursing Practice

The Type of Care facet illustrates that nursing activities are organised into a coherent care delivery system. This system is structured such that the direct care of the patient is the primary focus of ward nursing. Nursing activities not involving the patients are seen as necessary in order to accomplish the primary tasks. A wide range of both nurse and patient activities are incorporated as part of the central focus of nursing in adult acute wards.

Both the structure and content of this description of nursing care are quite different from much of the discussion of nursing care found in the literature. Therefore it is proposed that further research into the nature of ward nursing is required to answer the questions raised by the
Type of Care facet.

1.2 Design Implications of the Type of Care Facet

The Type of Care facet plays a modulating role in the model, which means that it further defines each of the elements of the Referent facet. It specifies whether or not each referent relates to direct patient care or to indirect care. The most immediate design question raised by this facet is whether or not nurses consider the ward facilities to be related to the same aspect of care as specified by the designers.

The clearest example of how the Type of Care facet may be used to generate questions concerned with ward design is the location of the treatment room within the conceptual model.

The creation of the treatment room was one of the innovations of the Nuffield plan as part of a whole scheme to modify the way care to patients was being provided. As described in the previous section, the Nuffield work distinguished between basic care of the patient and the technical treatment prescribed by the doctor. A major objective of the design was to improve the status of the activities involved in the basic care of the patient, such as helping patients to eat and wash and generally looking after the patients. The concern was that the basic care activities were frequently forced to take a subordinate role to technical treatment. The design scheme included modifying the use of the bedspace and the creation of the treatment room. Each of these changes are discussed below in the light of the model. In addition, an alternative view of the most appropriate location of basic and technical care within the ward is suggested. Each section illustrates how ward designs can benefit from further research into the different aspects of direct patient care.

1.2.1 The Use of the Bedspace

One aspect of improving the status of basic nursing was to prevent basic activities being interrupted by technical nursing, which the Nuffield Job Analysis (1953) demonstrated frequently occurred (see Chapter 2). The design-related policy was that only basic care should occur at the bedside. The creation of the treatment room was intended to make that possible. A further, related design decision was the reduction of the amount of space allocated for each bed in the Nuffield plan. The reduction was based upon the assumption that the equipment necessary for technical care would no longer have to be fitted into the bedside space.

The content of the evaluation model suggests this expected change of use may not have happened. The content of the model is taken directly from the interviews with nurses working on hospital wards. All the comments that make reference to the bedspace do so in the context of providing
technical care to the patients; such as moving and using equipment. Thus, according to the nurses, technical care still occurs at the bedside. This finding raises the possibility that the Nuffield plan actually made the provision of direct patient care more difficult. The same amount of space is still being allocated for the bedspace in current wards as was provided in the Nuffield plan (see Table 2.1 in Chapter 2). Observational research is needed to determine the actual functions being served by the bedspace in present day wards. The possibility remains that care is being provided in an inadequate amount of bedside space and that the space allocated to the treatment room is under-utilised. This possibility is given further support by the classification of the treatment room in the model.

1.2.2 The Classification of the Treatment Room

The original prediction of the model was that the questions pertaining to the treatment room would be construed as a part of the direct care of the patient. However, the interpretation of the smallest space analysis in Chapter 10 places all the treatment room questions in the indirect care region of the space. The present research can only point out that there is an apparent mismatch between the designers' view and the nurses' view of what the role of the treatment room is in the provision of nursing care. Further research is needed to ascertain why nurses do not see this facility as an integral part of direct patient care. However, the most likely explanation is that the treatment room is not used as originally intended by the designers. In Chapter 2 it is argued that the Nuffield plan fragmented patient treatment in terms of where it takes place. It is possible that nurses resist this fragmentation of care by simply not using the treatment room for treatment.

If under-utilisation as a treatment area is the explanation for this facility being construed as part of indirect care, the reason does not appear to be the location of the treatment room in the ward. An inspection of the plans of the wards used in the present study indicates that the treatment rooms are, in general, placed as close to the bed areas as possible. The reason may be simply that the nurses find it more convenient to take the treatment to the patient rather than the patient to the treatment. The major conclusion that can be drawn with confidence is that research on the uses of the treatment room and the explanations for its use are needed. The design implications of such work may be that not all adult acute hospital wards require this facility.

A final possible explanation of the conceptual location of the treatment room is that the Type of Care facet can be further defined. The
possibility also has wider implications for the relationship between nursing care and ward design and is discussed below.

1.2.3 The Distinction between Basic and Technical Treatment

The Type of Care classification does not distinguish between Basic and Technical Direct patient care. Yet the significance it has been given, both in terms of ward design (Nuffield, 1953 and 1955) and for the development of the nursing profession (White, 1978), makes it an important issue. In both contexts the assertion is made that ward nurses place greater emphasis on the provision of technical nursing care (see Chapter 2). However there are indications, from the structure of the Type of Care facet, which suggest that further research is required to verify the above assertion. In addition, the structure to be proposed provides an alternative interpretation to the nurses' conceptualisations of the role of the treatment room and the bedspace. These implications result from incorporating the distinction between basic and technical activities into the Type of Care classification.

An examination of the questions classified as Direct care finds that they can be further distinguished as technical or basic nursing activities according to the Nuffield definition. Technical nursing, which involves the implementation of treatment prescribed by the doctor, includes the questions on treatment at the bedside, treatment in the treatment room and the movement of patients to other parts of the hospital for treatment. Basic care are those activities necessary to the 'comfort and well-being of the patient' (Nuffield, 1953). Examples of basic activities are: nurses chatting to patients, reassuring patients, helping patients to wash as well as the patients' own activities.

An elaboration of the smallest space analysis of the data (Figures 10.8 and 10.9 in Chapter 10) indicates that the technical nursing activities appear to occupy an intermediate position in the space, between the basic care activities and the indirect nursing activities. Figure 12.1 illustrates the partitioning of the space by the Type of Care facet when the three elements are included.

The further classification of the facet into three elements is only applicable to a portion of the total domain. Nevertheless it does raise questions about nursing care and the role of the ward design in facilitating that care. The structure in Figure 12.1 presents the indirect care activities as facilitating both technical and basic direct patient care, as demonstrated previously. In addition, it presents technical nursing activities as facilitating the achievement of basic nursing care. This interpretation places basic nursing, directed towards
the 'comfort and well-being of the patient', as the central focus of nursing care in modern adult acute hospital wards. This is opposite to the conclusions drawn by writers on the nursing profession. Further research is needed to establish exactly what nurses see as the focus of their role.

Figure 12.1 The Distinction between Basic and Technical Direct Care for projection 2 & 3 ($A_2$ & $A_3$)

A second aspect of the interpretation is that the bedspace and the treatment room are both construed as places associated with technical treatment. Making the bedspace smaller has not eliminated its use for this type of care. This suggests that a rethink of the relationship between design and care is needed if basic nursing care is not to be disrupted by the technical procedures. The interpretation illustrated in Figure 12.1 incorporates a wider range of activities as a part of Basic Care than did the Nuffield work; for example, nurses talking to and reassuring patients. This expanded range of basic care incorporates activities that Roper (1976) specifies as necessary expansions of the role of the nurses in order to remove the custodial character of nursing. In contrast, the description of the technical activities associated with the bedside and treatment room implies that all these nursing activities require care of bedridden patients. This interpretation suggests the design solution which would be most successful in separating basic and technical care would include the provision of alternative facilities for basic care, such as dining facilities, away from the bedside. This would not only remove the conflict between basic and technical nursing; but may also contribute to the conversion of the custodial image of nursing to a more dynamic role as advocated by Roper (1976).
1.2.4 **Summary of the Implications of the Type of Care Facet for Design**

The discussion of the bedside space and the treatment room is used to illustrate the way in which design implications can be drawn from the model of ward evaluation. For example, it suggests that current designs may be over-providing for the technical treatment of the patient while ignoring many of the activities involved in basic patient care.

A more general implication of the discussion is that design principles aimed at modifying behaviour should not be perpetuated without further investigation as to whether or not they are appropriate. The Nuffield work, aimed at creating an environment for facilitating what they thought nursing care ought to be, was carried out in the 1950's. Yet there has been neither research to validate their design principles nor the creation of ward designs that are anymore than minor modifications of the basic Nuffield plan. The structure and content of the Type of Care facet suggests there is sufficient evidence to propose that an updating of information is necessary.

1.3 **Summary of the Implications of the Type of Care Facet**

In summary the structure and content of the Type of Care facet raises issues both about the nature of current nursing practice and the design which will most successfully promote the nurses' objectives. The content suggests that the focus of care is not restricted to bedside activities and incorporates both patient and nurses activities. Its structure questions the design decisions concerning the bedspace and the treatment room and provides sufficient evidence to suggest that further research is required to establish with confidence what ward nurses see as the central focus of providing patient care.

2 **LEVEL OF INTERACTION: FACET (A)**

Four elements are needed to describe the range of activities involved in nursing care. The elements are ordered from the most distant form of interaction (just observing) to a level of contact which actually results in disturbances. The Level of Interaction facet plays an axial role in the structure of the total domain; that is, it is orthogonal to the Referent and Type of Care facets.

2.1 **Implications for the Nature of Nursing Care**

In Section 1 it is argued that nurses see direct patient care as more than providing care at the bedside. It is the axial role played by the Level of Interaction facet which identifies and orders this range of activities. Observing, chatting with, treating patients and the prevention of disturbances to patients are all part of direct care and are ordered in terms of decreasing distance. Equally, indirect care activities also order on this facet from staff supervision, access to
ancillary facilities, use of these facilities, to the nearest level, privacy for staff discussions. As stated earlier, the successful retrieval of the Level of Interaction facet suggests that descriptions of ward care such as 'custodial' give an impoverished account of the role played by the ward nurses.

2.2 Design Implications of the Level of Interaction Facet
The elements of the facet specify four distances at which interactions take place between the individual ward user and his environment. For example, it makes a distinction between having access to a facility and the actual use of that facility. Likewise, the observation of patients and the treatment of patients are demonstrated to belong to different levels of interaction. These examples illustrate that for any one environmental referent there may be a range of activities associated with it. In addition, the distinctions specified by the facet and its ordered, axial structure suggest there is a potential for conflict between the different activities. This is particularly so for the more psychologically distant activities such as observing patients and patient privacy. The potential conflicts between activities, indicated by the facet, have direct design implications. Examples of the design implications for each of the three referents are given below.

2.2.1 Design Implications of Interactions with Locations
The necessity for design compromises, suggested by the Level of Interaction facet, is particularly evident with respect to the positioning of facilities in the ward. An example is the position of the dayroom. Section 1.1.2 points out that the inclusion of patient facilities is important because they are a part of Direct patient care. According to the design conclusion drawn by Bott (1970), these facilities should be centrally located in the ward because they are a part of the central focus of the ward. This conclusion fails to take into consideration the range of activities associated with a facility. For example, a centrally located dayroom may facilitate access to it by patients and supervision of it by nurses. However, it might also be a source of disturbance to patients still in bed, as found by Cartwright (1964). This range of potential activities points to the design problem of whether to place the dayroom at the periphery of the ward to reduce disturbance or near the bedrooms to encourage use. The Level of Interaction facet can not point to the best design solution. However, it makes explicit the compromises involved in a particular design solution. Compromises are also identifiable for design solutions concerning interactions with other people.
2.2.2 Design Implications of Interactions with Other People

The classification of nursing activities into four levels of interaction is based upon the distinctions made by the Nuffield team (1955) in determining what levels of interaction their plan would facilitate. The Nuffield design assumption was that easy access to patients would lead to greater contact with the patients than would easy observation of patients. It is a policy decision where the conflicts implied by the Level of Interaction facet were recognised by the designers and the decision was taken to facilitate the less distant forms of interaction.

The validity of the design assumption for American hospital wards, with mainly single and double bedrooms, is demonstrated by Trites et al. (1970). They find that more compact wards facilitate more contact with the patients. However the content and structure of the Level of Interaction facet suggests that the validity of the design assumption, that 'easy access' would be an adequate replacement for 'easy observation', can be questioned for British wards.

The first reason for suspecting that easy access is not an adequate replacement for easy observation comes from the content of the original interviews. The interviews contain reference to both the observation of patients in general and the observation of patients from the staff base. This demonstrates that nurses in British wards still consider observation an aspect of nursing care and that the staff base is an appropriate location from which the observation of patients should take place.

The Level of Interaction facet illustrates conflicts. Cubicled wards, the basic current design, and the stated requirement of the present day nurse, to be able to observe the patients easily, represent one of these conflicts. A Nuffield approach is needed to solve this problem; that is, both research on the necessity for easy observation and the use of the research findings for formulating design principals for future ward plans.

The partitioning of British hospital wards only began with the Nuffield plan in 1955 and many of the wards still in use are the open Nightingale plan. This may explain why observation is still a part of direct care for British nurses. However, it is not just the content of the model that questions the design assumption that partitioning wards to facilitate access will lead to greater contact between nurses and their patients.

An additional reason for suspecting the Nuffield design assumption comes from the analysis presented in Chapter 10. The analysis shows a difference in Level for the various 'access' items. The items concerned
with 'access to patients' occur in the region corresponding to the most remote level of interaction, observation \( (A_1) \), while 'access to facilities' items are in a less distant category \( (A_2) \). In Chapter 5 it is proposed that the facet will order activities in terms of the relative psychological distance between the Referent and the individual. The structure and content of the Level of Interaction facet indicates that, for nurses working in modern cubicled wards, access to patients is a psychologically more distant activity than is access to facilities. This suggests that the partitioning of the layout of these wards, which was intended to improve 'access to patients' by making the wards more compact, has resulted in the activity being construed as the same thing as observation. The nurses see both activities as more remote from the direct contact with patients than the design team intended 'access' to be. It is an empirical question as to whether or not this is due to the partitioned layouts of modern wards or that nurses simply do not differentiate between observation and access to patients. Regardless, the analysis indicates that easy access to patients does not necessarily facilitate contact with patients, as was assumed by the Nuffield design team.

2.2.3 Design Implications of Interactions with Environmental Services

The ordering of the interactions with the environmental services, such as heating and lighting, also has design implications. For example, the night light at the staff base is related to two activities; one being clerical work of the nurses and the other the discomfort of the patients. These results suggest that design improvements can be made in order to retain the lighting service without the accompanying patient disturbance. In fact, a complete rethink of the lighting at night is suggested by the present work. All lighting at night, at the bedside, at the staff base, and in the ward in general, is considered by the nurses to be a source of disturbance to the patients. These results suggest that lighting is an aspect of ward design which would benefit from further work. For example, lighting on the skirting boards of the corridors may allow adequate surveillance for the night staff without causing disturbances to the patients.

The position of the heating and ventilation on the Level of Interaction facet also has design implications. Heating and Ventilation occur at a level which suggests they are a part of the whole ward atmosphere \( (A_2) \). This position indicates that these concerns are not restricted to just the bed areas and utility rooms. When these services are designed for hospital wards it should be remembered that they have an impact on the entire ward.
2.3 Summary of the Implications of the Levels of Interaction Facet
The structure and content of the Level of Interaction facet illustrate the range of activities which are a part of nursing care. The facet also points to the conflicts which may arise between activities. Examples of these conflicts are presented to indicate the possible design consequences. In addition the Level of Interaction facet questions the basic design principle of the Nuffield plan that greater compactness will lead to more direct contact between nurses and their patients.

3 THE REFERENT: FACET (B)
The three elements of the Referent facet are People, Locations and Environmental Services. It is an unordered facet which plays a polar role in structuring the phenomenon of ward evaluation.

3.1 Implications for Nursing Care
The referent classification is proposed by the BPRU's model of the environmental system and is implied by Raphael's (1969) classification of patient complaints, as obtained from interviews. However it has been unobtainable from observational studies, such as Trites et al. (1970), because the experience of the environmental services is mainly an internal event and can not be directly observed. Also, the facet has not been retrievable from linear-based analytical models, as used by Sears and Auld (1976). The successful demonstration of the polar role played by the facet in the SSA space explains why this is so. The qualitative nature of the differences between the three referents can not be illustrated by linear models.

The Referent facet illustrates the richness of the nurses' experience of the ward environment. It demonstrates that the provision of nursing care involves the interaction with three different aspects of the environment. It also illustrates that the physical environment does not just situate behaviour. Rather, the Referent facet shows that the provision of care to patients is achieved through the interaction between the nurses and the setting as described by the three elements.

3.2 Implications of the Referent Facet for Ward Designs
The prediction of the three elements of the Referent facet was derived from the BPRU's functions of a building. One function is provided by the environmental services, such as the heating system providing thermal comfort. The other two functions are served by the spatial layout of the building. They include facilitating the interaction between people and facilitating the direct use of the building. The retrieval of the three referents demonstrates that the facet describes the functions served by a building in a way which is relevant to people's experience of that
environment. In turn this retrieval allows people's environmental experience to be a source of information for improving the functions served by the building.

A consideration of the three referent elements provides information directly relevant to the design of hospital wards. They identify different aspects of more general issues which a ward design ought to accommodate. This is most clearly illustrated when the referent elements are taken in conjunction with the elements of the Level of Interaction facet. For example the general atmosphere of the ward \( A_2 \) can be described as having three different components:

- patients having a place to sit and chat in the ward area \( B_1 \)
- patients having access to the dayroom \( B_2 \)
- the heating and ventilation systems \( B_3 \)

Each of these is a necessary, but not sufficient, requirement for a good ward atmosphere. All three must be considered in producing a design which will facilitate the general requirement. Other examples of this three-component classification are:

for patient treatment:

- treatment at the bedside \( B_1 \)
- treatment in the treatment room \( B_2 \)
- adequate lighting at the bedside for treatment \( B_3 \)

for preventing disturbances:

- from noise from other patients \( B_1 \)
- from intrusion in the sanitary facilities \( B_2 \)
- from lighting at night \( B_3 \)

While the examples given above are all concerned with direct care, this classification of general issues can also be applied to indirect nursing activities. The necessary but not sufficient characteristic of the components, illustrated above, suggests that designers must be aware of all three aspects of patient care. For example disturbances to patients do not just occur while patients are in bed. A design to reduce disturbance would also have to consider the level of provision and location of the sanitary facilities in the ward. Thus while the Level of Interaction facet points to possible design conflicts, the Referent facet points to possible design omissions.

3.3 **Summary of the Implications of the Referent Facet**

In summary, the successful retrieval of the three elements of the Referent facet confirms the general model of environmental systems proposed by the Building Performance Research Unit (1972). It also illustrates the richness of the nurses' experience of their ward
environment. In addition, the demonstration of the polar role played by the facet provides information on how nurses think about the ward which is directly useful to the design process. The polar nature of the facet illustrates that general issues can be described as having three different components, all of which must be taken into account when designing a ward to facilitate the general concerns.

4 SUMMARY OF THE IMPLICATIONS OF THE MODEL FOR NURSING CARE AND WARD DESIGN

The content and structure of the three facets, as retrieved from the empirical analysis, provide information both about the nature of current nursing practice and about the design of the wards in which this activity takes place. The Type of Care facet illustrates how nursing activities in the ward are organised as a system, with Indirect care activities facilitating the Direct care of the patient. The content of each element questions the design decisions concerning the amount of bedspace to provide and the location and provision of the treatment room.

The Level of Interaction facet illustrates the range and order of the activities involved in the direct care of the patient. This facet casts doubt on the assertion that nurses have a restricted view of what direct care to the patient may involve. It also illustrates the conflicts which may occur between activities and the design compromises which may result.

The Referent facet confirms the general model of environmental system proposed by the BPRU (1972). It is a qualitative facet and, as such, has not been retrievable from linear-based analytical models. The Referent facet is useful to design decision-making in that it illustrates that general issues have three components, all of which must be taken into account when designing a ward to facilitate these general concerns.

This chapter has been concerned with the direct implications of the model of ward evaluation for the nursing in and design of hospital wards. Chapter 13 extends the applied contribution of the model. It uses the ward evaluation model to examine the relationship between the evaluations of the wards and the physical characteristics of the wards.
Chapter 13
THE POTENTIAL OF THE MODEL FOR STRUCTURING
THE PHYSICAL CHARACTERISTICS OF MODERN HOSPITAL WARDS

1 INTRODUCTION
The applied objective of the work is the examination of the relationship between modern ward designs and the provision of nursing care. As discussed in Chapter 1, there are three aspects to the general applied objective. One aspect is to provide an account of the nurses' experience of giving patient care in the modern ward context. Chapter 12 describes the applied implications of the model of ward evaluation for the nature of current nursing practice and for the design of future wards. A second aspect is to use the model of evaluation to develop a concise instrument for the evaluation of future wards. The successful accomplishment of this objective is presented in Chapter 10.

The third aspect of the applied objective is presented in Chapter 13. It is an attempt to establish the relationship between the physical variations of the wards and the evaluations the wards receive. The purpose is to illustrate how different design types compare in terms of facilitating the various aspects of nursing care. The approach to this problem is to use the structure of the evaluation model to develop a model of physical ward descriptors. From the model of physical descriptors a taxonomy of ward types is derived.

The discussion of the physical model is structured in the same manner as that of the evaluation model. Chapter 13 presents the development of the model. While it must be emphasised that the work in this chapter is of an exploratory nature, the model of physical descriptors does provide design-relevant information. Chapter 14 discusses the results of Chapter 13 and their implications for future ward planning.

The remainder of Section 1 provides a brief summary of the rationale behind the approach used to develop the model, the basic requirements of the model and an outline of the organisation of the chapter.

1.1 The Rationale for the Approach
The evaluation of physical settings is a well established method of studying the environment. However, the next stage of linking these evaluations to the variations in the physical characteristics is infrequently attempted. This gap in the field of environmental research is reflected in the inclusion of a symposium called 'The Status of the Objective, Physical Environment in Environmental Psychology' in the 1980 American Psychological Association Conference. In his paper given at the
symposium, Margulis (1980) suggests that there is 'precious little psychological theory (which) has attempted to relate behavior to the structural aspects of the objective environment'. Canter (1977) suggests that pragmatic approaches to the objective physical environment have also tended to be inconclusive. The problem as stated by Canter (1977) is that:

'Taken in the abstract, independently of any conceptual framework, there is an infinity of ways of dividing up and measuring physical parameters. Weight, size, colour, shape, form, texture or combinations of any or all of these and many others, at any scale, are feasible. So researchers have either selected one which caught their fancy, with disappointing results, or given up because they were spoilt for choice.'

The basic premise of the approach, being utilised in Chapter 13, is that in order to establish whether the physical characteristics of wards facilitate nursing activities, it is first necessary to structure these characteristics such that they reflect the structure of the evaluations.

The premise is adopted from Rapoport's (1977) work which suggests the environment has a structure which both reflects and facilitates people's activities. The examples Rapoport cites concern the match between plans of primitive villages and the pattern of the dwellers' social life styles. In settings where the designers and users are not one and the same, this match can not be assumed. For example, as described in Chapter 2, the prototype plan for modern wards developed by the Nuffield team, was a reaction against the then current nursing practice rather than a reflection of it. Nevertheless, to investigate the degree to which a setting facilitates people's goals and activities, the most appropriate structure to impose on the physical characteristics is one that reflects the structure of the activities the environment houses.

The evaluations by the nurses are used to represent the activities. It is taken that the purpose of a nurse being in a ward is to provide nursing care. This general purpose initiates and directs the nurses' activities. The role of the physical environment is to facilitate these purpose-based activities. Therefore, nurses evaluate the wards in terms of the extent to which they facilitate the activities involved in the provision of nursing care. Consequently, the pattern of the evaluations, as illustrated in the evaluative model is taken as a reflection of the pattern of the activities within the ward. The structure of the evaluations, as represented by the Evaluation Model in Chapter 10, is used to structure the physical characteristics.
1.2 Requirements of the Physical Descriptors Model

There are three basic requirements of the model of physical ward descriptors. The first is that it is multivariate. Each ward has a range of both evaluative and physical characteristics by which it can be described. Consequently the problem requires a multivariate approach such as facet theory. Through the facet approach the structure of the nurses' evaluations of modern wards (as defined by the evaluation model) is used to organise the physical characteristics of the wards.

A second requirement of the model is that it can be used to derive a taxonomy of ward design types. Unique physical characteristics of hospital wards do not exist on their own, independently of each other. Rather, together they form the entity known as a hospital ward. Therefore it is necessary to treat them as a part of an integrated whole when exploring their relationship with the evaluations. This requirement is satisfied through the use of the multiple classification system of the facet approach. This system of description generates the ward design types.

The third requirement of the model is that it be capable of describing individual wards. Much of design involves the creation of an individual unique plan. Even though ward planning in Britain is moving towards a standardised approach, this is not as yet fully implemented and unique design solutions are still being generated. In addition, the building of new hospitals is not the only solution to improving the quality of the physical environment. As is discussed in Chapter 14, remodelling plays an important role in maintaining standards. If the model is to contribute to this process it must be capable of describing the relationship between the physical and evaluative descriptors of individual wards.

In summary, the objective is to develop a model of physical ward descriptors which is based upon the evaluations and has the characteristics of being a multivariate, integrated system of description applicable to the individual ward case. Such a model has not been attempted before. Consequently the procedure of development is one of exploration, with one stage evolving out of the results of previous stages. The following section summarises the stages in the development.

1.3 Organisation of the Chapter

The process of linking together the physical and evaluative descriptors of wards is an involved one. Therefore it is of value to briefly summarise the route through.

Section 2 provides a brief review of previous approaches to the problem of accommodating environmental descriptors into environmental psychology.
There are two major requirements of the physical descriptors suggested by previous work. The first is that they be related to human activities. The second is that this relationship can not be expected to be an one-to-one deterministic relationship; therefore the physical descriptors are best dealt with as general characteristics. The remainder of the chapter illustrates the method used to develop a model of ward design types based upon the evaluative model. The five major stages in the development of the model are:

1. Structuring the ward population according to their evaluative scores.
2. Generating general physical descriptors for each ward.
3. Structuring the physical descriptors such that they reflect the structure of the evaluations.
4. Illustrating the evaluative-based model of physical descriptors.
5. Testing the model on a sample of wards.

Section 3 describes the structure of the evaluative scores to be used in structuring the physical descriptors. The purpose is ultimately, to identify patterns of physical descriptors unique to subgroups of wards with similar evaluative scores. The structure of the evaluative scores is restricted to the classification by the Level of Interaction facet. Partial Order Scalogram Analysis (POSA) is used to structure the subgroups of wards. This provides an integrated system for describing the population of wards which illustrates systematic variations in both type and number of high evaluative scores received across the groups.

Section 4 presents the data to describe the wards in terms of their physical characteristics. It describes the data collection and the method used to generate general physical descriptors of hospital wards. Nine physical indices, corresponding to the nine major types of facilities within a ward, are produced. Each index consists of a range of physical variables related to the specific type of facility. The indices are the physical data to be structured by the evaluative measures.

Section 5 describes the matching of the evaluative and physical descriptors. As stated previously, wards based upon the Nuffield design can not be assumed to be structured to reflect the nursing activities that take place in that setting. The purpose of Section 5 is to establish whether the structure of the indices can be retrieved when structured by the evaluative measures. Multidimensional Scalogram Analysis (MSA) is used to test the match. This analysis is appropriate because it assumes no a priori structure to the data. The conclusion
drawn from the analysis is that, at a general level, the physical descriptors do reflect the structure of the evaluative measures.

The model of ward types is presented in Section 6. The method for developing the model is to group the wards together according to their evaluative scores. Through the use of MSA these groups are ordered by their physical descriptors. The ordering reproduces the structure of the ward population by the evaluative scores proposed in Section 3. The three general physical descriptors obtained from the analysis are:

1. The degree of partitioning of the main ward area.
2. The level of provision of essential facilities.
3. The level of provision of extra facilities.

Each of the general physical descriptors corresponds to an aspect of nursing care. The degree of partitioning of the main ward area is most closely associated with the ease of patient observation ($A_1$). The provision of extra facilities corresponds to preventing disturbances and affording privacy ($A_2$). A high provision of essential facilities has the overall impact of increasing all the evaluative scores that wards receive.

The final requirement of the model is that it is capable of describing individual wards. To test this, Section 7 presents a MSA on a sample of 99 wards. The analysis demonstrates that, in general, the model can be used reliably to describe individual wards. Section 8 is a summary of the chapter.

2 PREVIOUS APPROACHES

Environmental research which attempts to accommodate physical characteristics tends to adopt one of two approaches. One approach is to develop general environmental descriptors independently of people's responses to settings and then establish the relationship between them. Such work has been carried out by Venturi (1966) and Kaplan, Kaplan and Wendt (1972). Examples of environmental descriptors developed by these researchers are complexity, incongruity and novelty. However, as illustrated by Wolhwill (1976), there is little agreement about the definitions of these general descriptors and, more importantly, there is no clear consensus about the relationship that exists between the general descriptors and people's responses. A basic requirement of a description of the physical characteristics to be of use in the field of environmental psychology, is that it is related to some characteristic of the people who use the environment.

An alternative approach, at the other extreme, is to take individual characteristics and examine their relationship with human responses.
Sears and Auld (1976) illustrate the inadequacies of this approach in their evaluation study of hospital ward designs. When one-way analyses of variance were carried out for each physical variable (for example number of baths) against each evaluation factor, the number of statistically significant differences are such that no clear pattern of relationships can be established. The above example suggests that a structure must be imposed on the physical characteristics in order to identify the relationship between them and human activities.

In summary, previous work in the area suggests that for physical descriptors to be of use in environmental psychology research they must be related to human activities and must be structured to give general environmental descriptors. Section 3 presents the description of the evaluative measures which are used to structure the physical variables. It includes a description of the analysis to be used and the form the data is to take.

3 THE STRUCTURE OF THE EVALUATIVE SCORES

Section 3 describes the steps involved in providing an integrated description of the population of wards according to the evaluative scores they received from the nurses. Section 3.1 presents the rationale for using the Level of Interaction facet to structure the evaluative scores. Section 3.2 describes the steps in calculating the evaluative scores for each ward and Section 3.3 presents an integrated description of the ward population described in terms of evaluative scores.

3.1 The Classification of the Evaluations by the Level of Interaction Facet

The description of the evaluations is restricted to the classification of the items by the Level of Interaction facet. The use of this facet relates to the applied objective of environmental evaluations, as stated by Canter (1975); that is to:

'evaluate an existing building or aspects of it so as to provide information upon the effectiveness of the principles upon which it was based.'

The most distinctive characteristic of the Nuffield plan which has been incorporated into all the wards in the present survey, although in varying degrees, is the increased partitioning of the layout. The design principle behind the Nuffield plan was the desire to redirect the emphasis of the type of contact between nurses and their patients. As stated in Chapter 12, the concern of the design team was that the open Nightingale wards overemphasised the 'observation of patients' rather than the 'direct contact between nurses and patients'. By partitioning the wards into bedroom cubicles the Nuffield design team produced a
prototype plan which is more compact than the older styled open wards. The basic assumption of the designers was that while 'patient observation' would be made more difficult, 'access to patients' would be easier and would, therefore, result in greater 'direct contact'. In addition the smaller bedrooms were intended to improve 'patient privacy and reduce disturbances such as noise'. This design policy is a direct attempt to influence the level at which nurses interact with their patients. Yet to date there is no clear information about how the various design consequences of the policy relate to current nursing activities.

The distinction made between nursing activities in the Nuffield design policy is the same as the elements of the Level of Interaction facet, retrieved from the analysis of the nurses' evaluations of the modern ward designs based upon the Nuffield plan. Therefore this facet is used to examine the relationship between the physical and evaluative descriptors of modern wards in order to 'provide information upon the effectiveness of the principles upon which they are based' (Canter, 1975).

3.2 The Evaluative Descriptions of Individual Wards

The initial stage of examining the relationship between the physical and evaluative ward descriptors is to group together wards on the basis of their similarities in facilitating the activities which occur at each of the levels of interaction. To make it an integrated system of evaluative descriptors, the facet approach is used to develop a multiple classification to describe each ward in terms of its evaluative assessments. The particular structural analysis used to describe the wards in this manner is Partial Order Scalogram Analysis, referred to as POSA (Shye, 1978). POSA is used to systematically describe the similarities and differences between individuals (or groups) in terms of their profile of variables.

One POSA requirement is that each variable or item in the profile must be 'an aspect of the concept under study' (Shye, 1978). In this instance each item is an aspect of ward evaluation as represented by one of the elements of the Level of Interaction facet. A second requirement of the data necessary to ensure that POSA is appropriate is that each item can be ordered from 'high' to 'low' with respect to the underlying concept. The scaled evaluations are consistent with this requirement.

The above requirements are the same as for developing a perfect scale or Guttman Scale (Stouffer et al., 1950). What distinguishes POSA from a perfect scale is that it can accommodate subjects with incompatible profiles. For example, one ward may score high on just facilitating
'patient observation' while another receives a high score for facilitating 'privacy' only. Both these wards can be included in the POSA structure.

In order to group the wards according to the scores on the Level of Interaction facet, the scores are broken down into their element constituents. The steps are:

1. Deriving the 21 structuple scores for each ward.
   A structuple contains questions which share the same category membership across all the facets. For example all questions about patient privacy in the bedrooms belong to the structuple $A_iB_1C_1$. A structuple score consists of the total score for all questions within a structuple divided by the number of questions in the structuple.

2. Calculating the 4 element scores for each ward.
   An element score is derived by adding together all the structuple scores belonging to a given element and dividing by the number of structuples. For example the element score for Preventing Disturbances ($A_i$) is the average score across the following structuples:
   - Patient Privacy ($A_iB_1C_1$)
   - Staff Privacy ($A_iB_2C_2$)
   - Privacy in Sanitary Facilities ($A_iB_2C_1$)
   - Storage of Unused Furniture ($A_iB_2C_2$)
   - Disturbances from Bedside Light ($A_iB_2C_1$)
   - Disturbances from Lighting at the Nursing Station ($A_iB_3C_2$)

   The reason for using average structuple scores to calculate element scores is that the number of questionnaire items in the structuples varies; consequently average scores prevent the overrepresentation of structuples with large numbers of questions.

3. Categorising the 4 element scores for each ward.
   POSA operates on categorical data. Therefore, to group together wards with similar element score profiles it is necessary to create categories of ward scores. All the scores to be used in the POSA are dichotomous, with wards with average and above scores on an element belonging to one category and all below average wards in another category. This produces 4 dichotomous element scores for each of the 138 wards.

3.3 An Integrated System of Describing the Population of Wards
The purpose of structuring the evaluative measures is to identify the accompanying structure of the physical measures. Using the pattern of
how the nurses' conceptualise these measures, (for example 'observation' being more similar to 'access' than to 'direct contact') predictions can be made about the relationship between these evaluative measures and the physical attributes. For example, in Chapter 12 the proposal is made that wards with open bays for bedrooms will be expected to receive high scores for facilitating observation, while wards with closed bedrooms will be expected to be evaluated highly on preventing disturbances.

However, treating the evaluations as discreet measures will be of limited use in design terms. In any one given ward, nursing activities relating to observation, access, contact and preventing disturbances all take place; generating potential sources of conflict. For example, Chapter 12 illustrates how the location of the dayroom should provide easy access for patients, yet must not be a source of disturbance for the patients still in their beds. Some ward designs may facilitate the whole range of nursing activities, while others none, or a combination of activities occurring at different levels. To state this in another way, wards can be described both in terms of the number and kinds of interactions their design facilitates. Figure 13.1 gives the POSA description of the domain of wards grouped according to their dichotomised evaluative scores. In the structure 0 represents a low score and 1 refers to a high score. The number in brackets represents the number of wards with a given profile of evaluative scores. (15 of the total 138 wards can not be accommodated by this description.)

Figure 13.1 POSA Structure of the Ward Population ordered by the Evaluative Scores

A=observation  B=access  C=contact  D=preventing disturbances

A B C D

0 0 0 0 (26)

1 0 0 0 (10) 0 1 0 0 (3) 0 0 1 0 (2) 0 0 0 1 (14)

1 1 0 0 (4) 0 1 1 0 (7) 0 0 1 1 (4)

1 1 1 0 (13) 0 1 1 1 (10)

1 1 1 1 (11)

The top row of Figure 13.1 describes all the wards which receive low
scores for all four measures (represented as 0000). The bottom row contains all the wards which are evaluated highly on all four measures (1111). The middle three rows contain wards with various combinations of high and low scores. Thus moving down the diagram there is an increase in the number of high evaluation scores received.

Figure 13.1 also distinguishes wards in terms of the kinds of evaluative measures for which they receive high scores. On the left are the wards which score high on 'observation', either on its own or (moving down the diagram) in conjunction with high scores on other measures. On the right are the wards which receive high scores for 'preventing disturbances', either alone or in combination with other measures. Thus moving across the diagram differences between wards are described in terms of the kinds of activities they facilitate. Figure 13.1 illustrates how POSA can be used to produce an integrated system of ward descriptors which illustrates systematic variations in both type and numbers of high evaluative scores received.

A further characteristic of the POSA structure presented above is that very few wards receive high scores for just Access (n=3) or for just Contact (n=2). This is also true for high scores on both Observation and Access (n=4) and for high scores on both Contact and Preventing Disturbances (n=4). The tendency is for wards to score either high on both Access and Contact or low on both of these element scores. Consequently, in order to provide a more parsimonious description, the scores for Contact are being used to represent the activities involved in the middle range of Levels of Interaction. The simplified structure is presented in Figure 13.2. The classification incorporates all but 8 wards of the original 138 and is the structure to be used in establishing the relationship between the evaluative and physical descriptors of the wards.
4 THE PHYSICAL CHARACTERISTICS OF THE WARDS

Section 4 presents the data used to describe the wards in terms of their physical characteristics. It describes the data collection procedure and the method used to generate general physical descriptors of hospital wards.

4.1 The Collection of the Data on the Physical Characteristics

Appendix 1, Section 1.3 contains a copy of the Physical Description List (PDL) used to collect the data. The PDL is a self-completion document to be filled in by the Nursing Officers in charge of the sampled wards. The development of the instrument follows the same procedure as for the Evaluation Questionnaire. During the three pilots the PDL was modified and clarified to provide the instrument used in the main survey.

The Physical Description List consists of a series of questions concerning the type and level of provision of the prescribed ward facilities. The basis of the PDL is the schedule of accommodation for all ward plans contained within Hospital Building Note 4: Ward Units (DHSS, 1976). The Building Note lists all facilities and systems to be provided within any one ward. In addition, floor plans of all the wards were obtained from the DHSS and a reduced copy attached to each PDL. The Nursing Officer was asked to indicate whether it was the correct plan, whether the rooms were correctly labelled and to indicate any structural changes or changes in use. The incorporation of the plans allows the identification of the location of various facilities which can not be obtained from written questions. In total 61 variables are retrieved from the PDL and plans (See Appendix 5 for a list of the variables).

Of the 144 wards included in the main survey, PDL's were returned for 138 wards. The physical and evaluative measures for these 138 wards form the basis of the analyses to be discussed.

4.2 Classification of the Physical Characteristics

The work of Sears and Auld (1976), which demonstrates that dealing with individual physical variables produces uninterpretable results, suggests the necessity of combining similar variables. As recommended by Maxwell (1972) the data was submitted to a principal components analysis to reduce the variables to fewer components (See Appendix 5, Section 5.2 for the factor loadings). The first component of the analysis accounted for only 8.5% of the variance, with the loadings of the variables low for all the components. In addition, no logical sense can be made of the combination of variables which have the highest loadings for any particular component except when variables share a common category. An
example of this is the variables concerned with describing the dayroom. The variables used to describe the dayroom (the provision of a dayroom, whether the dayroom is shared with another ward, the location of the dayroom in the ward and the type of dayroom) all contain the category 'no dayroom'. Similar results were obtained from a Multidimensional Scalogram Analysis carried out on the same data. The only clear partitions which occur are when a category is shared by several variables, as with the provision of the dayroom.

The fact that the physical characteristics are evenly distributed is consistent with the discussion of modern wards presented in Chapter 2. In that chapter the suggestion is made that modern wards in England are basically the 1955 Nuffield design with variations occurring with respect to specific characteristics, but these variations do not combine to provide radically different ward designs. For the current sample of modern wards this assertion is substantiated; a variation in one characteristic is not accompanied by consistent variation in any of the other measured characteristics.

The above results indicate that the specific characteristics, as taken from the PDL, can not be used to provide an overall description of the setting. What is required is a more general level of description. The procedure adopted is the creation of a physical index for each type of facility within the ward. The criterion for a physical variable being included in an index is that it is a part of the description of a type of facility. For example the provision of an equipment room is a part of the description of the Ancillary Facilities. Thus each physical index consists of physical variables which refer to a particular facility. The nine major facilities described in this manner are:

1. **General Ward Characteristics** (eg. size, percentage of patients visible from the staff base)
2. **Multi-bedded Areas** (eg. location, number of beds)
3. **Staff Base** (eg. location, number)
4. **Dayroom** (eg. location, bay or room)
5. **Sanitary Facilities** (eg. ratio of beds to w.c.'s, baths, showers)
6. **Ancillary Facilities** (eg. provision of treatment rm., pantry, equipment rm.)
7. **Offices** (eg. provision of doctor's rm., use of sister's rm.)
8. **Nurses' Facilities** (eg. provision of changing rm., staff w.c.'s)
9. **Extra Facilities** (eg. provision of cleaners' rm., relatives overnight rm.)
The construction and quantification of the 9 physical indices involves three steps. The steps in the computation are:

1. Coding the variables.

The physical variables are coded in terms of facilitation. Using the Ancillary facilities as an example, 'to have an equipment room, is assumed to facilitate the work of the nurses, while 'to share the treatment room with another ward' is assumed to be less convenient than 'not sharing'. Therefore 'to have' and 'not to share' are coded at the same level.

2. Grouping the physical variables according to the type of facility they describe.

43 of the physical variables from the PDL refer to one of the 9 indices. However 10 of these variables have a level of provision which is applicable only to a small percentage of wards. For example, peripherally located Utility Rooms occur in only 2 of the 138 wards, with the rest having these facilities centrally located. Such variables are excluded from the indices, leaving 33 variables to describe the physical characteristics of the wards. Table 13.1 gives a detailed list of the variables and their levels of provision included in each of the 9 indices.

The variables taken from the PDL to describe the General Ward Characteristics, the Bedroom and the Dayroom all appear to be concerned with openness or accessibility. Physically, they are described in terms of the level of partitioning. The remaining 6 Indices describe the level of provision of facilities.

3. Calculating the 9 Index scores

Each index score is a summation of the levels across the physical variables assigned to a given Index. Table 13.2 gives the levels of partitioning or provision of each Index and the frequency distribution of wards across the range of levels for each of the 9 Indices.

The index scores in Table 13.2 are the physical descriptor data to be structured by the evaluations made by the nurses. This matching of the evaluative and physical descriptors is presented in Section 5.
Table 13.1  Variables used in the Construction of the Nine Physical Indices

1. Overall Ward Characteristics

<table>
<thead>
<tr>
<th>% of patients visible from staff base</th>
<th>% of beds in single beds</th>
<th>number of beds in ward</th>
<th>shape of ward</th>
</tr>
</thead>
<tbody>
<tr>
<td>1=0%</td>
<td>1=23-HI%</td>
<td>1=32-HI</td>
<td>1=L shape</td>
</tr>
<tr>
<td>2=1-15%</td>
<td>2=18-22%</td>
<td>2=30-31</td>
<td>2=linear</td>
</tr>
<tr>
<td>3=16-25%</td>
<td>3=1-17%</td>
<td>3=27-29</td>
<td>3=racetrack</td>
</tr>
<tr>
<td>4=26-39%</td>
<td>4=12-26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5=40-HI%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Bedroom

<table>
<thead>
<tr>
<th>number of beds in largest bedroom</th>
<th>type of multibedded area</th>
<th>location of bedrooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1=4 beds</td>
<td>1=rooms only</td>
<td>1=1 side</td>
</tr>
<tr>
<td>2=5 beds</td>
<td>2=rooms &amp; bays</td>
<td>2=2 or more sides</td>
</tr>
<tr>
<td>3=6 beds</td>
<td>3=bays only</td>
<td></td>
</tr>
<tr>
<td>4=8 beds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5=12 beds</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Nursing Station

<table>
<thead>
<tr>
<th>two-way speech</th>
<th>location of desk for drug supply system</th>
<th>number of stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1=not have</td>
<td>1=same side as bedrooms 2=desk 2=requisite</td>
<td>1=one 2=two</td>
</tr>
<tr>
<td>2=have</td>
<td>2=opposite</td>
<td></td>
</tr>
</tbody>
</table>

4. Dayroom

<table>
<thead>
<tr>
<th>location dayroom</th>
<th>type of dayroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>1=central</td>
<td>1=without door</td>
</tr>
<tr>
<td>2=peripheral</td>
<td>2=with door</td>
</tr>
</tbody>
</table>

5. Sanitary Facilities

<table>
<thead>
<tr>
<th>ratio beds to W.C's</th>
<th>ratio beds to baths</th>
<th>provision of showers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1=5-HI</td>
<td>1=11.5-HI</td>
<td>1=no showers</td>
</tr>
<tr>
<td>2=LOW-4.99</td>
<td>2=LOW-11.49</td>
<td>2=have showers</td>
</tr>
</tbody>
</table>
Table 13.1 (cont) Variables used in the Construction of the Nine Physical Indices

<table>
<thead>
<tr>
<th>6. Ancillary Facilities</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>sharing</td>
<td>provision of</td>
<td>sharing pantry</td>
</tr>
<tr>
<td>treatment room</td>
<td>equipment room</td>
<td></td>
</tr>
<tr>
<td>1=not shared</td>
<td>1=have</td>
<td>1=not shared</td>
</tr>
<tr>
<td>2=shared</td>
<td>2=not have</td>
<td>2=shared</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. Offices</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>provision of</td>
<td>use of</td>
<td>sharing</td>
</tr>
<tr>
<td>doctors' office</td>
<td>sister's rm.</td>
<td>seminar rm.</td>
</tr>
<tr>
<td>1=have</td>
<td>1=used by</td>
<td>1=not shared</td>
</tr>
<tr>
<td>2=not have</td>
<td>nurses only</td>
<td>2=shared</td>
</tr>
<tr>
<td></td>
<td>2=used by others</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8. Nurses' Facilities</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>changing facilities</td>
<td>sharing</td>
<td>ratio beds to</td>
</tr>
<tr>
<td></td>
<td>changing facilities</td>
<td>staff W.C.'s</td>
</tr>
<tr>
<td>1=have</td>
<td>1=not shared</td>
<td>1=LOW-13.49</td>
</tr>
<tr>
<td>2=not have</td>
<td>2=shared</td>
<td>2=13.5-25.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3=25.5-HI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9. Extra Facilities</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>provision of</td>
<td>provision of</td>
<td>provision of</td>
</tr>
<tr>
<td>cleaners' rm.</td>
<td>cleaning rm.</td>
<td>flower rm.</td>
</tr>
<tr>
<td>1=have</td>
<td>1=not shared</td>
<td>1=have</td>
</tr>
<tr>
<td>2=not have</td>
<td>2=shared</td>
<td>2=not have</td>
</tr>
<tr>
<td></td>
<td>2=not have</td>
<td>2=not have</td>
</tr>
</tbody>
</table>
Table 13.2  Frequency Distribution of Wards for each of the Nine Physical Indices

<table>
<thead>
<tr>
<th>WARD CHARACTERISTICS</th>
<th>BEDROOMS</th>
<th>NURSING STATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Index Score</td>
<td>Number of Wards</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>51</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>48</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DAYROOM</th>
<th>SANITARY FACILITIES</th>
<th>ANCILLARY FACILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Index Score</td>
<td>Number of Wards</td>
</tr>
<tr>
<td>4</td>
<td>58</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>63</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OFFICES</th>
<th>NURSES' FACILITIES</th>
<th>EXTRA FACILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Index Score</td>
<td>Number of Wards</td>
</tr>
<tr>
<td>3</td>
<td>28</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>44</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>53</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
5 MATCHING THE STRUCTURE OF THE PHYSICAL DESCRIPTORS WITH THE STRUCTURE OF THE EVALUATIVE DESCRIPTORS

As stated by Canter (1977), without a conceptual framework any classification of physical variables is valid. However as suggested by Rapoport (1977):

'The environment has a structure and is not a random assemblage of things. It both reflects and facilitates relations and transactions between people and the physical elements of the world.'

The basic premise of this work is that before it is possible to establish whether or not the physical setting of the ward facilitates the provision of nursing care, it is first necessary to structure the physical characteristics such that they reflect the structure of the evaluations.

The rationale for the nine physical indices developed in Section 4 is, simply, that each index refers to a particular part of the ward. Also, the ordering of the levels of the Indices in Section 4 is based upon the assumption of facilitation; that is, the varying levels of partitioning and provision will influence the ease with which nursing care can be carried out. The purpose of Section 5 is to establish whether the structure of the indices, that is the order, either in terms of degree of partitioning or in terms of the level of provision as proposed in Section 4, can be retained when the indices are structured by the evaluative measures. This requires a form of analysis which demands no a priori assumptions about the structure of the data. The analysis most appropriate for this is Multidimensional Scatalogram Analysis (MSA).

5.1 The Data

The procedure adopted to examine the match between evaluative and physical descriptors is to organise physical classes of wards by their evaluative scores. Physical ward characteristics do not exist independently of each other. Rather together they form the physical entity known as a hospital ward. Consequently, each physical index is treated as a part of an integrated system of physical ward descriptors.

In order to provide an integrated description, each level of each of the nine physical indices is treated as if it were a separate individual, giving a total of 38 such 'individuals' (see previous Table 13.2). As stated in Section 4, each ward is assigned to one level of each of the nine indices on the basis of its physical characteristics. For the present analysis, average scores on each of the three evaluative elements are calculated for each group of wards having one of the 38 index levels. The evaluative scores are simplified by dichotomising them, using the mean score for each facet element as the dichotomising point. So, in
effect, each group of wards is treated as one of 38 classes of ward type, for which 3 evaluations are available, each score being either a 0 for low or a 1 for high. This 38x3 matrix was submitted to an MSA.

5.2 Multidimensional Scalogram Analysis

MSA is a geometrical analysis which serves two functions (Zvulun, 1978). Firstly, it illustrates the similarities between individuals (the 38 index levels) in terms of their category membership on the items (the 3 evaluative scores). To do this MSA only operates on unique profiles, combining together all individuals which have identical profiles. For the 38 index levels there are 7 unique evaluative profiles.

Secondly MSA illustrates the relationship between the items (the 3 evaluative items); that is whether they partition the space in a similar manner. Each individual which has a unique combination of item categories is represented as a point in a two-dimensional space. The procedure of the MSA algorithm is to arrange these points in the space in such a way that for each of the 3 evaluative items, there will be a clear partition of the space into regions corresponding to each of their categories. The interpretation required is to identify whether these partitions are compatible with the order of each of the nine indices from which the 38 individuals were drawn.

MSA Space Diagram

In order to facilitate the interpretations, the output of the MSA programme produces a 'space diagram' which displays each of the 7 unique profiles as points in the space. Figure 13.3A presents the 'space diagram' for the 7 unique profiles representing the 38 index levels. Figure 13.3B gives the evaluative profiles for each of the 7 points. This figure illustrates the POSA structure of the evaluative profiles as presented in Section 3, Figure 13.2.

Figure 13.3 Space Diagram of the 7 Unique Profiles ordered by the 3 Evaluative Measures (MSA 38 x 3)
MSA Item Diagrams

MSA also produces 'item diagrams' (one for each of the three evaluative items). In each item diagram the profile points are in the same position as in the space diagram, but are labelled according to the category of the item to which they belong. Figure 13.4 presents the partition lines for each of the three evaluative measures, with each element partitioning the space in a different manner. According to Zvulun's (1978) discussion of MSA, if all 3 of the scores gave an evaluative description of the wards which ordered the classes in the same manner (i.e. an unidimensional Guttman scale), all 3 partition lines would be at the same angle. However each of the 3 evaluative scores divides the classes of wards into different groups, as represented by the angles of partition. This illustrates that each element makes its own unique contribution to ordering the physical indices.

Figure 13.4  Item Diagrams illustrating the Partition Line for each of the 3 Evaluative Measures (MSA 3 x 3)

5.3 The Interpretation

The purpose of Section 5 is to establish whether the structure of the physical indices, that is whether the order, either in terms of degree of partitioning or in terms of level of provision proposed in Section 4, can be retrieved when the indices are structured by the evaluative measures. Figure 13.5 is the same MSA plot as given in Figure 13.3 and 13.4. Each of the nine diagrams in Figure 13.5 presents the position in the MSA space of the levels of each physical index. In general, these diagrams demonstrate at the dichotomous level, a match between the physical and evaluative descriptors of the wards. For example the level of provision of both Patients' Sanitary Facilities and of Offices are partitioned by the two values of the 'Prevention of Disturbances' measure in a manner consistent with an increase in provision.
Figure 13.5  The Levels of the Nine Physical Indices ordered by the 3 Evaluative Measures (MSA 3 x 3).
However the strongest relationship illustrated in Figure 13.5 is that between the degree of openness in the layout (as represented by the Ward, Bedroom and Nursing Base indices) and the extent to which they facilitate 'Observation and Communication' ($A_1$). The evaluations made about the wards in terms of Observation also appear to be sensitive to other ward design variations, such as the level of provision of the Ancillary Facilities.

The evaluative measure concerned with Direct Contact between people or Direct Use of facilities ($A_2$) also structures the indices for the Bedroom and the Nursing Base at exactly the same level as Observation ($A_1$). The independent contribution made by the $A_2$ item is the partition line for the level of provision of the Nurses' own Facilities. For two facilities, no clear partitions can be made which preserves their ordered increase in provision; they are the Dayroom and the Extra Facilities.

5.4 Conclusion

The MSA analysis structuring the 38 index categories according to their three evaluative scores demonstrates that, in general, the physical variables can be structured to reflect the structure of the evaluative measures. However, it also suggest that the relationship between 'Observation' and the degree of partitioning in the layout dominates this matching. The importance of 'ease of observation', demonstrated in this work, is consistent with the findings of Sears and Auld (1976). They found it necessary to restrict the detailed analysis to exploring the relationship of the evaluation of the general ward layout (mainly in terms of observation) with the percentage of patients visible and the physical descriptors of the general ward area. This was necessary because the analytical method they used showed no clear relationships between the other evaluations and other physical characteristics. However Section 6 presents a simplified model of the relationships which suggests additional patterns of similarities can be identified.

6 A MODEL TO DESCRIBE THE RELATIONSHIP BETWEEN THE PHYSICAL AND EVALUATIVE DESCRIPTORS OF MODERN HOSPITAL WARDS

The analysis discussed in the previous section is used to explore whether or not it is possible to structure the physical characteristics in such a way as to reflect the structure of the evaluative measures. The final stage in exploring the relationship between these two types of descriptors, is to examine how the different design types compare in terms of facilitating the various aspects of nursing care. As the classes of wards used in the previous analysis are not independent, it is also necessary to test the match identified in Section 5.
As stated at the beginning of the chapter, a model is sought which not only illustrates the relationship between these two types of descriptors, but which will also allow the relationships to be described as an integrated system of ward descriptors. The values the wards receive on the evaluations are used to provide a multiple classification system for the comparison of different design types.

The first stage in illustrating the relationships is to determine whether the proposed evaluative structure in Section 3 (and reproduced in Figure 13.6) can be retrieved when the groups are ordered by the physical characteristics. Having established that the evaluative and physical descriptors reflect one another, the nature of the relationships is examined.

**Figure 13.6** POSA Structure of Ward Population in terms of their Evaluative Profiles

A=observation  B=contact  C=preventing disturbances

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(29)</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>(14)</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>(13)</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>(14)</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>(33)</td>
</tr>
</tbody>
</table>

**6.1 The Data**

The model to be presented is a simplified account of the relationship between the evaluative and physical ward descriptors. A part of the preparation of the data includes dichotomising the physical indices into two levels of provision, in order to make them compatible with the evaluative scores. The content of each dichotomous level of the physical indices is determined by the partition lines made by the evaluative measures in the MSA in Section 5. For the Dayroom and Extra Facilities, where the partition lines are not clear, an even distribution of wards between the two levels is used.

Table 13.3 provides a summary of the predominante physical characteristics of the two levels for each index. As described in Section 4, each physical index is comprised of a range of physical variables. A given level may be obtained from different combinations of levels of provision of specific ward variables. Consequently, for some of the dichotomised indices there is more than one major combination.
Table 13.3 Description of the Groups of Wards that Partitioned the Nine Physical Indices

1. **Ward Characteristics**  
   (high partitioning)  
   - 0-15% patients visible  
   - at least 22% of all beds in single bedrooms  
   - 30 or more beds in ward  
   - L shape, linear or racetrack  
   (low partitioning)  
   - 16-39% patients visible  
   - less than 22% of all beds in single bedrooms  
   - less than 30 beds in ward  
   - linear or racetrack

   OR
   - 0-39% patients visible  
   - less than 22% of all beds in single bedrooms  
   - less than 30 beds in ward  
   - linear or racetrack

2. **Bedroom**  
   (high partitioning)  
   - all closed rooms  
   - bedrms on 1 side only  
   - 6-8 beds in largest bedrm.  
   OR
   - all closed bedrms.  
   - bedrms on more than 1 side  
   - 4-5 beds in largest bedrm.  
   (low partitioning)  
   - both rooms or bays  
   - bedrms on more than 1 side  
   - 6-12 beds in largest bedrm.  
   OR
   - bays only  
   - bedrms on more than 1 side  
   - 4-5 beds in largest bedrm.

3. **Nursing Station**  
   (low provision)  
   - 1 station  
   - located on same side of ward as bedrms.  
   (high provision)  
   - 2 stations  
   - located on opposite side of ward as bedrms.

4. **Dayroom**  
   (not accessible)  
   - located on periphery of ward  
   - with door  
   (accessible)  
   - located in centre of ward  
   - without door

5. **Sanitary Facilities**  
   (low provision)  
   - 5 or more beds per W.C.  
   - 11.5 or more beds per bath  
   - with or without showers  
   (high provision)  
   - less than 5 beds per W.C.  
   - high provision of either baths or showers

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<table>
<thead>
<tr>
<th>Table 13.3 (con't) Description of the Groups of Wards that Partitioned the Nine Physical Indices</th>
</tr>
</thead>
</table>

6. **Ancillary Facilities**
   - (low provision)
     - no equipment room
     - either treatment room or pantry shared
   - (high provision)
     - have equipment room
     - treatment room and pantry not shared

7. **Offices**
   - (low provision)
     - no doctors' office
     - sister's rm shared
     - seminar rm not shared
   - (high provision)
     - have doctors' office
     - neither sister's room nor seminar rm shared
     OR
     - have doctors' office
     - shared sister's rm.
     - shared seminar rm.

8. **Nurses' Facilities**
   - (low provision)
     - no changing rm.
     - changing rm. shared
     - at least 25.5 beds per staff W.C.
   - (high provision)
     - have changing rm.
     - changing rm not shared
     - less than 25.5 beds per staff W.C.
     OR
     - low provision on just one

9. **Extra Facilities**
   - (low provision)
     - 2 or less of the following facilities
   - (high provision)
     - 3 or more of the following facilities
     - provision of cleaners' rm.
     - sharing of cleaners' rm
     - provision of shampoo rm.
     - provision of flower rm.
     - provision of relatives' overnight rm. in ward

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which characterises a level. Table 13.3 provides a description of all the major combinations where this occurs.

The wards are grouped together according to their dichotomous scores on the three evaluative measures, giving 7 groups of wards in all, as illustrated in the POSA structure of Figure 13.6. For each of the 7 groups, the distribution of the two levels of each of the nine physical indices are calculated (See Table 13.4). From Table 13.4 the modal or most frequently occurring level of each index can be identified. Each group is assigned its modal level on each of the nine indices. (For the Offices index there is an instance where the number of wards is the same for both levels. Consequently three levels are used for this index: 1=low provision, 2=even distribution and 3=high provision.) This provides a matrix of 7 individuals described by 9 variables (see Table 13.5). An MSA was carried out on this 7x9 matrix.

Table 13.4  Modal Distribution of Physical Indices for each Combination of Evaluative Measures

<table>
<thead>
<tr>
<th>Ward</th>
<th>Bedroom</th>
<th>Nursing Station</th>
<th>Dayroom</th>
<th>Sanitary Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>cat. 1</td>
<td>cat. 2</td>
<td>cat. 1</td>
<td>cat. 2</td>
</tr>
<tr>
<td>000</td>
<td>9</td>
<td>20</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>001</td>
<td>4</td>
<td>14</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>010</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>100</td>
<td>9</td>
<td>5</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>011</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>110</td>
<td>10</td>
<td>3</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>111</td>
<td>22</td>
<td>11</td>
<td>20</td>
<td>13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ancillary Offices</th>
<th>Nurses' Facilities</th>
<th>Extra Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>cat. 1</td>
<td>cat. 2</td>
<td>cat. 1</td>
</tr>
<tr>
<td>000</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>001</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>010</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>100</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>011</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>110</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>111</td>
<td>14</td>
<td>19</td>
</tr>
</tbody>
</table>

Category (cat.) 1=low partitioning or low provision
Category (cat.) 2=high partitioning or high provision
Tables 13.5 Matrix of Modal Scores

\begin{tabular}{cccccccccc}
  WD & BD & NS & DAY & SF & ANC & OFF & NF & EX \\
  000 & 2 & 2 & 2 & 2 & 1 & 1 & 2 & 1 \\
  001 & 2 & 2 & 2 & 2 & 1 & 2 & 2 & 1 \\
  010 & 2 & 2 & 2 & 1 & 1 & 1 & 1 & 2 \\
  100 & 1 & 1 & 1 & 1 & 2 & 1 & 3 & 1 & 2 \\
  011 & 2 & 2 & 1 & 1 & 2 & 1 & 3 & 2 & 2 \\
  110 & 1 & 1 & 1 & 2 & 2 & 1 & 3 & 1 & 1 \\
  111 & 1 & 1 & 1 & 1 & 2 & 2 & 3 & 2 & 1 \\
\end{tabular}

1=Low Partitioning or Low Provision
2=High Partitioning or High Provision

6.2 The MSA Analysis

To reiterate, the prediction is that the physical indices will reflect the structure of the evaluative measures. Each point in the space is a group of wards which are evaluated in the same manner. However the position of these points in the space is being ordered by their modal level of provision on the nine physical indices. The expected pattern is that the physical variables will structure the groups of wards as represented in the POSA structure of Figure 13.6.

The MSA Space Diagram

The distribution of the points in the MSA space diagram, each point representing one of the combinations of evaluative measures, is given in Figure 13.7. In general, this is the same structure as predicted by the nature of these measures. For example 'Contact' is intermediate to 'Observation' and 'Preventing Disturbances'. Also the groups that score high on two evaluative measures lie between the groups which score high on only one measure and those wards which receive high scores on all three measures. This demonstrates that the classification of the physical characteristics does reflect how the wards are evaluated. The combination of scores which does not match well with the physical variables is that of all low scores. This suggests that the receiving of all low scores is less predictable from the physical characteristics than are the various combinations of high scores.
The Nine MSA Item Diagrams

Figure 13.8 presents the partitioning of the same space by the nine Physical Indices. The partitions divide the space according to the two levels of each of the nine Physical Indices. These partitions show the similarities between the indices. The MSA illustrates four different angles of partitioning by the nine Physical Indices. They are:

- the vertical partitioning by the Ward, Bedrooms and Nursing Base Indices
- the diagonal partitioning by the Sanitary Facilities, Ancillary Facilities and Offices Indices
- the horizontal partitioning by the Nurses' Own Facilities and the Extra Facilities
- A diagonal partitioning by the Dayroom Index

6.3 The Relationship between the Evaluative and Physical Descriptors

The clearest interpretation of the results of the MSA is for the vertical partition which occurs for the general Ward Characteristics, the Bedroom and the Nursing Base. On the left of each of the item diagrams are the wards which are small and open, have large open bedrooms and a high provision of nursing bases.

The relationship between the physical indices which have the vertical partitionings and the evaluative measures is illustrated in Figure 13.9. As shown by the diagram, the wards on the left are also the groups which receive high scores for 'ease of observation'. This illustrates that the variations in these three general physical descriptors make their greatest contribution to the provision of nursing care in terms of the general visibility of the ward they provide.
Figure 13.8 The Partitioning of the space by the Nine Physical Indices (7 x 9 matrix)
The second type of partition illustrated in Figure 13.9 is diagonal, which occurs for the Ancillary rooms, Offices and Sanitary Facilities. While this angle does not correspond to any one evaluative measure, it does reflect the number of high scores received. The higher the level of provision of these facilities, the higher the scores for all three measures. This suggests that good provision of essential facilities has a general effect of improving the ease with which nurses provide care.

The third partition angle, illustrated in Figure 13.9, corresponds with the scores received for the Prevention of Disturbances measure. This horizontal partition occurs for Nurses' own Facilities, such as changing rooms and staff toilets, and for Extra Facilities including, for example, cleaners' rooms and relatives' overnight rooms. Wards with a high provision of Nurses' Facilities do well on preventing disturbances. This is consistent with the evaluative items, in that several questions are asked about staff privacy and sanitary facilities. However, a high provision of Extra Facilities appears to have the opposite impact. This suggests that wards which accommodate people other than patients and nurses, are more likely to have instances where these extra people are seen by the nurses as causing disturbances.

The final partition is that created by the two levels of the Dayroom index. The meaning of this is not clear except that, in general, wards with centrally located dayrooms receive high scores for all combinations except 'the prevention of disturbances' only (001).

6.4 The Taxonomy of Ward Types

The analysis indicates that there are three different ways in which a ward may be classified by its design, each of which reflects a different aspect of use:

- the extent of partitioning of the main ward areas
- the provision of essential facilities
- the provision of extra facilities

Taking these three general ward characteristics, eight different types of wards can be described (See Table 13.6). For example, one type would be wards with large, closed layouts with a high provision of both essential and extra facilities. Another type would be small, open wards with high levels of essential facilities and a low provision of extra facilities. Because each design type corresponds to a particular combination of evaluative descriptors, their characteristics can be used to predict the relative success of future ward designs in facilitating the full range of nursing activities.

The final requirement of the model is that it can describe individual wards, not just design types. Section 7 describes the test of this.
Figure 13.9 The Partitions illustrating the Relationships between the Physical and Evaluative Ward Descriptors

THE VERTICAL PARTITIONS

THE DIAGONAL PARTITIONS

NUMBER OF HIGH EVALUATIVE SCORES

THE HORIZONTAL PARTITIONS

PREVENTION OF DISTURBANCES

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Table 13.6  **The Eight Ward Types derived from the Model of Physical Descriptors**

<table>
<thead>
<tr>
<th>Level of Provision of Essential Facilities</th>
<th>Level of Provision of Extra Facilities</th>
<th>Level of Partitioning of Main Ward Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Provision</td>
<td>High Partitioning</td>
<td>High degree of partitioning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High Provision of Essential and Extra Facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low Provision of Essential and Extra Facilities</td>
</tr>
<tr>
<td>Low Provision</td>
<td>Low Provision of Essential Facilities</td>
<td>Low degree of partitioning</td>
</tr>
<tr>
<td></td>
<td>Low Provision of Extra Facilities</td>
<td>Low Provision of Extra Facilities</td>
</tr>
<tr>
<td>Low Provision</td>
<td>Low Provision of Essential Facilities</td>
<td>High Provision of Essential Facilities</td>
</tr>
<tr>
<td></td>
<td>High Provision of Extra Facilities</td>
<td>High Provision of Extra Facilities</td>
</tr>
<tr>
<td>Low Provision</td>
<td>Low Provision of Essential and Extra Facilities</td>
<td>High degree of partitioning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low Provision of Essential and Extra Facilities</td>
</tr>
</tbody>
</table>
7 THE MODEL APPLIED TO INDIVIDUAL WARDS

As stated in the Introduction, it is important that a model or description of the relationship between design variations and the provision of nursing care be applicable to the individual ward case. A final Multidimensional Scalogram Analysis provides a test of this requirement.

7.1 The Data

Each ward is treated as a separate individual to be described by both the evaluative measures and the physical indices. Each of the combinations of evaluative scores is used as a separate dichotomous variable, with the classification being whether a ward receives that combination or not. (As the previous analysis indicates that the receiving of all low scores is not well predicted from the physical indices, wards with this combination are excluded). 99 of the possible 101 wards which have one of the six remaining combinations of scores are included in the analysis (MSA handles a maximum of 99 cases). Each ward is also described by its dichotomous level on each of the nine physical indices, making a total of 15 variables in all. This 99x15 matrix was analysed using MSA. The 99 wards generated 86 unique profiles. Figure 13.10 gives the distribution of the profiles in the MSA space.

Figure 13.10 Space Diagram of the 99 Individual Wards ordered by the Physical and Evaluative Descriptors

7.2 The Evaluative Items

The first step in determining whether the model is applicable to the individual ward case is to examine the spatial relationship between wards with different evaluative profiles. MSA groups together individuals on the basis of similar category membership. Therefore, all wards with the same evaluative combination will be found in the same region of the MSA space. Figure 13.11 presents the regions occupied by each category of
each of the six evaluative variables (2=has that combination of evaluative scores). However, because the evaluative variables are mutually exclusive, their relationship to each other in the MSA space will be determined by the similarities they share in terms of the levels of the physical indices. Figure 13.12 presents a composite representation of the regions of the six combinations. The relationship between the regions is topographically very similar to the order produced by the index modal levels in the previous analysis (See Figure 13.7)

Figure 13.11 Item diagrams for each of the 6 Combinations of Scores
7.3 The Relationship between the Physical and Evaluative Descriptors

Figure 13.13 presents the MSA item diagrams for the nine physical indices. A perfect partitioning of each of the indices into its two levels of provision can not be achieved. However partitions can be drawn that make a clear distinction between the levels, suggesting that the model can be used to describe individual wards. The partitions for the Ward, Bedrooms and the Nursing Base correspond to the partitioning of the space by the 'Observation' measure. Also, while large wards with small bedrooms and a low level of provision of Nursing Bases are seen as facilitating the 'Prevention of Disturbances', the small open wards not only facilitate 'Observation' but are more likely to be evaluated more highly on all the measures.

The Nurses' Facilities and the Extra Facilities again partition the space in a manner which is quite similar to the 'Prevention of Disturbances' measure. Wards with high levels of provision for the Nurses' Facilities receive higher scores, while wards with a high level of Extra Facilities receive low scores. The Ancillary index also partitions the space in a manner similar to the model, with a high level of provision resulting in a general increase in all the evaluations the wards receive. The Dayroom again partitions the space such that peripherally located dayrooms give rise to a high score for Preventing Disturbances only. However, dayrooms located in the centre of the ward are a characteristic of wards which receive high scores on all the other combinations of evaluative scores.
Figure 13.13 Item Diagram for the Nine Physical Indices
Figure 13.13 (con't) Item diagrams for the Nine Physical Indices
Two indices do not work as predicted. A high level of provision of the Sanitary Facilities appears to result in higher evaluations in terms of 'Preventing Disturbances' rather than having the general effect of an overall increase in high scores. The other index is Offices which has its two levels of provision evenly distributed across the evaluation profiles.

7.4 **Summary of the Model applied to Individual Wards**
The work demonstrates that in general the model can be used, not only to describe design types, but also to describe individual wards. This permits predictions about the success of the design to be made in the individual ward case. Section 8 provides a summary of the model of physical descriptors and its development.

8 **SUMMARY AND CONCLUSIONS**
The purpose of the work reported in Chapter 13 is to produce a model of physical ward descriptors based on the evaluations of the wards by nurses. The requirements of the physical descriptors are that they be related to nursing activities and that they be general descriptors. The requirements of the model are that it accommodates a range of both evaluative and physical ward descriptors, that it will provide an integrated system of description and that it can be used to describe individual wards. Section 8 summaries the approach used to incorporate these requirements and also the stages of development.

8.1 **The Approach used in the Development of the Physical Descriptors Model**
The fundamental basis of the approach is the assertion that it is first necessary to structure the physical descriptors, such that they reflect the structure of the evaluations, before the relationships between these two descriptors can be illustrated. Thus, while there are any number of ways of structuring the physical environment, this work argues that the most useful structure to illustrate how the setting facilitates purpose-based activities is in terms of the pattern of the actions themselves.

The first step in developing the model is to provide a systematic description of the population of wards in terms of the evaluations they receive from the nurses. It is argued that the common structure of nursing activities, identifiable both from the evaluations and from the design principles behind modern wards, is in terms of their Level of Interaction. Therefore these evaluative descriptors are used to classify the wards both in terms of the type and number of levels of interaction the wards facilitate.

The next step is to describe the wards in terms of their physical characteristics. Nine separate indices of physical characteristics are
derived. Each index describes a particular type of facility. For example, the Bedroom index includes the number of beds in the multi-bedded areas, whether these areas are rooms with doors or open bays and also where the bedrooms are located in the ward. Each ward is described by its level of provision (or partitioning) for each of the nine physical indices.

The third step is to explore whether it is possible to match the structure of the evaluations with the structure of the physical indices. To do this, the wards are grouped into classes, each class representing one level of an index. A profile of evaluative scores is calculated for each class and an MSA carried out on the data. The analysis illustrates that, at the dichotomous level, the ordering of the classes of wards by their evaluative scores is compatible with the levels of provision of the physical indices.

Having established that the physical characteristics can be ordered in such a manner as to reflect the structure of the evaluative measures, the final stage of development is illustrating the relationship between the physical and evaluative descriptors. MSA is again used. Wards with similar evaluative profiles are grouped together. The most frequently occurring level of provision of each of the physical indices is used to described the nine physical characteristics of the wards. The analysis illustrates that there were three general physical descriptors which correspond to different aspects of nursing care. They are:

1. The level of partitioning of the main ward areas.
   This includes the level of partitioning of the ward and of the bedrooms and also the level of provision and the position of the staff bases. Variations in this physical descriptor correspond with variations in the evaluations of the wards in terms of facilitating ease of patient observation.

2. The level of provision of essential facilities.
   The indices that are a part of this general descriptor are the sanitary facilities, the ancillary facilities and the offices. This descriptor appears to make a general overall contribution to the effectiveness of the ward, with high levels of provision corresponding to high scores on all the evaluative measures.

3. The level of provision of extra facilities.
   This includes the index which describes the provision of facilities for the nurses own use, such as changing rooms, and also the index describing the provision of facilities for other people's use, such as the cleaners' room. Variations in this general descriptor are most closely related to the evaluations concerned with preventing disturbances in the ward. High
provision of facilities for nurses correspond to high scores on preventing disturbances while high levels of extra facilities lower these scores.

The 3-way, general model of physical descriptors is tested on a sample of wards to determine whether it can be used to describe individual wards. The three environmental facets are retrieved, although there is some variation in terms of which facet particular indices belong. The work demonstrates that an integrated model of ward descriptors, based upon the pattern of nursing activities, can be produced which will be applicable to the individual ward case.

In summary, this chapter explores a method of developing a model of the physical characteristics of modern hospital wards which is based upon the evaluations these wards received from the nurses. While the work must be considered exploratory in nature, three general physical descriptors are derived which are related to three important aspects of nursing care. Chapter 14 discusses the results of Chapter 13 in more detail and explores their implications for the design of hospital wards.
Chapter 14
THE IMPLICATIONS OF THE MODEL OF
PHYSICAL WARD DESCRIPTORS FOR THE DESIGN OF HOSPITAL WARDS

The method of developing hospital plans is at a crucial stage in Britain. As pointed out in Chapter 1 the Department of Health and Social Services, the government body responsible for health care, is currently proposing the implementation of standard hospital plans. This policy of freezing the evolution of design gives the present work a particular significance, in that the sample of modern wards in the survey contains a range of different design types. Chapter 13 takes advantage of the design variations in current plans. It describes how the evaluative model is used to develop a model to describe the variations in the physical characteristics of modern wards.

The physical descriptors model provides a three-way classification system for modern wards. Each of the three general descriptors correspond with an aspect of nursing care. They are:

1. The level of provision of essential facilities.
Variations in this descriptor appear to influence the overall effectiveness of the ward design, with high levels of provision of essential facilities resulting in high evaluations for facilitating all aspects of nursing care.

2. The level of provision of extra facilities.
This descriptor is related to the ease with which disturbances to patients and to nursing staff can be prevented.

3. The degree of partitioning of the main ward areas.
This physical descriptor corresponds with the ease with which nurses can observe patients in the ward.

Together the three physical descriptors generate eight different design types; as reproduced in Table 13.6 of Chapter 13.

The model is empirically derived and, as yet, untested against another sample of wards. Nevertheless, it was developed using a sample of wards which includes approximately 30% of the available modern wards in England (See Appendix 2). Consequently it is considered appropriate to use the model of physical ward descriptors to provide information relevant to the design of adult acute hospital wards. This is the purpose of Chapter 14. The chapter describes the relationships demonstrated by the model and discusses the implications of these results.

Section 1 describes the relationships between the physical and evaluative descriptors as indicated by the physical model. The identified
relationships are used to examine the assertions about the links between nursing care and ward design made in Chapter 12.

The remainder of the chapter considers the implications of the physical descriptors model for ward design. Section 2 describes how the model may contribute to the remodelling of existing ward stock. Section 3 presents the contribution the model can make to the design of standard plans for new wards.

The current thinking on ward design is still based upon the innovations of the Nuffield plan. Therefore Section 4 presents a critical evaluation of the Nuffield design principles in the light of the physical descriptors model. It suggests that a fundamental rethink of the principles behind modern wards is needed before the policy of standard plans is implemented.

1 THE RELATIONSHIPS BETWEEN THE PHYSICAL AND EVALUATIVE WARD DESCRIPTORS

The model presented in Chapter 13 describes modern wards on three general physical characteristics. Each descriptor is made up of a range of more specific physical variables and each has been demonstrated to be related to particular aspects of nursing care. This section describes the identified relationships between the physical descriptors and the nurses' evaluations of hospital wards. In addition the proposed implications of the evaluative model, presented in Chapter 12, are re-examined in the light of the empirically demonstrated relationships. The discussion is divided in sections, each corresponding to one of the aspects of nursing care facilitated.

1.1 The General Effectiveness of the Ward

The model presented in Section 6 of Chapter 13 demonstrates that a high level of provision of sanitary facilities, ancillary facilities and offices all correspond with high evaluative scores for all aspects of nursing care. As the model suggests high levels of provision of these facilities are essential to the general effectiveness of the ward, these facilities are collectively described as Essential Facilities.

This general ward descriptor illustrates the complex nature of providing care to patients. Administrative facilities such as offices for the medical staff and for the nursing staff are needed. Facilities for the basic care and comfort of patients such as sanitary facilities are needed as well as facilities for preparing for and treating patients.

The empirical evidence of this relationship also helps to explain an apparent discrepancy in the evaluative model. The evaluative model
predicts that the use of the treatment room will be a part of Direct Patient Care. Yet in the analysis the questions about the use of the treatment room occur in the Indirect Care region of the space. One proposed reason given in Chapter 12 for nurses not construing the use of the treatment room as a part of direct care of the patients, is that it is not being used for that purpose. However the nursing officers, who provided the physical data, reported only three of the wards which have a treatment room were not using it as intended.

The creation of this facility was an innovation of the Nuffield plan (1955). It was incorporated into the design in order to accommodate Technical Nursing; that is 'those nursing activities involving the implementation of the treatment prescribed by the doctor' (Nuffield, 1953). The objective of the plan was to remove this range of activities from the bedside to the treatment room, leaving basic care and comfort as the sole function of the bed area. If the treatment rooms are not being used as intended, the conclusion to be drawn is that current wards have an over-provision of Technical facilities.

Over-provision leads to the expectation that the different levels of provision of the treatment rooms will not correspond with different levels of the evaluative descriptors in the model of physical descriptors, as all the wards would have the necessary minimum provision. While no one physical index dealt solely with the treatment room, the Ancillary Index does include it as well as the equipment room and the pantry. The partitioning of the MSA space by this index illustrates that a high level of provision of these facilities has the overall impact of increasing all the evaluative scores.

This finding suggests that, whatever the function of the treatment room, it is an essential part of a well equipped modern ward. In addition, this evidence lends support to the tentative suggestion of Chapter 12 that nurses categorise the type of care into Indirect care, Technical care and Basic care; with Technical care occurring in the treatment room and at the bedside. As suggested in Chapter 12, this points to the necessity of an alternative solution to that of attempting to remove Technical Nursing from the bedside in order to separate Technical and Basic care.

In summary, one area of innovation of the Nuffield plan was improving the level of provision of essential facilities. The relationship found in the current work suggests the general increase in facilities introduced by the Nuffield plan has become an essential part of a successful ward. In addition, the demonstrated relationships suggests that if separating Technical and Basic nursing care is still considered an important
criterion of ward designs, a new way of thinking about this problem is needed, one possibility being, as suggested in Chapter 12, removing Basic care rather than all Technical care from the bedside.

1.2 Preventing Disturbances

The physical descriptors model of Chapter 13 demonstrates that the level of provision of two types of facilities corresponds with the evaluative scores for preventing disturbances. One is the level of provision of staff facilities and the other is the level of provision of facilities not directly used by patients or nursing staff.

The 'preventing disturbances' measure applies to both patients and nursing staff, as illustrated by the Type of Care facet. Indirect care disturbances include lack of privacy for discussion between staff, and problems of storing unused furniture. The Nurses' Facilities Index includes the provision of staff W.C.'s on the ward, the presence of changing facilities on the ward and whether these changing rooms are shared with nurses from other wards. High levels of provision of this Index correspond with high scores on the 'preventing disturbances' measure. The conclusion to be drawn is that the inclusion of facilities for the personal comfort of the nurses is an important aspect of modern hospital wards.

The other index related to Preventing Disturbances is the Extra Facilities Index. The inclusion of the cleaners' room, a relatives overnight room or a flower room on the ward, is associated with low scores in preventing disturbances. This suggests the accommodation of extra people in the ward makes the task of preventing disturbances to patients and/or nursing staff more difficult.

The prevention of disturbances to patients has three different aspects to it, as defined by the Referent facet of the evaluation model. They are: privacy and quiet while in bed, no disturbances from the lighting in the ward at night and also privacy in the sanitary facilities. Consequently, a proposal of Chapter 12 is that the level of provision of the Sanitary Facilities will be related to disturbances caused to patients.

The Sanitary Facilities Index does not specifically relate to the Preventing Disturbances measure in the physical descriptors model. Rather, a high level of provision generally increases the number of high evaluative scores. However the analysis using individual wards (Section 7, Chapter 13) does associate the provision of W.C's, baths and showers specifically with Preventing Disturbances.

While the precise relationship between the level of provision of sanitary facilities and the care of the patients can not be determined from the
present work, the information available does suggest good provision of these facilities plays an essential role in providing care and comfort to patients. A major concern of the Nuffield plan was increasing the general level of provision of these facilities. The current analyses suggest this is another instance where the innovations of the Nuffield plan have improved the ward situation.

1.3 Ease of Observation

The Observation measure includes observing patients in the whole ward, access to patients, observation of patients from the nursing base, patients being able to see staff and the supervision of junior staff.

Three different indices partition the MSA space in terms of good observation; the Ward Index, the Bedroom Index and the Nursing Station Index. The Ward Index includes the percentages of patients visible, the percentages of patients in single bedrooms, the shape of the ward and the overall size of the ward. The Bedroom Index describes the bed areas in terms of their location in the ward, the number of beds and whether they are open bays or closed rooms. The Nursing Station Index includes the number and location of the Nursing Stations.

Chapter 12 predicts that design compromises may be necessary, in that ease of observation and preventing disturbances are very different in terms of the level of interaction they imply. The question is raised as to whether one ward plan can adequately accommodate both aspects of nursing care. Similar concerns have been expressed by other researchers in this area such as Sears and Auld (1976) and Noble and Dixon (1977).

The partitions of the three indices in the physical model support the assertion that Observation and Privacy are, for many ward designs, incompatible. Large, closed wards with small bedrooms and low provision of nursing stations receive high scores on Preventing Disturbances; small open layouts with large bedrooms and a high provision of nursing stations improve Observation.

The relationship between Observation and Preventing Disturbances in the ward context is not, however, a simple dichotomy. The physical descriptors model includes a group of wards which are assessed as facilitating the full range of nursing activities, including Observation and Preventing Disturbances. The main areas of these wards have small open layouts with large bedrooms and a high provision of Nursing Stations.

The Prevention of Disturbances, a part of which is patient privacy, does not appear to be closely related to the characteristics of the main ward areas. Rather, it is more closely related to the level of provision of
various facilities. It is the ease of patient observation which is most affected by the plan of the main area. Consequently ward designs are potentially possible which do not necessarily have to involve compromises in terms of which Level of Interaction they are to facilitate.

1.4 Location of the Dayroom
A further source of conflict proposed in Chapter 12 concerns the location of the dayroom in the ward because of the range of activities associated with this facility. The expectation was that easy access to the dayroom, and the preventing of noise disturbances caused by the activities in the dayroom, can not be accommodated in one ward. However, from the point of view of the nurses, this is not the case.

The Dayroom index makes a unique grouping of wards in the analysis presented in Chapter 13. Wards with dayrooms on the periphery have high scores for preventing disturbance only (001). However, wards with centrally located dayrooms correspond with all the other high evaluative combinations including high scores on Preventing Disturbances when this high score is accompanied by other high element scores. This suggests ward layouts with dayrooms in the centre can accommodate the range of activities associated with the facility.

1.5 Conclusions on the Relationship between the Physical and Evaluative Ward Descriptors
In general the results indicate a more positive position concerning the relationship between current nursing practice and modern ward designs than is suggested in Chapter 12. Modern wards do exist which are seen by the nurses as facilitating all aspects of nursing care. In addition, the improvements in the levels of provision of patient and nursing facilities introduced by the Nuffield plan has resulted in more effective wards. However, it also illustrates that there are many modern wards with insufficient provision of essential facilities and wards which do not facilitate the full range of nursing activities. The following sections discuss the implications of the results for the design of hospital wards.

2 IMPLICATIONS OF THE PHYSICAL DESCRIPTORS MODEL FOR SYSTEMATIC VARIATION IN WARD DESIGNING
Implications from the model are identified for two quite different approaches to ward design. The first is variety in design, that is the generation of specific plans to respond to the particular situation. Section 2 describes how the 3-way model can be of use in this design situation. Illustrations are also given on how the physical model can be used to provide designers with alternative solutions to particular problems. Systematic variation in design is discussed in terms of the policy of remodelling older wards.
2.1 *A Taxonomy of Ward Design Types*

The model provides a three-way classification system for describing the physical characteristics of hospital wards, with each classification relating to a particular aspect of nursing care. As illustrated in Table 13.6, eight different ward types can be generated from the system. Consequently, one benefit of the model is that it can be used to facilitate systematic variability in design to correspond to the nursing needs of particular groups of patients. By way of example, the known characteristics of medical and orthopaedic patients are contrasted, to illustrate how the designs of the wards intended to house these patients may be systematically varied to respond to the patients' needs.

According to Cartwright (1964), patients in medical wards do not have a clearly predictable course of recovery. Cartwright suggests this results in greater anxiety and insecurity for these patients. The design type which appears most appropriate for the situation is one with small, open main areas for maximum contact between the patients and nurses, as previous research (Sears and Auld, 1976; Raphael, 1969; Noble and Dixon, 1977) suggest just being able to see a nurse is a source of comfort to patients.

A high provision of essential facilities such as the ancillary facilities and sanitary facilities would also be important to cater for the differing stages of recovery of the various medical patients in the ward. The exclusion of facilities for other ward users, such as cleaners, may also be important to prevent these patients from being further distressed by additional noise and activity.

A very different patient group are the surgical patients, particularly orthopaedic patients. Once past the stage of immediate post-operative recovery these patients have a more predictable recovery path (Cartwright, 1964). This would suggest that they do not need to be in a small ward to reduce anxiety. The major problem for these patients, according to Raphael (1969) and Cartwright (1964), is boredom. It is possible that the inclusion of facilities for extra users could be a source of interest rather than disturbance. Also these patients would require a high provision of patients' facilities such as the sanitary facilities and dayrooms. Centrally located dayrooms may also help because of the limited mobility of many of the patients. The above examples illustrate how the model can be utilised to produce rational variations in hospital ward designs.

2.2 *Alternative Design Solutions*

Flexibility in design is also suggested at a more detailed level of the model. As described in Chapter 13, each of the nine physical indices is
made up of a range of variables, with different combinations of physical variables having the same relationship with the evaluative descriptors. For example Table 13.3 of Chapter 13 illustrates that the ward does not have to be small for its layout to facilitate good observation, provided it does not have too many patients in single bedrooms and has a high percentage of patients visible from the nursing base. Consequently, the model does not dictate the best design solution, rather, it provides a range of alternatives, each of which facilitates particular aspects of nursing care. It is the role of the designer to choose the particular combination of variables which he considers best suited to the requirements of the situation.

A further characteristic which makes the model a useful aid in designing for flexibility is that it can be used to describe individual wards, as illustrated in Section 7 of Chapter 13. The most immediate contribution of this is for remodelling wards. The reduction in capital expenditure in the National Health Service has meant that remodelling rather than rebuilding has often become necessary. For example, the Welsh Division of the DHSS is currently involved in a large scale remodelling programme. Remodelling requires information about the individual case. The model can be used to find a match between the particular nursing needs and the design of individual wards. Because of the flexibility in the model it can also be used to examine which particular design solution can most effectively be implemented from the already existing characteristics of the wards.

2.3 **Summary of the Contribution to Systematic Variations in Design**

In summary, the integrated model of physical descriptors has the potential of contributing to the systematic designing of wards for specific situations. Because the pattern of physical characteristics corresponds to the pattern of evaluative descriptors, it can be used to facilitate the designer in choosing the most appropriate overall plan. However, because the model provides a range of different physical characteristics at the more detailed level which correspond to the evaluations, it allows the designer to produce a design tailored to the requirements of the particular situation. Confidence in the ability of the model to achieve this is provided by the demonstration that it can be used to describe individual wards. In this way, the model is seen as an aid to design flexibility. However, as pointed out in Chapter 1, the trend is towards standardisation in hospital design. Section 3 discusses the potential contribution of the model to this policy.

3 **The Potential of the Model for Use in Designing Standard Plans**

Chapter 1 suggests that much of the applied significance of the present
work relates to the DHSS's policy of developing standard plans to be used in the design of all adult acute hospitals in England. Section 3 discusses the immediate contribution the model can make to this method of ward design. Section 3.1 describes the change in policy and Sections 3.2 and 3.3 give examples of the model's applied potential in providing design-relevant information.

3.1 The Policy of Standard Plans

As stated by the King Edward's Fund (Baynes et al., 1969), standardisation constitutes a major change in the system utilised in the production of hospital buildings. Plans for a hospital have traditionally been generated at the Regional level of the NHS, with the central DHSS providing guidance only. This original procedure for developing plans results in unique design solutions for each building, a process which requires vast expenditure in both time and money. In order to improve efficiency, the DHSS intends to provide standard plans in the form of guidance which will be modified by the Region to accommodate the unique problems posed by a particular design site. The three prototype standard plans developed by the DHSS are 'Best Buy', 'Harness' and the most recent design 'Nucleus' (Stone, 1976).

At present building designs undergo a gradual process of modification and change. Thus, while the Nuffield Plan remains the basis of the layout and provision of current wards (See Table 2.1, Chapter 2), changes in design in the last 25 years are documented (Stone, 1976). Once standardised guidance is put into practice, the natural evolution of design ceases. Therefore, the designers must be confident that the design being enshrined is appropriate. The basis of such informed design decision making is evaluation. As stated by the King's Fund Foundation (Baynes et al., 1969):

'Evaluation is an essential corollary of standardisation and the use of those modern building methods that are intended to reduce cost.'

The policy of standardised hospital plans is in the developmental stage. There is still the opportunity to influence these standard plans by providing design-relevant information from the people who will use these buildings. The area of contribution of the present work is an account of the relationship between ward design and the provision of nursing care, an aspect of which is the model of physical ward descriptors. Sections 3.2 and 3.3 discuss the implications of the model of physical descriptors for the design of future standard plans. They include the contribution that a systematic taxonomy of current ward designs can make to the planning of standard designs, and an example of how the model can make an economical contribution.
3.1 **A Systematic Taxonomy of Design Types**

One characteristic of the model which makes it an important source of information for future standard plans is that it provides a systematic taxonomy of ward types. To date no such description has been available. For example ward types are frequently described only by their shape; such as Racetrack, Linear and L shaped (Stone, 1976). This is just one variable included in the present Ward Index as described in Chapter 13. It gives no indication of levels of provision and only in combination with other layout characteristics is it related to nursing activities. The names used to describe the prototype standard plans (Best Buy, Harness and Nucleus) are even less closely related to the activities within the ward. The first is a statement of the economic objective and the latter two describe the method of modular construction of the whole hospital. If future standard plans are to benefit from the successful modifications made in current ward plans, a systematic account of these variations is needed. The model can be used for this purpose.

3.2 **Ward Design Economy**

A second contribution of the model is the relationship it demonstrates between the provision of Extra Facilities and the evaluations of the wards in terms of preventing disturbances. The rationale behind the policy of standardisation is economic. It is estimated that 60% of all capital expenditure on a District General Hospital goes into the design and construction of the wards (DHSS, Bdg Note: 4, 1976). The model illustrates that a high level of provision of facilities directly concerned with the primary users, patients and nurses, is necessary. However, it also indicates that a high provision of facilities not directly related to these primary users reduces the effectiveness of the ward. This suggests that these extra facilities will be more effectively provided at the floor level, to be shared by wards; the result being either space for increasing the provision of essential facilities and/or a reduction in costs.

3.3 **Summary of the Physical Model's Contribution to Standard Plans**

In summary, the creation of standard plans to be used in all ward designs is still a relatively new policy. This section has given two examples of how the physical model can provide information in order to help ensure the standard design solutions will be effective in facilitating nursing care. Section 4 takes this one stage further and examines the design policies which underlie the plans of modern hospital wards.
4 IMPLICATIONS OF THE MODEL FOR THE DESIGN PRINCIPLES BEHIND MODERN WARD PLANS

A focus of the current work has been the design policies behind the Nuffield ward plan developed in 1955. The basic innovations of that plan are still a part of current DHSS guidance (See Table 2.1, Chapter 2) and are incorporated in the prototype standard plans. Consequently, by describing the implications of the model for the design assumptions inherent in the Nuffield plan, fundamental issues are raised concerning the match between the standard plans and current nursing practice.

As is discussed in Chapter 2, the Nuffield plan is based upon three general objectives; to improve nursing efficiency, to provide for the comfort and wellbeing of the patients and to improve the status of basic nursing care given to the patients. (Table 2.2 in Chapter 2 documents the nine major design innovations intended to accomplish these objectives.) The purpose of this section is to explore the match between these objectives and the physical descriptors model. In two areas the match is clear. As is discussed in Sections 4.1 and 4.2, the Nuffield plan increased the level of provision of both nursing facilities to improve efficiency and also patient facilities to improve the comfort and well being of the patients. The model illustrates that such links between these physical descriptors and nursing care do exist.

The other major design objective of the Nuffield plan was to improve the quality of basic care by facilitating greater contact between the patients and the nurses. The design assumption was that facilitating easy access to patients, through producing a compact design, would lead to greater nurse/patient contact. The model suggests this assumption is incorrect. There are five points of evidence:

- Access is equated with Observation by nurses working in cubicled wards.
- The direct contact between nurses and patients is not strongly affected by variations in ward design.
- The general layout must be assessed as facilitating the observation level of interaction before it is considered as appropriate for the full range of activities.
- The Observation level of interaction is not facilitated by highly partitioned wards.
- Observation and Preventing disturbances are associated with different ward characteristics and therefore are not in conflict.

Section 4.3 presents a detailed account of this evidence.

4.1 Nursing Efficiency

The Nuffield plan incorporated several design innovations with respect to the ancillary facilities in order to improve nursing efficiency. They include the provision of separate clean and dirty utility rooms, the
creation of the treatment room and the placement of the ancillary rooms in more convenient positions within the ward. The relationship between the physical and evaluative descriptors, found in the model, suggests the general increase in facilities introduced by the Nuffield plan has become as essential part of a successful modern ward.

However the model provides further evidence that the policy of separating Technical and Basic care, through removing Technical care from the bedside, has not been successful. Both the bedside area and the treatment room remain places used for this type of care. This is one area which requires both additional research and alternative design experimentation before standardisation is complete. Technical care, in general, involves treating bedridden patients, while Basic care (such as talking with and reassuring patients, providing meals, grooming patients, helping patients use the sanitary facilities and providing sources of recreation) is potentially less restricted in where it occurs. Therefore the solution may lie in providing more facilities away from the bedside for the activities involved in basic care.

4.2 Comfort and Wellbeing of the Patient

The Nuffield plan increased the provision of facilities for patients. The inclusion of a dayroom for patients and a general increase in the level of provision of sanitary facilities were intended to facilitate the patients' feeling of comfort and wellbeing. Again the model supports the Nuffield assumption about the link between levels of provision and patient wellbeing. Thus according to the physical descriptors model the Nuffield plan made a major contribution to the provision of nursing care by increasing the level of provision of essential facilities.

4.3 Improving the Quality of Basic Care through Partitioning of the Ward

The one innovation of the Nuffield plan that most radically changed the character of hospital wards was the partitioning of the bed area into cubicles in order to produce a more compact layout. As described previously in the chapter, the assumption was that easy access to patients would result in greater contact between patients and nurses. This, it was felt, would contribute to improving the quality of the basic care which was to take place at the bedside. The team acknowledged the fact that observation would be impaired, but felt it was adequately replaced as easy access.

The design principles behind the Nuffield partitioning of the ward were prescriptive in nature. The design was based on what the Nuffield team thought nursing care ought to be rather than what their research found it to be (Nuffield, 1953). Evidence from the present work suggests that the
Nuffield design assumptions lead to an inappropriate design solution to the problem. The first indications of this are presented in Chapter 12. Nurses construe 'access to patients' to be a more remote activity than anticipated by the Nuffield team. Also 'observation of patients' is still an activity nurses see as a part of nursing care.

By examining the relationships between the physical and evaluative descriptors further evidence is provided that the Nuffield design solution did not solve the problem. The key level of interaction the design was intending to facilitate was Direct Contact between patients and nurses ($A_3$). However the physical descriptors model demonstrates that this level of interaction, in itself, is quite unrelated to the physical descriptors. (None of the nine physical indices partitioned the MSA space in a manner that corresponds to that evaluative measure.) In other words, nursing activities at this level, such as providing bedside care, are not profoundly influenced by design. (The exception to this is the relationship between the Nursing Base Index and Contact/Use ($A_3$). However the $A_3$ evaluative measure covers both contact between people and use of facilities, including the use of the staff base for clerical work. It is more likely that high provision of staff bases is seen as facilitating the use of this facility for clerical work rather than contact between patients and nurses.) The implication of the finding that direct contact between patients and nurses is not effected by design is that design is not the most appropriate method for modifying people's behaviour. As is argued in Chapter 2, major changes in the current practice of nursing care must come from within the profession, perhaps through education; not prescribed from outside.

A further characteristic of the model is the fact that there are a group of wards which, relative to all the other wards, are seen by the nurses as facilitating the full range of nursing activities. These wards most closely resemble the open Nightingale wards. They are either small wards or have a high percentage of patients visible, have large bedrooms (6-12 beds) or have open bays for the bedareas and have a high provision of nursing bases. An implication of this group of wards is that for the general layout of the main ward area to facilitate the full range of nursing activities it must first facilitate ease of observation between nurses and patients. A ward which does not promote this activity is unlikely to be considered a successful design by nurses. This conclusion is also supported by research on patients' opinions of their stay in hospital. Cartwright (1964), Raphael (1969), Sears and Auld (1976) and Noble and Dixon (1977) all find that the most remote level of contact,
just seeing a nurse, is often sufficient in providing patients with a sense of confidence and assurance. Thus, ease of observation is not just an alternative to directly visiting a patient. It is an essential aspect of providing care and comfort to patients.

A further implication of this result is that 'observation of patients' and 'preventing disturbances to patients' are not mutually exclusive. The layout of the ward is more closely related to the Observation measure while the levels of provision of various facilities corresponds to Preventing Disturbances. Again this is supported by previous research. For example Sears and Aulds (1976) find that patients criticise the open Nightingale plans for lack of amenities, not lack of privacy. Noble and Dixon (1977) find patients are more concerned about social contacts with other patients than with privacy. They note that patients often will remove themselves to the sanitary facilities if they want privacy. Noble and Dixon further suggest that lack of privacy in the bedrooms concerns such things as having to use a bedpan in front of a nurse. Cubicled wards would not help remove such problems.

Another aspect of privacy is noise disturbance. Cartwright (1964) finds that the most disturbing noise to patients is from other patients who are distressed or very ill. Cartwright's work also suggests that that type of noise from other patients is most upsetting when the patient is known. The implication is that small bedrooms lead to a high level of involvement between patients which is potentially distressing. Noble and Dixon (1977) also suggest small bedrooms may lead to a level of involvement which is potentially detrimental to the patients.

The findings of previous work and also of the current work indicate privacy or lack of disturbances is not simply not being observed, nor is it simply provided by small closed bedrooms. Privacy can be considered a part of a larger issue, patients' control over their interactions with the rest of the ward environment. This control concerns the full range of interactions. For example, the most frequent complaint of patients is a lack of information about their condition (Raphael, 1969). Likewise being in visual contact with the nurses and having social contacts with other patients are equally important levels of interaction to the patients as is not being disturbed. In addition the evidence suggests that ward designs do not need to compromise one of these levels in order to adequately facilitate the others.

4.4 Summary of the Implications of the Model for the Principles behind Modern Wards

In summary, the discussion in this section is focused upon the design principles behind the prototype Nuffield plan (1955). Its purpose is to
explore the match between these principles and the physical descriptors model, and from the discussion identify the implications for future standard plans. The Nuffield plan increased the level of provision of both nursing facilities, to improve efficiency, and also patient facilities to improve the comfort and wellbeing of the patients. The model illustrates that such relationships between these physical descriptors and nursing care do exist. The conclusion to be drawn is that a high level of these essential facilities is an important component of standard plans.

Another objective of the Nuffield plan was to improve the direct contact between the patients and nurses. The design assumption was that facilitating easy access to patients, through producing a compact design, would lead to greater nurse/patient contact. The evidence presented suggests this is not true.

The conclusion to be drawn from the evidence is that a complete rethink of the basic layout of ward plans is needed. The assumption that compact, partitioned wards will lead to greater contact between nurses and their patients appears incorrect. In addition the partitioned layout reduces another level of contact, visual contact; nor is patient privacy appreciably improved. The Nuffield plan represented a radical departure from the then current ward design. The evidence presented above suggests a similar bold departure from the now current tradition is needed before a final standard plan is implemented.

5 SUMMARY OF THE RESULTS AND IMPLICATIONS OF THE PHYSICAL DESCRIPTORS MODEL

In summary, this chapter has described the relationships between the physical and evaluative descriptors of modern hospital wards. It provides examples of how the model of the physical ward descriptors can provide information relevant to both the problems involved in remodelling existing wards and in designing future ward plans. In addition the physical model is used as the basis for a critical evaluation of the policies underlying current ward design.

This chapter has dealt with the physical descriptors model as it relates to nursing care in the modern hospital ward. The final chapters include the wider implications of the model as a part of the conclusions to be drawn on the general model of environmental evaluations developed in the thesis.
Chapter 15
A SUMMARY OF
THE APPLIED CONTRIBUTION OF THE WORK

The applied objectives of the work, consistent with other research in the field, are restricted to the specific topic area. In this instance it is the hospital ward/nursing care context. As is argued in Chapter 2, this area is in need of input from the behavioural sciences. Historically the design of hospital wards has been a reflection of the type of nursing care being provided. This is an example of what Levy-Leboyer (1982) describes as equilibrium between people and their environment. The equilibrium is built up by creating specific environments suited to people's requirements and broken down by changes in people, society and technology. As nursing requirements changed, the design of wards changed to accommodate them. However the Nuffield Plan (1955) broke with this tradition. Rather than being a reflection of the then current nursing practices, it was a reaction against the way patient care was being provided.

The Nuffield Plan has become the prototype for ward planning in this country (Stone, 1976). For over 25 years nurses have been providing care in this type of ward. Yet there has been little research to examine the relationship between design and patient care from the point of view of the nurses working in the modern ward. The present work has sought to fill this gap in current information for ward planning.

The work has focused on three areas where it is felt an applied contribution can be made. They are: presenting an account of the nurses' conceptions of providing care in the ward, the development of a standard instrument for the evaluation of future wards and an examination of the relationship between the evaluations and the physical characteristics of the wards. The extent to which each of these objectives is achieved is discussed and suggestions are made for the expansion and strengthening of the present work.

1 AN ACCOUNT OF THE NURSES' CONCEPTIONS OF PROVIDING NURSING CARE

In this work it is felt that the most important contribution of the social sciences to design is in providing designers and decision makers with information on how people use and conceive the environments provided for them. In this instance it is to provide ward planners with an account of the nurses conceptions of providing care to patients in the modern ward context. The model presented in Chapter 10 provides this account. Section 1.1 gives examples of the implications which can be drawn from the model and Section 1.2 describes possible areas for further development.
1.1 **Implications of the Model of Ward Evaluation**

The model is a description of what activities the nurses consider constitute nursing care in the ward. In addition, it describes the functioning of the ward as an integrated whole, by illustrating the pattern of nursing activities involved in the provision of total patient care. Implications are drawn from the model for the way current writers on the nursing profession view the role of the nurses and also for future ward planning. For example, in Chapter 2 evidence is presented which indicates a consensus in the nursing literature that qualified nurses have as their focal role the administration of the ward. Yet the model, arguing from the stance of a hierarchy of purposes, illustrates that the focal activities of all ward nurses are those concerned with the direct care of the patients.

Another implication drawn from the structure is that the Nuffield assumption, namely that compact partitioned wards would remove the necessity for good visibility in the ward by improving the ease of access to the patients, appears to be incorrect. Observation between patients and nurses remains an important aspect of providing care. In addition, 'access to patients' is viewed by the nurses working in this type of ward as part of the most remote level of interaction between patients and nurses. In other words, there is no evidence to suggest that partitioning wards has had the desired effect of bringing the patients and nurses closer together.

Another example of the utility of the model is the information provided by the comparative analyses between different nurse groups presented in Appendix 4. The analyses demonstrate a homogeneity across the groups in their interpretation of providing care in hospital wards. The differences which do exist between the role groups are most evident in terms of the intensity of their responses, with each group being most critical of the aspects of the wards most relevant to their work. These examples illustrate that the model of ward evaluation provides a rich source of information about the functioning of current hospital wards.

1.2 **Possible Areas of Expansion of the Evaluation Model**

The content area of the current work is very specific, being the evaluation of modern cubicled wards by nurses caring for adult acute medical and surgical patients. There are several areas into which the work can be expanded in order to increase its potential in making an applied contribution to ward design. This section describes the areas.

The model is of the nurses' conceptualisations as they relate to evaluation. An important test of the work would be to demonstrate that a similar structure is obtainable using other methods, such as
observational studies. Some support for this possibility is provided in the present work. The predictions about the content and relationships of the ward evaluation model are derived from previous research in the ward context. As described in Chapter 7, this previous work utilises a range of different methodologies. The retrieval of the model lends support to the potential methodological generality of the model. However, wards and hospitals are very permanent structures. If the model is to be used to influence their design, verification using other methods will make a significant contribution to the strength of the work.

It has been proposed that nurses are the primary providers of care in the ward. While it has been argued that this, and the historically close relationship between nursing care and ward design, are justification for restricting the work to this group, it can not be forgotten that they are not the only ward users. Wards must accommodate patients, doctors, paramedical staff, cleaners and visitors as well as nurses. Basing a design solely on the activities of one group may result in an inadequate design solution for the others. The work of Sears and Auld (1976) suggests that all these groups have a somewhat different perspective on the ward functioning. An immediate area for future work is to examine the extent to which the model, both in terms of content and structure, is applicable to the other ward users. Such a complete description of the functioning of the hospital ward would provide a more accurate account of this facility.

There is one final area where expanding this work would contribute to the design of adult acute wards. The work has focused solely on modern cubicle wards. Yet the findings have suggested that future plans may be more successful in accommodating the full range of nursing activities if they incorporate some of the characteristics of the older Nightingale ward plan; the most obvious example is the improvement of visibility by opening up the layout. At present there is no information to indicate what would happen to the overall functioning of the ward if this were to occur. Previous work such as Ittelson et al.'s (1970) research on the remodelling of a solarium and Parsons' (1970) work on open plan schools versus individual classrooms, highlight quite unexpected changes in use when design modifications are introduced. These studies indicate the need for examining the structure of the ward evaluation model when applied to nurses working in these older styled wards. By illustrating the relationship between all the activities and places within the ward, the model may point to unforeseen consequences or ramifications of such design modifications.
Moving beyond the immediate context of modern acute wards in Britain, additional research can also be suggested. For example, American wards appear to function quite differently. Trites et al. (1970), in a study of American wards, find that improving the access to patients is a positive contribution to providing care. Yet the discussion of the model in Chapter 12 indicates that the Nuffield plan, while intending to improve this through making the ward more compact, actually resulted in access to patients being construed as part of the most remote form of communication between nurses and patients. Testing the model on American wards might help to explain these differing results. Extending the range of patients types is another area of expansion. For example, children, geriatric patients and psychiatric patients all would appear to require a quite different form of nursing to that provided in the adult acute ward. A final possible extension of the work to increase its contribution to health care delivery, is to establish whether the ward evaluation model can be used as a template for evaluating other locations within the hospital complex.

In summary, one applied objective of the work is to provide an account of nursing care in the modern ward context. The model represents this account. While the model is self-contained, suggestions have been made to strengthen and expand it to provide a more complete picture of the functioning of the ward, in order to facilitate the future planning of ward designs. In addition examples of future research have been given, which would extend the work beyond the immediate context of adult acute wards.

2 A STANDARD EVALUATION INSTRUMENT

The second applied objective is to develop a standard instrument to be used in future ward evaluations. As previously stated, a commitment to the concept of building evaluation by the Department of Health is suggested by its inclusion in Capricode (1973), the DHSS document which lays down the guidelines for the design process. However, design teams seldom include an expert on evaluation. Therefore, the tradition of standard instruments, so long established in psychology, can usefully be extended to environmental evaluations. The retrieval of the model using the 22 structuple exemplar questions, presented in Chapter 10, illustrates that the full range of the nurses' experience of providing care could be obtained using a one page, 22 item questionnaire. The data of the present work represents the data base against which future evaluations can be compared.

If such an instrument is found to be of use in the design process, future research may demonstrate that the instrument can function as a template.
for the development of a battery of such tests. However, as stated by Milcarek and Struening (1975), research instruments are the operational definitions of the concepts under study. Before the ward evaluation questionnaire can validly be used in other contexts, the generality of the model must be proven.

3 THE PHYSICAL DESCRIPTORS MODEL

The final applied objective of the current work is the linking of the evaluative descriptions of the wards, provided by the nurses, with the physical characteristics of the wards. Chapter 13 describes the approach used, namely the development of a physical descriptors model. Chapter 14 discusses the implications of the model for ward planning. This model remains the most tentative of the applied contributions because of the limited theoretical basis for its development. (A discussion of the more general implications of the physical descriptors model is presented in Chapter 16). However, the results of this work are not at variance with other findings in the field, and clear design implications can be drawn. Section 3.1 provides a summary of the results and Section 3.2 discusses possible ways of strengthening the model.

3.1 Implications of the Physical Descriptors Model

As argued in Chapter 13, there is an infinite number of ways of describing the physical characteristics of a building, (size, shape, form, etc). The approach of this work is to describe the physical characteristics in such a way that the descriptions reflect the pattern of nursing activities as represented by the evaluation model. This method of describing the physical features is necessitated by the purpose the model is intended to achieve, that is, to illustrate how different ward design types compare in facilitating the various aspects of nursing care.

The physical descriptors model provides three separate ways of describing the physical characteristics of modern wards, each of which relates to a particular aspect of nursing care. They are:

1. the level of partitioning of the main ward areas. Variations between wards on this descriptor correspond to the variation in the degree to which the wards facilitate ease of patient observation.

2. the level of provision of essential facilities. The relationship between this general descriptor and the evaluations is that high levels of provision of these facilities correspond with high evaluation scores for all aspects of nursing care.

3. levels of provision of extra facilities. Variations in this general descriptor are most closely related to the evaluations concerned with preventing disturbances in the wards. High levels of provision of
facilities for the nurses' own use, result in high scores with respect to this aspect of nursing care, while high levels of provision of facilities for people other than patients and nurses are construed as reducing the effectiveness of the ward in preventing disturbances.

As discussed in Chapter 14, the physical descriptors model is the first systematic taxonomy of modern ward types to be generated. One potential use is as an aid in the remodelling of existing ward stock. Because of its link with the evaluations, it can be used to identify the general ward type which would be most applicable to the specific remodelling problem.

The taxonomy of current ward types is also seen as having a contribution to make towards the design of future ward plans. As stated in Chapter 14, if future plans are to incorporate the successful modifications of present ward designs a systematic account of these variations is needed.

A final applied contribution of the model of physical descriptors is its implications for design policies. For example, Chapter 14 uses the model to discuss the appropriateness of the Nuffield design assumptions, which are the basic policies behind the modern cubiced ward plan. Two Nuffield design assumptions are clearly confirmed. One is that patient wellbeing can be facilitated by increasing the level of provision of patient facilities, such as dayrooms and sanitary facilities. The model illustrates that wards with high levels of patient facilities are evaluated more positively than those with lower patient provision. Likewise, the relationship between the provision of ancillary facilities and the evaluations of the wards confirms the assumption that increasing the provision of these essential facilities will improve the overall effectiveness of the ward.

The third Nuffield design assumption which the model clearly addresses, is that partitioning the ward into smaller bedroom cubicles, in order to create a more compact ward layout, would improve access to patients and in turn, would result in greater contact between patients and nurses. It was this design assumption which most radically changed the layout of hospital wards. Yet in Chapter 14, five points of evidence are presented which suggest this design assumption to be unwarranted.

Taken together the evidence presented in Chapter 14 suggests the modern hospital ward has perpetuated a design solution to a problem, which not only does not solve the problem of greater contact, but also makes other aspects of nursing care more difficult.

These findings signal the opportunity for major changes in current and
future ward planning. High levels of provision of essential facilities to ensure nursing effectiveness, good provision of patient facilities to promote patient independence and adequate provision of facilities for the nurses themselves to encourage nurses to see the focus of their work as providing care in the ward context, are all suggested by the model of physical descriptors. These characteristics, together with greater freedom in the general layout of the ward than that imposed by the partitioning of current wards, may well lead to new innovations in design which are capable of achieving the policies underlying the Nuffield work.

3.2 Areas of Further Work

The implications drawn from the physical descriptors model have dealt harshly with a whole trend in ward design. Yet, as previously stated, these implications are based upon work which, at best, must be considered exploratory in nature. Much work is still needed on the various stages of the development of the model to provide a stronger basis for the assertions regarding ward design. This section discusses the work remaining.

The criterion used to describe the physical variables is that the description should reflect the pattern of nursing activities. The nurses conceptualisations, as they relate to ward evaluation, are used to represent the pattern of activities. As previously stated, a demonstration with other research methods that such a pattern is retrievable would strengthen the evaluation model. Such work would also increase the confidence in the physical descriptors model, since the evaluation model is the basis of the description of the physical characteristics.

In the actual development of the physical descriptors model, several simplifications are imposed in order to make the linking of the evaluative and physical descriptors a manageable task. Checks on these research decisions are needed to ensure the present exploration process remained on the most appropriate path. The first of these is the decision to restrict the evaluative description of the wards to the scores on the elements of the Level of Interaction facet. As argued in Chapter 13, this is the most appropriate description of the three evaluative facets, given that one of the objectives is to examine the design principles behind the plans of modern wards. The match between the facet and the levels of interaction that the Nuffield plan was attempting to modify, gives the rationale for its use.

The question remains as to whether the structure of the physical variables reflects either of the remaining two facets of the evaluative model, and what such a description of the physical variables would look
like. For example, the Scottish observational research presented by Bott (1970), describes the nursing activities in a manner very similar to the Type of Care facet of the present work. That work was used to aid in the siting of facilities within the ward. It recommends that facilities for the Direct care of the patients, such as the bedrooms, treatment room and sanitary facilities, be centremost in the ward plan, with Indirect care facilities occupying more peripheral positions. The Bott work suggests that structuring the physical characteristics of wards such that they reflect the distinction between the type of care being provided, would place greater emphasis on the location of facilities than is given in the current work.

A second simplification imposed upon the model is the decision to restrict the matching of the evaluative and physical descriptors at a dichotomous level. The reason for such a restriction is to ensure that the groups of wards, each with a multivariate profile of evaluative and physical descriptors, would still contain a reasonable number of wards. However, the question still remains as to whether finer distinctions can be made or whether the match can only be described at the general level of more or less and high and low.

A further concern is the rather uncomfortable question of the origins of the initial pool of physical variables. (Chapter 16 considers the more general aspects of this question.) As described in Chapter 13, the 33 physical variables that are used in the model, concern the degree of openness of the main ward area and the level of provision of facilities. One area of neglect, suggested by the Bott (1970) work, is the location of facilities within the ward. In the present work the inclusion of variations in location are restricted to the nursing stations, the bedrooms and the dayroom. It would be useful to explore whether the inclusion of location (centre versus peripheral) of all facilities would contribute to the relationships identified between the evaluative and physical ward descriptors.

Another area of neglect is suggested by the Referent facet of the evaluative model. This facet is derived from the BPRU's (1972) notion of the environmental system mediating between people and the building system. They divide the environmental system into two subsystems. One is the spatial subsystem, which includes the layout and position of spaces. The other is the physical subsystem, such as the lighting and heating. The model of the physical ward descriptors contains no variables directly concerned with the physical subsystem, thus the relationship between nursing care and this aspect remains unexplored.
A final concern is the method of creating the physical indices which are used to establish the relationships between design and nursing care. The criterion for including a physical variable as part of an index is that it describes an aspect of the particular facility. For example, the number of beds in a cubicle and the location of the cubicles are two variables included in the Bedroom index. All variables within a given index are given equal weighting. This raises the question of whether they are all equally relevant to the provision of care. Nonrelevant variables may be obscuring the more pertinent physical characteristics of the facility. Some preliminary method of checking is needed in order to enhance the clarity of the relationships found.

In summary, the physical descriptors model was developed in order to illustrate the relationship between ward design and nursing care. This work is considered to be at an exploratory stage and suggestions have been made to strengthen it, in order to increase its potential for contributing to future ward designs. Further questions also can be raised about the approach used in addressing the problem of linking evaluative and physical descriptors. However, these are theoretical rather than applied concerns, and are discussed in Chapter 16. Whilst acknowledging the limitations of the work, the relationships identified are sufficiently clear to suggest that the time has come for ward designers to challenge the basic design assumptions behind the modern hospital ward.

4 SUMMARY OF THE APPLIED CONTRIBUTIONS OF THE WORK
The overall applied objective of the current work is to provide information on the relationship between the design of modern wards and the provision of nursing care within these wards. The three aspects of the objective which this work has addressed are: providing an account of the nurses' conceptualisations of providing care in the ward, developing a standard instrument to aid future ward evaluations and exploring the relationship between the evaluations wards receive and the physical characteristics of the wards.

Chapter 15 summarises the work carried out to achieve the objectives and provides examples of future work which would strengthen the applied contribution of the work. The discussion illustrates an important point in applied research. As stated succinctly by Lewin (1951), 'there is nothing so practical as a good theory'. The model of ward evaluation has been developed in order to provide an initial step in giving the field of environmental evaluation a more theoretical basis. However, it is not just an abstract theoretical account. For example, implications from the model have been drawn about the nature of current nursing practice and
about the design of hospital wards. The structure of the evaluation model is also used to develop an instrument which is concise and therefore practical, yet covers the range of issues required for a complete assessment of a ward's functioning with respect to the provision of nursing care. The evaluation model also provides the structure for describing the physical characteristics of the hospital wards. From this, general relationships have been identified. Thus, this work illustrates that applied and theoretical objectives are not only compatible in environmental research, but are virtually inseparable. Chapter 16 discusses some of the general issues raised by the physical descriptors model and Chapter 17 presents a summary of the theoretical contributions of the ward evaluation model.
Chapter 16
GENERAL ISSUES RAISED BY THE PHYSICAL DESCRIPTORS MODEL

The final chapter describes how the model of ward evaluation fits into the field of environmental research. Its contributions lie in clarifying, verifying and integrating previous work and providing a potential theoretical basis for future work. The contribution of the physical descriptors model is less positive. In part this is due to the greater difficulty of the problem. McGrath and Altman (1966) have illustrated that it is much more difficult to demonstrate relationships between variables of different domains, such as physical and psychological variables, than relationships between variables of the same nature.

The major contribution of the physical descriptors model is that it highlights general issues that are applicable to all research attempting to relate people's experiences and activities with the physical attributes of the environment.

This chapter provides a brief description of these issues, and the approach taken to them in the present work. Section 1 discusses the practical problem of deciding which physical variables to investigate. The remaining two sections discuss the general theoretical issues raised by such research. Section 2 is concerned with the nature of the relationships between the physical and psychological variables which such research attempts to demonstrate. Section 3 discusses the approaches to establishing such relationships.

1 THE SELECTION OF THE PHYSICAL VARIABLES

In evaluations of buildings the research question of the link between the physical and psychological variables can be stated as 'what is the relationship between the building system and the environmental system?' Based on the work of the BPRU (1972), the present study adopts the proposal that it is the environmental system, not the building system, which people experience. Therefore, while the environmental system can be elicited from the users, the physical attributes which give rise to this system are not so directly obtainable. Canter (1977) also raises the problem of the initial selection of physical variables. He suggests that studies of building evaluations either restrict the physical variables to a few likely characteristics, with disappointing results, or are overwhelmed by the choices, and therefore fail to take the step of attempting to relate variations in people's experiences with variations in the physical setting.

The problem of selecting appropriate physical variables is also documented in the field of environmental aesthetics (Wohlwill, 1976),
residential evaluations (Bechtel, 1976), air quality (Barker, 1976),
water quality (Coughlin, 1976), environmental noise (Weinstein, 1976) and
coastal land management (Zube, 1980). The universal nature of the
problem indicates that there is no immediate, foolproof solution.

One possible approach to deciding which physical variables to start with,
is to consider what the final physical description or taxonomy should be.
Zube (1980) proposes three major criteria of a taxonomy of environmental
domains. They are:

1. that the taxonomy be 'relevant to the perceptual/cognitive processes
   of user-participants'.
2. that 'the domains should be defined in terms of measurable physical
   elements, attributes or characteristics'.
3. 'the taxonomy needs to be policy relevant.'

In general these criteria can be applied also to the initial selection
of variables.

Zube's first criterion is concerned with communication; that is, the
taxonomies should be stated in language that is meaningful to the users
of the setting, as well as to the professionals. One means of ensuring
that the final taxonomy is relevant to the users, is to start with
variables expressed in the users' language.

By the second criterion Zube means that the taxonomies should be
quantifiable, in order to reflect physical differences between settings
or changes in a given setting and also differences in perceptions of
quality. The requirement of a relationship with psychological variables
can not be applied to the original pool of physical variables, as this is
the final test of the validity of the variables. The other aspect of
this criterion is practical and directly applicable to the initial
selection of physical variables. If they do not vary across settings
they can not be measured. An example from the present work is the
location of the utility rooms in the ward. Both previous research and
the model of ward evaluation suggest this may be an important aspect in
ward layout. However only 2 of the 138 wards have peripherally located
utility rooms. Therefore it is not possible to include this variable in
the physical descriptions of the wards.

The final criterion for describing the physical setting which Zube
proposes, is that 'the taxonomy needs to be policy relevant'. This
criterion relates to the applied orientation of environmental research.
As stated by both Canter (1977) and Zube (1980), one purpose of
environmental evaluations is to provide information to improve the
quality of decision making. Many environmental domains have physical
descriptions which are based on professional judgements and are the
physical representations of policy decisions. Such descriptions can take
many different forms. For example, there are formal indices such as the National Wildlife Federation's Environmental Quality Index (Kimball, 1972) and the water pollution index developed by the Council on Environmental Quality (1972), standard building regulations for types of buildings, and design briefs and specifications for the specific case. In the British hospital context the physical representation of policy is provided as guidance in the form of Building Notes. Each note specifies the minimum requirements, and the range of variations between designs, which will be tolerated for a specific setting such as a hospital ward. Canter (1977) suggests that a random selection of physical variables is seldom successful. For example, Sears and Auld (1976) adopted the strategy of measuring everything they could think of in their study of wards, which produced a virtually unmanageable amount of data (personal communication). Therefore, it would appear appropriate that the initial physical characteristics, to be examined for their relationship with human endeavours, should be those specified by the design professionals. The demonstration of a relationship (or lack of it) between the professionally-based environmental attributes and user responses, would provide information directly relevant to policy making. In addition, such preliminary work may lead to hypotheses about more relevant physical characteristics.

The physical variables incorporated into the physical descriptors model, as described in Chapter 13, in general meet the criteria laid down by Zube. They are taken from Building Note 4: Ward Units (DHSS, 1976). The questionnaire used to collect the physical data was piloted three times to ensure that the descriptions were stated in terms that are meaningful to nurses. From the data collected, only those physical variables which varied across the different wards provided the data used in the physical model. The relationships demonstrated in the model suggest that the approach taken in the present work provides a useful set of recommendations for the initial selection of the physical variables to be used in exploring the relationship between design and use.

The initial pool of physical variables to investigate is a practical problem. The nature of the relationship between the physical and psychological descriptors of the environment is a more theoretical concern. Section 2 discusses this problem.

2 THE NATURE OF THE RELATIONSHIP BETWEEN THE PHYSICAL AND PSYCHOLOGICAL MEASURES OF THE ENVIRONMENT

Much of the research which attempts to demonstrate relationships between people's experiences of the environment and variations in the physical attributes succumbs to the lure of the pursuit. The search for better
predictors obscures the more substantive issue of what it the most appropriate way to represent the relationship between the physical setting and people's experiences of it.

As discussed in Chapter 4, environmental psychology as a discipline, is based upon a goal-oriented model of man. In the present work this is stated in terms of purposes. People's purposes initiate and direct their activities. Consequently, the role of the physical environment is to facilitate the purposive activities. Yet the study of the relationship between physical and psychological variables is decidedly deterministic in flavour. While 'causal relationships are assumed not deduced' (Biddy, 1977), the independent/dependent paradigm adopted by Sears and Auld (1976) in their work on hospital wards suggests causes. The same paradigm is adopted in the studies which use regression analyses as a means of demonstrating the relationship between the physical and psychological measures. Examples are Shafer and Tooby's (1973) predictive regression model of landscape preferences, Daniel et al.'s (1973) predictions on forest landscapes and Peterson's (1967) predictions of residential preferences.

If environmental determinism is only an assumption, and as stated by Zube (1980) in a recent review, perfect prediction has not been achieved, why be concerned that it predominates in the approaches to the problem? One danger is expressed by Craik and Zube (1976) in their concern over partially successful physical predictors. They state:

'There is potential hazard in employing physically derived indices prematurely as surrogates for observer-based evaluations. Statistically derived combinations of physical measures are likely to yield substantial but far from perfect predictions of PEQIs (Perceived Environmental Quality Indices). Thus there is the danger that these imperfect surrogates will become embedded and enshrined in standards and guidelines that abstract only a partial set of components of environmental quality. Their widespread application in the field may systematically and relentlessly eliminate essential elements of environmental quality not captured in the statistical equations.'

Taking a deterministic stance and then not succeeding in perfect prediction may also contribute to what Heimsath (1977) calls fallacies held about the design process. One fallacy is that 'the design structures behaviour in a simple, direct and easily predictable way.' If environmental research promotes this deterministic attitude and yet has limited success, it leaves the designer to incorporate into the design his own predictions about what will happen in a place. Alternatively the lack of perfect prediction may facilitate the assumption that 'the physical design is irrelevant therefore the designer can really do what he wants'. Regardless of which fallacy is in operation, they both promote the carte blanche attitude in the design profession, and are both
encouraged by failed determinism.

The above discussion suggests two important points. One is that physical descriptors will not replace behavioural or evaluative descriptors of environments. For one thing, as documented by Brush (1976), there is general concern 'over the inadequacy of purely objective physical measures'. In addition, the evaluative descriptors serve functions beyond predicting physical correlates. For example, as stated by UNESCO (1973) 'those responsible for formulating policies, and any expert groups, should become aware of their own perceptual and conceptual bias by comparing it with the views of those whose lives are affected by the policies.' This type of contribution is illustrated in Chapter 12, where the evaluative model is used to contrast the perspective of ward nurses with those of writers on the theory of nursing and of ward planners.

The other conclusion to be drawn from the dangers described above is that the relationship between these two forms of descriptors must be stated as something other than a failed deterministic relationship. What is needed is a consensus in just what this relationship is to be, and to express the relationship in such a way as to provide directives for research which are not based on a deterministic model.

There are several terms in current use to describe the relationship between people and their physical surroundings. Levy-Leboyer (1982) and Studer (1970) speak of equilibrium, Ittelson et al. (1974) describe it in terms of 'goodness of fit' and Rapoport (1977), Craik and Zube (1976), Michelson (1970) and Brush (1976) all describe it as 'congruence' between people and their environment.

Gump (1971), in his work in ecological psychology, has coined the term 'synomorphic', which means 'similarity of shape' to describe the relationship between behaviour and setting. The term synomorphy is of significance for two reasons. Firstly, it is distinctive. Terms such as congruence and fit, can pass relatively ineffectually into common usage without adequately signalling to both designers and researchers that a distinctive relationship does exist between people and their environment without it being deterministic.

The second reason that synomorphy is an important description of the relationship between people and their environment, is that it has provided a directive for research which is not based on a deterministic model. In ecological psychology synomorphy describes the relationship between standing patterns of behaviour and the social and physical components of a behavioural setting. This relationship is not taken as direct but is mediated through the ongoing activities that occur within the setting. The fact that ecological psychology remains a separate
discipline attests to the success of the concept of synomorphy in generating research.

Canter (1977b), using the facet theory approach, has demonstrated the utility of the concept of synomorphy beyond the context of a behavioural setting. His analysis of children's hospital wards represents a major step forward in demonstrating a non-deterministic relationship between patterns of activities and experiences, and aspects of the physical domain. Similar to other attempts to illustrate the relationship between the physical setting and human experience, the work provides an account of each of the domains, and then establishes the association between them. What is unique to the work is that 'the concern is not to establish what causes what, but rather to find the underlying similarities between the structure of places and the experiences of them.'

Canter's study consists of describing the different locations within the ward, for example, the nursing station and the day space. The physical description of the locations is given by two facets. One classifies each location as to whether it is predominantly structurally open (eg. the day space) or closed (eg. the treatment room). The three elements of the other physical facet are: separate (eg. mother/child cubicles), central (eg. the nursing station) or special (eg. the treatment room). The prediction made is that the relationship between the locations in terms of their psychological descriptions will be similar in form to the relationships suggested by the physical descriptors.

Using smallest space analysis, Canter demonstrates that the two-way classification, proposed by the physical facets, can also be retrieved when the locations are described by the frequency of occurrence of different activities of the users. With the same method, using evaluative data from the nurses, this structure was again obtained. This is an accomplishment which Bechtel (1982) maintains ecological psychology has failed to do.

While the rationale behind the two physical facets is not fully developed, the study shows a similarity of form between the physical descriptors and the psychological descriptors of the ward locations. As stated to Canter:

'The key theoretical point is that evidence can be found for a strictly spatio-geometric classification of the design which is sensitive to variations in behaviour and experience. It is repeated, this is not a presentation of architectural causes of behaviour and experience but a demonstration of their relatedness.'

The physical descriptors model, presented in Chapter 13, also
demonstrates the relationship between the physical and evaluative descriptors in terms of similarity in form, although not expressed as directly in spatio-geometric terms as in Canter's (1977b) work. Rather, synomorphy is expressed in terms of shared descriptions. For example, wards which are described by the physical attribute of high levels of provision of ancillary and sanitary facilities, are also described by high evaluative scores for facilitating all aspects of nursing care.

Much of the utility of the physical descriptors model comes from the fact that it does not seek to demonstrate a one-to-one relationship between the two domains. This allows the subtleties of relatedness to be illustrated. For example, many highly partitioned wards can also be described by high evaluative scores for preventing disturbances and promoting privacy, but not all. One group with this physical description is described by all low evaluations. One reason for this may lie with the contribution of organisational variables, such as low staffing levels. An inadequate number of nurses combined with highly partitioned ward plans may be an explanation for the wards not being seen as facilitating nursing care.

Taking the privacy example further, closed wards do contribute to privacy but it is not the only influence demonstrated. For example, there is a group of wards described by both low partitioning and high evaluative scores for all aspects of care, including privacy. In addition, the model demonstrates a relationship between the level of provision of extra facilities and privacy.

Ittelson et al. (1974) describe privacy as one of the most complex concepts to deal with in the study of man and his environment. For example, Westin (1967) proposes four states of privacy; solitude, intimacy, anonymity and reserve; all of which he places under the 'rubric' of personal control of information about oneself. Even though the present work is only exploratory in nature, the fact that privacy is more than just not being observed is certainly illustrated in the physical descriptors model. This suggests that the approach adopted to illustrate the relationships between the physical and evaluative descriptors can accommodate the complexities to be expected in such relationships.

In summary, concern has been expressed in this section about the impression given by the more standard approaches of relating together physical and psychological measures of the environment. As discussed, there appears to be the implicit assumption of that one day perfect
physical predictors of people's evaluations and environment-related behaviour will be achieved. While the whole ethos of environmental psychology points to the fact that this will not occur, such a deterministic approach may give a false impression of just what environmental research can do. This may lead to inappropriate substitutions of physical descriptors for psychological information as the basis of decision making, as suggested by Craik and Zube (1976), or the total rejection by the design profession of the contribution environmental research can make.

This discussion has argued that an explicit non-deterministic statement of the relationship of the two domains be made, and proposes synomorphy (similarity in form) as an adequate description of this relationship. With the use of the facet approach, Canter (1977b) and the present work have demonstrated that synomorphy provides a directive for research which illustrates non-deterministic relatedness and is still capable of illustrating the complexities in the relationship between physical and psychological descriptors of the environment.

The final general issues to be discussed concern the problems of illustrating meaningful relationships between the two domains and providing a more predictive basis for the research. Section 3 discusses these issues.

3 THE APPROACH TO THE PROBLEM OF RELATING TOGETHER PHYSICAL AND PSYCHOLOGICAL DESCRIPTORS

In his review of research relating physical and psychological descriptors, Wohlwill (1976) makes two important criticisms of work which uses factor analysis to structure the physical attributes and multiple regression to predict preference judgements. One is that such methods 'suffer from the rather synthetic nature of the physical dimensions or factors resulting from such analyses'. The other criticism follows on from the problem of the meaning of statistically derived groupings. He suggests that it 'may prove difficult to place (the physical factors) into systematic relationship with behavioural measures in terms of any set of a priori defined hypotheses or theoretical principles.' Biddy (1977) takes this criticism further in his detailed discussion of methodologies such as multiple regression which are based on the general linear model. He concludes by suggesting such methods have 'the effects of narrowing, trivialization, technicalization, obscurantism, and expertization'. Both authors are concerned about the meaningfulness of the end result; without this predictions are impossible.

If meaningfulness is taken as a prerequisite of prediction then a quite
different approach to the problem is suggested. Wohlwill (1976) maintains that if the work is to be 'a scientifically based research effort' the physical attributes must be selected and assessed quite independently of the evaluations or behavioural responses to be made to them. This is the approach which has generally been adopted and, as stated by Wohlwill himself, without much success. Canter and Kenny (1982) propose that the Cartesian, dualist stance epitomised by the above quote by Wohlwill generates irreconcilable problems. They state:

'if these two sets of measurements do have independent origins the question is raised as to how or why they should be related.'

Canter and Kenny suggest as an alternative the phenomenological tradition; 'the experience of the individual, and his conceptualisation of that experience, is taken as paramount and attempts are made to develop measures of the physical world which grow out of the person's own perspective.' This proposal is given rueful support by Sears and Auld (1976) after their attempt to approach the problem from the other direction. They conclude by suggesting 'it would certainly seem to be more meaningful to incorporate perceived physical characteristics into the analysis as independent variables rather than trying to work with actual physical measures.'

Maintaining a strictly phenomenological approach does not, however, solve the problem of examining the relationship between the two domains. Perceived environmental attributes do not directly signal what physical attributes contribute to these descriptions. Nevertheless, the phenomenological approach can be used to guide the examination of the relationship. Milcarek and Struening (1975) have emphasised the concern that research should not partition the subject matter into arbitrary classifications which are not consistent with the phenomenon under study. This assertion is very similar to the gestalt approach to examining problems. As summarised by Wertheimer (1972) 'the gestalt view argues that the best way to understand the whole is to decompose it by analysis into its component parts, but these component parts should not be decided upon arbitrarily.' The work of Sears and Auld (1976) demonstrates that some structure must be imposed on the physical variables before systematic relationships can be illustrated. If the point of describing or structuring the physical attributes is to illustrate their relationship with people's experience of the setting, then the least arbitrary classification to impose is one that reflects people's experience. Thus, one contribution of the phenomenological approach can make is in structuring the physical domain.

If the experiences of the respondents are to be used in order to produce
meaningful classifications of the physical attributes, an account of the experiences is needed; that is, of the processes involved in the transactions between people and their surroundings. As suggested by Brush (1976) with respect to environmental management 'it is at least as important to understand the process by which the environment achieves its level of performance as it is to assess the level of performance.' The model of ward evaluation, based upon the concept of environmental interaction, provides such an account. By presenting the description of environmental experience as an integrated whole, the relationship between components of this experience are illustrated.

The physical descriptors model, described in Chapter 13, adopts the approach of using people's experiences to organise the physical domain, in as much as it uses the structure of people's experiences, as illustrated by the model of evaluation, to structure the physical indices. This approach goes some way towards providing a solution to the problem of 'meaningful classifications'. Thus, while concern is expressed in Chapter 15 that the structuring occurred only after the initial additive physical indices were developed, it does illustrate that it is possible to approach the problem of describing the relationship between the two domains by starting with people's experiences of the environment. In addition, intuitively at least, the relationships demonstrated appear to make sense.

Meaningfulness has been presented as a prerequisite to prediction, but it does not necessarily generate predictions. One of the major deficiencies of the model of physical descriptors is that it is totally empirical in nature. While the structure of the evaluations were used to structure the physical attributes, no attempt was made to predict the nature of the relationships identified.

With hindsight, certain predictions would seem to have been possible. For example, the similarity in description between the degree of partitioning of the main ward areas and the evaluative scores for ease of observation could have been predicted from the work of Sears and Auld (1976). In addition, the fact that the evaluations in terms of ease of observation are not negatively correlated with those concerned with preventing disturbances, but are just very low, (see Chapter 10) could have been used to predict that they would not both be related to exactly the same physical attributes. These examples suggest that prediction must be derived from the structure of people's environmental experiences. This places the demand on environmental psychology firmly back on the psychology side; that is, if people's experiences are to be used as the way into the problem of relating together the physical and psychological
descriptors of the environment, these experiences need to be more fully understood. The model of ward evaluation provides an initial starting point. However, it also highlights areas in need of further systematic work, such as the complex issue of privacy.

In summary, concern has been expressed that the relationships between physical and psychological descriptors of the environment are arrived at by a totally empirically-based process. As suggested by Wohlwill (1976) this is due, at least in part, to the meaninglessness of the statistically based physical descriptors used.

To overcome the problem of arbitrary classifications, the present work has utilised the structure of people's experiences, as represented by the model of ward evaluation, to structure the physical attributes. The relationships demonstrated by the physical descriptors model suggest that meaningful categories have been generated by this method. However, the work has failed to take the next step, that of predicting the nature of the relationships. Nevertheless, the results do suggest that such predictions must come from an understanding of the content and structure of people's environmental experiences.

4 SUMMARY OF THE GENERAL ISSUES RAISED BY THE PHYSICAL DESCRIPTORS MODEL

The development of the physical descriptors model is an empirical work intended as part of the applied contribution of the model of ward evaluation. However, it does raise more general concerns relevant to the field of environmental research. This chapter provides a brief account of these issues. Section 1 discusses the problem of selecting the initial pool of physical variable. Given the applied orientation of such research, it is suggested that the physical variables, presented by the designers as the implementation of policy, provide a useful starting point for examining the relationship between design and use.

The remainder of the chapter discusses more theoretical problems. Section 2 suggests that much research in this area has a deterministic orientation. It argues that such an approach gives an incorrect impression of what environmental psychology can contribute to the design process. The concept of synomorphy or 'similarity in form' is proposed as a more appropriate description of the relationship between physical and psychological variables.

Section 3 discusses the approach to the problem of relating together the two domains. The proposal is made that the physical variables must be grouped into meaningful categories before predictions can be made about the expected relationships. It is argued that the least arbitrary classification of the physical characteristics is one that reflects
people's experience. The model of physical descriptors uses such an approach. While it failed to take the next step of generating prediction, evidence is provided that the model of ward evaluation could have been used to predict the identified relationships.

The physical descriptors model illustrates many of the problems that are encountered when attempting to relate together the two complex domains of the physical environment and human experience. By making explicit the problems and the general issues raised by the work, the hope is that future environmental research will benefit. A more positive contribution of the physical descriptors model is that it illustrates the utility of the ward evaluation model in providing a range of information relevant to design decision making. The final chapter discusses the theoretical contributions of the model of ward evaluation to the field of environmental psychology.
Chapter 17
THE CONTRIBUTION OF THE MODEL OF WARD EVALUATION TO THE FIELD OF ENVIRONMENTAL EVALUATION

The field of environmental evaluation predominately has an applied orientation. Environmental evaluation research tends to be concerned with solving problems directly related to a specific context, as discussed in Chapter 3. Canter and Kenny (1982) characterise this field as the 'pragmatic research endeavour par excellence'. The consequence of this pragmatic approach is that the field of environmental evaluation remains a vast collection of unrelated research findings about specific settings. Criticisms of this nature are not isolated. For example, considerable concern has been expressed about the lack of coordination of research across different environmental domains (Craik and Zube, 1976; Peterson, 1976; Stokols, 1978) with individual pieces of research in the field being described as 'rudimentary and inconclusive' (Zimring and Reizenstein, 1980).

According to Simon (1969), the fragmented nature of the field is a result of the lack of an adequate conceptual framework. Twain (1975) has stated that the construction of an adequate theory is essential to ensure that future research will be a logical development from previous work. The major theoretical objective of the present work is one of developing an approach to evaluation that will provide the basis for a more general theory of environmental evaluations. The intention is to provide a framework for a more cumulative approach to the field. The model of ward evaluation is presented as this initial step towards a more integrated field of endeavour.

The model is a structural account of the relationships between the various evaluations being made by the nurses. To assist in the construction of the model, the facet approach to theory construction is utilised. This approach satisfies the requirements of the topic area, in that it handles multivariate problems, provides multidimensional solutions when necessary and treats the research problem as an integrated whole. In addition, models developed within the facet framework are open to direct empirical testing.

The model of ward evaluation consists of a multiple classification system for describing the evaluations. The development and testing of the model are described in Chapters 4 to 10 and a detailed summary presented Chapter 11. The major stages are:

1. an examination of the psychological processes involved in making an environmental evaluation. This is to ensure that the concepts or rules of the model are consistent with the characteristics of the phenomenon of
evaluation.
2. the specification and definition of the basic unit of study, the behavioural unit.
3. the proposal of a preliminary general model of environmental evaluation, derived from the literature within the field of environmental psychology.
4. the application of the general model to the hospital ward/nursing care context, and the refinement of the model to make predictions about the relationships between the evaluations.
5. the construction of a ward evaluation questionnaire to be used as the instrument for testing the model.
6. the empirical test of the model of ward evaluation.

The empirical retrieval of the cylindrical structure of the questionnaire data, using smallest space analysis, confirms the predictions made by the model about the relationships between ward evaluations.

Twain (1975) has suggested that research, regardless of its content, should fit into a logical sequence of cumulative knowledge. An aspect of this concerns how the research fits with previous knowledge of the subject matter. A partial explanation for the fragmented nature of the field of environmental evaluations rests with its failure to utilise existing knowledge from the wider field of environmental psychology as an aid to understanding the common process uniting all the work, namely the psychological process of making an evaluation. A requirement imposed on the present work is that the description of the evaluations be consistent with the characteristics of the phenomenon under study, that is the process of making an evaluation. This process is summarised by the basic unit of study, which is the behavioural unit. Section 1 of this chapter describes the contribution made by the 'behavioural unit' concept in clarifying what is meant be the process of environmental evaluation.

The model, or description of ward evaluation, is based upon a range of conceptual notions, assumptions and research findings from previous work. The unique aspect of the model is the integration of these concepts into a coherent statement about the phenomenon of evaluation. The successful empirical demonstration of the ward evaluation model provides support for several previously untested ideas. Section 2 discusses the contribution the model makes towards verifying and integrating this previous work.

A second aspect of research being part of a cumulative process of knowledge acquisition is the potential contribution to future research. The model developed in this present work has been tested in a very
specific context, that is the evaluation of modern hospital wards by nurses. Section 3 following discusses the extent to which the model may be applicable to other settings. Section 4 examines the ways in which the model may contribute to the more general field of Evaluation Research. Section 5 places evaluations in the psychological literature on attitudes and Section 6 summarises the previous discussions.

1 THE BEHAVIOURAL UNIT AS THE BASIC UNIT OF STUDY

According to Forgas (1979b), one of the most difficult aspects of studying naturally occurring phenomena in psychology is the identification of the basic unit of study. Both Milcarek and Struening (1975) and Forgas express the concern that research often partitions the subject matter into forced or arbitrary classifications which are not consistent with the way the phenomenon occurs in the real world. In the present work the 'behavioural unit' is taken as the basic unit of study which is consistent with the phenomenon of evaluation.

A behavioural unit contains:

'an aspect of the environmental system of a location within a setting, together with a purposive activity associated with the aspect.'

The following sections summarise what a behavioural unit is, how it relates to environmental evaluations and the contribution it makes to the field of environmental evaluation.

1.1 The Unit as part of People's Conceptualisations

Evaluations are statements about the effectiveness or quality of a setting (Friedmann et al., 1978). It is proposed that in order for people to make such statements, they must rely on their perceptions or interpretations of that setting, in other words on their conceptual systems. Therefore, a model to describe environmental evaluations is a model of people's conceptualisations of a setting. The 'behavioural unit' is taken as the basic unit of these conceptualisations. Each behavioural unit generates a unique evaluation.

1.2 Evaluations as Emergent

One of the major characteristics of the phenomenon of environmental evaluations, which has guided the theoretical developments of the work, is the proposal of Ittelson et al. (1974) that evaluations are emergent. That is evaluations:

'express the interaction between the properties of the object, place or event being perceived and the behavioural characteristics of the perceiver.'

In addition, Ittelson et al. go on to suggest the experience resulting from this interaction can not be obtained by considering either the person or the setting in isolation.

The need to retain this emergent quality of evaluations has directed the
specification of the content of the basic units of study and, as described in Section 2 following, the concepts used to describe them. The major consequences of evaluations being described as emergent are:

1. that they are taken to be behaviourally based. In order to provide a description of environmental evaluation it is necessary to describe the individual's conceptualisations of his direct experience of using the setting. The label 'behavioural unit' to describe the basic conceptual unit is given in order to emphasise the behavioural basis of this environmental experience.

2. the evaluations are the result of the interaction between the individual and the setting. Therefore, a model of environmental evaluations is a model of people's conceptualisations of environmental interaction.

3. the basic conceptual unit must contain both 'the properties of the setting and the behavioural characteristics of the evaluator'. The behavioural unit, containing both of these components, is taken as the smallest unit of study which preserves this emergent quality.

As stated previously, it is the description of evaluations as emergent which provides the direction for the development of the model of environmental evaluation. The successful retrieval of the model confirms the utility of this theoretical proposition. Yet the research of Ittelson et al., which is predominately observational in nature, makes no attempt to incorporate their assertions into research. (The criticism that the theoretical assertions of Ittelson tend to remain just that, theoretical, is also made by Massoud-Moghadam, 1975).

One limitation of the theoretical proposals of Ittelson et al. is that they remain at a very general level. For example, no adequate definitions of 'properties of the place', 'behavioural characteristics of the perceiver' or 'interaction between them' are provided. A contribution of the present work is that it utilises proposals from other areas of environmental research to define the constituents of the emergent experience of environmental evaluation. In this way it provides a link between the theoretical assertions of Ittelson et al. and other work in the field. The following sections summarise the attributes identified from other work as being the most appropriate components of the unit. Section 1.3 presents the argument for 'purposive activities' being the behavioural component of the behavioural unit and Section 1.4 presents the environmental system as the properties of the setting.
1.3 Purposive Activities as the Behavioural Characteristics Component of the Behavioural Unit

The physical environment is a complex, multidimensional entity. Therefore, as suggested by Sears and Auld (1976), it can not be assessed in quantitative terms. Consequently, in order to specify the components of the behavioural units that are relevant to evaluation, it is first necessary to state what are the criteria for evaluating an environment.

In line with most environmental research, this work adopts a goal-oriented model of man. The criteria for making an environmental evaluation is taken to be the purposes the individual is trying to achieve in the setting. The definition of environmental evaluations is based upon three assumptions about the relations between purposes and the physical environment. They are:

1. People are aware of their purposes and can estimate the extent to which these purposes are being achieved (BPRU, 1972).
2. Because purposes, not the environment, initiate and direct actions (Rozeboom, 1970), the relationship between people and their environment is not deterministic.
3. Purposes are not regarded as initiating pre-programmed series of actions (Simons, 1968). Therefore, the environment can influence these actions by facilitating them.

Taking the three characteristics of the relationship between people and the physical environment, evaluation is defined as:

'\text{a subjective assessment of the goodness of a setting based upon the individual's perception of the degree to which it facilitates the purposes the individual associates with that setting.}'

The above definition provides an explicit statement of what the process of evaluation is taken to be. While such postulates about internal processes cannot be proven, the model provides no evidence to suggest the definition to be incorrect. Also the precision with which the predicted model is retrieved from the spatial analysis illustrates the clarity of meaning which can be achieved with a research instrument when the purposes are explicitly stated. In addition, without specifying what purposes people associate with different settings, comparisons across settings must remain strictly empirical. Canter (1975a) illustrates that this is exactly what has happened with the general evaluation scales based on the semantic differential.

Purposes are proposed as the criteria for evaluation; people evaluate a setting in terms of the extent to which the setting facilitates the achievement of the purposes. As previously proposed, the evaluations are formed through using the setting. The point of contact or interaction
between the individual and the setting is when he is carrying out the activities directed towards achieving his purposes. Therefore the most appropriate 'behavioural characteristics' upon which people form conceptions, for this context, are purposive activities. Consequently, the behavioural component of the behavioural unit is specified as purposive activities.

1.4 The Environmental System as the Properties of the Setting Component of the Behavioural Unit

The behavioural unit is the basic conceptual unit being dealt with in the present work. Because it is a conceptual unit, the properties of the setting comprising it are those attributed to it by people, not characteristics inherent in the setting. The attributed characteristics incorporated into this work are derived from the BPRU's (1972) model of a building as a system. The BPRU describe the characteristics inherent in the setting as the building system. This system, they suggest, gives rise to the environmental system through providing structure, fabric, services and contents of the building. They propose that it is the environmental system, comprised of a spatial subsystem and a physical subsystem, that is experienced by the people using the building. The aspects of the environmental system proposed by the BPRU are taken as the relevant 'properties of the setting' component of the behavioural unit. (Section 2.1 discusses the support the model of ward evaluation has given to this assertion.)

1.5 Summary of the Contribution of the Behavioural Unit

The behavioural unit is taken as the smallest conceptual unit of environmental experience which retains the interactive aspect necessary for an evaluation to emerge from it. It is defined as containing:

'an aspect of the environmental system of a location within a setting, together with a specific purposive activity associated with the aspect.'

Each behavioural unit generates a unique evaluation statement. An evaluation is, therefore:

An assessment of the extent to which an aspect of the environmental system of a location facilitates the individual in carrying out a specific purposive activity.'

The behavioural unit is a theoretical construct used to help articulate the process of evaluation. One contribution it makes is the support it provides for Ittelson et al.'s (1974) assertions about the nature of the phenomenon of evaluation. In addition, it clarifies their assertions by utilising proposals from other environmental research to define the constituents of the emergent experience of environmental evaluations.
Another contribution of the concept of the behavioural unit is that it is an aid to the description of environmental interaction. As stated in Chapter 5 'environmental interaction' is one of the key concepts used in the environmental literature. In general it is used to indicate that the physical environment makes a contribution to people's goals and activities without being deterministic. For example, Lee (1971a) describes human behaviour as 'not a response but an interaction with the environment.' Yet the term 'interaction' remains elusive, being a label for a relationship without describing what it is. A partial explanation for the ambiguity of the term is that it is used to describe the relationship between two complex domains. On the one side there are people using the environment with their range of activities and aspirations. On the other, is the physical environment, with its multidimensional, multimodal and multi-purpose character (Ittelson, 1973). One contribution made towards defining environmental interaction, by the present work is the specification of the behavioural unit as the basic conceptual unit under study. Rather than describing people and the physical environment as separate domains, it is used as the smallest conceptual unit which incorporates aspects of both domains. This makes the description of the relationship between people and the physical environment a more manageable task.

A further contribution of the behavioural unit is that it can be seen as a unifying concept for the field of environmental evaluation. It defines the basis of each evaluation and states the minimum requirement for an unambiguous evaluative statement without being context specific.

A final contribution of the behavioural unit is that it provides a link between environmental evaluations and other areas of environmental psychology. It is specified as a unit of people's conceptualisations about the environment. Therefore, existing theoretical proposals and research findings on how people structure their conceptualisations can be used to describe the relationships between these units. Section 2 describes the empirical support given by the model of ward evaluation to these proposals.

2 THE EMPIRICAL SUPPORT PROVIDED BY THE MODEL OF WARD EVALUATION
The behavioural unit is taken as the basic unit of study. Therefore, in order to describe the relationships between the evaluations based on these units, it is first necessary to describe the relationships between the behavioural units. The model developed is a multiple classification system for describing the units on the basis of similarities and
differences. The requirement is that each concept or facet used in the description be applicable to all the behavioural units.

Three such concepts are identified from the environmental literature, with each of the concepts being a description of one component of the behavioural unit. This section describes the contribution made by each of the three facets to previous literature in terms of providing empirical evidence and integrating research findings.

2.1 The Classification of Attributes of the Environment

One constituent of the behavioural unit is the physical environment. The model of ward evaluation describes the environment in terms of the functions it serves. The functions are distinguished by reference to the activities of the individual; that is, whether the activity being facilitated involves interaction with other people (B1), direct use of the setting (B2) or the individual's experience of the environmental services (B3).

The three environmental Referents provide a qualitative, categorical classification of the environment in terms of function. Therefore, the predicted relationship between the referents is that they are all equally related to each other. The smallest space analysis confirms this relationship with each referent region being adjacent to the two others, forming 'wedges in a pie' around a centre point. In facet terms, this is described as a polar facet (Guttman, 1977b).

The retrieval of the Referent facet provides empirical evidence for a major theoretical proposal from the environmental literature, that is, the BPRU's (1972) assertions on the interaction between the physical environment and human activities. As described in the previous section, the BPRU specify the environmental system as the attribute of the physical environment that people experience. The BPRU further describe this system by subdividing it into the spatial and physical subsystems. The final proposal of the BPRU is that, in order to describe the contribution made by the physical environment to human goals and activities, it is more fruitful to specify the qualitative contribution, (the function the subsystems serve), rather than a quantitative description in terms of amount of contribution.

The three referents in the model of ward evaluation are taken directly from the three functions the BPRU propose for the physical environment. Two are performed by the spatial subsystem. The layout and location of spaces are associated with the interaction with other people and with the use of the setting. The physical subsystem is derived from the filter function of the building. The model illustrates that interaction
with aspects of this subsystem, such as the lighting, is also a part of people's experience of the environment. Further support is given to the Referent classification in that the three elements are identifiable in other evaluation work. For example, Farrenkopt and Roth (1980) list issues people are concerned about in offices, each of which can be classified under one of the general referents.

In summary, the proposals of the BPRU for describing environmental interaction are all given support by the model of ward evaluation. The fact that issues identified in other building evaluation studies can also be classified by the Referent facet suggests it has applicability beyond the ward context.

2.2 The Classification of Purposive Activities

The second constituent of the behavioural unit is purposive activities. In the present context they are defined as those activities specified by the nurses as a part of providing patient care in the ward context. The model describes the nursing activities in terms of the Type of Care they imply; Direct or Indirect patient care. The Type of Care facet is an ordered, modulating facet. It is represented in the smallest space by the Direct care evaluations occupying the centremost region of the space, with the Indirect evaluations in an adjacent but more peripheral spatial region.

The empirical demonstration of the predicted structure of the Type of Care facet makes several contributions. It confirms that, not only are purposes useful constructs in clarifying the process of evaluation, but also that the hierarchial structure to purposive behaviour, proposed by Sears and Auld (1976), can be used to predict the relationships between evaluations. Their argument is as follows:

"At the centre are long-term primary purposes. These give rise to lower level purposes which must be achieved in order to achieve the more centre purposes. A hierarchical structure is needed to describe this network of purposes in that not all lower level purposes are necessarily linked to all the purposes at the next level up. Purposive behaviour is a part of this system in that 'any purpose defines the goal of behaviour at the next level down the hierarchy'."

Evidence is presented in Chapter 5 that hierarchies are a useful way of describing people's conceptions of a range of experiences. However, the hierarchal structure of purposes proposed by Sears and Auld is an untested theoretical construct. The prediction, taken from the Sears and Auld's argument and confirmed by the model, is that evaluations based on behavioural units which incorporate purposive activities at the same level of the hierarchy, are more closely related than evaluations based on purposive activities at different levels. Thus, one contribution of
the model is the support it gives to the description of purposes as a hierarchical network.

A second contribution of the Type of Care facet is that it utilises a substantive basis for the content of each level of the hierarchy. In their own ward evaluation research, Sears and Auld make no attempt to propose what activities in the ward will occupy the different levels of the hierarchy. Rather they assume that the most primary purpose will be tapped using a general bi-polar adjectival scale. To identify which activities are most closely related to the purposes behind the general evaluation, a step-wise regression of the factors from the more specific questionnaire is used. This empirical basis for identification has the same problem as previously discussed with respect to all general bi-polar adjectival scales. It requires the assumption that these scales tap primary purposes without any attempt to identify just what they may constitute.

Facet theory demands that the descriptions being used are descriptions of the observations to be made in the research. The rationale behind the prediction that the type of care being provided will, in part, describe ward evaluations, comes from the proposal of a hierarchical structure to purposes. However, the actual content of the description comes from the substantive area under investigation; that is from the frontstage/backstage description of service-based settings by Goffman (1961), and the placement of direct care of patients as the focus of the ward routine by Bott (1970). Sears and Auld failed to utilise the hospital literature in order to convert their theoretical proposal into a description of the ward setting; rather they used an empirical derivation to establish content. This has the consequence of leaving their theoretical assertion untested.

The Type of Care facet also makes a contribution by illustrating consensus. One area of consensus is between the nurses' conceptualisations on the nature of nursing care and the categories employed by the Bott observational research. Also the structural interpretation of the prediction that Direct Care is the more focal concern is based upon a similar facet analysis by Levy and Guttman (1975) concerning the structure of wellbeing. Thus, the central spatial position occupied by the Direct Care element of the facet provides a consensus in the facet literature that the hierarchical structure of purposes is represented by an ordered modulating facet.

2.3 **The Classification of Interaction**

The third facet used to describe the behavioural units, and confirmed by
the model of ward evaluation, is the Level of Interaction facet. It classifies each behavioural unit according to the subjective distance between the person and the referent as implied by the activity in the unit. It is an ordered facet, ordering the units from the most to the least distant interaction. The four levels of interaction confirmed by the model are: observation, access, direct contact or use, and preventing disturbances.

One contribution of the Level of Interaction facet to previous work is that it helps to unify a wide range of environmental experiences. It is based on the notion that people structure their experiences with environmental referents in terms of a distance continuum. Such a concept is used to describe people's environmental experiences at the urban scale; Rapoport (1977) refers to this as 'subjective distancing'. Both Rapoport (1977) and Canter (1977) describe people's conceptions of the environment in terms of a hierarchical structure. The further up this hierarchy that two referents are joined together, the more subjectively distant they are construed to be.

At the other extreme of environmental experiences, that is the study of interpersonal distances, the term subjective distancing is also applicable. A person's regulation of social interaction has been demonstrated to include, for example, physical distancing, eye contact, tone of voice and use of the physical environment (Canter and Kenny, 1975). The importance of such work for the present discussion is that all these activities are used to create the 'subjective distance' that the individual prefers. Here again the concept of more to less distance is relevant to how people perceive their environmental referents, in this instance other people.

The retrieval of the Levels of Interaction facet demonstrates that people's conceptions of their environmental experiences at the level of using a building can also be described in terms of subjective distances between the individual and the referent. This experience can be conceived of as at an intermediate scale between the urban experience and the interpersonal experience. In this way it provides a link between the different scales, and provides support for the proposals of Rapoport and Canter that scale, or levels of interaction, is a fundamental conceptual structure people use to organise their environmental experiences.

The notion that environmental experiences can be classified in terms of 'the subjective distance between an individual and an environmental referent' has not been used as a theoretical construct to systematically describe the use of a building. Rather, it is used in a practical sense.
The clearest example of a practical application of levels of interaction is that of the Nuffield design team (1955). Their ward plan was intended to facilitate the direct contact between patients and nurses. They sought to achieve this through improving 'access' and reducing 'observation'. Thus, while they did not explicitly acknowledge such an ordering of nursing activities, they used it as a policy basis for design. Similar practical applications of the Level of Interaction facet are identifiable from the literature on psychiatric hospitals. Osmond (1957), Ittelson et al. (1970) and Sommer (1969) have all been involved in environmental modifications to change the level of interaction most readily facilitated by the setting. Like the Nuffield work, emphasis is on facilitating direct contact. However, while the Nuffield plan was intended to reduce the most remote level of interaction (observation), the modifications in the psychiatric hospitals are directed towards reducing the other extreme (patient solitude and isolation).

The Level of Interaction facet makes explicit just what changes in behaviour are being engineered through such environmental manipulations. In addition, it illustrates a consensus in thinking about the built environment between users conceptions, categories utilised in observational studies such as Ittelson et al., and teams developing design policies. This consensus provides confidence for the assertion that identifying the levels at which the individual wishes to interact is an important aspect of understanding how the building is being used.

Also, as suggested by the literature above, this aspect of environmental interaction is frequently subjected to manipulation through physical modifications. This makes it particularly important to identify just what are the relevant levels. In the ward context four levels are identifiable. It remains an empirical question as to whether other building types, such as schools and offices, have the same requirements in terms of the levels of interaction they are to facilitate.

One final contribution of the Level of Interaction facet is that it is applicable to all three environmental referents. Research at the personal space level is solely concerned with interaction between people. At the building level people are also the predominant referent discussed. An exception to this is Rivlin and Wolfe's (1979) concern for environmental exploration. At the urban scale, Rapoport (1977) distinguishes between locational attributes (eg. areas, buildings, bridges and paths) and non-location attributes (ie people). He uses this 2-way classification of scale and referent to identify particular issues.
The model of ward evaluation extends the classification by Rapoport by illustrating that interactions within a ward can be ordered in terms of subjective distances between the individual and other people, locations within the ward and also the environmental services of the ward. It is the interaction with this final referent, environmental services, which has not previously been subjected to ordering along the continuum of levels of interaction. While there are only three levels of interaction in the model that are relevant to the experience of the physical subsystem, they are clearly identifiable. For example the level of preventing disturbances (A^) contains the prevention of disturbances to patients from the lighting at night. Direct contact or use (A_2) includes the lighting for treating patients and for clerical work. At the more general ward level of 'access to' (A_2) is the evaluation of the heating and ventilation of the whole ward. The successful retrieval of the Level of Interaction facet demonstrates that a wider range of environmental experiences can be further defined by the level at which it occurs than is suggested by previous work.

2.4 Summary of the Contribution of the Model of Ward Evaluation to Previous Work

The major contribution of the model of ward evaluation is not that it identifies new concepts for describing environmental experience. No one concept or facet used in the model is unique to the present work. Rather one of its contributions lies in providing a direct empirical test of what are, in several instances, theoretical speculations. The Referent facet gives empirical evidence for the BPRU's (1972) description of a building as a system. The Type of Care facet provides empirical support for Sears and Auld's (1976) proposed hierarchical structure to purposes and illustrates how this conceptual structure can be substantively converted into a description of environmental experience which is directly open to testing. The Level of Interaction facet illustrates that peoples' environmental experience of using a building can be ordered along a continuum of subjective distancing as has been demonstrated for people's conceptions at the urban level and at the interpersonal distance level.

The unique contribution of the model is that it integrates the three concepts into a coherent account of the experience of environmental evaluations. With the exception of Rapoport (1977), no previous work has used any of the concepts in conjunction to describe environmental experience. In addition, Rapoport's work is restricted to a 2-way classification, with no precise statement of the nature of the
relationship between his Levels of Interactions and Referent concepts. There are three important advantages to describing environmental experience as an integrated system. They are:

1. it allows the relationship between all the evaluations to be articulated. It is no longer necessary to treat the evaluation of a setting as discreet lists of assessments.

2. it is consistent with the way people use a setting. For example, nurses use the ward as an integrated unit to provide total patient care. Therefore their evaluations should reflect this experience.

3. it provides a detailed description of each evaluation. The three-way classification provides a precision of definition which facilitates unambiguous evaluative statements.

The ability to describe the environmental experience as an integrated whole comes from the demands of the facet approach. To empirically test a facet description of a given phenomenon, the role played by each facet in the description must be specified. The Referent facet describes the contribution of the physical environment by specifying the different kinds of human activities each environmental subsystem facilitates. This qualitative facet distinguishes between interactions with other people, locations within the setting and the environmental services. The Type of Care facet is an ordered, modulating facet. It further defines each referent by specifying whether the interaction with the referent is to facilitate Direct or Indirect patient care. Together these two facets provide a radex definition of environmental interaction.

The Level of Interaction facet further defines the functions to be served by the setting. This is done by identifying the subjective level of interaction between the individual and the Referent which the setting is to facilitate. It is an axial facet with four elements, ordering the interactions from the most remote level of just observing through to actually preventing disturbances caused by too much contact. Each interaction with a referent is ordered by the Level of Interaction.

Together the Referent, Type of Care and Level of Interaction facets provide a detailed account of the environmental interaction taking place in each behavioural unit. The role specified for each facet signals the spatial configuration which must be retrieved for the analysis to confirm the model. The ordering of the radex structure by the Level of Interaction facet generates a cylindrical hypothesis of environmental interactions.

The model of environmental interaction can be described as an account of
the 'conceptual ecology' of a setting. The relationship between any two behavioural units can be identified by the similarities between their classification by each facet. This allows the conflicts and compatibilities between the different interactions to be articulated. The successful retrieval of the cylindrex structure from the analysis of the ward evaluations confirms that the account of environmental interaction, provided by the model, is reflected in the evaluations the wards receive.

The facets used in the model are derived from the general environmental literature. Therefore, it can be expected that they will have applicability beyond the ward context. However the description of environmental interaction and of its relationship with evaluation, developed in the work, is based upon the relationships between the facets. The successful retrieval of the cylindrical model of environmental evaluations in another context is important support for the model. Section 3 describes such support.

3 THE CONTRIBUTION OF THE MODEL TO FUTURE WORK

The general theoretical objective of the present work is the creation of a basis for integrating the field of environmental evaluations, which at present is a vast collection of unrelated research findings about specific settings. Sections 1 and 2 demonstrated one aspect of the objective, namely how the research fits with previous knowledge on the subject matter.

A second aspect of being a part of a cumulative process of knowledge acquisition is the potential contribution to future research. The model developed has been portrayed as a general account of environmental experience. However, it has been tested in a very specific context. This section presents the evidence which suggests that the model has applicability beyond the specific context.

Section 2 provides some evidence that the model may generalise beyond the ward context. For example, the three referent elements are identifiable from the evaluation work of Farrenkopt and Roth (1980). The rationale behind design modifications in psychiatric hospitals such as those proposed by Sommer (1969) specify two of the levels of interaction that occur between people. The Type of Care facet is compatible with Botts (1970) interpretation of the nursing procedure in the ward. However these examples do not provide evidence that the relationship between the facets will produce the cylindrex structure as found in the model of ward evaluation. Levy (1976) describes one of the advantages of using the facet approach is that generalisability is sought in terms of common structures, not content. The result is that a precise definition,
specific to a given situation, can be used, thus avoiding problems such as those encountered in the use of general evaluation scales. The present work is fortunate in that since the publication of the ward evaluation model (Kenny and Canter, 1981) a direct test of its structure has been carried out.

The context is people's satisfaction with their house (Canter and Rees, 1982). In the housing study, 44 items were taken from the questionnaire and classified by three facets. The elements of the Levels of Interaction facet are the house, the location (e.g., parking space and garden) and the neighbourhood. The Referent facet classifies the items in terms of whether they concern social contact, space or services. The third facet is labelled as the Focus with the elements being overall, in general and in particular. Together the three facets produce a cylindrex structure of housing satisfaction.

These results can be considered as direct support for the model of evaluation developed in the present work. The rationale behind the Levels of Interaction facet and Referent facet is the same as used for the ward model. The only major difference between the two studies lies in the modulating facet. The rationale for the Type of Care facet is the hierarchical structure of purposes, with Direct patient care being proposed as more closely related to the overall purpose of the ward setting than are Indirect care activities. Such a theoretical rationale is less clearly articulated for the housing work. While the authors state the degree of focus is with respect to a person's purposes and intentions and the overall concern 'to have a pleasant house' is central, Canter and Rees predict the structure on the basis of a correlational rationale. The rationale is that the more general the question the higher are the correlations, on average, likely to be with all other questions; therefore they will occupy a more central region of the spatial configuration.

There are several possible explanations for the differences between the two modulating facets. One possibility is that, like Sears and Auld (1976), the housing work has failed to utilise existing work to provide content for each level of the purpose hierarchy. A second, suggested by the researchers, is that in informal settings such as a home, clear distinctions in terms of content can not be made. A final possibility is that the general/particular distinction between elements of a modulating facet is sufficient to provide the clarity of description needed, without resorting to more complex explanations such as conceptual hierarchies. Further testing of the model in a range of both informal and service settings is needed to ascertain the rationale for the modulating facet in
the cylindrical structure of environmental evaluations. Nevertheless, using the criterion specified by Levy (1976), that generalisability is demonstrated through common structures, the work of Canter and Rees (1982) provides empirical evidence for the generalisability of the model of environmental evaluations.

4 THE CONTRIBUTION OF THE MODEL TO THE FIELD OF EVALUATION RESEARCH

Section 3 provides evidence to suggest that the ward evaluation model may be a basis for a more general theory of environmental evaluation. In Chapter 3, it is argued that environmental evaluations can be considered a specific aspect of a wider field, that of evaluation research. This section briefly considers the contribution the ward evaluation model may make to the field of evaluation research.

As stated in Chapter 3, evaluation research covers an enormous range of applied research. Examples are, assessments of programmes such as remedial reading schemes, services such as healthcare delivery systems, and administrative units, e.g. schools. The common ground between these different research projects is that they are all concerned with evaluating the effectiveness of programmes and organisations. Yet Chapter 3 argues that the pragmatic and disparate nature of the field is a result of a failure to recognise this common psychological process of evaluation. The present work has sought to describe this process, culminating in the generation of the ward evaluation model to predict the outcome of the process.

The previous section suggests that environmental evaluation as a field is strengthened by the identification of common structures to peoples evaluations of different settings. This argument is also applicable to the larger field of evaluation research. The quest for common structures as a basis for cumulative knowledge is not just an exercise in intellectual tidiness. They are also relevant to applied objectives, which are so central to the field of evaluation research. For example, a major problem for the field are the constraints on time and resources. Knowledge of the major evaluative concepts or facets would provide an efficient basis for defining the research problems and designing the appropriate research instruments. Common structures may also aid in understanding by helping to predict what similarities and differences in the assessments are likely to occur. Finally common structures may help to improve the situation concerning implementation of results. If the findings in a specific topic area can be backed up by similar results from a range of research topics, they are more likely to be considered valid interpretations and be taken note of.
The retrieval of the cylindrex hypothesis is not unique to the ward evaluation model. The cylindrex structure is identified for intelligence (Guttman and Levy 1980), political involvement (Levy 1979), attitudes towards medical treatment (Levy and Guttman, 1980), attitudes towards the computer (Elizur and Guttman, 1976), adjustive behaviour (Levy and Guttman, 1978), and wellbeing (Levy and Guttman, 1975). However the study most similar to the present work, in that it utilises the process of evaluation, is Shapira and Zvulun's (1979) study of soldiers' evaluations of officers.

The study by Shapira and Zvulun is presented as an example of hypothesis generation and testing from the field of organisational behaviour research. The cylindrex hypothesis is generated from three facets. The axial facet is the rank of the officer to be evaluated (platoon commander and company commander). Rank specifies the organisational distance between the soldier and his officer. Therefore the rationale of this facet can be considered conceptually similar to the rationale behind the Level of Interaction facet of the present work.

Shapira and Zvulun's polar facet consists of the different areas of evaluation (professional, interpersonal and disciplinary). The prediction of a polar role for this facet is based on the assumption that all three elements are responsibilities of leadership, with no area necessarily considered more important than the others. This is similar to the Referent facet of the present work in that each referent represents a different function served by the building, all of which must be satisfied by the building.

The modulating facet of the Shapira and Zvulun study deals with the specificity of the evaluation (general or particular). The rationale for the facet is more similar to that used by Canter and Rees (1981) than the Type of Care Facet of the present study. Nevertheless, the retrieval of the cylindrex structure from studies, focused on very different subjects (buildings and military officers) but sharing the common psychological process of evaluation, suggests that there may be common fundamental ways in which people structure their experience of objects in order to evaluate them. Considerably more facet design and analysis of evaluation research and comparisons of results are needed before the postulation of the cylindrex model of evaluation. However, the above discussion suggests the possibility of such theory building, and indicates it would make an important contribution to the very diverse and applied field of evaluation research.
The present work has argued that the unifying factor of much of the research discussed is the common psychological process of making an evaluation. In the discussions, this work has treated evaluation as a unique psychological process. However evidence does exist which suggests evaluations are an aspect of a more general class of human behaviour, that of attitudes.

An enormous amount of research on attitudes has been carried out using the facet theory approach. In their discussions of attitude research, the exponents of the facet approach readily accommodate building evaluations as a specific case of attitudes (see for example Levy, 1981). However before accepting this conclusion it is useful to examine the common ground between the two concepts. This section provides a brief account of the nature of attitudes, as presented by the literature, and the evidence to suggest evaluations can be defined as a part of the domain of attitudes. Section 5.1 illustrates that evaluations conform to the attitude requirements of being affect responses based upon beliefs. Section 5.2 discusses the difference of scale at which the two concepts are handled.

5.1 Attitudes as Affective Responses Based Upon Beliefs

Thurstone (1931) defines an attitude as 'the amount of affect for or against a psychological object'. Thus, if a person is favourably or unfavourably disposed towards an object, or can express a like or dislike for the object, he holds an 'attitude' with respect to the object. This affect nature of attitudes is one aspect of attitudes which does not appear to be disputed. Guttman expresses the amount of affect in terms of the range the responses can cover, that is, along the continuum of from very positive to very negative (Gratch, 1973). Based on the environmental literature, an environmental evaluation has been defined as a 'subjective assessment of the goodness of a setting.' Therefore, using the criterion of 'an expression of an amount of affect,' evaluations can be said to be attitudes.

The attitude literature also represents these affective responses as learned, enduring responses formed on the basis of an individual's beliefs or cognitions about the object (Rokeach, 1968; Fishbein, 1967; Zajonc, 1954; and Rosenberg, 1960). Fishbein defines beliefs as being:

'the probability or improbability that the object is related to some other object, value, concept or goal.'

According to the above authors the sources of information, upon which attitudes are formed, are those which make the object relevant to other aspects of a person's life.
Environmental evaluations, as previously described in this work, can be considered attitudes in that they are:

positive or negative statements about a setting based upon the individual's perception of a relationship between that setting and his purposes.

As the purposes for being in a setting have been specified as the impetus for behaviour, the relationship between the object and the purposive behaviour is one of utility or facilitation. That is, the belief is that the ward setting is related to the provision of nursing care. (This is one of the specifications for defining the domain to be studied, i.e. only those goals and activities the nurses consider to be related to the design are included in the definition of nursing care). To restate, the belief is that there is a relationship between the ward environment and nursing care and this relationship is one of facilitation. The purpose of the environmental interaction model is to characterise the perceived relationship. The attitudes or evaluations are the assessments (from positive to negative) of the ward in terms of the extent to which the facilitation occurs. Therefore it can be accepted that evaluations are affect responses based upon beliefs.

5.2 Evaluations as a System of Attitudes

The present work has treated each evaluation item as an evaluation based upon a unique behavioural unit. Together they provide a system of evaluations, as described by the model. The question remains as to whether they can also be described as a system of attitudes.

In general the attitude literature considers an attitude to be a more molar phenomenon. For example, Reich and Adcock (1976) suggest that there is consensus in the field that each attitude has an affective, cognitive and conative component, and are directed towards classes of objects. However Fishbein (1967) states that a definition must have utility, and suggests the global descriptions of attitudes, such as proposed by Reich and Adcock, are at least partially the reason why verbally expressed attitudes are not good predictors of overt behaviour.

One problem with such general phenomena is that the psychological object is not clearly specified. Perhaps the most famous illustration of this is LaPiere's (1934) study of racial attitudes. As pointed out by Fishbein, the psychological object of verbally expressed attitudes is frequently a whole class (e.g. Chinese), while the psychological object of overt behaviour is a specific member of that class. There is no reason to expect an expressed attitude towards one object to be directly predictive of an action towards another object.
A further problem with treating attitudes as very general responses, as pointed out by Fishbein, is that a person may hold different attitudes towards what appears to be a common object. The example he quotes is Bales' (1958) research which shows that the person we best like is most probably not the person we most want to work with. This suggests that a person can hold more than one attitude towards an object and that these attitudes are towards particular attributes of the object.

Guttman's (1973) 1st Law of Attitudes also implies that a person can hold more than one attitude towards an object. This law is:

'If any two items are selected from the universe of attitude items towards a given object, and if the population observed is not selected artificially, then the population regressions between these two items will be monotone and with positive or zero sign' (Guttman, taken from Gratch, 1973).

Levy (1981) refers to 18 different pieces of attitudinal research which conform to the 1st Law of Attitudes. The consistent demonstration of these findings lends support to the assertion of a domain or system of attitudes held by people towards a common object.

Before examining whether ward evaluations conform to this law, it is useful to consider what is meant by 'a non-artifically selected population' for such a domain. In Guttman's work dealing with general attitudes such as the safety of the nation, the population of respondents is established as being non-artificial by large scale sample surveys. In the current work, a much more focused set of attitudes are being sought; that is, attitudes towards a specific setting, the hospital ward. While all the users (e.g. doctors, domestics, administrators, visitors, patients and nurses) may associate this setting with the common purpose of improving the health of the patient, their roles with respect to this are quite different. That is, their subordinate purposes, directed towards this general purpose, will be quite different. A natural population, relative to an attitude universe for hospital wards, is taken as a population with shared purposes at the level where the purposes are associated with the architectural features of the setting. This requirement can be considered an extension of that for a common object. Not only must the attitudes be towards an 'objectively' common object, but also that this object must be common in terms of its subjective meaning. The greater the specificity of the attitude object, the more selective becomes the appropriate population.

Guttman's 1st Law of Attitudes is concerned with the sign of the correlation coefficients computed between items. That is, that attitudes held towards a common object will not be contradictory but rather that
they will be positively related to each other or be totally unrelated. The common object for the current work is the ward environment. Thus, while the specific evaluations may refer to different subsystems, the physical attributes are all part of the environmental system of the ward. In addition, the specific purposes referred to by each evaluation have been specified as subordinate to a common, more general purpose, total nursing care. Because they meet the requirements of being an 'affective response' to a 'common object' taken from a 'non-artifically selected population' it is expected that the evaluations made by the nurses will conform to Guttman's 1st Law of Attitudes. An examination of the correlation matrix of the 93 evaluative items identifies only three correlations which are negative, the largest being -.11. According to Levy (1981) this amount of deviation from the rule 'may be regarded as sampling error or error of approximation (noise). Therefore it can be concluded that the evaluations conform to Guttman's 1st Law of Attitudes.

5.3 Summary of Evaluations as Attitudes

In summary, the acceptance of evaluations as part of the domain of attitudes depends upon the definitions being utilised. Evaluations, as defined in the present work, conform to attitudes in two important aspects. They are affective responses based upon beliefs; that is, they are assessments of wards (from positive to negative) which are based upon the belief that the ward setting does influence the provision of nursing care. Identifying environmental evaluations as a specific case of attitudes provides another illustration that environmental evaluation research has a body of literature behind it to help provide a theoretical basis for the creation of a more integrated field of endeavour.

The major difference between evaluations, as defined, and the generally accepted definition of attitudes, is the level at which they are presented. Generally an attitude is considered to be a response to a class of objects. In his presentation of the 1st Law of Attitudes, Guttman avoids the problem of specifying the level at which attitudes are best described. Rather the Law describes the relationship between the empirical observations; i.e. the attitude items. However, because the items are not perfectly correlated with each other, it can be concluded that what he is describing is a system of attitudes towards a common object. A similar description has been applied to evaluations in the present work. A system of attitudes is less parsimonious than that of a single, more molar attitude. However it does provide greater clarity. Fishbein criticises the ambiguity of the general definitions of attitudes used in
the literature. He considers that this may be a partial explanation for the failure to illustrate consistent relationships between such attitudes and people's actions. Overt behaviour is usually a response to a quite specific object. Using a system of attitudes, with detailed distinctions between different attributes of the object, may bring the specification of the affect response closer to the overt action. While as yet no research has been conducted to test this assertion, Guttman's system of attitudes may help solve the long standing problem of the relationship between behaviour and attitudes. If environmental evaluations can be taken as a specific case of attitudes, further research in this field could be used to examine this problem arising from the general field of attitude research.

6 SUMMARY OF THE CONTRIBUTION OF THE MODEL OF WARD EVALUATION TO THE FIELD OF ENVIRONMENTAL EVALUATION

Chapter 17 has presented the evidence to suggest that the evaluation model has applicability beyond the ward context. It describes how the model provides empirical support for and integrates previous work in the field of environmental psychology, and also the empirical support given to the model by more recent work.

The basis for proposing that the ward evaluation model is an integral part of the field of environmental psychology is the examination of the psychological process of making an evaluation. By establishing that evaluations are a part of people's conceptions of using their environment, it was possible to utilise work from other areas of environmental psychology to specify the components of that experience and propose a structure to describe environmental evaluations. Thus material from observational studies, theoretical proposals from environmental cognition work as well as results from other evaluation studies were used to formulate the model of ward evaluation. In addition the process of formulating an evaluation, which has been proposed, is not dissimilar to that proposed in the more tradition psychological literature on attitudes. This provides further evidence that environmental evaluation has a basis for a more theoretical approach and suggests that an applied field such as evaluation research may actually be able to contribute to the theoretical understanding of more general classes of behaviour, such as attitudes.

Placing the ward evaluation model into the context of other research was further aided by the approach used to develop the model, namely facet theory. The facet theory principles provided a useful guide for the examination of previous work, for the development of the rationale of the model and the identification of the components of the model.
The unique aspect of the model was the specification of the relationship between the definitional concepts. This is a facet approach requirement for rendering the model open to direct empirical testing, which gave the model the ability to provide empirical support for previous work. In addition it made it possible to develop an integrated model of evaluation which illustrates the conflicts and compatibilities between all the experiences of using a setting that form the basis of the evaluations.

Support for the generality of the model has been provided by reference to other evaluation work which have used similar concepts and retrieved the same cylindrical structure. Such results suggest that the concepts underlying the model of ward evaluation are applicable to a range of evaluation experiences.

The field of environmental evaluation has a strong applied tradition. One of the unfortunate consequences of this has been that there has been no unifying theoretical basis for coordinating the vast number of research projects. The present work also has applied objectives, concerned with contributing to the design of hospital wards. However, its orientation has allowed it to incorporate theoretical objectives as well.

Focus on the psychological process of evaluation, common to all evaluation research, and the use of the facet theory approach to research, have enabled the work presented in this thesis to be integrated into the field of environmental psychology and have provided the initial steps for a more general theory of environmental evaluation.
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Appendices

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APPENDIX 1: INSTRUMENT DEVELOPMENT

A1.1 Issues obtained from Interviews

A1.2 Evaluative Questionnaire

A1.3 Physical Description List

A1.4 Administration of Main Survey
**APPENDIX 1: INSTRUMENT DEVELOPMENT**

A1.1: Issues obtained from Interviews

<table>
<thead>
<tr>
<th>ASPECT</th>
<th>Facilities</th>
<th>Fixtures</th>
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<tbody>
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<td>lighting layout</td>
<td>furniture</td>
</tr>
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<td>lighting at night</td>
<td>space equipment</td>
</tr>
<tr>
<td></td>
<td>sunlight position</td>
<td>piped supplies</td>
</tr>
<tr>
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<td>ventilation provision</td>
<td>curtains</td>
</tr>
<tr>
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<td>fresh air design</td>
<td>lockers</td>
</tr>
<tr>
<td></td>
<td>heating appearance</td>
<td>telephones</td>
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<tr>
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<td>view</td>
<td>patient/nurse call-system</td>
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<td>Ancillary</td>
<td>Patient Facilities</td>
</tr>
<tr>
<td>ward</td>
<td>treatment rm.</td>
<td>toilet facilities</td>
</tr>
<tr>
<td>corridors</td>
<td>sluice rm.</td>
<td>sanitary facilities</td>
</tr>
<tr>
<td>nursing station</td>
<td>kitchen</td>
<td>dayspace</td>
</tr>
<tr>
<td>other depts.</td>
<td>dirty utility rm</td>
<td>sun lounge</td>
</tr>
<tr>
<td>lifts</td>
<td>linen cupboard</td>
<td></td>
</tr>
<tr>
<td>bays</td>
<td>drug cabinet</td>
<td>relatives overnight rm</td>
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<tr>
<td>single bedrooms</td>
<td>clean utility rm</td>
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<tr>
<td>bedspace/bed area</td>
<td>interview rm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>storage rm</td>
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Staff Facilities
- staff sanitary facilities
- changing facilities
- offices
- sister's room
- teaching room
- coffee room

**PEOPLE**

<table>
<thead>
<tr>
<th>Staff</th>
<th>Patients</th>
<th>Visitors</th>
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A3
NURSES' GOALS/ACTIVITIES

<table>
<thead>
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<th>General Nursing Efficiency</th>
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<tbody>
<tr>
<td>preventing cross infection</td>
<td>observation of patients</td>
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<tr>
<td>preparing clinical trolley</td>
<td>surveillance of the ward</td>
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<td>preparing snacks/beverages</td>
<td>contacting other depts.</td>
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<tr>
<td>disposing of dirty linen</td>
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<td>clerical work</td>
<td>patients seeing staff</td>
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<td>teaching</td>
<td>contact via patient/nurse</td>
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<td>call system</td>
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<td>observation of critically ill patients</td>
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<td>contact between staff on ward</td>
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<td>access to other depts.</td>
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<tr>
<td>space for medical tasks</td>
<td>access to patients</td>
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<tr>
<td>space for bulky equipment</td>
<td>access to critically ill patients</td>
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<tr>
<td>space for treatment</td>
<td>movement of patients</td>
</tr>
<tr>
<td>space to have easy access to</td>
<td>movement of supplies</td>
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<td>patients</td>
<td>movement of equipment</td>
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<tr>
<td>space for use of emergency</td>
<td></td>
</tr>
<tr>
<td>equipment</td>
<td></td>
</tr>
<tr>
<td>space for use of equipment</td>
<td></td>
</tr>
<tr>
<td>access to piped supplies</td>
<td></td>
</tr>
<tr>
<td>space to prevent curtains</td>
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<td>causing cross infection</td>
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A1.1 (continued): *Issues obtained from Interviews*

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</tr>
<tr>
<td></td>
<td>noise from other patients</td>
<td>ventilation</td>
</tr>
<tr>
<td></td>
<td>noise from dayspace</td>
<td>temperature</td>
</tr>
<tr>
<td></td>
<td>noise from telephones</td>
<td>air conditioning</td>
</tr>
<tr>
<td></td>
<td>noise at night</td>
<td></td>
</tr>
<tr>
<td></td>
<td>draughts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>lights at night</td>
<td></td>
</tr>
<tr>
<td></td>
<td>sunlight</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ambulant Patients</th>
<th>General Comfort</th>
</tr>
</thead>
<tbody>
<tr>
<td>access to sanitary facilities</td>
<td>easy to get out of bed</td>
</tr>
<tr>
<td>use of sanitary facilities</td>
<td>storage of personal belongings</td>
</tr>
<tr>
<td>access to dayroom</td>
<td>feel at ease</td>
</tr>
<tr>
<td>recreational activities</td>
<td>activities to absorb time</td>
</tr>
<tr>
<td>sit and chat</td>
<td>not lonely</td>
</tr>
<tr>
<td>comfortable eating place</td>
<td>not isolated</td>
</tr>
<tr>
<td></td>
<td>companionship</td>
</tr>
<tr>
<td></td>
<td>quiet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Privacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>visual privacy during treatment</td>
</tr>
<tr>
<td>auditory privacy during treatment</td>
</tr>
<tr>
<td>private discussions with staff</td>
</tr>
<tr>
<td>privacy from people passing the ward</td>
</tr>
<tr>
<td>privacy during visiting</td>
</tr>
<tr>
<td>private discussions at the bedside</td>
</tr>
</tbody>
</table>
APPENDIX 1: INSTRUMENT DEVELOPMENT

A1.2: Evaluative Questionnaire

This survey is concerned with the extent to which the design of this ward helps nurses and patients to carry out their activities. Each section of the questionnaire represents a particular aspect of the ward design and each question a particular activity.

Instructions:

1. To assess the success of the design, please rate one of the numbers from 1 to 7 for each question which best describes the ward design.
2. Please treat each question separately. Any apparent repetition of questions is for statistical control.
3. Please ensure that you have completed every item.
4. Please ensure this questionnaire individually.

Section 1: Overall Design and Layout

How well does the general design of this ward help:

- to reach critically ill patients quickly
- to reach patients who are being observed
- to provide a relaxed atmosphere for nurses to work in
- to provide a relaxed atmosphere for patients
- to provide a pleasant and relaxing atmosphere for the patients

Job Grade: Main Nurse
- Staff Nurse
- Student Nurse
- Junior Staff Nurse
- Auxiliary

This questionnaire is being completed in reference with your staff during which shift:
- Day Shift
- Night Shift
A1.2 (continued): Evaluative Questionnaire
Section 1.2: Lighting

How well does the lighting:

- on the ward help nurses to find supplies easily
- on the ward help nurses to carry out clinical work
- at the bedside help nurses to treat patients efficiently

Only complete the questions in Section 1.2 if you feel you have sufficient experience of night duty on this ward. If not, pass on to Section 1.3.

Section 1.3:

How well does the lighting at night:

- on the ward help nurses to carry out their work effectively
- on the ward in general avoid disturbing the patients
- at the staff nurses help nurses to carry out clinical work
- at the bedside help nurses to treat patients
- at the bedside avoid disturbing patients

Section 1.4: The Whole Ward

This section of the questionnaire has been developed to measure your reaction to the whole ward in general.

Please indicate where this ward is placed on each of the scales below by using the appropriate number (1-11). Please treat each response separately and record your answers separately for each section.

To what extent is this ward:

Good 7 6 5 4 3 2 1 Bad
Cheerful 7 6 5 4 3 2 1 Displeased
Comfortable 7 6 5 4 3 2 1 Uncomfortable
Welcoming 7 6 5 4 3 2 1 Unwelcoming
Working well 7 6 5 4 3 2 1 Not working well
Suitable 7 6 5 4 3 2 1 Unsuitable
Satisfactory 7 6 5 4 3 2 1 Unsatisfactory

Thank you very much for filling in the questionnaire. Please return it to the envelope provided for all the questionnaires for each ward. This will be collected by the Nursing Officer.
APPENDIX 1: INSTRUMENT DEVELOPMENT

A1.3: Physical Description List

<table>
<thead>
<tr>
<th>Page 1</th>
<th>Page 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1.3:</td>
<td></td>
</tr>
<tr>
<td>Physical Description List</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Room of ward:</td>
</tr>
<tr>
<td>2</td>
<td>Room of hospital:</td>
</tr>
<tr>
<td>3</td>
<td>Type of hospital opening:</td>
</tr>
<tr>
<td>4</td>
<td>Number of beds in ward*:</td>
</tr>
<tr>
<td>5</td>
<td>Number of beds in ward**:</td>
</tr>
<tr>
<td>6</td>
<td>Bed/care type:</td>
</tr>
<tr>
<td>7</td>
<td>Size of ward:</td>
</tr>
<tr>
<td>8</td>
<td>Size of ward*:</td>
</tr>
<tr>
<td>9</td>
<td>Size of ward**:</td>
</tr>
<tr>
<td>10</td>
<td>Size of ward*:</td>
</tr>
</tbody>
</table>

*If no other, please state number of rooms/grey and number of beds which were here.

**If the ward has been doubled in size, please state which amount of space was used by the patients.

---

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are there multi-bed units?</td>
</tr>
<tr>
<td>2</td>
<td>Are there any patient positions on the ward?</td>
</tr>
<tr>
<td>3</td>
<td>Are there any medical equipment?</td>
</tr>
<tr>
<td>4</td>
<td>Are there any technical aids?</td>
</tr>
<tr>
<td>5</td>
<td>Are there any fire precautions?</td>
</tr>
<tr>
<td>6</td>
<td>Are there any sanitary facilities?</td>
</tr>
</tbody>
</table>

---

*Please answer all items to help us in our evaluation of ward design. Answers in relation to ward conditions at present.*
A1.3 (continued): Physical Description List

(11) Number of patients you consider would fall into each of the following dependency categories on a typical day if all the beds were filled:

a) Seriously ill patients who require a considerable amount of nursing and treatment and must be under observation. Although very ill, some may be able to go with assistance to a w.c. or sit out of bed for short periods.

b) Patients who can help themselves to a limited extent and a higher proportion of whom are able to wash, bath and use a w.c. and sit out of bed.

c) Patients who are up most of each day and are ambulant.

(12) DAY SPACE

Is there any day space or room (PLEASE TICK) [Yes No]

How many day spaces of the following types are there? (PLEASE ENTER NUMBER)

a) area set aside within a multi-bed bay

b) room opening off the bedroom

c) separate day space - room with door, shared with another ward

(13) Activities in day space(s)

Which of the following are available in the day space(s) (PLEASE TICK):

(a) television

(b) dining

(c) physiotherapy

(d) smoking area

(e) quiet area

(14) Clean utility room (PLEASE TICK)

Is there one

Is it centrally located on the ward

(15) Treatment room (PLEASE TICK)

a) Is there a treatment room

b) Is it: (PLEASE TICK ONE)

(a) shared with other wards but not in a central treatment area

(b) a central treatment area

(c) for this ward only

c) Is the treatment room used as intended

d) If not, what is it used for

(16) Dirty utility rooms (including sluice and disposal rooms) (PLEASE TICK)

a) Is there one

b) Is it centrally located

### A1.3 (continued): Rhvrisal Pegeripfcion List

<table>
<thead>
<tr>
<th>Page 5</th>
<th>Page 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>(17) <strong>Staff base</strong> (i.e. nurses' station)</td>
<td></td>
</tr>
<tr>
<td>Is there more than one staff base in use on the ward? [ ] Yes [ ] No</td>
<td></td>
</tr>
<tr>
<td>Please enter how many of the following there are:</td>
<td></td>
</tr>
<tr>
<td><strong>By day:</strong> Desk/table in the corridor or bed area [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>[ ] (with doors) ____________</td>
<td></td>
</tr>
<tr>
<td><strong>By night:</strong> Desk/table in the corridor or bed area [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>[ ] (with doors) ____________</td>
<td></td>
</tr>
<tr>
<td>(18) How many patients in bed are visible from the vicinity of the staff base? [a] by day [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>[ ] (b) by night [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>(19) <strong>Patients' sanitary facilities</strong> (ENTER NUMBER OF EACH)</td>
<td></td>
</tr>
<tr>
<td>(a) Number of baths [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>(b) Number of showers [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>(c) Number of wash basins ____________</td>
<td></td>
</tr>
<tr>
<td>(d) Number of bidets ____________</td>
<td></td>
</tr>
<tr>
<td>(e) Number of w.c.s ____________</td>
<td></td>
</tr>
<tr>
<td>In the main w.c. provision? (PLEASE TICK)</td>
<td></td>
</tr>
<tr>
<td>[a] grouped together [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>[b] separate w.c.s (or combined with bathroom) opening off a corridor [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>[c] opening off multi-bedrooms ____________</td>
<td></td>
</tr>
<tr>
<td>[d] opening off single bedroom ____________</td>
<td></td>
</tr>
<tr>
<td>(20) <strong>Staff sanitary facilities</strong></td>
<td></td>
</tr>
<tr>
<td>a) Number of w.c.s [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>b) Number of wash basins [ ] ____________</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page 6</th>
<th>Page 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>(21) <strong>Staff changing and cloakroom facilities</strong> (PLEASE TICK)</td>
<td></td>
</tr>
<tr>
<td>Are there facilities on the ward for staff to change? [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>[ ] Do these facilities include a locker [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>[ ] Are the facilities shared with another ward [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>[ ] Are there central changing facilities [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>Number of w.c.s ____________</td>
<td></td>
</tr>
<tr>
<td>(22) <strong>Ventilation</strong></td>
<td></td>
</tr>
<tr>
<td>In opening and closing windows the main form of ventilation? (PLEASE TICK) [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>(23) <strong>Caterers' Room</strong></td>
<td></td>
</tr>
<tr>
<td>Is there one in the ward? [ ] Yes [ ] No [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>Is it shared with other wards? [ ] Yes [ ] No [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>(24) <strong>Flower Room</strong></td>
<td></td>
</tr>
<tr>
<td>Is there one in the ward? [ ] Yes [ ] No [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>(25) <strong>isters' Office</strong></td>
<td></td>
</tr>
<tr>
<td>a) Is there one in the ward? [ ] Yes [ ] No [ ] ____________</td>
<td></td>
</tr>
<tr>
<td>[ ] b) Is this used solely by nursing staff [ ] ____________</td>
<td></td>
</tr>
</tbody>
</table>
(24) Doctor's Office
   a) Is there one in the ward ................. Yes No
   b) Is this used exclusively by doctors ........ Yes No

(27) Patients' Overnight Room
   a) Is there a room on the ward ................. Yes No
   b) Is there one in the hospital which this ward can use ................. Yes No

(28) Does the clerk/receptionist on the ward have:
   a) a desk place ................. Yes No
   b) an office ................. Yes No

(29) Catering
   a) Does the ward pantry provide: (PLEASE TICK)
      i) beverages and snacks ................. Yes No
      or ii) part of the meal service function
           e.g. preparing trays, washing up, etc................. Yes No
   b) Is the ward pantry shared with other wards ................. Yes No
   c) Do nurses serve patients' food: (PLEASE TICK ONE)
      i) rarely or never ................. Yes No
      or ii) sometimes ................. Yes No
      or iii) often ................. Yes No

(30) Supply
     For each sort of supply, please tick to show which one of these supply systems is used:
     a) topping up i.e. supplies regularly replenished
     b) exchange trolley i.e. trolley the only place of storage
     c) requisitioning i.e. ward staff order as required

<table>
<thead>
<tr>
<th>Supplies</th>
<th>Topping up</th>
<th>Exchange trolley</th>
<th>Requisitioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.S.S.D. items</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic stores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disposables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stationery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas cylinders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catering/pantry supplies</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(31) Call system (PLEASE TICK):
     a) Bell or buzzer and light ................. Yes No
     b) 2-way speech ................. Yes No

(32) Seminar Room
     Is there a seminar room:
     a) for this ward only ................. Yes No
     b) shared with other wards ................. Yes No
(33) Equipment store
In there a store where large pieces of equipment such as wheelchairs can be kept ...

(34) Shampoo booth
In there one

(35) Alterations
Have any significant alterations been made in the ward since opening?
   a) structurally
   b) in the use of particular areas

If so, please describe these alterations briefly below:
   a) Structural alterations:
      1) ....................................................
      2) ....................................................
      3) ....................................................
      What year was this?
      4) ....................................................
      5) ....................................................
      6) ....................................................
      7) ....................................................
      What year was this?
   b) Alterations in the use of particular areas:
      1) ....................................................
      2) ....................................................
      3) ....................................................
      4) ....................................................
      5) ....................................................
      6) ....................................................
      7) ....................................................
      What year was this?

(36) Date on which this form was completed

(37) The plan below (or overleaf) is the general ward plan for this hospital.
Is this plan the basic design of this ward?
If any structural changes have been made please indicate what they are.
Please indicate any rooms which are used for purposes other than those for which they were designed and what their present function is.

eg.
A1.4 Procedure for the Administration of the Main Survey

The development of an efficient method of administering the questionnaire is a necessary part of the instrument construction. The requirements are that it be easily accommodated into the hospital schedule, ensures a high response rate, will allow a large survey to be carried out and can be utilised for future use of the instrument.

The third pilot and the main data collection are postal surveys. This allowed the collection of data from hospitals throughout England. The method for administering the postal survey was developed during the 2nd pilot through consultation with the senior nurses of the hospitals visited. The procedure utilised the hierarchical structure of the nursing profession and was as follows:

1. 30 District Nursing Officers (DNO's) were contacted by the DHSS and asked if their hospital would participate in the survey.

2. Letters were sent to the District Nursing Officers giving details of the procedure and asking for the names and specialities of the wards to be used and the names of the Nursing Officers in charge of each department (copy of letter enclosed). (2 of the 30 hospitals were not applicable, one refused, one was postponed indefinitely, one did not reply and three were used in the 3rd pilot; leaving 23 hospitals for the final survey).

3. Overall responsibility for supervising the survey in each hospital was given to the Divisional or Senior Nursing Officer. A letter similar to that sent to the DNO was sent to these nurses documenting the wards specified by the DNO and the details of the survey.

4. The package of questionnaires was sent to the Senior Nursing Officer. It contained:

   - a letter recapping the procedure
   - 2 packages of questionnaires labelled for each ward (16 for the day shift and 4 for the night shift)
   - The Physical Description List
5. The Nursing Officer (a nurse in charge of a particular department) carried out the mechanics of the survey. This included:

- informing the ward nurses of the survey
- distributing and collecting the questionnaires from each of his/her wards included in the survey.

6. The ward nurses were instructed to complete the questionnaire while on the ward. Each questionnaire took approximately 35 minutes to complete.

7. When all questionnaires had been returned to the Senior Nursing Officer, the entire survey was posted back to the University of Surrey. The average time taken between posting and packages and receiving them back was 3 to 5 weeks.

The survey was conducted in the Autumn of 1977.
Dear

With respect to our telephone conversation on the (date) August, I would like to outline to you the details that we discussed regarding the proposed ward design survey.

The Hospital Evaluation Research Unit has been commissioned by the DHSS to develop methods for evaluating hospital designs. At present the work is concentrating on evaluating ward designs for new medical and surgical wards, from the point of view of the people who use them. The DHSS has suggested Hospital as one possible hospital to be looked at. There are two different aspects involved in the work, a questionnaire to be completed by nurses in October and a questionnaire to be completed by patients in January 1978.

Outlined below are the details of the procedure for the nurses' survey we envisage for your hospital and have successfully used in the past.

1. The nurses' survey consists of two separate aspects. They are:

   (a). a questionnaire to assess the design of the ward. This is to be completed by all grades of nurses and both day and night staff working on the appropriate wards. It takes about 15 minutes to complete.

   (b). a physical description list for each ward, asking about, for example, the number of six bedded-bays etc. This is to be completed by the Nursing Officer in charge of the ward during the day. (We have found they prefer to complete these themselves as this minimizes the time nurses on the ward have to commit to the survey).

2. The survey will involve all new medical and surgical wards (including gynaecology, urology and ENT). This will also require the co-operation of the Nursing Officer in charge of each ward and also the Night Nursing Officer.

3. The survey is conducted by post. The procedure suggested to us by S.N.O.'s and N.O's from other hospitals and we have found to be very successful is as follows:
a). Two packages are prepared by us for each ward. One is for the day staff and the other is for the night staff. The day staff package contains twelve questionnaires and also one physical description list. It is labelled with the name of the Nursing Officer, the name of the ward and what it contains. The second contains four questionnaires for the night staff and has the name of the Night Nursing Officer on it and the name of the ward. (Examples are enclosed).

b). These packages will all be sent together directly to the Senior Nursing Officer's office for collection by the Nursing Officers. Each N.O. distributes the questionnaires to the appropriate wards and completes the description list.

c). About three or four days later the N.O. will have to re-collect the questionnaires and return them along with the physical description list for each ward in the envelope provided to the Senior Nursing Officer's office. From there they would be posted back to us. If any are returned later we would appreciate it if they were also posted back to us.

It would be helpful to have the names of the Nursing Officers who would be involved in this work and the names of the wards under their charge. This will make the labelling that much more precise. Also, if there are any ward plans available they would be very helpful to our work.

I realise that this procedure places considerable demands upon the Nursing Officers. However, in the past we have found the staff prefer this to strangers wandering around their wards.

We have considered circulating a general letter to all the nurses before the survey is carried out, but again other Nursing Officers have said they would rather mention it themselves to the nurses on their frequent trips to the wards. We will follow whichever procedure you see as most appropriate.

I would also like to request permission to conduct a patient survey on ward design in your hospital in January 1978. The details of the procedure for the patient survey are basically the same as for the nurses but will not involve the completion of a description list by the Nursing Officers. The other major differences are that a letter is to be distributed to the patients a day or so before the survey asking for their consent (a copy is enclosed) and the choice of patients to complete the questionnaire is left up to the discretion of the Sister on each ward.

If permission is granted for this survey, Ms. M. Veitch will be contacting you with regard to precise dates later.

It is our policy to produce a report on the results for each individual hospital that is surveyed. Approximately twenty copies of the report are returned to the hospital and two copies are sent to the DHSS. In any other publications the hospitals are anonymous and only general trends are reported.

I hope these details are comprehensible and meet with your approval. We look forward to hearing from you.

Yours sincerely,

Cheryl Kenny
Research Fellow
APPENDIX 2: DESCRIPTIVE CHARACTERISTICS OF THE MAIN SURVEY SAMPLE

A2.1 The Response Rate of the Nurses

A2.2 The Estimate of the Percentage of the Total Population of Wards included in the Survey
APPENDIX 2: DESCRIPTIVE CHARACTERISTICS OF THE MAIN SURVEY SAMPLE

Oppenheim (1966), in his discussion of questionnaire survey, distinguishes between analytic attitudinal research and factual enquiries with respect to the necessity of obtaining a representative sample of the total population. He suggests that analytic attitudinal research is concerned with describing the nature of and the relationship between the components of attitudes of a group of people and, in general, is not concerned with generalising to a larger population. Factual surveys, however, are intended to be representative of a large population and must, therefore, reflect the proportional distribution of groups within the total population.

In the current work a similar distinction can be applied. The pilot surveys are concerned with defining the range and content of the domain of nurses evaluations of wards, clarifying the questionnaire and identifying the relationships amongst the questions. Consequently, all grades of nurses on both shifts in a range of different specialties and ward designs were consulted. However no attempt was made to ensure that these samples are representative of the proportional distribution of all adult acute hospital wards.

The objectives of the final survey are to test the validity of the proposed model of evaluation and to provide a data base against which future wards can be compared. The first objective requires that the sample of nurses used in the survey is not self-selecting, but rather represents all nurses working on modern acute wards. The latter objective necessitates that the sample of wards to be surveyed be representative of the total population of modern adult acute hospital wards.

A2.1 Response Rate of the Nurses in the Main Survey

In total, 2,286 questionnaires were sent out to 144 wards in 23 hospitals for the main survey. The population intended to be surveyed is: all nurses working in a ward over a 24 hour period. This includes all grades of nurses (sister, staff nurse, State Enrolled Nurses, student State Registered Nurses, pupil State Enrolled Nurses and auxiliary nurses) for both day and night shifts in medical and surgical wards. Table A2.1 provides a breakdown of the nurse sample by grade and shift.
Table A2.1  **Number of Nurses in the Sample belonging to each of the Grades and Shifts**

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
<th>Percentage of Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sister</td>
<td>227</td>
<td>11.9%</td>
</tr>
<tr>
<td>Staff Nurses</td>
<td>372</td>
<td>19.5%</td>
</tr>
<tr>
<td>SEN</td>
<td>284</td>
<td>14.9%</td>
</tr>
<tr>
<td>Student</td>
<td>539</td>
<td>28.2%</td>
</tr>
<tr>
<td>Pupil</td>
<td>231</td>
<td>12.1%</td>
</tr>
<tr>
<td>Auxiliary</td>
<td>257</td>
<td>13.5%</td>
</tr>
<tr>
<td>Day</td>
<td>1,352</td>
<td>71.0%</td>
</tr>
<tr>
<td>Night</td>
<td>558</td>
<td>29.0%</td>
</tr>
</tbody>
</table>

No precise statement of the staffing levels for each ward is available. However an estimate, obtained from administrative nurses, is that approximately 12 nurses cover a ward in a 24 hour period. To ensure that this population was adequately provided with questionnaires, 20 questionnaires were sent to each ward; 16 for the day shift and 4 for the night shift. 1921 completed questionnaires were returned and used as the data base. This represents 84% of the total number distributed, and on average includes 13.34 nurses for each ward (1921 nurses/144 wards).

In order to obtain an indication of whether the intended population (all nurses working on a ward in a 24 hour period) is covered by the survey, reference must be made to information collected in the 3rd pilot. In that pilot, questions on 'the number of staff in 24 hours' and 'the number of beds staffing levels are based upon' were contained in the Physical Description List (PDL) for each ward.

This information allows the calculation of the average ratio of staff to beds, which is 0.39 staff per bed. (See Table A2.2)
Table A2.2  Ratio of Nurses to Beds in 3rd Pilot

<table>
<thead>
<tr>
<th>Average no. of staff/ward (438 nurses/43 wards) = 10.19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average no. of beds (1065/41 wards) = 25.98</td>
</tr>
<tr>
<td>Average ratio of staff to beds (10.19/25.98) = .39 to 1</td>
</tr>
</tbody>
</table>

In the final survey the PDL does not contain a question on the actual number of staff. However, using the ratio of .39 nurses to 1 bed, an estimate of the average number of nurses can be calculated. 9 of the 144 wards are atypical in that they are intensive care units or contain such units within the ward. The remaining 135 wards accommodate a total of 3902 beds; the average number of beds per ward being 28.9 (Table A2.3). Taking the ratio of .39 nurse per bed (calculated above), the estimated average number of nurses working on a ward is 11.27 nurses. As the average number of nurses per ward completing the questionnaire is 13.34 it can be concluded with reasonable confidence that the intended population of nurses was surveyed.

Table A2.3  Estimate of Average Number of Nurses per Ward

<table>
<thead>
<tr>
<th>Average no. of beds/ward (3902 beds/135 wards) = 28.9 beds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average no. of staff/ward (28.9 x .39) = 11.27 nurses</td>
</tr>
</tbody>
</table>

A2.2  The Estimation of the Percentage of the Total Population of wards included in the Survey

The wards in the survey are compared against DHSS statistics on Patients and Beds taken from the Hospital Year Book (Chaplin, 1976 and 1980). The DHSS describe the population of current stock in terms of the number of staffed beds allocated for particular types of patients. Therefore, the size of the wards in the survey will be expressed in terms of 'the number of beds staffing levels are based upon for given types of patients'. This information was obtained from the PDL.

The population from which the sample was drawn is all new adult acute medical and surgical wards. 28 different specialties are included in
the 144 wards surveyed. 132 of these wards can be classified as belonging to one of five general types of patient used in the DHSS classification. (This classification includes one group for medical patients and four different groups for surgical patients).

**A2.2.1 Proportional Distribution in terms of Specialty**

Table A2.4 contains the average number of beds allocated at any one time, for the five specialty groups, in the years 1974, 1975 and 1977. It also contains the number of beds covered by the survey for each of the five groups.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>General Medicine</td>
<td>29,653</td>
<td>29,402</td>
<td>29,300</td>
<td>1,477</td>
</tr>
<tr>
<td>General Surgery</td>
<td>30,093</td>
<td>29,573</td>
<td>29,000</td>
<td>1,336</td>
</tr>
<tr>
<td>Gynaecology</td>
<td>10,567</td>
<td>10,631</td>
<td>10,300</td>
<td>534</td>
</tr>
<tr>
<td>Ears, nose and throat (ENT)</td>
<td>5,677</td>
<td>5,705</td>
<td>5,300</td>
<td>338</td>
</tr>
<tr>
<td>Urology</td>
<td>2,430</td>
<td>2,369</td>
<td>2,800</td>
<td>129</td>
</tr>
<tr>
<td>Total for the 5 groups</td>
<td>78,420</td>
<td>77,680</td>
<td>76,700</td>
<td>3,814</td>
</tr>
</tbody>
</table>

From these numbers the percentage of the total beds which are contained within each group are calculated (Table A2.5). This table indicates that the distribution of specialties in the survey is representative of the distribution for the total specified population.
Table A2.5 Percentage of Total Beds in each Specialty Group

<table>
<thead>
<tr>
<th>Specialty</th>
<th>1974</th>
<th>1975</th>
<th>1977</th>
<th>SAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>General medicine</td>
<td>37.8%</td>
<td>27.9%</td>
<td>38.2%</td>
<td>38.7%</td>
</tr>
<tr>
<td>General surgery</td>
<td>38.4%</td>
<td>38.1%</td>
<td>37.8%</td>
<td>35.7%</td>
</tr>
<tr>
<td>Gynaecology</td>
<td>13.5%</td>
<td>13.7%</td>
<td>13.4%</td>
<td>14.0%</td>
</tr>
<tr>
<td>ENT</td>
<td>7.2%</td>
<td>7.3%</td>
<td>6.9%</td>
<td>8.9%</td>
</tr>
<tr>
<td>Urology</td>
<td>3.1%</td>
<td>3.1%</td>
<td>3.7%</td>
<td>3.4%</td>
</tr>
</tbody>
</table>

A2.2.2 Proportion of Total Population in Survey

Table A2.6 contains the percentage of the total allocated beds for 1977 which are contained within the survey, as calculated from the total numbers in Table A2.4. The table indicates that approximately 5% of all English medical and surgical wards, irrespective of age, are a part of the survey.

Table A2.6 Percentage of Total Beds Allocated (1977) which are a part of the Survey Sample

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Medicine</td>
<td>5.0%</td>
</tr>
<tr>
<td>General surgery</td>
<td>4.6%</td>
</tr>
<tr>
<td>Gynaecology</td>
<td>5.2%</td>
</tr>
<tr>
<td>ENT</td>
<td>6.4%</td>
</tr>
<tr>
<td>Urology</td>
<td>4.6%</td>
</tr>
<tr>
<td>All medical and surgical wards</td>
<td>5.0%</td>
</tr>
</tbody>
</table>
A2.2.3 Estimate of the Proportion of New Medical and Surgical Wards in the Survey

DHSS statistics on the number of beds provided in new or converted buildings (DHSS, 1980) do not distinguish amongst the 41 different types of patients (including both acute hospitals and mental hospitals). Therefore, only an estimate of the number of new medical and surgical beds can be obtained. In order to provide this estimate, the assumption must be made that the provision of new beds is evenly distributed across all types of patients.

Statistics from the DHSS Statistics on Patients and Personnel (1980) indicate that during 1977 375,900 beds were allocated. Of this total, 76,700 beds were of the five specialties used in the survey; that is, 20% of the total population of beds.

The span of years when the wards in the survey were opened covers from 1962 to 1976, with the majority of the wards (137) being opened between 1966 and 1976. The DHSS statistics on the number of new beds are not available for all ten years. Table A2.7 provides a breakdown of the number of new beds added for each of the eight years where statistics are available (from 1968 to 1976). The average number of new beds for all patient types is 6,341 beds per year.
Table A2.7  **Number of New Beds Provided for all Types of Patient (DHSS, 1980)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>68/69</td>
<td>4,604</td>
</tr>
<tr>
<td>69/70</td>
<td>5,395</td>
</tr>
<tr>
<td>70/71</td>
<td>6,492</td>
</tr>
<tr>
<td>71/72</td>
<td>8,306</td>
</tr>
<tr>
<td>72/73</td>
<td>6,540</td>
</tr>
<tr>
<td>73/74</td>
<td>4,621</td>
</tr>
<tr>
<td>74/75</td>
<td>9,518</td>
</tr>
<tr>
<td>75/76</td>
<td>5,245</td>
</tr>
<tr>
<td>Total</td>
<td>50,724</td>
</tr>
</tbody>
</table>

Average per year = 50,724 beds/8 yrs = 6,341 per year

Using the average of 6,341 beds per year, it is calculated that approximately 63,340 new beds were provided in the ten years when the wards in the survey were opened, with 20% of the new beds being medical and surgical beds. An estimate of the total number of new medical and surgical wards (20% of 63,400 beds) is 12,682 beds. The current survey includes 3,902 beds, or 31% of the estimated total population of medical and surgical wards built between 1966 and 1976.

**A2.3 Summary of the Description of the Main Survey Sample**

The response rate calculated in Section A2.1 demonstrates that the intended population of nurses, that is all nurses working on a ward over 24 hours, is covered.

The comparison of the surveyed wards with the total population of wards in England in Section A2.2 illustrates that the distribution of beds by Specialty is consistent with that of the total population. In addition the sample incorporates 5% of the total population of medical and surgical wards in England and approximately 30% of all new wards. The relative size of the sample provides confidence that the findings of the survey can be generalised to all new adult acute hospital wards in England.
APPENDIX 3: STRUCTURES PRODUCED AND ROLES PLAYED BY FACETS

A3.1 Basic Structures

The Simplex

The Circumplex

A3.2 Facet Roles

Polar Role
Axial Role
Modulating Role

A3.3 Total Structures

The Multiplex
The Radex
The Cylindrex
APPENDIX 3: STRUCTURES PRODUCED AND ROLES PLAYED BY FACETS

A3.1 Basic Structures

The relationship between the elements of a given facet can form one of two basic structures, the simplex or the circumplex.

A3.1.1 The Simplex

The simplex reflects a simply ordered facet with the element regions arranged in a line. The regions of the most similar elements are adjacent to each other and the least similar elements are most distant. For example, a simply ordered facet (A) with four elements would produce this simplex structure:

```
<table>
<thead>
<tr>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>high</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A3</td>
<td>lower</td>
<td>high</td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td>lowest</td>
<td>lower</td>
<td>high</td>
</tr>
</tbody>
</table>
```

Where \( r(A_1, A_2) > r(A_1, A_3) > r(A_1, A_4) \)
A3.1.2 The Circumplex

The circumplex structure reflects an unordered facet (where all elements are equally related to each other) or an ordered facet where there are no extreme elements. An example of the circumplex for a facet (B) with four elements is:

In the circumplex structure an element is least highly related to the element opposite it in the space. The structure requires two dimensions for its expression. The corresponding correlation matrix is:

<table>
<thead>
<tr>
<th></th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td></td>
<td>high</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>high</td>
<td></td>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>B3</td>
<td>low</td>
<td>high</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B4</td>
<td>high</td>
<td>low</td>
<td>high</td>
<td></td>
</tr>
</tbody>
</table>

If the circumplex structure is representing an unordered facet with three elements, the cells of the matrix will be of equal value.

A3.2 Facet Roles

The relationship between a facet's elements dictates the role that facet will play in producing the total structure. Guttman (1977b) specifies three roles relevant to the current discussion. They are polar, axial and modulating roles.

A3.2.1 Polar Role

The polar role is the role played by unordered facets or ordered facets with a circumplex structure. "Each element of the facet corresponds to a different direction of the SSA space, emanating from a common origin" (Guttman, 1977b).
Two dimensions are required to spatially display a polar facet. An illustration of a polar facet is:

Example of unordered polar facets are:

Shapira and Zvulun (1979) - areas in which a soldier can evaluate his officers
   \( B_1 \) Professional
   \( B_2 \) Interpersonal
   \( B_3 \) Disciplinary

Guttman (1965) - Types of Intelligence Tests
   \( B_1 \) Verbal
   \( B_2 \) Numerical
   \( B_3 \) Spatial

Examples of circular ordered polar facets are:

Levy and Guttman (1975) - life areas where people can express levels of satisfaction
   \( B_1 \) Economy
   \( B_2 \) Housing
   \( B_3 \) Spare time
   \( B_4 \) Health
   \( B_5 \) Work

Levy (1979) - Political Issues
   \( B_1 \) Social
   \( B_2 \) Economy
   \( B_3 \) Security
   \( B_4 \) In general

A30
A3.2.2 **Axial Role**

An axial role will be hypothesized for a simply ordered facet if its order is unrelated to another facet. An axial facet can be represented by one dimension. The regions of the SSA space occupied by the elements of an axial facet will correspond with the regions indicated in the simplex structure.

Examples of axial facets are:

Shapira and Zvulun (1979) - rank of officer to be evaluated
   - (A₁) Platoon commander
   - (A₂) Company commander

Elizur and Shye (1976) - country to be evaluated
   - (A₁) Host country
   - (A₂) Israel in future
   - (A₃) Israel in past

Levy (1979) - type of involvement with political issues
   - (A₁) Cognitive
   - (A₂) Instrumental

A3.2.3 **Modulating Role**

The modulating role is also played by simply ordered facets. Guttman (1977b) defines it as a 'simply ordered facet with an "absolute" origin, this origin being common to that of a polar facet.' The structure of a modulating facet is an inner circle surrounded by one or more adjacent rings. An illustration of a modulating facet is:

![Modulating Facet Illustration](image)

The distinction between an axial facet and a modulating facet is whether the facet further classifies the polar facet, if so it will be hypothesized that it is a modulating facet. Examples of modulating facets are:

Guttman (1965) - levels of complexity of intelligence tests
   - (C₁) Analytical
   - (C₂) Achievement
Shapira and Zvulun (1979) – whether areas of evaluations of officers are expressed in:
(C₁) General terms
(C₂) For specific issues

A3.3 Total Structures
The roles played by the facets dictate the total structure to be retrieved. The three predominant structures are: the multiplex, the radex and the cylindrex.

A3.3.1 The Multiplex
When all the facets of a structure play an axial role this is known as a multiplex, with the number of dimensions needed to illustrate this structure being equal to the number of facets.
An example of a two-faceted multiplex (or duplex) is Elizur and Shye's (1976) study of re-immigration to Israel. The space is partitioned to provide a two dimensional cartesian co-ordinate system in the following manner:

<table>
<thead>
<tr>
<th>Country Referred to (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host Country</td>
</tr>
<tr>
<td>Future</td>
</tr>
<tr>
<td>Past</td>
</tr>
</tbody>
</table>

**The Duplex**

(A)

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Referred To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spiritual</td>
<td>Intermediate</td>
</tr>
<tr>
<td></td>
<td>Material</td>
</tr>
</tbody>
</table>

A3.3.2 The Radex
Taken together a polar facet and a modulating facet produce a structure known as the radex (Guttman, 1954) and which looks like:

[Diagram of radex structure]
In an idealised radex, the modulating facet will be reflected in the correlation matrix by the correlations between the polar facet's elements being higher for those variables contained in the inner most circle of the modulating facet than those belonging to the more peripheral elements of this facet. Two dimensions are required to illustrate a radex structure in data. An example of a radex is:

Guttman (1965) - structure of intelligence tests where the polar facet (type of test) is modulated by the (level of complexity) of the test.

A3.3.3 The Cylindrex
This is a three faceted structure obtained by each of the facets playing one of the three possible roles. The polar facet and the modulating facet form a radex. The axial facet partitions the space such that the radex is sliced into a number of radices (equal to the number of elements of the axial facet). This structure requires three dimensions to illustrate it in the space.
An example of a cylindrex is the study of evaluation of officers by soldiers conducted by Shapira and Zvulun (1979). The facets are:

**Axial-Referent (A)**

(A₁) Company commander  
(A₂) Platoon commander

**Polar-Areas of evaluation (B)**

(B₁) Professional  
(B₂) Interpersonal  
(B₃) Disciplinary

**Modulating-Aspect (C)**

(C₁) General  
(C₂) Specific
APPENDIX 4: COMPARISON OF NURSE GROUPS

4.1 Comparison of Nurses by Grade

4.2 Comparison of Nurses by Shift

4.3 Comparison of Nurses by Specialty
APPENDIX 4: COMPARISON OF THE NURSE GROUPS

In Chapter 8 it is concluded that a general questionnaire can be produced that will be applicable to all nurses working on adult acute hospital wards. However, it is also concluded that the validity of treating the nurses as an homogeneous population requires testing. Appendix 4 provides this test. It discusses the comparative interpretations between qualified and unqualified staff, between nurses working on medical wards and nurses working on surgical wards and between day and night staff. Smallest Space Analysis, using the 22 exemplar questions from Chapter 10 (see Table A4.1), is used to make the comparisons of the interpretations. t-tests are used to compare the differences in the intensity of the responses. Results are discussed in terms of the content of the original interviews, with each job description discussed separately.

A4.1 Comparison of Nurses by Grade

Chapter 8 describes the differences between the interviews with qualified staff and with unqualified staff. The major points of difference are that the qualified nurses give more detailed descriptions of the activities associated with particular locations within the ward, as well as placing more emphasis on the administration of the ward and communication within the ward. However, with the exception of office activities, the same activities and locations are identifiable from the unqualified nurses' interviews, although stated at a more general level. This lends support to the assumption that both groups will have a similar structure to their conceptualisations of working on adult acute wards.

Figure A4.1 3-D SSA for Qualified Staff

Plot 1 & 2

Plot 2 & 3

A36
Figure A4.1 is the 3-dimensional smallest space analysis of the 22 exemplar questions for qualified staff (n=885). Figure A4.2 is the same analysis for unqualified staff (n=1020). (Questions circled indicate those which are misplaced in the space).

Figure A4.2 3-D SSA for Unqualified Staff

Plot 1 & 3

Plot 2 & 3

The three facets play the same role for both groups, producing the cylindrex structure, with all element regions identifiable. The differences between the two groups of nurses are in terms of the location of individual items in the space. The unqualified nurses (students, pupils and auxiliaries) do not distinguish clearly between 'access to' ($A_2B_2$) and 'use of' ($A_2B_2$) the ancillary facilities. This is consistent with their more general description of ancillary rooms in the interviews. The qualified nurses do not construe 'access to' and 'use of' the dayroom as part of direct nursing care of the patients. The explanation for this is not known.

A final potential difference between the two general grades of nurses is with respect to the intensity of the scores they give the wards when evaluating them. Such a comparison has not been found in the literature. However, Raphael (1965) does find a difference between patients and nurses which may be relevant. While patients and nurses have a very similar list of criticisms of the hospital, the relative level of satisfaction is far higher for the patients. 73% of the patients reported that they are very satisfied with the hospital, while only 29% of the nurses give this response. If the reason for the difference is in terms of amount of experience of the ward context, the argument can be extended to suggest that the qualified staff will be more critical of the ward environment than the unqualified nurses.
In order to compare the two groups, average scores for the elements of each of the facets and for each of the structuples were calculated for each group and a t-test for independent samples used to compare the means. Qualified staff give their wards lower scores than the unqualified nurses for 7 out of the 9 elements and 14 out of the 21 structuples. For the facet elements, these differences reached statistical significance for only 2 elements: Observation (A1) and Environmental Services (B3). Results of the t-tests for the elements are in Table A4.2.

Comparison of the groups on the structuple scores provides more details on where these difference occur (see Table A4.3). For three of the four structuples contained within A1, the lower scores of the qualified nurses are statistically significant. The lower scores for observation of patients in the ward (A1B1C1) and from the staff base (A1B2C1) are consistent with the qualified staff's greater emphasis on these issues in the interviews. The ease of supervision of trainee staff (A1B1C2) is also lower. This may be a reflection of the fact that this activity is the responsibility of qualified staff. Other structuples giving statistically significant lower scores for qualified staff are: heating and ventilation (A2B3C1), the lighting for treatment (A3B3C1), and the storage of unused furniture (A4B2C2). The only structuple for which the unqualified nurses give significantly lower scores is A4B1C1, patient privacy and disturbances due to noise. This may be related to the issue raised in the interviews with unqualified staff, that the administration of the ward is a source of disturbance to patients, particularly with respect to the noise from equipment and telephones. This is not included in the qualified nurses' interviews.

In summary the interviews and the smallest space analyses indicate that both the content and the structure of qualified and unqualified nurses' conceptions of providing nursing care in the ward context are very similar. The t-tests illustrate that the difference between the two groups occur in terms of the actual scores given, with the qualified nurses tending to be more critical of the environment than are the unqualified nurses.

A4.2 Comparison of Nurses on Different Shifts

The interviews indicate that the greatest differences for groups, in terms of their requirements, is between nurses working on a ward during the day and those on night duty. The night nurses interviewed give only 19 specific activities, while those interviewed with respect to the day shift listed 61 activities. The major issues for the night staff are the observation of patients and the use of the patient/nurse call system,
providing treatment to the patients at the bedside and the disturbance of patients due to noise and lighting. These issues are consistent with their role of vigilance while patients sleep and the necessity to respond to crises when they occur. The following analyses also support this interpretation.

Figure A4.3 is the SSA for day shift (n=1358) and Figure A4.4 is the SSA for night shift (n=560). The cylindrex structure and all the elements of the three facets can be identified for the day shift. The only misplaced item is no. 6 (supervision of staff) which also occurred for the analysis for all groups, as discussed in Chapter 10.

Figure A4.3 3-D SSA for Day Staff

While retrievable, the structure is not as clearly evident for the night shift. The analysis suggests that the nurses who work on the night shift tend to make less clear distinctions between behavioural units than do those working during the day. For example, they do not clearly differentiate between the referent 'people' and 'locations', both in terms of having easy access these referents and also contact with them. Nor do the night staff distinguish between the levels of interaction implied in the three environmental services. This may be a result of the more limited range of experience of the night staff, as indicated by the interviews. This suggests that they do not clearly distinguish between aspects of the setting which are not of great relevance to them. This is also supported by the t-tests.
The t-test comparison of the evaluative scores, given by the two groups, produced significant differences for 4 of the elements. The night shift give lower scores for Observation (A₁) and interactions with other People (B₁); while the day shift give lower evaluations for interactions with Locations (B₂) and Indirect Care (C₂) (see Table A4.4).

The scores for the structuples illustrate the consistency of these element scores (see Table 4.5). The night shift consider interactions with People for Direct Care (B₁C₁) to be more difficult for all levels of interaction. Thus, observing patients, talking to patients, giving treatment to patients and the prevention of disturbances are all considered to be more difficult to carry out at night. In addition, the supervision of staff is also seen as more difficult by the night staff.

Of the 6 structuples where the day shift are significantly lower, 5 are concerned with interactions with Locations (B₂) and 5 with the provision of Indirect Care (C₂). They are: access to the telephone (A₁B₂C₂), access to the ancillary rooms (A₂B₂C₂), the use of the ancillary rooms (A₃B₂C₂), the use of dayrooms and sanitary facilities (A₂B₂C₁), (A₃B₂C₁) the storage of unused furniture (A₄B₂C₂), and the lighting at night for clerical work (A₄B₃C₂). With the exception of the last structuple the results are consistent with the original interviews which suggest nursing care for the day shift involves all aspects of the ward while night duty revolves around the patient in bed.

In summary, the cylindrex structure is retrievable for both the day and night shifts, although the structure is not as well differentiated for
the night shift as for those nurses working during the day. The t-test comparisons illustrate that the night shift are more critical of their ward environment when considered in terms of the activities most relevant to them, as identified through the content analysis of the interviews. While these analyses have identified differences in the way the two groups think about and evaluate their wards; a ward design must accommodate both types of nursing care. Therefore, it is considered appropriate to provide assessments covering the full 24 hours of nursing responsibility in all future use of the instrument.

A4.3 **Comparison of Nurses working on Surgical and Medical Wards**

Chapter 8 discusses the requirements for medical, surgical and orthopaedic wards as obtained from open-ended questionnaires completed by nurse tutors specialising in one of each of these three types of patient. The content analysis of the questionnaires indicates that there are no major differences between these types of wards in terms of content, but rather it is a matter of emphasis. Orthopaedic wards are not included in the final survey and therefore, will not be discussed. The tutors for surgical wards emphasise the necessity of having spacious treatment rooms and ancillary rooms, as well as the wards being located near the operating theatres and X-ray department. The medical tutors emphasise the requirements of good observation, adequate numbers of single bedrooms for very ill patients, the provision of dayspace and the necessity for quiet.

These requirements of medical patients are consistent with previous literature (Coser, 1958; Cartwright, 1964) which suggests medical patients tend to be more ill than surgical patients, have a less predictable rate of recovery and in general stay in hospital longer. The dependency levels obtained from the Physical Description List of the wards in the final survey support the suggestion that medical patients tend to be more ill. 37% of all medical patients were classified as high dependency patients while 24% of all surgical patients were considered to belong to this high dependency category.

Figure A4.5 is the smallest space analysis for all wards classified as surgical; this included general surgical, mixed surgical, gynaecology, ENT and urology (number of nurses=1079). Figure A4.6 is the SSA for all medical wards, n=696. The general cylindrex structure is retrievable for both types of patients, although for neither group is the array of points exactly as predicted. For surgical wards, the axial role of Facet A 'Levels of Interaction' is apparent, however two of the questions do not
occupy the regions they were selected to represent. Question 20 'access to and from the ward' is in region A_1 rather than A_2. As this particular concern is emphasised by the surgical tutors it can be suggested that, because trips away from the ward do occur with greater frequency for surgical wards than for medical wards, the nurses see this as a more distant level of interaction than do nurses who do not make these trips. The other item which does not occupy the predicted region is Q30 'disturbance of patients due to noise.' This occurs in the A_3 region rather than A_4, the disturbance element. This result is consistent with the comparison of the open-ended questionnaires which shows that the surgical tutors do not specify noise as a source of disturbance for the patients. The only departure from the general model for nurses on medical wards is illustrated in Plot 1 & 2 of Figure A4.4.6. The nurses do not distinguish clearly between the use of ancillary facilities (B_2C_2) and the lighting of these facilities (B_3C_2). The conclusion drawn from the SSA's is that, in general, nurses working on medical and surgical wards do experience the ward environment in a similar way.

Figure A4.5 3-D SSA for Nurses working on Surgical Wards

Plot 1 & 2

Plot 2 & 3

The t-test comparisons of the scores for medical and surgical wards result in 8 out of the 9 elements being lower for medical wards, with the differences being significant for 5 of the elements: Observation (A_1), Access (A_2), Contact (A_3), interactions with People (B_1) and with Locations (B_2) (see Table A4.6). The T-tests for the structuples confirms the lower scores for medical wards. For 17 out of the 21 structuples medical wards have lower scores, with 13 of them being statistically significant (see Table A4.7). There are no statistically significant differences for the structuples which have lower scores for surgical wards.
In summary, nurses working on medical wards and surgical wards share a common interpretation of providing nursing care. However, as previous literature has suggested, medical patients are more difficult to nurse. This pressure is reflected in the current work by medical nurses being far more critical of the ward's ability to facilitate the provision of nursing care.

**A4.4 Summary of the Comparisons of the Nurse Groups**

The smallest space analyses have demonstrated that the model of ward evaluation is applicable to all nurses working on the wards in the main survey. The fact that all the facets are retrievable and all play their predicted role indicates that the nurses are a relatively homogenous group in terms of their interpretations of providing care on adult acute hospital wards. The differences between the groups are most evident in terms of the intensity of their responses. It is suggested that different groups have different pressures, associated with their roles, to which they must respond. Their evaluations of the ward design are a reflection of these demands.
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<td>How well does the general design and layout of this ward help nurses to observe patients easily?</td>
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<tr>
<td>A B C 2 6</td>
<td>How well does the general design and layout of this ward help nurses to supervise unqualified staff?</td>
</tr>
<tr>
<td>A B C 1 44</td>
<td>How good is the position in the ward of the staff base in helping patients to gain the attention of the staff?</td>
</tr>
<tr>
<td>A B C 2 45</td>
<td>How good is the position in the ward of the staff base in helping for easy access to the telephone?</td>
</tr>
<tr>
<td>A B C 1 16</td>
<td>How well does the general design and layout of this ward help nurses to have frequent chats with patients?</td>
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<tr>
<td>A B C 2 20</td>
<td>How well does the location of the ward help people to find it easily when entering the hospital?</td>
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<tr>
<td>A B C 1 76</td>
<td>How good is the position of the dayspace(s) in the ward in helping patients to gain easy access to it?</td>
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<tr>
<td>A B C 2 58</td>
<td>How good is the position of the dirty utility room for nurses to gain easy access to it?</td>
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<td>A B C 1 84</td>
<td>How well does the heating/ventilation on the ward in general help patients to feel comfortable?</td>
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<tr>
<td>A B C 1 26</td>
<td>How well does the layout of the bedside space help nurses to give treatment to the patients?</td>
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<tr>
<td>A B C 2 12</td>
<td>How well does the general design and layout of the ward help patients to store their personal belongings?</td>
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<tr>
<td>A B C 1 78</td>
<td>How good is the layout within the dayspace(s) for patients to feel comfortable in it?</td>
</tr>
<tr>
<td>A B C 2 61</td>
<td>How good is the layout within the clean utility room for nurses to prepare for the treatment of patients?</td>
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<tr>
<td>A B C 1 68</td>
<td>How well does the lighting at the bedside help nurses to treat patients efficiently?</td>
</tr>
<tr>
<td>A B C 2 86</td>
<td>How well does the lighting on the ward help nurses to find supplies easily?</td>
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<tr>
<td>A B C 1 30</td>
<td>How well does the layout of the bedside space help patients to rest undisturbed by noise from other parts of the ward?</td>
</tr>
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<td>A B C 2 9</td>
<td>How well does the general design and layout of this ward help nurses to have private discussions with relatives?</td>
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<td>How good is the position of the sanitary facilities in terms of patients privacy?</td>
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<td>A B C 4 35</td>
<td>How well do the storage facilities provided on this ward help staff to store unused furniture easily?</td>
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### Table A4.2

**t-tests**

**Elements by Grade**

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<th>Degrees of Freedom</th>
<th>Pooled Level of Significance</th>
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**t-tests**

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### Table A4.4

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#### t-tests Elements by Type of Patient

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A47
APPENDIX 5: THE PHYSICAL CHARACTERISTICS
OF THE WARDS

A5.1 The 61 Physical Variables
from the Physical Description
List (PDL) and Ward Plans

A5.2 Principal Components Analysis
of the 61 Physical and
Organisational Variables
Appendix 5: The Physical Characteristics of the Wards

A5.1: The 61 Physical Variables from the PDL and Ward Plans

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### A5.2 Principal Component Analysis of the 61 physical and organisational variables (eigenvalues and percentage of variance)

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<td></td>
<td></td>
</tr>
</tbody>
</table>
A5.2 (con't) Loading on the Components
HOSPITAL EVALUATION RESEARCH UNIT
University of Surrey

This ward is one of a number which have been selected to take part in a survey sponsored by the DHSS, concerned with nurses' views about ward designs. Your answers to this questionnaire will be used to help improve the planning and design of hospital buildings.

The questions are all about various aspects of the particular ward you are presently working on. We would like you to answer all the questions about this ward. Please try to answer the questions whilst you are on the ward.

We want to know what you think about the ward so please complete the questionnaire without consulting with colleagues. Your answers are anonymous and will be treated confidentially. Thank you for your help.

Name of Hospital

Name of Ward

Ward speciality

Sex of patients on this ward

For the following, please indicate with a tick where appropriate:

Job Grade:  Ward Sister
            Staff Nurse
            SEN
            Student Nurse
            Pupil Nurse
            Auxiliary

This questionnaire is being completed in reference with your work during which shift:

Day Shift
Night Shift
This survey is concerned with the extent to which the design of this ward helps nurses and patients to carry out their activities. Each Section of the questionnaire represents a particular aspect of the ward design and each question a particular activity.

Instructions:
1. To assess the success of the design, please ring one of the numbers from 7 to 1 for each question which best describes the ward design.
2. Please treat each response separately. Any apparent repetition of questions is for statistical control.
3. Please ensure that you have completed EVERY item.
4. Please answer this questionnaire individually.

Section 1: Overall Design and Layout

<table>
<thead>
<tr>
<th>How well does the general design and layout of this ward help:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- nurses to reach critically ill patients quickly ..................</td>
</tr>
<tr>
<td>- nurses to ensure safety on the ward is maintained ................</td>
</tr>
<tr>
<td>- nurses to move supplies and equipment easily ......................</td>
</tr>
<tr>
<td>- nurses to co-ordinate their activities with one another ..........</td>
</tr>
<tr>
<td>- nurses to observe patients easily ..................................</td>
</tr>
<tr>
<td>- nurses to supervise unqualified staff ................................</td>
</tr>
<tr>
<td>- nurses to gain easy access to all parts of the ward ...............</td>
</tr>
<tr>
<td>- nurses to have private discussions without being overheard by patients ....</td>
</tr>
<tr>
<td>- nurses to have private discussions with relatives ..................</td>
</tr>
<tr>
<td>- staff to use the telephone without being overheard by patients ..........</td>
</tr>
<tr>
<td>- patients to rest undisturbed by noise from equipment ...............</td>
</tr>
<tr>
<td>- patients to store their personal belongings ........................</td>
</tr>
<tr>
<td>- in preventing noises from one patient disturbing other patients ........</td>
</tr>
<tr>
<td>- to provide a relaxed atmosphere for nurses to work in ...............</td>
</tr>
<tr>
<td>- patients to sit and chat ...........................................</td>
</tr>
<tr>
<td>- nurses to have frequent chats with patients ........................</td>
</tr>
<tr>
<td>- patients to establish a sense of companionship ......................</td>
</tr>
<tr>
<td>- patients to become active as soon as possible ......................</td>
</tr>
<tr>
<td>- to provide a pleasant and relaxed atmosphere for the patient ........</td>
</tr>
</tbody>
</table>

-2-
Section 2: Location of the Ward in the Hospital

How well does the location of the ward help:

- people to find it easily when entering the hospital
- nurses to take patients to other parts of the hospital for medical treatment
- nurses to gain easy access to their dining facilities
- patients to visit other parts of the hospital

Section 3: Bedspace

How well does the layout of the bedspace help:

- nurses to operate equipment satisfactorily
- nurses to move equipment and supplies to and from the bed
- nurses to give treatment to the patients
- nurses to use emergency equipment easily
- prevent cross infection
- staff have a private discussion with a patient without being overheard
- patients to rest undisturbed by noise from other parts of the ward
- patients to have private discussions
- patients to use the electronic communication system in order to contact the nurses
- patients to store their personal belongings
- patients to have adequate privacy

Section 4: Storage

How well do the storage facilities provided on this ward help staff to store easily:

- unused furniture
- all necessary equipment
- sterile supplies
- pharmaceutical and drug supplies
- household and domestic supplies
- catering and pantry supplies
- stationery supplies
- clean linen supplies

Legend:
- 7: Helps a great deal
- 6: Helps
- 5: Neither helps nor hinders
- 4: Hinders
- 3: Makes it very difficult
- 2: Makes it extremely difficult
- 1: Makes it extremely difficult
Section 5: The Staff Base

How good is the position in the ward of the staff base in helping:

- nurses to observe critically ill patients easily .......................................................... 60
- patients to gain the attention of the staff ................................................................... 5
- for easy access to the telephone .................................................................................. 4
- nurses to reach patients quickly .................................................................................. 3
- patients to see what staff are doing ............................................................................. 2
- how good is the position of the multi-bed rooms in helping nurses to observe patients easily ................................................................. 1

How well does the layout of the staff base help staff to:

- gain easy access to records and files ........................................................................ 60
- carry out clerical work ................................................................................................ 5
- store documentation efficiently .................................................................................. 4
- use the telephone easily .............................................................................................. 3

Section 6: The Treatment Room

How good is the position in the ward of the treatment room:

- for easy access ........................................................................................................ 60

How good is the layout within the treatment room in helping nurses to:

- move supplies and equipment to and from the patient ........................................... 5
- give treatment to the patient ...................................................................................... 4
- operate equipment satisfactorily .................................................................................. 3

Section 7: Ancillary Rooms

How good is the position of the:

- clean utility room for nurses to use it conveniently .................................................. 5
- dirty utility room for nurses to gain easy access to it ................................................. 4
- pantry area for staff to use it conveniently .................................................................. 3
Section 7: Ancillary Rooms (cont.)

<table>
<thead>
<tr>
<th>How good is the layout within the:</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>- dirty utility room for nurses to clean equipment and dispose of dirty supplies efficiently</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>- clean utility room for nurses to prepare for the treatment of patients</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>- pantry area for staff to prepare beverages and snacks easily</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Section 8: Nursing Office

<table>
<thead>
<tr>
<th>How convenient is the location of the nursing office on the ward for:</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>- nurses to gain easy access to it</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>- nurses not to be disturbed by the activities on the ward</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

How good is the layout of the nursing office for:

| - staff to carry out clerical work | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| - staff to have discussions | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

Section 9: Multi-bed Rooms/Bays

<table>
<thead>
<tr>
<th>How well does the layout within the multi-bed rooms/bays help:</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>- the patient to feel at home</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>- provide a friendly atmosphere</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>- nurses to work efficiently</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>- patients to have some privacy</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>- informal contacts between patients and nurses</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Section 10: Single Bedrooms

<table>
<thead>
<tr>
<th>How good is the position of the single bedroom in helping:</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>- nurses to reach patients quickly</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>- patients not to feel isolated</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>- nurses to segregate patients who may disturb other patients</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
### Section 11: Sanitary Facilities

How good is the position of the sanitary facilities:

<table>
<thead>
<tr>
<th>How good is the position of the sanitary facilities:</th>
<th>Helps a great deal</th>
<th>Helps somewhat</th>
<th>Helps a little</th>
<th>Neither helps nor hinders</th>
<th>Helps not at all</th>
<th>Makes it slightly difficult</th>
<th>Makes it very difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>- for patients to gain easy access to them</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- in terms of patient privacy</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- for nurses to gain easy access to their own facilities</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How good is the layout within the sanitary facilities for:

<table>
<thead>
<tr>
<th>How good is the layout within the sanitary facilities for:</th>
<th>Helps a great deal</th>
<th>Helps somewhat</th>
<th>Helps a little</th>
<th>Neither helps nor hinders</th>
<th>Helps not at all</th>
<th>Makes it slightly difficult</th>
<th>Makes it very difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>- patients to carry out their personal activities easily</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- nurses to assist patients when necessary</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Section 12: Dayspace

How good is the position of the dayspace(s) in the ward in helping:

<table>
<thead>
<tr>
<th>How good is the position of the dayspace(s) in the ward in helping:</th>
<th>Helps a great deal</th>
<th>Helps somewhat</th>
<th>Helps a little</th>
<th>Neither helps nor hinders</th>
<th>Helps not at all</th>
<th>Makes it slightly difficult</th>
<th>Makes it very difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>- patients to gain easy access to it</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- nurses to reach it quickly if necessary</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How good is the layout within the dayspace(s) for:

<table>
<thead>
<tr>
<th>How good is the layout within the dayspace(s) for:</th>
<th>Helps a great deal</th>
<th>Helps somewhat</th>
<th>Helps a little</th>
<th>Neither helps nor hinders</th>
<th>Helps not at all</th>
<th>Makes it slightly difficult</th>
<th>Makes it very difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>- patients to feel comfortable in it</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- accommodating a variety of different patient activities</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Section 13: Electronic Communication System

How well does the design of the electronic communication system help:

<table>
<thead>
<tr>
<th>How well does the design of the electronic communication system help:</th>
<th>Helps a great deal</th>
<th>Helps somewhat</th>
<th>Helps a little</th>
<th>Neither helps nor hinders</th>
<th>Helps not at all</th>
<th>Makes it slightly difficult</th>
<th>Makes it very difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>- patients to use it easily</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- nurses to respond easily to calls from the patients</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- nurses to identify easily which patient in what part of the ward is using the system</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Section 14: Heating and Ventilation

How well does the heating/ventilation:

<table>
<thead>
<tr>
<th>How well does the heating/ventilation:</th>
<th>Helps a great deal</th>
<th>Helps somewhat</th>
<th>Helps a little</th>
<th>Neither helps nor hinders</th>
<th>Helps not at all</th>
<th>Makes it slightly difficult</th>
<th>Makes it very difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>- in the bed area lead to patient comfort</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- on the ward in general help patients to feel comfortable</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- on the ward help nurses to work efficiently</td>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Section 15A: Lighting

How well does the lighting:
- on the ward help nurses to find supplies easily ................
  7 6 5 4 3 2 1
- on the ward help nurses to carry out clerical work ...........
  7 6 5 4 3 2 1
- at the bedside help nurses to treat patients efficiently ...
  7 6 5 4 3 2 1

Only complete the questions in Section 15B if you feel you have sufficient experience of night duty on this ward. If not, pass on to Section 16.

Section 15B:

How well does the lighting at night:
- on the ward help nurses to carry out their work efficiently.
  7 6 5 4 3 2 1
- on the ward in general avoid disturbing the patients ...........
  7 6 5 4 3 2 1
- at the staff base help nurses to carry out clerical work ...
  7 6 5 4 3 2 1
- at the bedside help nurses to treat patients...................
  7 6 5 4 3 2 1
- at the bedside avoid disturbing patients .......................
  7 6 5 4 3 2 1

Section 16: The Whole Ward

This Section of the questionnaire has been developed to measure your reaction to the whole ward in general.

Please indicate where this ward is placed on each of the scales below by ringing the appropriate number (7 - 1). Please treat each response separately; any apparent repetition is for statistical control.

To what extent is this ward:

<table>
<thead>
<tr>
<th></th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>7 6 5 4 3 2 1</td>
</tr>
<tr>
<td>Cheerful</td>
<td>7 6 5 4 3 2 1</td>
</tr>
<tr>
<td>Comfortable</td>
<td>7 6 5 4 3 2 1</td>
</tr>
<tr>
<td>Welcoming</td>
<td>7 6 5 4 3 2 1</td>
</tr>
<tr>
<td>Working well</td>
<td>7 6 5 4 3 2 1</td>
</tr>
<tr>
<td>Suitable</td>
<td>7 6 5 4 3 2 1</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>7 6 5 4 3 2 1</td>
</tr>
</tbody>
</table>

Bad 44  Depressing 45  Uncomfortable 46  Unwelcoming 47  Not working well 48  Unsuitable 49  Unsatisfactory 50

Thank you very much for filling in the questionnaire. Please return it to the envelope provided for all the questionnaires for each ward. This will be collected by the Nursing Officer.

-7-