ARCHITECTURAL PROGRAMMING FOR ACHIEVING VALUE-ADDED DESIGN

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ABSTRACT

ARCHITECTURAL PROGRAMMING FOR ACHIEVING VALUE-ADDED DESIGN

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Values and concerns of project participants have influence on design quality as well as on the design process itself. These determine the functional, social and æsthetic characteristics of the project that are necessary to achieve client satisfaction. The issues of value and quality are compared within the context of architectural programming, including their theoretical and philosophical ground as well as current management techniques. Value and quality can be misunderstood and confused with each other; therefore, it is vital for project participants to have a common understanding of terminology and meaning.

This study includes a comprehensive literature survey on architectural programming and design quality. The current approaches to the construction project process in Turkey were observed through analyzing an hotel project in Turgutreis, Turkey. Supporting tools like Project Definition Rating Index (PDRI) and Design Quality Indicators (DQI) were studied in detail and discussed by the project participants who involved in and affected the design of the project.

This study on architectural programming aimed to explore opportunities for identifying and delivering values into the current process of construction projects. It attempted to claim due recognition for designers in that they had an important role to play in developing better quality buildings and that they designed buildings within pertinent social, political and cultural contexts. It was expected that analysis of participants' values would provide an understanding of the elaborate decision-making that architects have to perform in order to produce added value in designs, and of how architects resolve design problems.

Keywords: architectural programming, value-added design, design quality, Design Quality Indicators (DQI), Project Definition Rating Index (PDRI).

ÖZ

DEĞER KATILMIŞ TASARIMA ULAŞMAK İÇİN MİMARİ PROGRAMLAMA

Akınç, Günseli
Yüksek Lisans, Yapı Bilimi, Mimarlık Bölümü
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Proje katılımcılarının değer ve ilgilerinin, tasarım süreci kadar tasarım kalitesi üzerinde de etkisi vardır. Bunlar, müşteri memnuniyetini sağlamak için gerekli olan projenin fonksiyonel, sosyal ve estetik karakterini belirler. Değer ve kalite konuları, günümüz yönetim teknikleri kadar teorik ve felsefik altyapıyı da göz önünde bulundurarak, mimari programlama çerçevesinde değerlendirilmiştir. Değer ve kalite yanlış anlaşılabilir ve birbiri ile karıştırılabilir, bu yüzden proje katılımcılarının ortak bir terminoloji ve anlayış sahibi olmaları çok önemlidir.

Bu çalışma mimari programlama ve tasarım kalitesi üzerine bir kaynak araştırması içermektedir. Ayrıca Türkiye'de inşaat proje sürecinin günümüz yaklaşımları Turgutreis'deki bir otel projesinin analizi ile gözlemlenmiştir. Proje Tanım Değerlendirme Göstergesi (PDRI) ve Tasarım Kalite Göstergeleri (DQI) gibi destekleyici araçlar detaylıca çalışılmış ve proje tasarımına katılan ve tasarımı etkileyen proje katılımcıları ile tartışılmıştır.

Mimari programlama üzerine olan bu çalışma, değerlerin belirlenmesi ve bir inşaat projesinin günümüz sürecine katılması için imkanların incelenmesini hedeflemişti. Daha kaliteli binaların oluşmasında tasarımcıların önemli rollere sahip oldukları ve onların binaları belirli sosyal, politik ve kültürel şartlarda tasarladıkları anlatılmaya çalışıldı. Katılımcıların değerlerinin analizlerinin, mimarların tasarıma değer katmak için dikkatle işlenmiş karar alma aşamalarını ve mimarların tasarım sorunlarını nasıl çözdüklerini anlamaya yardımcı olacağı beklenildi.

Keywords: Mimari Program, Değer Katılmış Tasarım, Tasarım Kalitesi, Tasarım Kalite Göstergeleri, Proje Tanım Değerlendirme Göstergesi.

To My Parents and My Sister

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ABBREVATIONS

A/E	Architect and/or engineer
CII	Construction Industry Institution
CIC	Construction Industry Council
CPSMA	Commission on Physical Sciences, Mathematics, and Applications
DQI	Design Quality Indicators
HQI	Housing Quality Indicators
IT	Information Technology
OGC	the UK Office of Government Commerce
PDRI	Project Definition Rating Index

CHAPTER 1

INTRODUCTION

Many of the important formative decisions are taken before the architect begins to design the building. Hence, architectural programming is a project phase encompassing all the tasks between project initiation and detailed design. However, in the current steps of the design process, too few architects, and clients are consciously developing an architectural program for defining the project requirements that affect the building design. They jump directly to identification of client goals, user needs, and space requirements. At this point, the architect is left with his own value judgment to try to achieve quality architecture.

Architects, on the other hand, work with many different professionals who are directly or indirectly involved in the building process. These participants range from clients, people of different occupations, the state, and the people for whom they design buildings, the users. Each of these participants has an opinion about buildings. The challenge is to develop a method for understanding the value of buildings in relation to their design for different uses and in meeting a wide variety of physical, social, and psychological needs of the occupants and users.

Managing design and design quality is primarily about understanding what is required and setting in place the right process, people and supporting technology to achieve it. Indeed, many participants in industry realize that programming efforts are a key to ensuring the success of the projects. The program, in brief, underlines the critical quality factors for achieving design quality which are: -

- A clear statement of business-case;
- An adequate budget and timescale;
- A good site review;
- Areas where necessary expert advice is needed from other professionals;
- Selection of project participants with appropriate skills and experience;
- Early involvement of the integrated project participants; and
- Well-managed design and procurement processes.

In general, a good design should: -

- Make a positive addition to the location, the environment and the society;
- Add value and reduce lifetime costs;
- Create built environments that are safe to construct and safe to use;
- Minimize waste of materials, energy, and pollution both in construction and in use;
- Be attractive and healthy for users; and
- Produce facilities that are easy and cost effective to manage, clean and maintain.

1.1. Argument

Many programming methods have been created and many guides have been developed with experienced practitioners (Duerk, 1993; Preiser, 1993; Cherry, 1999; Hershberger, 1999; Pena and Parshall, 2001). However, early planning in many cases is not performed well within the current construction process and, as a result, the building sector suffers from poor or incomplete scope definition, frequently experiencing considerable changes that result in significant cost and schedule overruns. These deficiencies create poor customer satisfaction and contribute to the failure of a project in meeting customer requirements.

The most important measure in any evaluation of a building's design quality is whether or not it satisfies user requirements and what users think and feel about it. However, understanding the views of users is not easy: there might be many different and conflicting views held by individuals and groups. Facilities managers, clients, occupants, visitors, cleaners, repair staff, *etc*. might all have different perspectives on the same facility.

Developing a programming method is the tool to facilitate communication among the participants of any building project. Only while analyzing the design process can one determine the multiple factors and conditions that act upon the decision making of architects, rather than by making direct interpretations about architects' value judgments from their products.

The aim of this study was to investigate the design process and to extract architects' values and concerns with respect to other participants of the building project. The first hypothesis was that architectural programming starts at the pre-design stage, includes design, construction and post-construction phases, and finishes with the feedback of post-occupancy evaluations. Identification of the project participants is an important step in analyzing the entire process. Another hypothesis was that the list of value issues of project participants should be documented, analyzed and discussed in order to achieve design quality. The third and the last hypothesis was that architectural programming will act as a framework to facilitate communication among the participants of any building project.

1.2. Objectives

Planning has long been a subject for academic research in the construction industry. The purpose of these studies was to underline the importance of pre-design activities that architectural programming offers for gathering information to identify project requirements. These activities include identification of project participants, extraction of their values and concerns, analysis of budget, cost and project schedule, and design review.

In the UK and the USA, professionals and researchers working on built environments have developed sophisticated approaches for gathering information and understanding user requirements, facility needs, and values and concerns of project participants. These tools were used to assist participants in reaching a consensus about priorities and relationships. The objective was to define key principles, which are: -

- Early involvement of key members of the project team;
- Clear identification communication lines with defined roles and responsibilities for coordinating aspects of the design and construction processes;
- Selection by value, not lowest price;
- Common processes such as shared IT;
- A commitment to measurement of performance as the basis for continuous improvement; and
- Long-term relationships in the supply chains.

In this investigation, PDRI questionnaire was used. It was aimed to underline critical points that process of a construction project involves. These were: -

- Define the overall project requirements for developing and assembling the project participants;
- Develop project milestones, standard terminology used in information flow;

- Check the completeness of the project scope during programming in order to assist work responsibilities;
- Analyze the level of definition to facilitate risk assessment; and
- Monitor the overall process.

In this research, DQI questionnaire was chosen for identifying the values and concerns of the participants. It was aimed to: -

- Identify needs and the hierarchy of objectives;
- Determine preferred options;
- Ensure that the design and construction approach provides value for project; and
- Learn from best practice or mistakes for future projects.

1.3. Procedure

The study began with a literature survey of related documents from the libraries in Ankara and from electronic resources on the Internet. Here, existing architectural programming methods and supporting tools were examined in detail. It was then decided to study the current approach of construction project process in Turkey through analyzing a case study. In the second phase of the study, existing tools were used with the help of project participants who were involved in and affected the design of the project. In the third phase of the study, the analyses of these tools were presented to the project manager and the architect, and the results were discussed with the architect.

1.4. Disposition

The thesis begins with this introduction chapter defining the aim and scope of the work. The problem definition, method and expected outcome of the work are followed by a presentation of the structure of the thesis.

The second chapter elaborates on the theoretical basis for architectural programming, including the definition of architectural programming and its development throughout history. In addition, values and concerns of a building project are examined briefly, considering the values as issues, values in architecture, and evaluation of the project in the light of described values. This chapter also presents the questionnaires/checklists as existing tools used world-wide to identify and analyze values and concerns that have an affect on building design.

The third chapter deals with the material and methods used during the study. The aim was to link the literature survey with the current design process as practiced in Turkey and to examine whether architectural programming can add value to a building project or not by analyzing a case study project. Interviews were held with the project participants. Furthermore, they were asked to fill out the questionnaires described in the second chapter.

The fourth chapter consists of the evaluations of the interviews and questionnaires. It emphasizes the importance of measuring value and of constantly monitoring its development throughout the project in order to achieve the desired results. As a result, the organizational hierarchy, the information flow, and the affect of the project participants were observed in the current process in Turkey. The discussions with the architect on questionnaires are also presented in this chapter.

The final chapter includes the summary and the conclusion of the study.

CHAPTER 2

LITERATURE SURVEY

This chapter presents a literature survey on four subjects: architectural programming, values as issues, values in architecture and methods of evaluation. The first part of the chapter deals with definition of architectural programming, approaches of architectural programming and starting to program. The second part consists of value issues which are grouped as human, cultural and æsthetic issues, safety issues, temporal issues and economical issues. The third part includes importance of issues, enduring values of architecture and contemporary values in architecture. Examples of existing tools used for supporting architectural programming were also introduced in this section. In the last part, methods of evaluation were examined. These are program evaluation, design evaluation, building evaluation and body of knowledge.

It should be noted that it was very difficult to find published materials on architectural programming in Turkey. On the other hand, there were many resources of on-line information related to programming in other countries. Moreover, these web-sites included the web-based versions of supporting tools presented in this chapter.

2.1. Architectural Programming

Programming is the first and the most important stage in the architectural process. It takes place through the interaction of the client, the users, and the architect. Pena (2001) calls a program, "A statement of an architectural problem." Hershberger (1999) defines programming as "the definitional stage of the design – the time to discover the nature of the design problem, rather than the design solution." He emphasizes that many formative decisions are made before the architect begins to design. The point is that the values and concerns of the parts will have a considerable influence on the form of the building.

> "If the client and programmer are primarily interested in functional efficiency, organizational and activity decisions may be made that could significantly affect the form of the building. If the client and programmer are more concerned with the social and psychological needs of the users, prescriptions for form may be inherent in the listed spaces, sizes, characteristics, and relationships. If they are concerned with economics, it is possible that numerous material and system opportunities, as well as potentially unique spaces and places, will be eliminated from the design considerations." (HERSHBERGER, 1999, p. 3)

Values and concerns also affect the methodology of any construction company. Through a survey of architectural firms, Hershberger (1999) indicates that the inclusion of programming provides a firm a competitive frame over the ones that do not offer such service. He states: if firms realize the importance of programming, design can begin earlier, continue more efficiently with less failures and delays. Programming saves both the firm's and the client's time and money.

2.1.1. Definitions of Architectural Programming

The term Architectural Program, meaning a statement of requirements for what should be built, was frequently used in the mid-nineteenth century by architects and students at the *Ecole des Beaux Arts* in Paris. It came into use in American Universities as the French system was adopted for teaching architecture in the USA. Meanwhile, in Britain and parts of Canada, the term "briefing" includes programming, but the distinction between functional, architectural and technical programming was not often made (Whelton and Ballard, 2002).

An architectural program is generally defined as the first stage of the architectural design process in which the relevant values of the client, user, architect, and society are identified; facts about the project are discovered; values are stated clearly; and goals are articulated. Afterward, it becomes a document in which the identified values, goals, facts, and needs are presented (Hershberger, 1999). Similarly, Duerk (1993) describes architectural programming as a systematic method of managing information. It provides the right kind of information to be available on time during the design process so that the best possible decisions can be made in shaping the overall project. In other words, programming is the gathering, organizing, analyzing, interpreting, and presenting of the information relevant to a design project.

Programming was needed to support changing project objectives and means. Where design problems became more complex and could not be easily defined by the decision-makers, quality in design was more difficult to obtain. Such problems involved solving a set of interlocking issues and constraints by multiple stakeholders. A set of auxiliary management tools are required by groups engaged in programming to help manage such complexity (Whelton and Ballard, 2002).

2.1.2. Approaches to Architectural Programming

Throughout the years, methods range from informal discussions of client and architect to detailed studies that cover similar facilities and users together end up with a detailed program (Hershberger, 1999). Until architectural firms took on the job of programming, the client was expected to define the architectural problem in a program document as well. Program documents may still be provided by a client-owner as well as by a design team or a programming consultant. These generally list briefly the required rooms and their square footages, with very little explanation of the values of the client, users, or society; purposes to be served by the building; relationships between spaces; requirements of the spaces; and so on. These documents are not to be confused with architectural programs, which are the documents for the organization of the services (Duerk, 1993; Hershberger, 1999).

The client-based approach in architectural programming becomes less effective since buildings become more complex. As the clients may have provided inadequate or incorrect information to the architect, deficiency adds more cost to the project during its design, and construction phases, and even afterwards because of the expensive changes required to make the building work (Hershberger, 1999). Regional investigations into the process reveal that the process is ineffective in many areas attributed to organizational and human factors. Barrett *et al*. (1999), for instance, propose key solutions for UK that include: client participation to make decisions within the team, management of project dynamics, information and visualization techniques of values and concerns. As a result, architectural programming was offered in the offices to achieve functional planning. These programs have been reshaped by the integration of new sciences and methods; such as 'Design-Based Architectural Programming', 'Knowledge-Based Architectural Programming', 'Agreement-Based Architectural Programming', and 'Value-Based Architectural Programming'.

A. Design-Based Architectural Programming

Hershberger (1999) describes design-based architectural programming as a method occurring simultaneously with the design process. Usually, the architect and client meet to discuss the client's requests and the architect takes notes as the discussion proceeds. In most cases, a minimum amount of time and effort are spent for generating the program, and architect starts to draw up (Hershberger, 1999).

> "If something was left out of the brief and not covered in the discussion, it becomes evident in the drawings. The new information is then taken into account and a new drawing is produced. This process is repeated until the client and architect are satisfied that all problems have been uncovered and resolved in the design." (HERSHBERGER, 1999, p. 7)

The whole design process is seen as a development of problem definition. Conversely, any definition of the problem is premature until the design is completed (Whelton *et al*, 2002). As a result, the programming creates disadvantages that affect the common goals of the client and the architect. First of all, the design-based approach can be expensive and time consuming programming method. Because generating a program is much simpler and less expensive than generating designs. In order to reduce the time spent on design stage, the architect may be restricted in using his creativity. In addition, the approach may also transfer the authority of decision making from the architect to the client. In brief, the process may lose its function since there is no documentation of the values or feedbacks of the previous decisions (Hershberger, 1999).

B. Knowledge-Based Architectural Programming

In the late 1960s, researches in the field of architectural psychology and sociology gave rise to a notion that the construction industry was disregarding quality demands of users. Most segments of the population were finding the design of the architects to be inappropriate to their lives (Dewulf *et al*, 2004). In response, a growing movement was calling for a re-examination of urban planning and architecture from a user point of view. Universities played an important role in this, doing valuable work on participatory planning, post occupancy evaluation and environmental psychology (Dewulf *et al*, 2004). Seminal studies of personal space and territoriality were introduced to the architectural profession. The main conclusion to be drawn from the research on personal space is that people need to place more emphasis on variety, flexibility, and personalization of space. As a result, it is thought that psychology and sociology would provide a firm basis for "design-for-people" (Schnell *et al*, 2001; Reardon *et al*, 2004).

This programming research has improved the methodology used for information gathering. As complex building types are needed, the architect or client may not have a very good conception of values, goals, and needs of users in various divisions in the organization. In order to determine the different perceptions of values and goals, it becomes necessary to interview key personnel. It may also be useful to review the research literature on special user needs, to visit the similar facilities for observations, and to devise questionnaires to sample typical users about their attitudes and ideas about specific facility, furnishing, and equipment requirements. Afterwards, the information gained is classified, statistically analyzed, and summarized in a program document that covers all of the human requirements involved in the design (Hershberger, 1999; Long *et al*, 2002).

The relationship between design and human behavior, however, proved to be more difficult than initially assumed. The research community had difficulty in communicating with the design community because of the specialized language and statistical analysis (Dewulf *et al*, 2004). Therefore, the approach began to lose its efficiency. In some cases, the interest in being systematic in developing knowledge about users may tend to obscure issues of importance. There may be a tendency to under emphasize non-behavioral science areas such as site, economics, time, and technology. Moreover, the use of more detailed research methods on fairly easy problems can also require excessive amounts of time and money (Hershberger, 1999).

C. Agreement-Based Architectural Programming

In the agreement-based approach, it is important to gather the necessary information for the program before starting design. At first, available information is collected from the records about local site and climate data, applicable governmental regulations, and the like. Secondly, the areas where more information is needed are identified. Then the participants get together in meetings to interact with a representative group of the client. During these work sessions, specific project goals are documented, additional facts are identified, the concept of the problem is determined, and specific needs are formed for each value category. (Hershberger, 1999)

The most famous example of presentation of this approach is a problem-seeking matrix designed by William Pena (2001). The problem-seeking matrix has four values or issues along one side: function, form, economy, and time. Pena (2001) argues that any relevant information in a design project can be placed in one of these categories. For example, site, context, climate, materials, technology, landscape, and aesthetics can be included under form. Along the other side of the matrix are five information areas: goals, facts, concepts, needs, and problem. If the total cells of the program matrix are filled with acceptable information about the project, then the problem is considered as defined. After the matrix is complete, the participants continue to develop specific lists of required spaces, square footages, and appropriate relationship diagrams (Pena *et al*, 2001).

This programming approach avoids both the misunderstandings and reactionary nature of the design-based programming process and the higher costs and time requirements of the knowledge-based process. As Hershberger (1999) states:

> "First, it is a way to ensure that information is obtained for every area in which the architect has design concerns. Second, it is an economical method of generating the information needed to begin design. Very little effort is spent on time-consuming research on user needs. The firm relies, instead, on a representative group of users to communicate these needs during work sessions. Third, and perhaps most importantly, both client and architect agree on the nature and scope of the design problem before design commences. Fourth, time is conserved in the initial programming process by avoiding development of information not required to commence schematic design." (HERSHBERGER, 1999, p. 22)

Despite its advantages, the pre-fixing of the values may become a weakness. As the certain categories are chosen to define the whole problem, there is a chance that the matrix will be excluding some values. Besides, the source of information may not be proper for gathering the accurate information if the client's selected group is not the representative of the entire organization. Finally, a feedback system is needed to visualize the development of the program in order to understand the nature of the problem. (Hershberger, 1999)

D. Value-Based Architectural Programming

Value-based programming tries to integrate the advantages and avoid the disadvantages of all of the programming approaches discussed before. First, like design-based programming, value-based programming examines the fundamental nature of the design problem in the earliest stages of architectural programming. Then, the value-based programming process adopts the organized procedures used in knowledge-based programming whenever they are needed to ensure that the information obtained during programming is reliable and valid. Finally, the value-based approach to programming includes a feedback system to the agreement-based method of programming (Hershberger, 1999).

The challenge is to develop a method for understanding the value of buildings in relation to their design for different uses and in meeting a wide variety of physical and psychological needs of project participants and users. Central to the approach is the recognition that participants (architects, consultant engineers and other specialists involved in design of buildings) have an important role to play in developing better quality buildings, and that they design buildings within particular social, political and cultural contexts (Gann *et al*, 2003).

The major source of information relies on interviews and discussions between the architect and the client to uncover the values and goals. By determining the important values relating to the design problem early in the programming process, it becomes possible to identify those crucial areas in which more systematic research procedures should be used. It incorporates the objective of being comprehensive and relies on a similar matrix format to ensure that all of the necessary information is collected, presented, and agreed upon (Preiser, 1993; Cherry, 1999; Kliniotou, 2004).

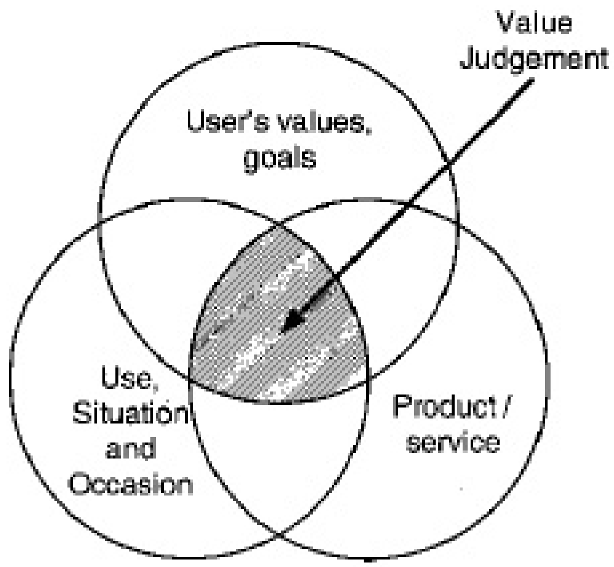

Figure 2.1 Content of Value Judgment.
Source: Thompson *et al* (2003)

Duerk (1993) mentions that preparing a program should be done by the specialized person called programmer:

> "It is the designer's role to articulate ideas that will work to solve the problem that the programmer defines, and it is the programmer's role to keep the concept generic and abstracts so that the alternatives for a concrete solution are not limited in these early phases of the project. As the design process moves forward, the programmer's role is to help the designer evaluate how well the evolving design fulfills the intent or communication." (DUERK, 1993, p. 19)

2.1.3. Starting to Program

As it is described before, programming is a process of gathering and managing necessary information that is needed to understand, develop, and analyze a design problem (Duerk, 1993; Hershberger, 1999; Pena, 2001). A programmer who is creative enough can manage missing information, transforming the information into a strategy for action, and knowing what to construct at the end. The aim is to focus attention on the critical issues and paths of the design as well as outlining the overall pattern of design (Preiser, 1988).

Hershberger (1999) describes programming under two headings: pre-design stage, and architectural programming. Duerk (1993), similarly, describes programming in two main areas of concern; ‘the analysis of existing state’, and ‘the projection of the future state’:

> “Analysis of the existing state is the context within which the design is to be embedded and includes such things as site analysis, user profiles, codes, constraints, and climate. Alternatively, projection of the future state is the set of criteria that the design must meet in order to be successful and includes the mission, goals, concepts, and performance requirements.” (DUERK, 1993, p. 11)

A. Pre-design Stage

Pre-design stage is the project phase including all the tasks between project initiation and detailed design. According to Hershberger (1999), reviews of needs take place a number of times during the pre-design stage; beginning with the client’s first conversation about a project. Several services are conducted according to design problem. These services are generally organized under two studies: planning, and programming.

Planning is defined as gathering required information for the project. In order to prepare this stage, the architect needs information about the client's values, goals, and expectations, the type and overall size of facilities, space requirements, and the like, as well as site particulars, climate conditions, etc. The main sources of information are "literature search" of the previous works, "diagnostic interviews" with the client and/or users, "diagnostic observations" of the similar facilities, and such. The information taken in the pre-design stage articulates desired images or meaning for the development (Duerk, 1993; Hershberger, 1999; Hansen *et al*, 2003).

Gathering data in this context is a survey on three issues: financial feasibility, site suitability, and master planning. First of all a financial feasibility study is a necessity that involves prediction of the market conditions, available financing, site situation, and building costs. It is an important pre-design activity when developing plans for speculative developments (Devaux, 1999). After a project has been determined as feasible, it is important to discover if the planned facility can be accommodated on the probable site. Site suitability means only to demonstrate that a site is large enough and configured properly to allow alternative suitable plans. It does not mean to articulate a design that fulfills all the requirements of the participants (Hershberger, 1999). Once the site has been selected and purchased, it is common to prepare a master plan for the development of the site. It is a plan that shows the different stages of the design problem so that an organized and economical growth of the facility can be maintained. All is needed for the prediction of future events. Therefore, for planning activities, the architect needs information on the immediate and future requirements of the organization (Hershberger, 1999; Meacham *et al*, 2005).

Programming is a process usually starting with the functional program and concluding with the architectural program (Hershberger, 1999). It uses the information gathered during the planning stage. However, it requires considerably more detailed perception of the values on the specific facilities to be built.

Programming takes place at three stages of the project: “schematic design”, “design development”, and “construction documents”. First of all, programming for schematic design must provide the information the architect needs in order to decide on the basic formal and spatial organization and aesthetic character of the proposed building. Hence, necessary information on the human and cultural issues essential to making appropriate design decisions about building organization and relationships should be prepared as well as information on environmental issues, urban or rural context, growth and change, special material or system needs, and economic opportunities. Then, programming for design development is essential so that the architect becomes aware of the requirements in detail, such as the material finishes, illumination levels, lighting control, and the like. A design development program typically includes all such requirements stated in the standards and those that differ from or exceed accepted standards. Finally, the construction documents phase of programming involves obtaining the information necessary to select particular building materials, equipment, furnishings, and systems needed to complete the construction documents. Selection is often made in direct consultation with the client’s representative or with professional engineers and other consultants. This information might make a design difference in the details of a building, but generally not in its overall formal or spatial organization (Kirk and Spreckelmeyer, 1988; Hershberger, 1999).

When the programming stage is ignored, the omission certainly costs the owner’s time and money, because it is the program that defines the project in terms of purpose, scope and functions. Based upon information collected during planning stage, it should set forth clearly the needs to be fulfilled including the specific services to be provided and if available, the organizational structure and staffing pattern. The program provides the basis for development of the architectural program (Hershberger, 1999).

B. Architectural Programming

The next service, referred to as architectural programming, generally has steps of developing essential information to complete schematic design and to start the design development stage. Programming allows the architect to discover the significant differences of a project required by institutional or personal preferences, and to make a hierarchy of architectural spaces out of those differences (Long and Wilson, 2002).

In order to plan a programming activity, it is necessary to have a preliminary understanding of the scope and complexity of the design problem.

i. Project Participants

Architectural programming for achieving value-added design is generally concerned with maximizing the benefits of a project or a business by seeking to satisfy or exceed the requirements of the various parties involved. The discussions during which these professionals express their respective opinions on value matters typically involve client representatives, the design team and third parties related to the project. Their participation is essential for useful and necessary input to the people who will use or who may be affected by the facility; especially the design group (CPSMA, 2000; OGC, 2004).

It may be a challenge to achieve an adequate level of communication while maintaining clear lines of responsibility and reasonable efficiency in the process. Architectural programming can structure the flow of information and ideas because the members of a construction project represent the separate facets of the process (Turin, 2003; OGC, 2004).

ii. Values and Goals

Hershberger (1999) has stated that presenting the ‘values and goals’ is an effective way to compel the designer to focus on the crucial issues. The importance of this section is setting ‘an appropriate framework’ for the decision-making process. The primary values of the client defined in the programming matrix should be identified and placed in order of importance with regards to each issue heading. The goals should also be ranked relative to importance from essential, to important, or some similar listing. Prioritization of values and goals is a guide for the programmer when budget limitations require reductions in program requirements (Hershberger, 1999).

After receiving the list of values and goals, the decision makers within the client’s organization will discuss in work sessions for additional space, equipment, furniture, etc. They decide what can be supported or not, based on the budget and various other important issues discussed previously within programming. The programmer present the design considerations generated to help the designer to develop a clear “understanding of what must be accomplished and what would be desirable to accomplish if various constraints allow” (Hershberger, 1999).

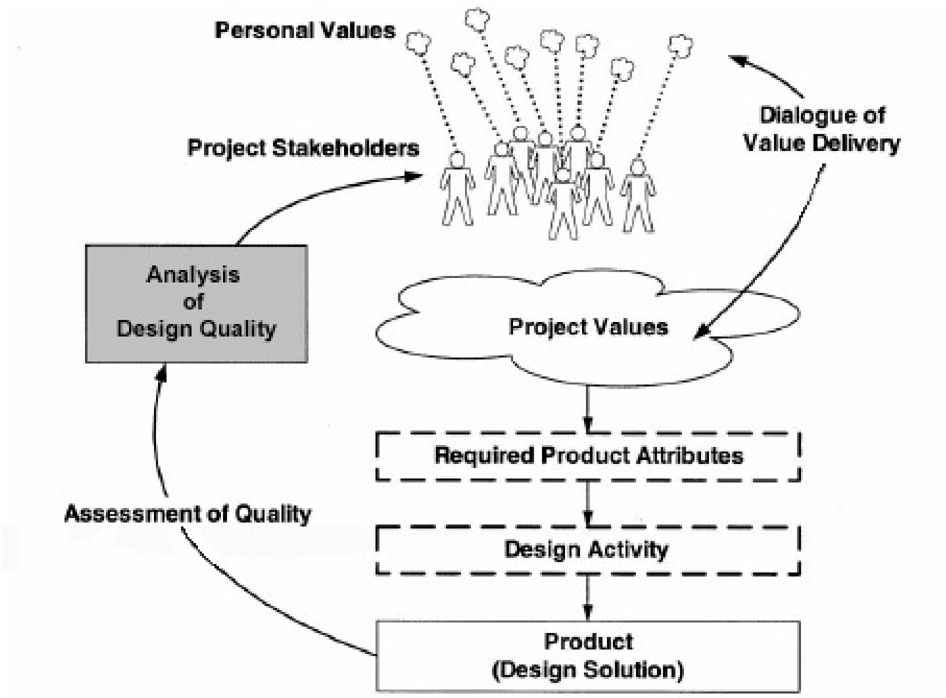

Figure 2.2 Extracting Values.
Source: Thompson *et al* (2003).

iii. Budget and Cost Analysis

The budget will always be the concern of client and will be articulated as the main value subject. Design decisions are critical to designing, methods of construction, and operational costs after occupancy. So, budget and cost analysis should be included as a part of programming (Kirk and Spreckelmeyer, 1988).

Whether the owner's budget is fixed or it can vary depending on the quality and character of the design, this should be noted clearly in the program. If market conditions or specifics of financing are the crucial areas of concern, then these should be covered in the program. These basic assumptions will affect the calculations of construction costs, and even project costs such as the cost of land, taxes, salaries, governmental approvals, and the like (Hershberger, 1999). It should also be possible for the architect to develop a breakdown of costs based on the expected programming procedures to be used, including costs for gathering information on values and goals, negotiating and coming to agreement with program participants relative to specific facility needs, and preparing the programming document (Preiser, 1993). The sum of these costs associated with project can exceed the funds available, and then it will be necessary to reassess the program to determine what can be reduced to bring the project within budget (Hershberger, 1999).

> “Providing for a range of costs will allow the client to set the project budget at the level needed to obtain the quality of building materials, systems, site development, furnishings, and equipment desired. It is very important that the cost estimate be realistic, and especially not unreasonably low, so that the designer can produce a design of suitable quality within the budget.” (HERHBERGER, 1999, p. 411)

Estimation starts from the design stage till the end of the project for specific tasks. The project program and the associated cash flow estimates can provide the baseline reference for project control. The original cost estimate is converted to a project budget (Hendrickson and Tung, 1989).

iv. Project Schedule

Project scheduling is a process requiring the architect to estimate the time needed to do a reliable program. It first involves preparation of a list of all of the activities necessary to develop the program. After deciding on the programming activities, a time allocation schedule is formulated. This schedule typically itemizes every activity, sets up a bar chart indicating when each activity will be conducted, and indicates the number and type of personnel to be involved for each task (Hendrickson and Tung, 1989).

The unique conditions of the project are revealed by the programming process. Clients may have seasonal needs that must be met. Climatic conditions may affect the construction methods or duration. In addition, the size of the project influences the schedule. These time goals should specify a move-in date, and the discussion of those goals should make the important time considerations clear. The best way to develop a realistic schedule is to talk to someone with construction experience in the area where the project is to be located (Cherry, 1999).

Preparing a schedule is helpful in determining how long the programming will take and what it will cost. As a result, the project schedule helps the managers effectively coordinate and facilitate the efforts of all project team members during the life of the project. Moreover, it becomes the effective part of the project control system (Hendrickson and Tung, 1989).

When time is mentioned as an important issue, a project schedule is included as a separate section of the program. This schedule should address every stage of the project, such as programming, design, construction, and occupancy. If the schedule is very tight, it becomes necessary to prepare a crucial path schedule to show that everything can be completed not later than a certain deadline. Such a tight schedule can have a pressure not only on how the work is carried out, but also on the final character of the building itself. The architect must be careful in choosing the methodology so that it becomes possible to avoid unplanned delays in construction (Cherry, 1999; Hershberger, 1999).

v. Design Analysis

Design ideas are formulated while people concerned defining the type of problems. There may also be ideas about a suitable design solution that the client, user, or programmer wants the architect to consider. If the client or user suggestions usually based on journals or on personal experience, are given verbally, they should be recorded and included in the programming matrix under the ideas category. Moreover, information about similar buildings collected during the literature reviews should be included. So that, if a part of the design problem has already been dealt with, the architect can use this example by adapting it to satisfy the requirements of the particular program (Hershberger, 1999).

	Goals	Facts	Concepts	Needs	Problem
Function					
Form					
Economy					
Time					

Figure 2.3 Pena Matrix

Source: Pena *et al*. (2001)

Pena (2001) defined ‘programmatic concepts’ as concepts having primarily organizational or operational implications. Hershberger (1999) also agrees on that similar programmatic concept cards can be used effectively to visually explain many of the programmatic ideas that are expressed during the programming process. Such ‘ideas’ can be expressed in diagrams to make them more understandable to the designer than if they were expressed only in words (Hershberger, 1999; Pena, 2001).

As the architect is a member of the programming team, it is also possible to begin the development of design concept diagrams as a concluding part of the programming activity. Three to six concept or precept cards, including functional, context related, image related concepts, can be summarized according to the type and size of the project. Hershberger (1999) reshapes these concept cards by adding verbal explanations to one side. If they are included in the program document in this way, they give the design architect the benefit of all of the ideas outlined in the programming process.

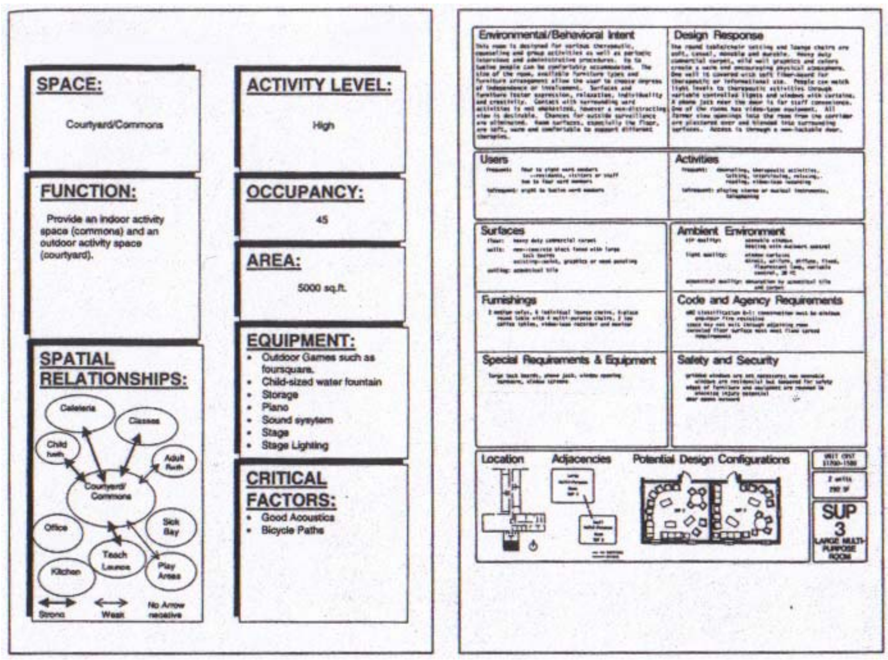

Figure 2.4 Examples of Concept Cards

Source: Hershberger (1999)

The architect, however, is not involved in the programming process in some cases. Then, it is preferable to leave all but the most basic design analysis to the architect. The premature fixing of conceptual ways of solving the design problem may hamper exploration of other alternatives. The basic reason is that the architect may see other possibilities for the problem solution (Hershberger, 1999).

> "The fact is that programming and design analysis are not really complete until the building is constructed and occupied. Design exploration, schematic design, design development, and even the ultimate occupancy of the building will uncover new ideas, opportunities, and constraints which will make some objectives of the original program difficult to achieve, and often will cause clients to change their minds as to the requirements of the program." (HERSHBERGER, 1999, p. 429)

2.2. Values As Issues

Duerk (1993) describes the term "issues" as "a topic that makes a difference in a particular design – a concern that requires the designer to take action and decisions". Her method, sorting information into issue-based categories, develops a strategic plan for uncovering necessary information, for identifying the critical decisions, at the same time, for developing a format of reporting to the client, the architect, or the design team. This provides a tool for designers to categorize the facts and useful information at the very beginning of the project. In other words, it provides a tool for managing information during the design process. For this reason, Duerk (1993) points out that the set of "facts" brings out the "issues", the "issues" that are considered under certain values create "concepts or potential solutions".

> "Facts are objective, specific, and verifiable by some measurement or observation. Their existence is not subject to judgment, but their use and interpretation is based on values.

> Information about the constraints and the context within which the designing is done is vital to understanding the project, but the context and constraints are not usually the major forces in shaping a design. However, the visual qualities of the site (facts) may inspire an image (issue) response and the climate (facts) may require an energy efficiency (issue) response." (DUERK, 1993, p. 25)

Hershberger (1999) and Long *et al*. (2002) underline that all of these issues are not equally important in every project. It is essential that the programmer defines, and the designer decides, which values should be the critical issues for that specific project. Focusing upon those essential issues makes a difference in the quality of the project as well as in the life of the users. The following sections will examine these issues under four subheadings: Human, Cultural and Aesthetic Issues; Safety issues according to Environmental and Technological Aspects; Temporal Issues; and Economic Issues.

2.2.1. Human, Cultural and Aesthetic Issues

> "Different cultural groups, people from different parts of the country, and people with different educational and economic levels all have different sets of values that will influence what they think is a good outcome for a project. Different departments will have different goals and values and, therefore, they will have different priorities." (DUERK, 1993, p.26-27)

The architect should know the social relationships that will help the participants achieve their objectives successfully. If these relations can be recognized during programming, it will greatly assist the designer in improving design solutions (Long *et al*, 2002). For this reason, programming does not only deals with providing the minimum or even optimum spatial layout to accommodate some activity, but also presenting 'information on the hierarchy or relative importance of various activities, essential relationships, adjacencies or proximities of activities, specific space sizes and equipment needs, furnishings, and other materials necessary to support the functional activity' (Hershberger, 1999).

> "There has been extensive work in the area of human factors, which is also known as anthropometrics or ergonomics, the latter emphasizing work-environment-related human factors. This field concerned with the dimensions and configuration of the designed environment, often near environment, to match building occupants' physiological needs and physical dimensions. Equipment, such as telephone, keyboard will be designed with concern for human factors in terms of comfort, safety and ease of operation." (PREISER, 1988, p.44)

Moreover, the physical and physiological characteristics of the occupants can have a great influence on the form of a building. Special user needs of all kinds are encountered in architectural problems; such as designing for children, the elderly and physically handicapped people (Thompson *et al*, 2003; Reardon *et al*, 2004). The designer should propose the minimum width of halls; the size, location, and swing of the doors; the height and location of bathroom fixtures; the heat and humidity levels of the buildings; and many other necessities depending on the requirements of the people to be accommodated (Hershberger, 1999).

Wilson (1986) points out that architecture must serve the needs of society in two ways; first, to set up a spatial order that makes possible the fulfillment of manifold operations in an effective way, second, to bring to life an order of representation that embodies those occasions so that they can be recognized in an intelligible way. Wilson (1986) insists that the meaning of architecture lies in use, and buildings only come into being to serve the needs of a culture. He asserts that,

> "… the limits of an architecture are the limits of the culture that it serves. It is the embodied values that have been worked out before by a culture in all its levels of awareness (religious, political, economic.) The cathedral did not invent religion." (WILSON, 1986, p.17)

Historical background will establish the cultural framework into which any new development will be placed. It will have a powerful effect on what is programmed and designed, even if some of the issues are not clearly expressed by anyone. There will also be a tradition of language and art that states how people think, use space, and understand forms (Thompson *et al*, 2003). This is normally no problem for architects working in the country in which they live. This background will likely be an ordinary part of the architect's system of managing architecture. Similarly, it is accurate for regional building traditions based on available materials and labor. There will be materials that are cheaper to use than others, and craftsmen available to practice only one kind of system. However, it is a more complex problem that architects perform in another country, or culture. Unless a careful environmental research is done, there is a chance that these architects will create something appropriate for their own place, but not suitable in another culture (Hershberger, 1999).

The client may be a member of an activity that has a continuity or history of development in society. Therefore, the architect will be designing for an institution. For this reason, the institution's place in society should be defined carefully so that the designer can state this value in the form, space, and meaning of the project. A research on institutional values could be made for practically any institution: educational, religious, commercial, or residential.

The identification of institutional purpose at the beginning of the architectural programming activity and within the program document is important to establish the direction of the rest of the programming and design activities (Hershberger, 1999).

> "There may also be traditions of community life that should be known to the designer, so that if a departure from the norm is selected, it will be with an understanding of its likely effect. It is important that the architectural program clearly set forth the conditions that establish the context for a project to be situated outside of the architectural designer's immediate region." (HERSHBERGER, 1999, p. 111)

It should be indicated here that many communities have orders that are specific in terms of the adequate form of buildings, signs, parking, and landscape areas. They define 'maximum heights, setbacks, land coverage, and the like'. All of that have significant effects on form and, of course, the aesthetics of the building (Hershberger, 1999).

Generally, architects want to understand and use the aesthetic values of clients, users, and even society in the design. They choose certain materials, shapes; have some preferences as regards how the building should match to its environment; and so on. Correspondingly, if there are existing buildings to which the new building will relate, building owners and clients will demand that the new project conform in terms of color, materials, or configuration. However, in these cases, clients have a desire to communicate a specific image to the community and perhaps to the building's users. Sometimes the image involves a level of quality or concern that needs to be conveyed to the users. At other times, the image relates to specific referential meanings. Occasionally, the desired meaning is more emotional or affective. It is still within the architect's ability that how this meaning will be translated in the design (Hershberger, 1999).

Individual, cultural and universal responses tend to be all mixed up together. Subliminally, these interwoven levels influence how we respond to places. Personal preferences can usually be recognized, cultural occasionally, but the universal level is least conscious (Day, 2002).

2.2.2. Safety Issues

Safety is an essential part of the design process. In fact, safety cannot be left to design only; it must begin in project planning. Safety in programming occupies three basic functions. The first is foreseeing hazards. The second is providing the standard of protection that is necessary. The third is completing initial investigation to determine risk, and the cost and effectiveness of corrections. A programmer may need to analyze the hazards and safety requirements for each facility in a project; being aware of the fact that any facility type may require different rules to apply (Preiser, 1993; CPSMA, 2000).

> "The main goal is removal of hazards. If there are no hazards, it makes little difference what occupants do – the potential for harm has been removed. However, not all hazards can be removed or eliminated. When that is the case, planners and designers should look for ways to reduce hazards. This can be accomplished by reducing the potential for an accident event or by reducing the severity if such events occur." (BRAUER, 1993, p.474)

Standards and codes are also adopted by communities as a standard for protecting the public health, for safety, and for welfare. If the designer is fully aware of the rules and regulations before beginning to design, the official requirements become another issue of design (Hershberger, 1999). The issue of safety is examined in detail under two different concerns: environmental concerns, and technological concerns.

A. Environmental Concerns

Environmental concerns in architecture include site, climate, urban and regional context, available resources, and waste products. Their influence on the building and its users is very direct and crucial. If the designer ignores these issues, the building will be inappropriate for that specific site, climate, or other environmental concerns and the building or occupants will experience some loss of over life-cycle (Hershberger, 1999).

> "The igloo is a clear response to the cold environment of the arctic, both in its use of available material and its hemispherical form, which maximizes internal space and minimizes surface area to avoid heat loss and reflects interior-generated heat and light back into the interior. Here the architectural form is very much in response to climate. Environment and human survival are clearly values of great importance in this case." (HERSHBERGER, 1999, p. 96)

For the building designed for certain facilities, safety issues include many environmental concerns. If some activities within facility are hazardous, it should be documented in the programming. The containment, destruction, or removal of the disposal should be described in order to create a safe environment not only for the building occupants, but also for people off-site (Hershberger, 1999; CPSMA, 2000). Also, within a building, the client or users may prefer to separate one area from the others because of the hazardous effects of that specific part. For example, one room may be isolated for certain activities and operations that produce noise (Preiser, 1993). Moreover, the site or surrounding may contain dangerous conditions. These should be pointed out in the site analysis and controlled as to provide safety for everyone (Hershberger, 1999).

> A safety principle is controlling environmental (indoor or outdoor) hazards at their source and minimizing potential distribution of hazardous conditions or materials.” (BRAUER, 1993, p. 480)

If there is unusual information about a part of the project or users, it should be included in the architectural program. This can be a special requirement for security in environments for the elderly or the disabled people. Moreover, there may be a need for privacy of the individuals in an institution. (Hershberger, 1999)

B. Technological Concerns

Chosen technology has always been one of the crucial issues on architecture. The form directly imitates the potential qualities of the materials and techniques used. Today, what the architects select from the tremendous variety of available building materials, systems or processes is often a matter of personal preferences (Hershberger, 1999).

The first consideration is the strength of the structure. It must not collapse under its own weight (dead load) or the weights that might be imposed upon it (live load). The architect’s duty here is to identify if there are any extraordinary loads. These might include loads imposed by special equipment or furnishings, occupant loads, or external loads created by wind, earthquake, snow, or other uncontrolled conditions (Hershberger, 1999). In addition, the client or users may demand more secured spaces for the certain operations or workstations; such as mechanical rooms. Locks and access control may be required in areas with dangerous equipment or material, and some operating areas to keep unauthorized or unqualified people from getting into unsafe positions. Moreover, special ventilation systems, non-stop power supply, or support systems is needed to secure these areas in case of a failure (Preiser, 1993). These security goals must be enlightened so that it will affect the structure, the material, and the technology that will be used in the project.

2.2.3. Temporal Issues

Time has an impact on architecture in a variety of ways (Brand, 1994; Duffy, 1998; Hershberger, 1999). The timeless value of a building is no longer determined by the strength of building materials but how long the building remains useful (Duffy, 1998). The organization may demand growth and change of the building, as well as it may require the building last for a very long time (Hershberger, 1999). Commercial buildings have to adopt quickly, because of competitive pressure to perform, and they are subject to the rapid advantages that occur in any industry. Domestic buildings are another changing type of building, responding directly to the family's values, growth and needs. Institutional buildings, on the contrary, act as if they were designed specifically to prevent change for the organization inside and to express timeless reliability to everyone outside (Brand, 1994).

Buildings keep changing by irresistible forces. Technology, one of them, offers new systems or materials that usually reduce the operating costs of the building; such as a new insulated window that saves on energy costs for the building (Brand, 1994). Likewise, most building types are forced to change internally as technologies become obsolete and new equipment and systems are introduced (Hershberger, 1999). In addition, people may change the buildings to follow current fashion whether it is necessary for the function of the building or not (Brand, 1994). Duffy (1998) creates a layering system to understand how buildings actually behave during their life cycles. This method is named as the ‘six S’s’: Site, Structure, Skin, Services, Space, and Stuff. Because of the different rates of change of its components, a building is always under pressure to change.

The architect, therefore, must determine if the facility is possible to change. Making spaces more general, with free spans from exterior wall to exterior wall will help to accommodate change. If the growth of the facility is likely to occur, the architect must conclude the particular areas of the change, and result in acceptable strategies for accommodating the growth (Hershberger, 1999).

2.2.4. Economic Issues

Project financial feasibility, as discussed previously, is an important pre-design service. It involves both market assessment and financial planning for the project, in order to determine the size of the facility, the acceptable level of quality, the construction methods, and such issues (Kirk and Spreckelmeyer, 1988; Preiser, 1993; Hershberger, 1999). At first, clients seem to be more concerned with the initial cost; such as construction cost, architect’s fee, the price of the construction technology. However, as well as the construction of a facility, the cost of operations, and maintenance continue and even increase over the life cycle of the building (Hershberger, 1999).

> “It takes time to solve the functional and technical problems of building. It takes even more time to compare the life cycle costs of various materials and systems. The most effective money that the client can spend to solve these problems will be for

> architectural services, including architectural programming." (HERSHBERGER, 1999, p. 141)

The exceeding cost of construction is an unwanted situation. If the increase is discovered during programming, it can be eliminated by reconsidering the design decisions (Kirk and Spreckelmeyer, 1988). During the actual construction, changes are likely to delay the project and lead to inordinate cost increases. It may result in bankruptcy for the client, the architect, and the construction company (Hendrickson and Tung, 1989).

In programming, additionally, it is the architect's responsibility to understand and present information that directly relates to operating costs. Inefficient planning of the space will require additional personnel, or cause extra time to be consumed in developing a product. It will have a negative impact on the finances of the client, or users (Hershberger, 1999).

Maintenance, like operations, should be considered during the programming stage. If inexpensive, low quality materials or systems are used in design, they probably require expensive maintenance and replacement than higher quality products. The architect should inform the client about maintenance costs, so that the client may have the possibility to change the amount of space required or increase the budget to a level where the needed space can be obtained at an acceptable level of maintenance cost (Evans *et al*, 2004).

> "The cost of construction is a one-time event or, more typically, is spread over a number of years with a constant monthly mortgage payment. The costs of operations, maintenance, and energy, on the other hand, continue for the life of the building and, in an inflationary economy, can increase to become major costs... The best time to make these determinations is during the

programming process. It can be very costly to make them later."
(HERSHBERGER, 1999, p. 145)

2.3. Values In Architecture

Values in this context mean beliefs, understandings, purposes, or other deeply held ideas that are the reason for building and influence how the building is designed. It is these essential values and purposes that serve as the framework of programming (Hershberger, 1999). Different building types also require different design responses based upon the values of different users and the needs of different activities. These values come together to form issues and to define a goal that will be applied to programming. A goal, then, is a concise statement of the architect's view about the quality of the design in relationship to a particular issue (Duerk, 1993).

Devaux (1999) discusses the value of a staircase in a house as an example. He points out that it depends very much on where the staircase leads. If the house is a one-floor ranch, and the staircase leads nowhere, its value is at most, decorative. On the other hand, if most of the important rooms in the house are on the second floor, then the staircase acquires a value almost equal to the total value of the second floor. This is called its value-added factor (Devaux, 1999).

2.3.1. Importance of Values

Every program will involve different values, depending on the client, users, site, climate, etc. Personal value judgments vary from project to project. As a result, it is expected that the values chosen for each project will be unique in character. It has been discussed previously that a number of values often have a remarkable effect on architectural form (Hershberger, 1999).

> "Wicked problems have a right solution only from one point of view. A point of view is dependent on an individual's value system. When an individual is in a decision-making role, the solution that seems right to that individual will be the one that supports his or her value system. Problem-solving processes are subject to all the forces of value systems in regard to gathering information and organizing it. Moreover, value affects not only the decisions we make but also the information we gather prior to making our decision." (CHERRY, 1999, p. 33)

Goals should reflect the values of all participants. It is possible that a proper solution can be originated easily if the values are identified. The principal values of a particular problem also determine the appropriate performance level for a qualified solution. As they decide on crucial values, it is the job of the architect to discover the appropriate level of performance (Duerk, 1993).

2.3.2. Enduring Values of Architecture

The enduring values of architecture were first discussed by the Roman Vitruvius in the first century BC as 'firmitas, utilitas, and venustas'. These values were modified somewhat as 'firmness, commodity, and delight'. (Haldane, 1999; Gann *et al*, 2003) Primarily, firmness means whether the building stands related to science, and to the standards of science. The thrust and balance, pressure and its support, material and structural system should be considered in terms of physics, statics, and dynamics (Preiser, 1993). In addition, buildings may be judges by the success to satisfy the needs of users; that means commodity. Politics, society, religion, the large movements of races and their common occupations will be considered as an issue of architecture. Finally, delight is described as a desire for beauty that is created by aesthetic values of architecture (Haldane, 1999).

Hershberger (1999) refers to them as ‘survival, good life, and meaning and art’. Certainly the first, primordial reason for architecture was ‘survival’: a protection against one’s enemies, a shelter for human needs such as sleeping, eating, breeding, and child rearing. Hence, the architect should assure a structurally, mechanically, and electrically safe building by estimating any unusual loads that may occur in the building (Hershberger, 1999). Secondly, for the concern of a ‘good life’, buildings should accomplish the standards of comfort for the users. Therefore, functional, personal, social, and security values of the users are added in programs by the influence of social and behavioral scientists (Hershberger, 1999; Long *et al*, 2002; Reardon, 2004). Finally, the art of architecture should enrich the everyday lives of the users by including their current needs for protection and such. The program should identify the aesthetic values of society, client, and user to encourage the architect to express them in the architecture (Hershberger, 1999).

> “Programmer is in a unique position to uncover that which is particularly meaningful to clients and users, as well as to discover what architectural objects and features are most likely to affect these folk.” (HERSHBERGER, 1999, p. 45)

2.3.3. Contemporary Values in Architecture

The three enduring values elaborated above are certainly important in architecture. However, it is difficult to use them to describe the whole range of values that are important in contemporary architecture. Various programmers have attempted to develop comprehensive lists of values and issues (Duerk, 1993; Preiser *et al*, 1993; Cherry, 1999; Hershberger, 1999; Pena *et al*, 2001). However, current practice in the design of buildings usually results in information from users not being transferred to design teams in a shape and form that can be used for reconfiguring and improving upon design (Gann *et* *al*, 2003). As a result, the building sector suffers from poor or incomplete scope definition. These deficiencies create poor customer satisfaction and contribute to the failure of a project to meet customer requirements (Gibson *et al*, 2003).

In designing, it is important to understand the different views of project participants and then to reach a consensus about shared priorities and relationships. A number of different indicators are being used for trying to capture the values and integrate them into architectural programming process (Gann *et al*, 2003; Gibson *et al*, 2003). The aim of these tools is to assist participants in reaching a consensus about priorities and relationships (Hershberger, 1999). Notable examples among these are Housing Quality Indicator (HQI), Project Definition Rating Index (PDRI), and Design Quality Indicator (DQI).

Development of the tool is to complete the existing procedure of design development. It is also designed for capturing lessons from the current building design and feeding these into following projects. The goal is therefore to create a tool for learning about design quality and thus continually improving upon it (Gann *et al*, 2003; Whyte *et al*, 2003).

A. Housing Quality Indicators (HQI)

The HQI system is an evaluation tool designed in 1996 to allow housing schemes in UK to be evaluated on the basis of quality. HQI allows an opinion of quality for a housing project using three main categories: “site, design and performance”. These three categories produce the ten quality indicators that make up the housing quality indicator system as seen in Figure 2.5.
The HQI system consists of two parts: the “HQI form” and a “scoring spreadsheet”. The “HQI form” is a booklet containing information on the project and the ten indicators. The first page of the HQI form contains the

project description. The main body of the HQI form contains information on the ten indicators that measure quality. Each indicator contains a series of yes/no questions that are completed by the architect or client. The second part of the HQI system is a "scoring spreadsheet". The information from the HQI form is transferred to this spreadsheet. The spreadsheet, with its computer-based score calculation, turns the answers to the HQI form into a standardized score. This score is expressed as a series of scores showing how well the scheme performed on each indicator as well as an aggregated score. The most current version of the HQI system is available online on Housing Corporation web-site (http://www.housingcorp-online.org) [Accessed: 16.05.2005].

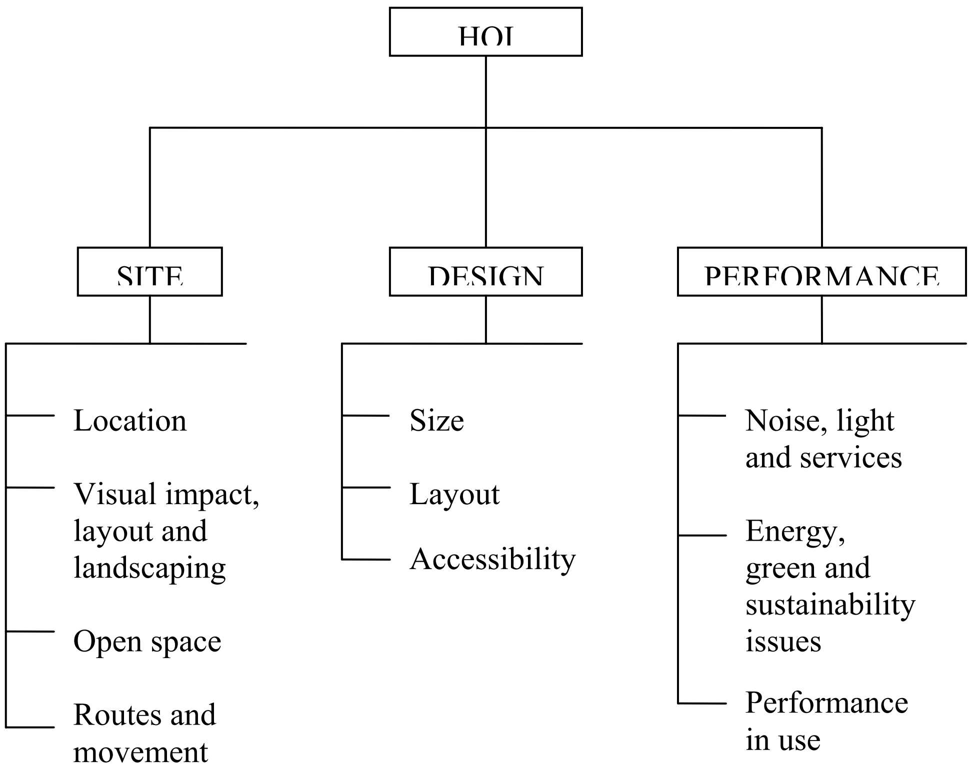

Figure 2.5 HQI categories and quality indicators

B. Project Definition Rating Index (PDRI)

The PDRI for buildings was developed by US Construction Industry Institution in 1999 to address scope definition in the building sector of USA. The building type of projects can include multi-story or single story commercial, institutional, or light industrial facilities. The PDRI system consists of three main categories; "Basis of Project Decision, Basis of Design, Execution Approach". These three categories produce the list of the quality indicators to be rated (Gibson *et al*, 2003).

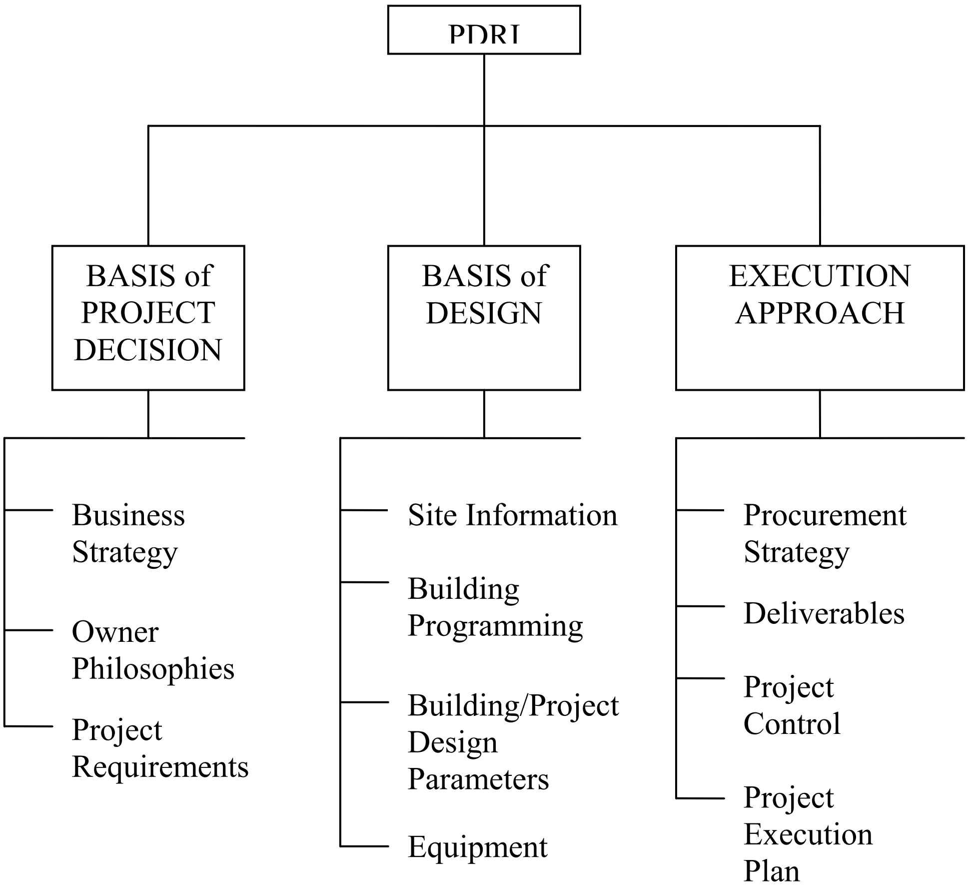

Figure 2.6 PDRI categories and quality indicators.

The PDRI for buildings is a comprehensive, weighted checklist of 64 questions in the Project Score Sheet. It is used to evaluate the level of completeness of the project scope definition at a point in time. It is suggested to use the PDRI system during the pre-project planning. Each of the questions is subjectively evaluated by the key project stakeholders and rated numerically from 0 to 5. The scores range from 0 - not applicable, 1 - complete definition to 5 - incomplete or poor definition (Gibson *et al*, 2003).

C. Design Quality Indicators (DQI)

DQI was developed by UK's Construction Industry Council in 2001 with research input from the authors and the architects in practice. It can be used through strategic briefing stages to set priorities and answer questions till the completeness of the post-occupancy evaluations in order to receive feedback from the project team and the building users to make improvements in value judgment. The DQI is divided into three categories: *"Functionality, Impact, and Build Quality"*. These three categories introduce the quality indicators of the DQI system. These are illustrated in Figure 2.7.

DQI Online is an interactive tool that includes a simple and non-technical questionnaire. The scores range from 0 to 5 where 0 means not applicable, 1 – strongly agree to 5 – strongly disagree. The process of answering these questions will help to make an assessment of the quality of the building in an interactive and participative process which will enable all the stakeholders to get involved. The results can be obtained instantly and displayed in different ways to help facilitate discussion among project participants (DQI Online Web-Site, 2005; Gann *et al*, 2003; Whyte *et al*, 2003). The online application of the DQI system is obtainable on DQI Online web-site (http://www.dqi.org.uk) [Accessed: 16.05.2005].

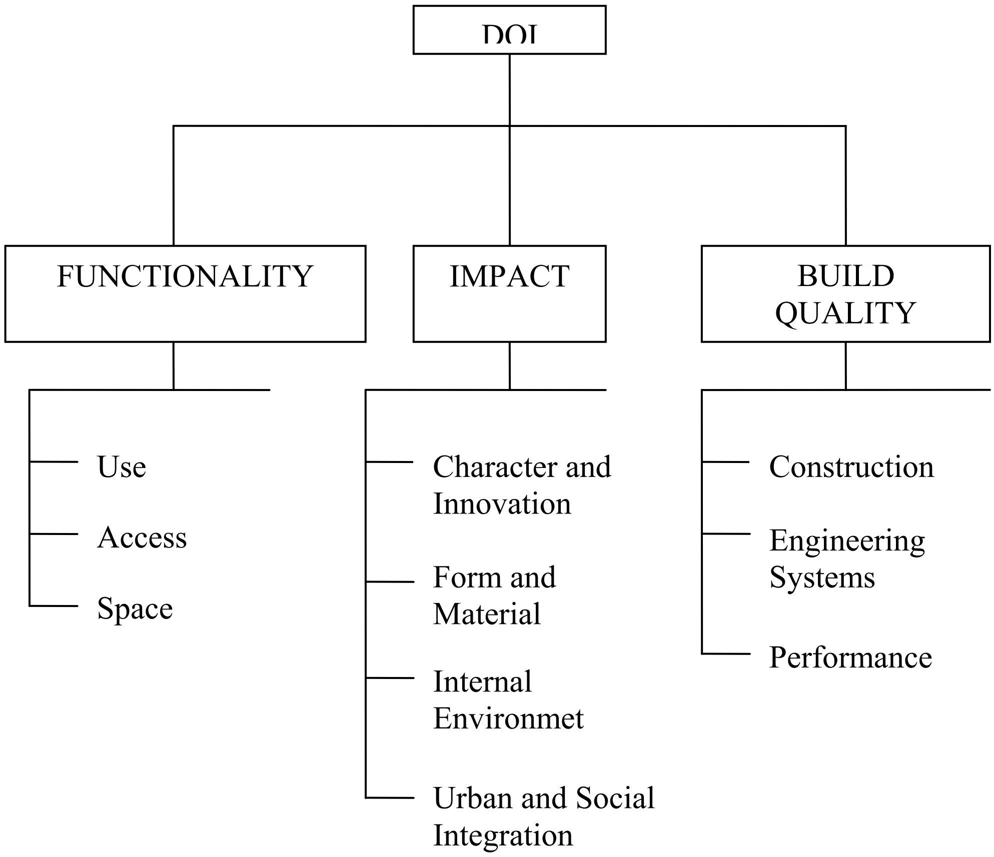

Figure 2.7 DQI categories and quality indicators.

D. Building Evaluation Checklist

The checklist was developed by Düzgüneş (2003) in the eighties and published as “Case-Study Report Form” in 2003. It can be used through pre-design stage to document the early desicions till the completeness of the construction stage. The report form consists of three parts. The first part is called introductory information, where include background information on the project and the graphics and drawings of the design if possible. The second, analysis, involves eleven sections, each evaluating a building sub-system. The last, Evaluation, is the part where the architect summarizes his/her observations and results of the analysis part (Düzgüneş, 2003).

The second part of the reports consists of following sub-headings:

1. Site Planning
2. Design Efficiency
3. The Structural System
4. The Enclosure System
5. The Fenestration System
6. The Cladding System
7. The Conduit/Flow System
8. The Comfort-Control System
9. The Transportation System
10. The Amenities System
11. Overall Result

Analysis includes the scores of the respondent to each element of the building sub-systems. These scores range from 1 to 6 where 1 means neglected or irrelevant, 2 – poor, and 6 – very good. Applying the checklist will help, especially the architect, to make observations necessary to form an evaluation and control of decisions taken.

2.4. Methods of Evaluation

The term evaluation is derived from the root "value". A meaningful evaluation focuses on the values behind the goals and objectives of clients or those who carry out the evaluation. But it should be noted that there is a difference between the quantitative and qualitative aspects of building performance and the respective performance measures. Quantifiable aspects of the building performance, like lighting, acoustics, temperature, and so on, can be measured if special tools and mechanisms are used. On the other hand, the qualitative aspects of buildings, such as aesthetic beauty or visual compatibility with a building's surroundings, are more difficult to evaluate. In this case, performance judgment will be developed from goals and objectives (Preiser *et al*, 1988).

Buildings vary, and require many investments, sit on various sites in various climates, and respond to different codes and ordinances; it is almost impossible to prepare a full-scale working prototype at the very beginning of the project. There are several key points in the design process when an evaluation should take place. The purposes of each evaluation vary to some extent, but they all tie together as essential elements of effective architectural programming and design (Hershberger, 1999). In this research, these milestones are categorized as program evaluation, design evaluation, building evaluation, and body of knowledge.

2.4.1. Program Evaluation

The decision-making process is examined and introduced as a procedure. The process involves the identification of the particular problem, the design and representation of alternative solutions, the evaluation of these and the choice. Each decision, in fact, is the result of an evaluative process. That is why; evaluation of the program begins with the very first decisions about the program (Kirk and Spreckelmeyer, 1988; Hershberger, 1999).

> "If a team – composed of the owner, the architect, programmer, user and technical consultant – is assembled during the feasibility stage of the facility cycle, major decisions concerning overall design strategy can be resolved before expensive and time-consuming design efforts have been expended. Inappropriate decisions taken during the early phases of the design process may have devastating consequences on a project's design development or occupancy phase." (Kirk and Spreckelmeyer, 1988, p. 43)

2.4.2. Design Evaluation

Having identified the issues of design, such as the values of the client, specific goals of the project, the program can provide the standards of evaluation for use by the designer, client, and programmer. It can serve as both a guide and a control as an effective tool in reminding the architect of the major design issues and goals. If client, programmer, or the architect suggests some changes in the program, it is desirable to document all these whether they are applied or not. After the consideration of each suggestion, the architect should point out and insist that adjustments be made to the program so that a satisfying building can be provided within the budget restrictions. It is expected that he will articulate personal or institutional values, associated goals, and even project requirements while confirming the program as outlined (Hershberger, 1999).

During decision-making in design phase, the programming team explores how information can be combined to physical solutions. The purposes are to generate design alternatives. During evaluation phase, the team members carefully investigate these alternatives of building components such as structural, mechanical systems within very specific areas of concern, like life-cycle costing, functional use, and environment controls (Kirk and Spreckelmeyer, 1988).

2.4.3. Building Evaluation

According to Hershberger (1999), the programmer should agree with the client and user about building evaluation: during programming, during the client or user move-in, and six months to one year after initial occupancy. First of all, a carefully conceived program will produce some of the raw material to guide the architect in satisfying program requirements within the broad outlines of the value and goal statements and the constraints of site, climate, schedule, and budget. Secondly, programmer should instruct users on the intended purposes of various building, space, furnishing, and equipment elements during users move-in. finally, after six or twelve months, a post-occupancy evaluation is necessary to determine if the expectations and goals are achieved in term of building, furnishing, and equipments. These discussions between the user and the architect will produce a functional and valuable architecture and environment (Hershberger, 1999).

> "It is important to point out that post-occupancy evaluation can be greatly enhanced if the values to be expressed, the goals to be accomplished, and the specific program requirements have been articulated in a program. In this case, the programmed values and goals can be posed as hypotheses about the image, function, energy efficiency, etc., that the designed and built facility should recognize and incorporate." (HERSHBERGER, 1999, p. 450)

2.4.4. Body of Knowledge

The process of design requires a continuous flow of information among the architect, the building owner, the contractor, the people who will ultimately use the building, and like. The process involves the generation and selection of alternatives that satisfy client and user needs (Kirk and Spreckelmeyer, 1988). After collecting all these data under certain issue categories, all presented in the programmer's document. This document is not only the program, but also is the file containing all changes made during design and building evaluations. Also programmer can add a careful report of the post occupancy evaluation that emphasizes the successes and failures of the values and goals. Then, the programming and design activities of the future projects can benefit from the published results of the experiences. (Hershberger, 1999)

CHAPTER 3

MATERIALS AND METHODS

In this chapter are presented materials and methodology of different surveys performed by the author to examine the current process of construction projects in Turkey. To illustrate this process, a hotel project is chosen as a case study. The objective of this study was to examine a construction project life cycle by analyzing a mixed-use building which combines office use with operational and recreational areas. Materials and methods used in this study are explained in sections 3.1 and 3.2, respectively.

3.1. Survey Material

As it is mentioned in the previous chapter, program is defined as information gathering stage for the project. The architect uses the main sources of information like feedback of the previous works, interviews with the client and/or users, observations of similar facilities, and so on. The information taken in this stage articulates desired images and results in a schematic design, followed by design development and preparation of construction documents.

Architectural programming arranges value management studies with key project participants at key project stages, to identify opportunities for adding value and reducing inefficiencies. These studies include one-to-one discussions and use the existing tools, such as DQI and PDRI.

3.1.1. Case Study: Hotel Project in Turgutreis, Turkey

The five-star resort hotel, situated at a distance of 1 km from Turgutreis and 20 km from Bodrum center, is located on seashore with a panoramic view of Kos, Kardak and Çatal Islands. The resort covers an area of about 35,000 m^2. The neighborhood is the combination of different summer houses and a resort hotel.

The facility has 370 rooms with a total capacity of 1200 beds in a series of seven interconnected blocks around a central pool and activity area. There are 145 standard rooms with two beds, 125 family rooms with four beds, 90 rooms for three people, 6 suites, and 4 rooms for handicapped persons. Each of the rooms are equipped with an electronic key-lock system, fire alarm, central air-conditioning, direct-call telephone lines including lines in bathrooms, internet, satellite television, music broadcast, minibar, shower, WC, and hair dryer. All rooms have balconies with panoramic sea views.

The main restaurant has a direct link with lobby area. It is planned with a restaurant bar, open and close dining areas, patisserie, *pide* house, snack and salad bar. The pool area also offers a snack area, and a pool bar. Moreover, there is another restaurant with international cuisines opposite of the main restaurant.

Facilities and services include medical room, babysitting, services for disabled people, waking up service, business center with internet cafe, shopping areas, laundry service including dry cleaning, and parking lot with open and closed areas. Moreover, the facility contains three seminar rooms, and a conference hall. Each of them is provided with internet connection, sound system, voice recording system, illumination system, projection screen, air conditioning.

Leisure and recreational areas consist of one outdoor swimming pool with children section, one indoor swimming pool with children section, aqua slide, Turkish bath, Finnish bath, sauna, massage, Jacuzzi, fitness center, health center (spa) with vitamin bar, coiffeur, beauty parlor, solarium, gymnasium hall, garden, playing ground for children, TV room, and disco. Moreover, the hotel offers outdoor activities with 2 illuminated tennis courts, basketball field, beach volley, pool games including step, aerobic, and night and day animations.

The hotel is developed for a long-term operator, whereas the shops, and the like are developed for seasonal leasing. During the initial study (June 2005), the design was over budget, the design schedule was overrun and planning permission was not granted for some parts of the project.

3.1.2. Project Participants

Success in a construction project depends on having the right people involved with the project at the right time. The participants involved in a construction project were grouped under four major categories: a client group, a design group, a construction group, and a sub-contractor group.

The client group was composed of a client team and critical auxiliary staff. The members of the client team —representatives of the users, the budget authority, and the project manager—were intimately involved in all phases of the construction project. They were the core group; financially and administratively responsible persons. The client group also included representatives from the administration, business office, occasionally selected experts. Moreover, expert consultants could be placed in this group.

It was essential to have a project manager who had qualifications and experience commensurate with the type and scope of the project and had operational authority and responsibility for the project. The project manager was the center of decisions and communications and for most of the project acted as the single point of contact for other groups. Therefore, this person was familiar with the entire program, had some budgetary authority, and, most significant, remained within the process from beginning to end in order to provide continuity.

The design group consisted of an architectural firm, and an engineering design firm including a mechanical designer for engineering systems and a civil engineer for structural calculations. To understand the client's needs and to know what was necessary for an effective hotel design, the design group was chosen on the basis of relevant design expertise, and experience. It also included special consultants such as fire specialists, environmental consultants, and code consultants.

The engineering design firm was chosen among the ones as highly qualified as the design professional. It involved early in the design process, along with other appropriate consultants and experts in specialties such as fire, access and other facilities for the disabled, ventilation, and safety and environment. It was the architect who communicated with the general constructor for review of the constructability of the proposed design.

The choice of the general constructor was critical because construction requires an attention to detail beyond that necessary for many building projects. As was the case with the design professionals, the experience and previous work of potential contractors should be carefully evaluated. In this case study, the construction group was a construction firm. The construction group also included special consultants such as a construction manager, environmental site assessor, geo-technical consultant, commissioning expert, community relations expert, insurers, technical risk managers, and like.

3.1.3. PDRI

The PDRI for buildings was developed to address scope definition in the building sector. It provides a tool for an individual or project team to evaluate objectively the status of a building project during the whole process.

In this study, it was assumed that the process of a construction project was divided into four stages; pre-design stage, design stage, construction stage and post-construction stage. The PDRI tool was used to monitor the process from the pre-design stage until the completion of the construction stage while it focuses on basis of project decision, basis of design and execution approach.

A. Questionnaire

The PDRI for buildings is a comprehensive, weighted checklist of sixty-four scope definition elements presented in a score sheet format. The tool was developed using input from professionals in the construction industry who defined a list of sixty-four relevant elements in the scope definition process of a building project. These elements were carefully described so that they were meaningful to the different professionals in the construction industry.

In the framework to explore the process of a building project, the first section involves information necessary for understanding the project objectives. Second section consists of space, site and technical design element that should be evaluated to fully understand the basis for design of the project. And the last section includes elements that should be evaluated to fully understand the requirements of the owner's execution strategy.

The sixty-four elements in the PDRI for Building are arranged in a score sheet format and supported by a booklet of detailed descriptions including checklists

(Construction Industry Institute, 2005). A representative example is given in Figure 3.1; the entire booklet is included in Appendix D.

G1. Equipment List

Project-specific equipment should be defined and listed. (Note: Building systems equipment is addressed in element F4, Mechanical Design, and F5, Electrical Design). In situations where owners are furnishing equipment, the equipment should be properly defined and purchased. The list should define items such as:

- ❑ Process
- ❑ Medical
- ❑ Food service/vending
- ❑ Trash disposal
- ❑ Distributed control systems
- ❑ Material handling
- ❑ Existing sources and characteristics of equipment

…

Figure 3.1 A representative description of element G1, Equipment List. The description of each element serves as a checklist to visualize the project requirements.
Source: Construction Industry Institute Web-Site [Accessed: 16.05.2005].

B. Weighting Systems

The PDRI score sheet aims to evaluate the level of completeness of the project. Each of the sixty-four scope definition elements are subjectively evaluated by the project participants based on its level of definition. Six levels of definition that are listed at the bottom of each PDRI score sheet. These levels, including zero for not applicable, range from complete definition for level 1 to incomplete definition for level 5.

During the development process, workshops were held by Construction Industry Institute (CII), involving sixty-nine experienced project managers, architects and engineers to evaluate and weight the PDRI elements. Each participant's responses at the workshop were evaluated individually and normalized into scores. The sixty-four elements within the PDRI were not weighted equally. The scores were based on the participant's opinions about the relative impact of each element on the overall definition of the project. If all answers were corresponding to incomplete definition, the result was the higher score of the PDRI which was 1000 points. Similarly, if all answers were matching the complete definition level, the total was 70 points which was the lowest point of the PDRI (Gibson et al, 2003). The weighted version of the PDRI Score Sheet is presented in Appendix C.

The project manager in this case study was asked to fill out PDRI score sheet. By using the weighted version of PDRI, the responses were translated into weighted scores. Once the weights for each element are determined they are added to obtain a score for the entire project. This was statistically correlated with project performance to estimate the level of certainty in the project. Each section scores and overall PDRI score were discussed in the analysis of the score sheet. Higher scores signified that certain elements within the scope package had not been adequately defined and should be re-examined.

C. Graphic Representation of PDRI

The results of the analysis were presented in three different tables. The first one indicated the overall PDRI score of the respondent, including the scores of three sections; basis of project decision, basis of design and execution plan. However, this table was not efficient enough to monitor the lack of information. For that reason, some of the elements in the PDRI score sheet were grouped to evaluate certain steps of scope definition process. These were PDRI business score and PDRI technical score.

The PDRI score sheet was also analyzed at the level of individual elements. The poorly defined elements were listed and suggested actions were assigned to project participants in a separate table. Statistical analyses can be added for evaluating the cost of the project as a stage of PDRI tool. Since this thesis only depends on values and concerns of a construction process, the cost estimation studies were not detailed in this research.

Table 3.1 Comparison of projects with PDRI tool. Projects score above and below 200 versus budget at authorization for detailed design and construction.

Performance	PDRI Score	
	<200	≥200
Cost	3% below budget	13% over budget
Schedule	3% ahead of schedule	21% behind schedule
Absolute value of change orders	7% of budget	14% budget

Source: Construction Industry Institution Web-Site [Accessed: 16.05.2005].

3.1.4. DQI

The multifaceted nature of design has been recognized since late Antiquity, when Roman Vitruvius described design in terms of ‘firmitas, utilitas and venustas’, in terms of commodity, firmness, and delight. The conceptual framework of DQI is similar to Roman Vitruvius’ ideas while it focuses on three aspects of design: function, build quality and impact. In the framework to explore the design quality of a building, function encompasses aspects of its use, access and space; build quality encompasses aspects of its performance, engineering systems and construction; and impact encompasses aspects of its contribution to form and materials, internal environment, urban and social integration, identity and character. Developing a conceptual framework helped to create a shared language among participants in the project.

A. Questionnaire

At the core of the DQI tool was a questionnaire that was designed to be used by anybody involved in design or use of buildings, and to be short, simple and clear. A rough guideline of twenty minutes was established for respondents to complete the questionnaire. The aim was to ensure that the questionnaire were consistent and respondents able to move quickly through the questions without being overwhelmed by technical terms.

There are four versions of the DQI relevant to different phases of the project that is being assessed: -

- **The brief** version allows the project aspirations to be clearly set, addressing the opinions of all stakeholders and defining what aspects are fundamental that would add value and what would achieve excellence in the completed building;
- **Mid-design** version allows the client and design teams to check whether early aspirations have been met and make adjustments accordingly in focus and quality, and can be used throughout the design phase when things are not too late to change;
- **Ready for occupation** version is used to check whether the brief/original intent has been achieved immediately at occupation; and

- **In-use** version is used in order to receive feedback from the project team and the building users to help make improvements for this project and the next.

During analysis and evaluations of the case study, mid-design version was used.

B. Weighting Mechanism

The weighting systems are other elements of the DQI tool. The first weighting system is scoring each question. These scores range from 0 to 5 where 0 means not applicable, 1 – strongly agree to 5 – strongly disagree. By calculating the means, the scores of the subsections and sections are determined. As the score of the respondent was reaching close to the overall score that was 5.00, it was understood that he was informed well about the project. In order to understand the information flow among the participants, the questions that are scored as zero were included to the calculations as well.

As mentioned previously, values and concerns are not equally important in a project. So, individuals are asked to weight across the three main features of design quality: function, impact and building quality. Having addressed the sections, the respondent of the questionnaire was asked to indicate the relative importance of these three sections by allocating a total of 150 points. It was allowed to give any section zero for mentioning that it was not important at all only if the total was added to 150. This weighting is then compared with their scores for that section and highlighted the importance of their answers to particular questions on the questionnaire. The weighting system ensures that individuals are accorded their own importance to particular features of the design and their views are reflected in the scores they have received.

In this case study, the project manager, the architect and the mechanical engineer were asked to fill out DQI questionnaire. Means were calculated for sub-sections, and sections. For evaluating the overall DQI score, the means of the sections were weighted according to the respondent's indications. Higher score signified that the respondent was informed about the project and agreed with values and concerns of the project participants.

C. Graphic Representation of DQI

Results from the pilots were weighted and analyzed in a spreadsheet, but it was necessary to develop a simple and clear representation of this analysis. It was important to show the effect of the weightings and of the scores on the overall result. This allows users to examine critically the different assumptions and priorities behind their own and others' understandings of design quality.

The illustrations of initial studies used in the DQI web-site were 'doughnut' shaped. By using different colors, it was aimed to distinguish the three main sections: function, impact, and quality. However, these presentation graphics do not show the weightings and scores at the level of the subsection. So that, more detailed representations were needed to present the deficiencies in identifying values and concerns. A spider-diagram approach was adopted to represent results. It was illustrated the main sections which are function, impact and quality, with including the subsections. Additionally, results of the questionnaires are summarized in tables in order to show the effect of the weighting system.

3.1.5. Interviews with Project Participants

The goal of the interviews was to present the objectives of the research to the project participants that were to provide the necessary data, and to introduce the questionnaire. In this way, doubts on several questions were dispelled. The respondents showed satisfaction and immediately after browsing the questions, they were agreed to complete the questionnaires. In some cases the questionnaires were returned with some fields incomplete. If that happened, the respondent was immediately contacted and asked to review the missing data in an informal interview.

After presenting the results of the questionnaire, an interview was held with each project participant to discuss the purpose and usage of these questionnaires. The general objectives of the interview are: -

1. To explore and find out about the values held and expressed by project participants in the construction process; and
2. To examine whether these questionnaires can be integrated to the current process of building project.

Below are some of the questions that the interview contains. Each question is accompanied by the intention that lies behind asking that particular question. Intentions explain possible varieties of answers, or on what basis the replies of the interviewee will contribute to the aims of the study. It should be noted here that intentions are not expectations: -

- Question 1. “Do you believe that using these tools will generate a better understanding of project requirements?”

Intention: to question if these tools can be used to create a framework for the project;

- Question 2. “Do you think the elements/statements of the questionnaires are adequate enough to evaluate the process?”

Intention: to argue whether the tools have frameworks similar to the respondent’s view of the project or not. It is questioned if the respondent has more to say about the project; and

- Question 3. “Can these questionnaires be tools for thinking as a part of the current design process in Turkey?”

Intention: to examine the respondent’s idea of using these tools.

3.2. Survey Methodology

In the first phase, a literature survey was conducted to understand the approaches of architectural programming in the world. The existing questionnaires and tools were examined. PDRI and DQI questionnaires were chosen to examine the current design process in Turkey.

Values and concerns that have influence on project design are the subject of this research. For that reason, the participants who involved the design process; the architect, the project manager, and the mechanical engineer were asked to fill out the questionnaires. The initial study was held in June 2005. The results are presented to the architect and project manager before a scheduled meeting with the project participants is organized in July 2005.

The value and concerns of the participants may change during the development of a project, due to changing circumstances in the project environment such as legal, production and business issues. It was preferred to repeat the process to observe the development and delivery of the various value requirements. Accordingly, the DQI questionnaire was refilled by the architect and the project manager after the meeting organized in July 2005. This helped the project team to visualize the extra value that their actions have added to the project.

Finally, the effects of these tools on the current process of a construction project were discussed with the architect and the project manager after presenting the results of the second phase of the questionnaires in July 2005. The results of the questionnaires are presented in Chapter 4. The questionnaires are included in the Appendix A and Appendix F. Moreover, the Turkish versions of the questionnaires are presented in Appendix B and Appendix G.

CHAPTER 4

RESULTS AND DISCUSSIONS

This study aimed to question the need for architectural programming in extracting values and concerns that influence the design of a building. As mentioned earlier, a case study was prepared on a hotel project in Turgutreis, Turkey. During the initial study (June 2005), the design was over-budget, the design schedule was overrun and planning permission was not granted for some parts of the project. The architectural firm was working on construction drawings; while the construction was in progress.

Questionnaires as supporting tools and informal interviews were carried out with the project manager, the architect and the mechanical engineer who could influence the design of the hotel project. The responses were documented, and the original weighting systems of the questionnaires were used during analyses. The following sections present the results of the questionnaires including the discussions and suggestions held by the project participants.

4.1. Identification of Project Participants

During the identification of the participants, the entire process was divided into four stages: pre-design stage, design stage, construction stage, and post-construction stage. The project participants were grouped as client group, design group, and construction group as defined previously.

The client group, illustrated in Figure 4.1, was composed of the client team — who were representatives of the users, the budget authority, and the project manager— and all other members of the institution –who were involved in the project; the users, facilities operators, and the external relations office. This group also included special consultants, such as site assessor. Users communicated with the client team through the user representative. All other communication within the client group was through the project manager.

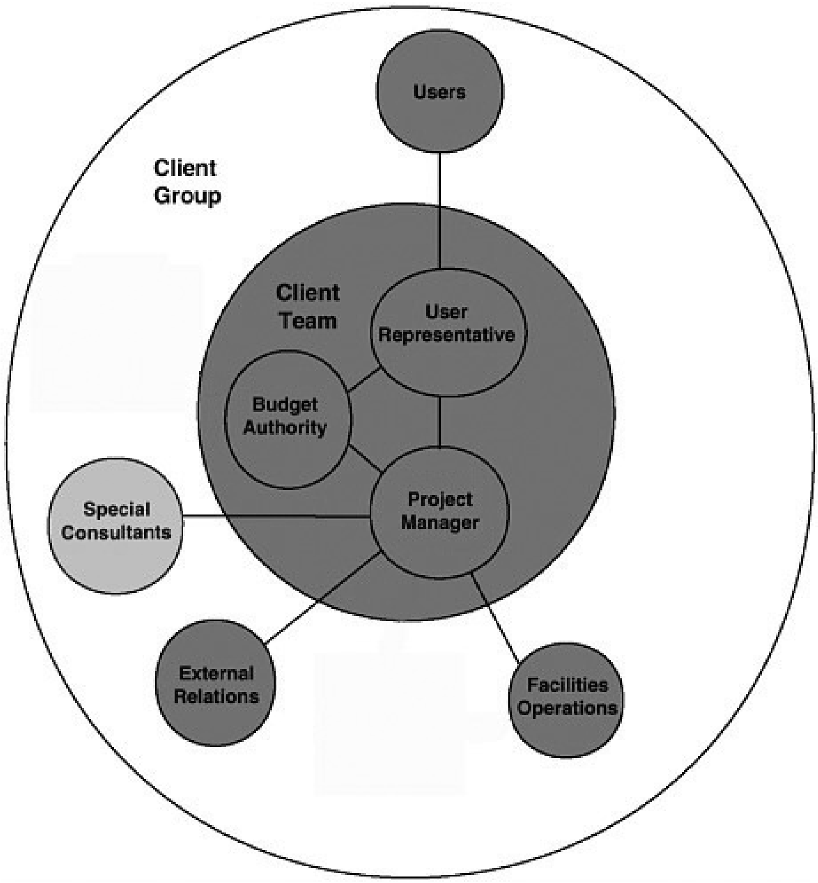

Figure 4.1 Members of the client group and their lines of communication.
Adopted from: CPSMA (2000)

The members of the design group were the architect and other design professionals, such as programmers, engineers, and special consultants hired by the design firm (e.g., fire specialists, and environmental consultants). All communication within this group was through the architect as shown in Figure 4.2. Similarly, members of the construction group were the general constructor and the subcontractors, also including suppliers. It was illustrated in Figure 4.3.

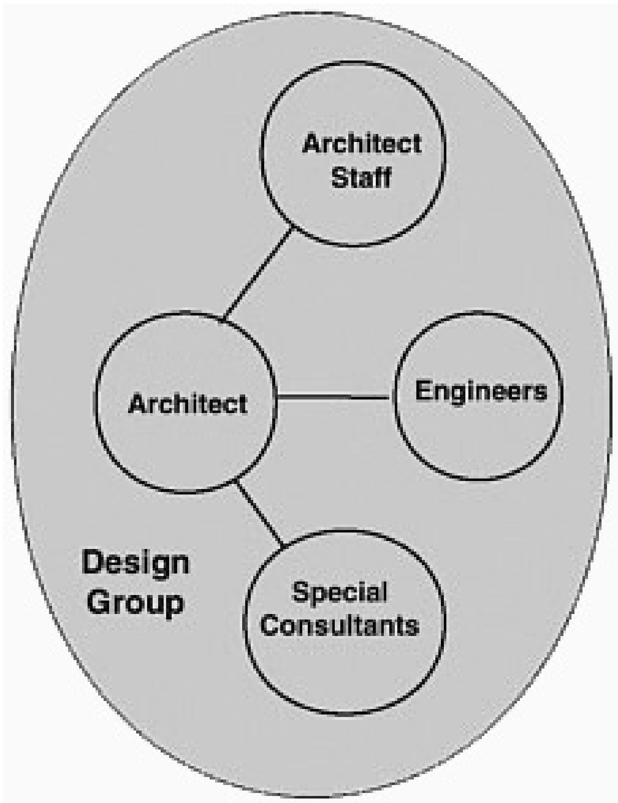

Figure 4.2 Members of the design group and their lines of communication.
Adopted from: CPSMA (2000)

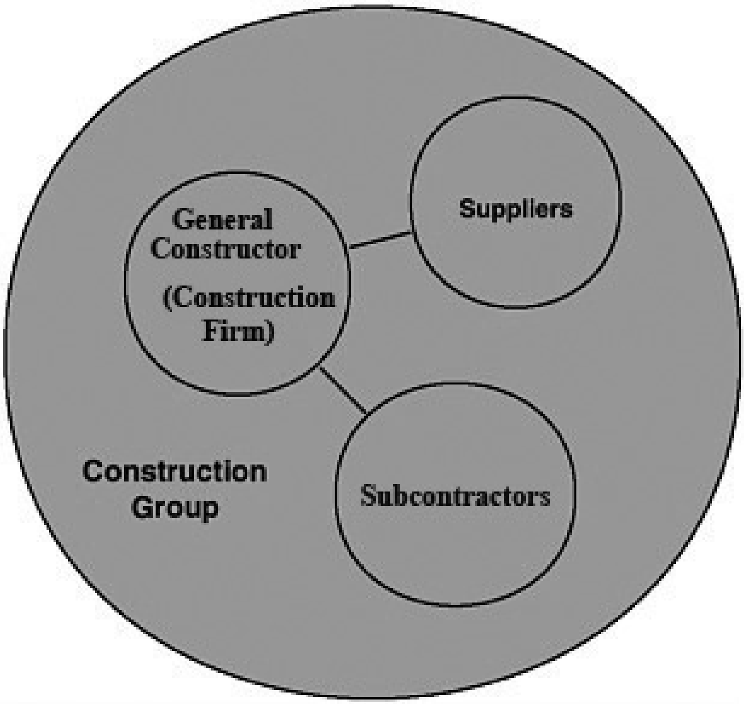

Figure 4.3 Members of the construction group and their lines of communication.
Adopted from: CPSMA (2000)

The client team was central to all communications within the client group. The users communicated with the client team through the user representative; all other communications with the client team was through the project manager. Communications between the client, design, and construction groups were only between the general contractor, the project manager, and the architect. Because of the large number of participants in this phase of the project, it was essential that these primary points of contact be respected. The communication paths among the project participants are illustrated in Figure 4.4.

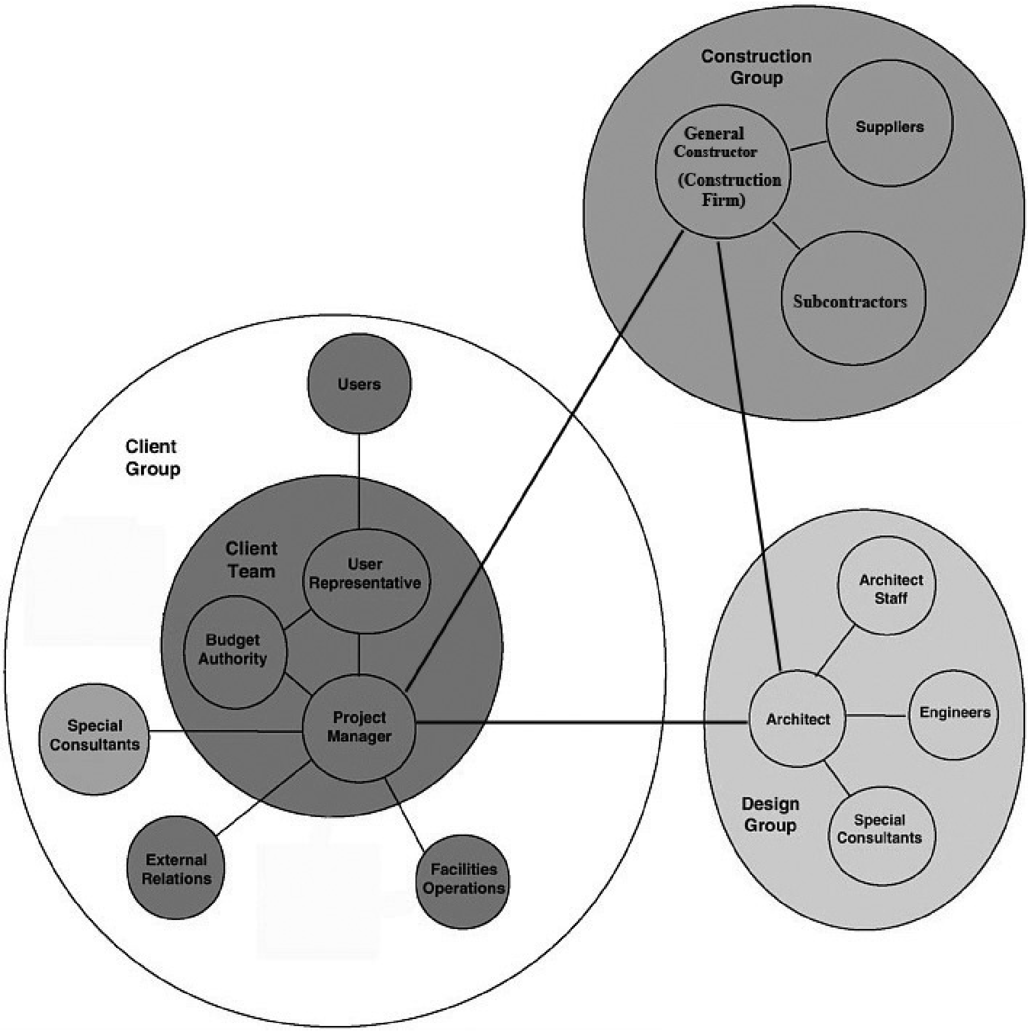

Figure 4.4 Participants involved in construction phase activities and their lines of communications.
Adopted from: CPSMA (2000)

Throughout the pre-design, design, and construction phases, only one person represented the client group and guided the process. This person was designated the project manager. He was responsible for the sustained progress of the project; served as the primary point of contact for all communications between the client group, design group, and the construction group; and ideally attends all meetings scheduled to discuss existing facility evaluation, proposed facility program requirements, renovation scope, and/or new construction size and site.

The design group was similarly guided by a single personwho was the architect and who was responsible for all communications from the design group to the client team, including communications from consultants engaged by the design professional (e.g., structural, mechanical, electrical, plumbing engineers).

The information flow among the project stages are illustrated in Figure 4.5. The horizontal scale presents the main stages of the building process: pre-design stage to post-construction stage. The vertical scale relates to the four main parties involved in the process. For the sake of simplification, many other participants are not represented in the graphic. This is not because they are not important but rather because their contribution is not critical for characterizing the stages of the building process. The length of each block is conventional and not related to the importance or duration of a particular stage. The arrows are meant to represent communications and flow of information between participants at each stage (vertical) and between stages for the same or different participants (horizontal).

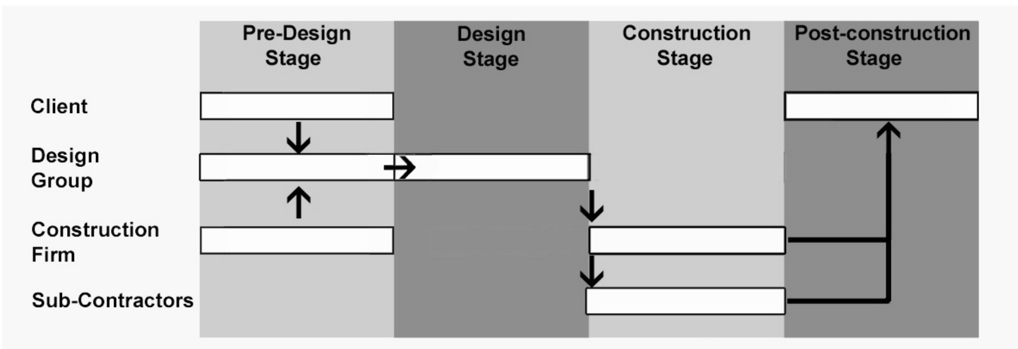

Figure 4.5 The information flow of the project.
Adopted from: Turin (2003)

The distinctive feature of this information flow was the dominant role of the construction firm throughout the process. In pre-design stage, the responsibility of the design group was to work with the client group to produce the facility evaluation, facility program, preliminary design alternatives, and preliminary construction cost estimates that constituted the pre-design report. It was observed that the construction firm shared with the client the responsibility for interpreting users' requirements. Both of them were advised by design group including the architect, mechanical and/or electrical design group, and like. In addition, the architect needed to get expert advice to understand the specific design qualities that would support the space arrangements, such as requirements for designing the spa/Hotel's Health Center.

In design stage, responsibility for the design was clearly separated between the construction company and the design group. The architect started to draw the plans and make suggestions for material selection. Besides, the construction company prepared a market survey for materials availability. The two were linked in producing the production drawing. And the construction firm began to seek proper subcontractors.

During the construction stage, the construction firm and the design group continued to work corporately. The architect mentioned that the production drawings were being discussed until the end of the construction stage.

4.2. Extraction of Values And Goals

To evaluate the success of the project it is important to establish measures for values. Measuring values helps to monitor the value development throughout the project. These values may affect the design at different scales, gradually focusing in from the overall environment to design detail.

In the context of the site and its environment: -

- Addressing the surrounding physical, social and economic context through the application of good urban/rural design principles;
- Helping to create a site with identity;
- Exploiting views and orientation; and
- Providing well designed public spaces both internally and externally.

At the scale of the facility: -

- Providing for all required functions;
- Offering options with degrees of flexibility and adaptability;
- Providing a healthy and safe environment during and after construction; and
- Sustainability during construction, operational use and disposal.

At the detailed scale: -

- Finishings and materials;
- Equipment; and
- Quality of light, acoustics, *etc*.

The project participants must develop a sound strategy for successfully managing the project during design and construction. The usage of tools like DQI, and PDRI, helps ensure that the right approach is chosen for the project design and execution. Both support the definition of issues including project schedule and cost estimate, critical equipment and materials, a risk management plan, and design documents. Moreover, these tools help the project participant reconsider the site evaluation, space planning, design parameters such as codes, regulations, user preferences, and like, and identification of equipment in detail.

The following sections include the results of these tools. PDRI was carried out with the project manager who was familiar with every detail of the project, and was in the middle of the communication lines. DQI was applied to the project participants who were involved in design stage of the project. These were the project manager, the architect and the mechanical engineer.

4.2.1. Results of PDRI

The project manager indicated that the construction company as the responsible project participant used a similar checklist like PDRI. With that checklist, they evaluated the basis of project definition including business strategy, project requirements; the basis of design such as civil and geotechnical information, governing regulatory requirements; and the execution approach consisting of construction needs. It was the project manager's responsibility to deliver this information to the relevant professions or project participants. The design parameters, however, was not an element in the checklist. The important point about drawings was the submission dates of the necessary drawings. The responses of the project manager and evaluations are included in Appendix E.

A shared understanding of design quality supporting business requirement must be formed as program of the project. The architect mentioned that looking carefully at the facilities in relevant locations, and environments was a good way to consider what had worked and what had not, and drew lessons for the new project. Moreover, the similar projects done by the architect were another information source. Looking back at what had been done previously, and how well that had worked, was an essential part of this process.

As a part of gathering data, financial feasibility study was conducted by project manager and construction firm. It involved prediction of the market conditions, available financing, and building costs. The project manager pointed out that the programming was an inexpensive, but, time consuming period of the process. As the client set an ending time for the construction, it had affected their vision for preparing a detailed program.

During the design process, the architect submitted three sets of drawings according to their scale. These were schematic design drawings, design development drawings, and construction drawings. However, the architect believed that the computer aided design has changed the design process. As the computer aided design gave chance to draw at any scale, the architect preferred to draw everything at one-to-one scale. Consequently, the design development went beyond the construction stage. The architect indicated that it enabled the re-evaluation of the design drawings during the construction process. On the contrary, the project manager complained that this causes delays on drawing submissions. As a result, the construction slowed down, and change in project schedule became necessary.

Table 4.1 The project manager's PDRI total score.

Overall	Score		Max Score
Section 1 - Basis Of Project Decision	**95**		413
Section 2 - Front End Definition	**87**		429
Section 3 - Execution Approach	**60**		158
TOTAL	**242**		1000
PDRI TOTAL SCORE (Maximum Score = 1000) **242**	**24,20%** **Definition Level: 2** **Minor Deficiencies**		

Table 4.2 The project manager's PDRI business score.

	Top Ten - Basis of Project Decision	Score		Max Score
1.	A1. Building Use	1		44
2.	A5. Facility Requirements	9		31
3.	A7. Site Selection Considerations	8		28
4.	A2. Business Justification	1		27
5.	C6. Project Cost Estimate	15		27
6.	A3. Business Plan	8		26
7.	C2. Project Design Criteria	1		24
8.	C3. Evaluation of Existing Facilities	2		24
9.	A6. Future Expansion/Alteration Considerations	12		22
10.	C5. Project Schedule	11		20
	TOTAL	**68**		**273**
	PDRI BUSINESS SCORE	**24,91% Definition Level: 2 Minor Deficiencies**		

Table 4.3 The project manager's PDRI technical score.

	Top Ten - Basis of Design	Score		Max Score
1.	F2. Architectural Design	7		22
2.	E2. Building Summary Space List	1		21
3.	F4. Mechanical Design	6		20
4.	D3. Civil/Geotechnical Information	2		19
5.	F3. Structural Design	1		18
6.	D5. Environmental Assessment	5		16
7.	E1. Program Statement	5		16
8.	E5. Growth & Phased Development	5		15
9.	E10. Building Finishes	5		15
10.	F5. Electrical Design	5		15
	TOTAL	**42**		177
	PDRI TECHNICAL SCORE	**23,73% Definition Level: 2 Minor Deficiencies**		

The PDRI total score of the project manager was calculated and presented in Table 4.1. The project manager declared that there was missing information on some areas of the project and the architect had decided where the expert advice was needed. These unknown parts of the design lacked the information of project requirements, the equipment and material selections.

Table 4.4 Low defined items and suggested actions of the PDRI.

PDRI Element	Relative Risk Score	Action Item	Assign to
C5	≤15	Further develop in the program development study	Project Participants
C6	≤21	Obtain cost estimate from the architect/engineer and further develop in program development study	Project Manager
K2	≤7	Capitalize on lessons learned	Project Manager with architect and engineer (A/E)
K3	≤8	Develop in design & take a closer look at phasing	Project Manager with A/E
K4	≤18	Hire a consultant to develop plan	Project Manager
L3	≤8	Define delivery method in the project management plan	Project Manager with A/E
L4	≤8	Define in project management plan	Project Manager

PDRI Elements stand for; C5: Project Schedule; C6: Project Cost Estimate; K2: Project Cost Control; K3: Project Schedule Control; K4: Risk Management; L3: Project Delivery Method; L4: Design/Construction Plan and Approach. The suggested actions and assignments are adopted from Construction Industry Institute Web-Site [Accessed: 10.08.2005].

The execution approach score was also found critical by the project manager. He mentioned that the design development of the project and the mechanical systems is too slow; consequently, the construction performance was affected.

4.2.2. Results of DQI

In the light of the interviews held during the initial study (June 2005), it was understood that the architect used a process which was similar to design-based architectural programming. The architect stated that the preliminary project objectives were discussed during the first meeting with the client. The challenging aim was the completion date of the project. As a result, the construction firm set up an overall project schedule.

The architect was asked to fill out a DQI questionnaire. The questions were grouped into three categories: impact, build quality, and functionality. The architect weighted these categories equally. After the completion of the questionnaire, a discussion was held with the architect about his value judgment.

The architect mentioned that primary design considerations were set so that he was satisfied with the solutions about *Use, Access, and Internal Environment*. However, several space requirements for the hotel activities had not been enlightened yet. Expert advice was needed from independent professionals in order to make decisions and set the right framework for design excellence. For that reason, the results on *Space* were not satisfying enough.

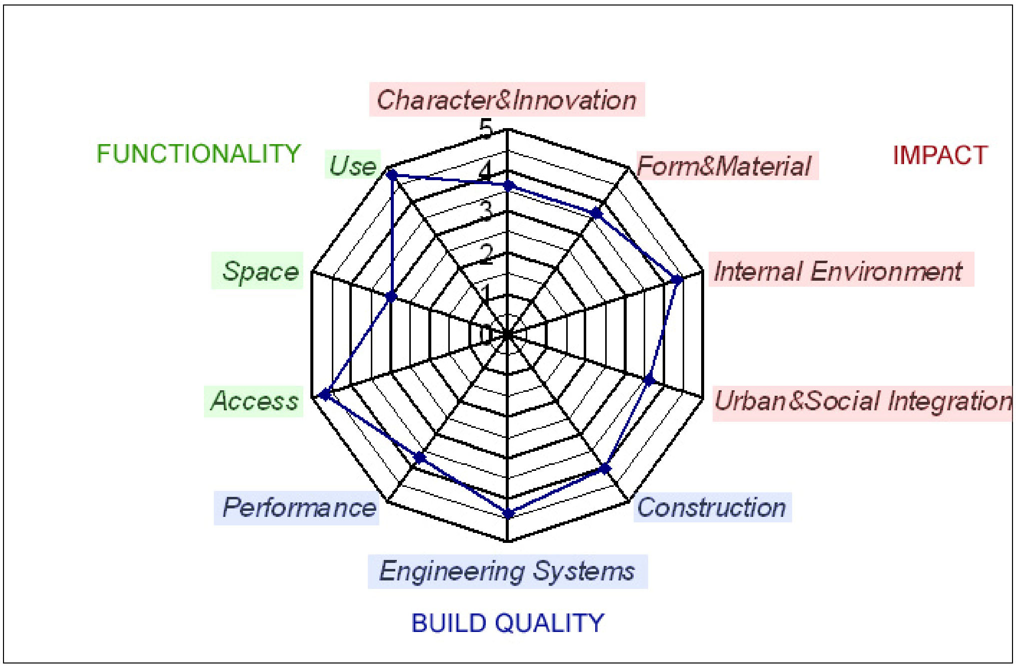

Figure 4.6 The architect's DQI results in June 2005.

Table 4.5 The architect's DQI scores in June 2005.

CATEGORIES		SCORE	WEIGHT	WEIGHTED SCORE
Impact	Character and Innovation	3.60		
	Form and Material	3.60		
	Internal Environment	4.33		
	Urban and Social Integration	3.60		
	MEAN	**3.78**	**0.33**	**1.26**
Build Quality	Construction	4.00		
	Engineering Systems	4.33		
	Performance	3.67		
	MEAN	**4.00**	**0.33**	**1.33**
Functionality	Access	4.67		
	Space	3.00		
	Use	4.75		
	MEAN	**4.14**	**0.33**	**1.38**
			TOTAL SCORE	**3.97**

While there were many questions about material and usage, the architect stated that he had made suggestions on the material selection. However, it was the construction firm that would decide the materials, with the help of the client. Therefore, the results of the questionnaire would be changing after the necessary information on materials was obtained from the construction firm.

In summary, the architect's DQI Score was 3.97/5.00. The architect believed that the project had quality on satisfying comfort for the client and the users. However, there seemed to be lack of communication on material selection, maintenance, and durability.

The project manager indicated that he tried to balance the importance of economics and build quality of the project, and that he believed deciding the functionality was entirely the duty of the architect.

After the completion of the questionnaire, a discussion held with the project manager about the values and concerns that affected the project overall. It was realized that the project manager was generally concerned with the economic decisions as well as with the functionality of the project. He believed that well-constructed facilities generally had a long-term asset value that extends the initial business need. Where additional cost was involved to achieve an appropriate level of design quality, it was important to understand that design and construction costs represent a small proportion of the cost-in-use of the facility over its whole life. The project manager also stated that resources spent wisely on design quality had the potential to save money in the long run, providing a facility built with sustainable principles, which was economical to manage and maintain. Late changes to the budget had a much greater effect on the design quality than early changes.

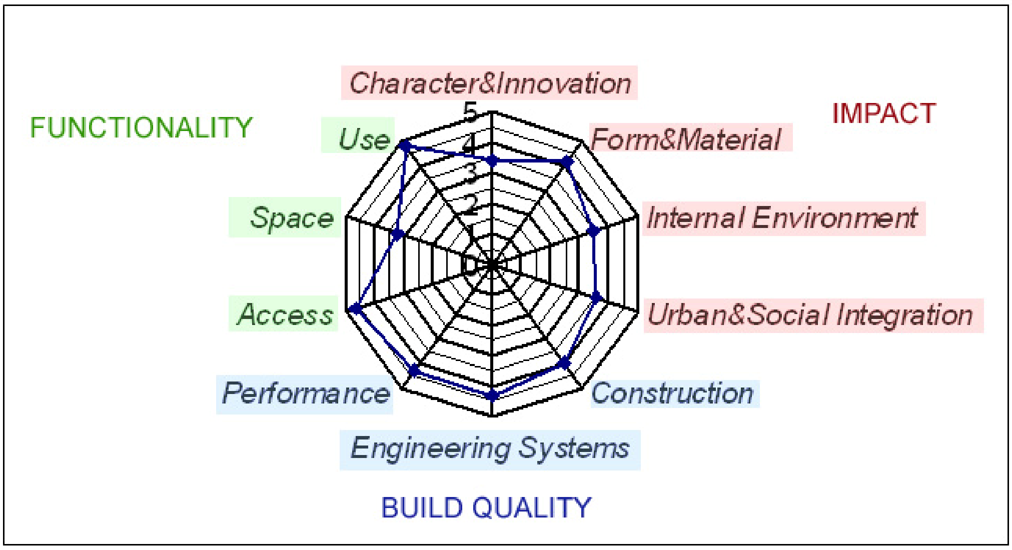

Figure 4.7 The Project Manager's DQI results in June 2005.

Table 4.6 The Project Manager's DQI scores in June 2005.

CATEGORIES		SCORE	WEIGHT	WEIGHTED SCORE
Impact	Character&Innovation Form&Material Internal Environment Urban&Social Integration	3.40 4.20 3.50 3.60		
	MEAN	**3.68**	**0.40**	**1.47**
Build Quality	Construction Engineering Systems Performance	4.00 4.33 4.33		
	MEAN	**4.22**	**0.40**	**1.69**
Functionality	Access Space Use	4.67 3.25 4.75		
	MEAN	**4.22**	**0.20**	**0.84**
			TOTAL SCORE	**4.00**

While the project manager had a direct contact to the construction firm and the sub-contractors, he had most recent information on construction, material selection, and like. The results of the questionnaire showed that he was satisfied with the quality of the *construction, performance, and engineering systems*. However, there were communication gaps about the impact of the design. The project manager preferred to see 3-D modeling of the project rather than filling out forms on aesthetics. Moreover, he mentioned that the valid information on impact could be obtained from the users during the post-construction stage.

In summary, the project manager's DQI Score was 4.00/5.00. The project manager believed that the architect had achieved good quality on functionality. The project was believed to be flexible enough, and cost effective. However, the project manager had conflicts on the aesthetics, and space affects.

Finally, the mechanical engineer was asked to fill out the DQI Questionnaire. However, he mentioned that he was not directly involved in the design process but that he was capable of evaluating the mechanical systems rather than evaluating the whole design.

The mechanical engineer had too little information on the impact of the building as he had little effect on design development. However, he declared that for creating a comfortable internal environment, the architect and the mechanical engineer had discussed room requirements and had examined the calculations for mechanical systems. Moreover, he mentioned that the maintenance of the systems was also considered during the design development.

The mechanical engineer, on the contrary, believed that he was in charge of constructing effective systems, so that information on construction, especially of mechanical systems, was available.

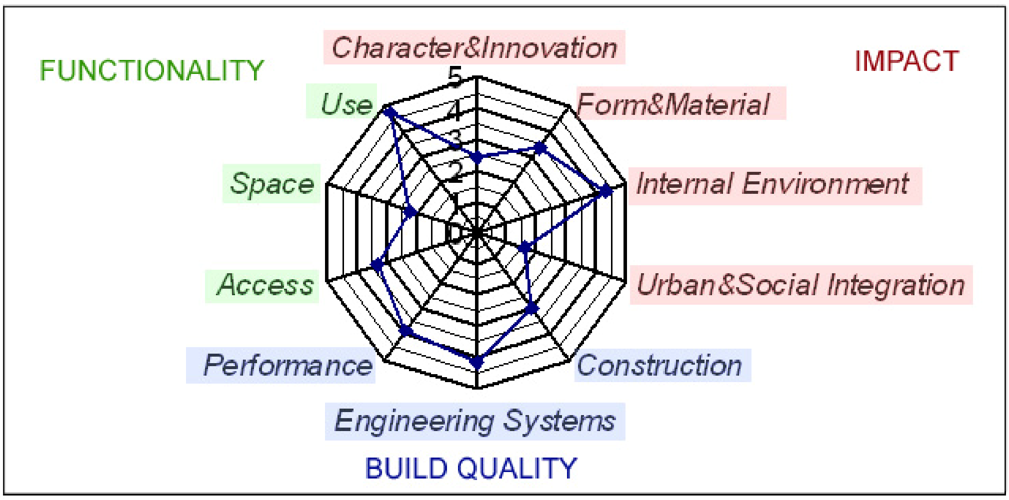

Figure 4.8 The mechanical engineer's DQI results in June 2005.

Table 4.7 The mechanical engineer's DQI scores in June 2005.

CATEGORIES		SCORE	WEIGHT	WEIGHTED SCORE
Impact	Character&Innovation	2.40		
	Form&Material	3.40		
	Internal Environment	4.33		
	Urban&Social Integration	1.60		
	MEAN	**2.93**	**0.20**	**0.59**
Build Quality	Construction	3.00		
	Engineering Systems	4.17		
	Performance	3.83		
	MEAN	**3.67**	**0.40**	**1.47**
Functionality	Access	3.33		
	Space	2.25		
	Use	4.75		
	MEAN	**3.44**	**0.40**	**1.38**
			TOTAL SCORE	**3.43**

In summary, the mechanical engineer's DQI score was 3.43/5.00. He had too little information on impact of the project. However, he had finalized the design of the mechanical systems and the selection of the materials.

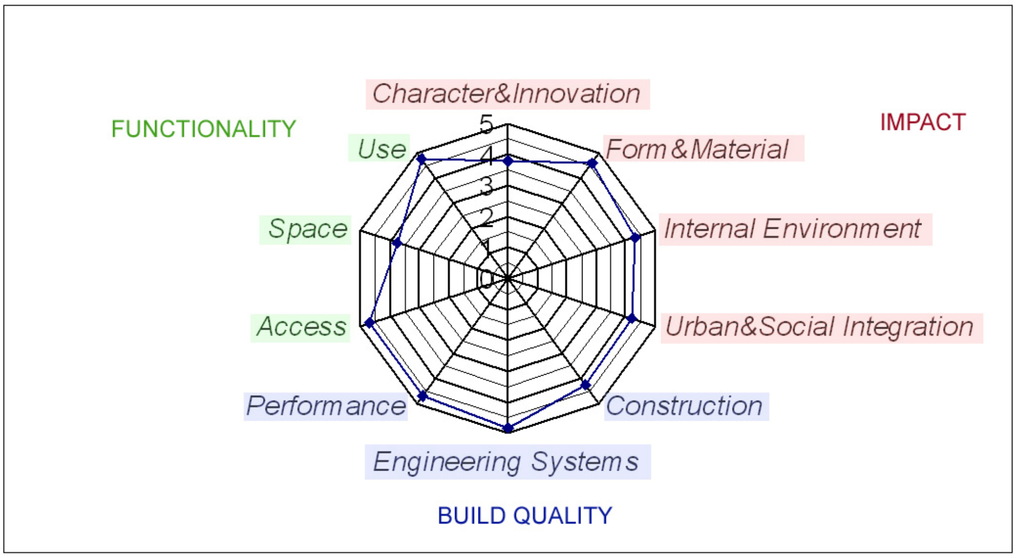

Figure 4.9 The architect's DQI results in July 2005.

Table 4.8 The architect's DQI score in July 2005.

CATEGORIES		SCORE	WEIGHT	WEIGHTED SCORE
Impact	Character&Innovation	3.80		
	Form&Material	4.60		
	Internal Environment	4.33		
	Urban&Social Integration	4.20		
	MEAN	**4.23**	**0.33**	**1.41**
Build Quality	Construction	4.25		
	Engineering Systems	4.83		
	Performance	4.67		
	MEAN	**4.58**	**0.33**	**1.53**
Functionality	Access	4.67		
	Space	3.75		
	Use	4.75		
	MEAN	**4.39**	**0.33**	**1.46**
			TOTAL SCORE	**4.40**

As it is mentioned in the previous chapter, the value and concerns of the participants may change during the project process. For that reason, the architect and the project manager were asked to fill out the DQI questionnaire one month later. It was observed that the values and concerns were not changed; however, with the development of the project, the information on unknown areas was enlightened.

In one month period, the material selection was finalized, and the constructions of the sample rooms were finished in selected blocks. For that reason, the architect now had a clear vision on form and material. The business operators had given the necessary information on specific spaces and equipments, so that the architect had finished the design of all recreational areas.

As it is seen in chart above, the architect was satisfied with the current situation of the design and construction. Therefore, the architect believed that the character and innovation of the building should be evaluated by the users during a post-occupancy study.

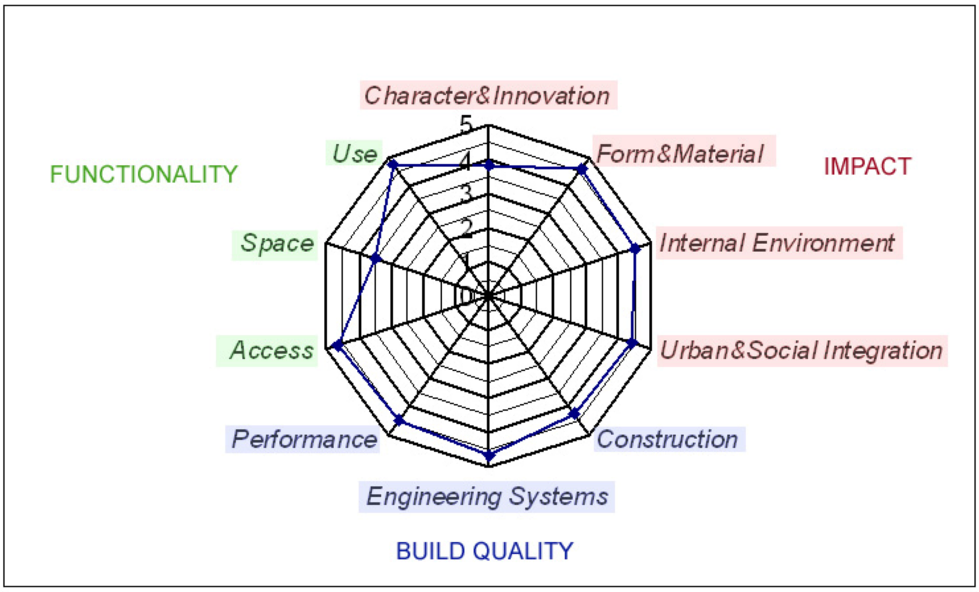

Figure 4.10 The project manager’s DQI results in July 2005.

The project manager had asked to see the 3-D modeling of the project. In addition, after the completion of the sample rooms, he had a more certain image of the building. As a result of this, DQI result of impact was raised apparently.

Table 4.9 The project manager's DQI scores in July 2005.

CATEGORIES		SCORE	WEIGHT	WEIGHTED SCORE
Impact	Character&Innovation	3.80		
	Form&Material	4.60		
	Internal Environment	4.50		
	Urban&Social Integration	4.40		
	MEAN	**4.33**	**0.40**	**1.73**
Build Quality	Construction	4.25		
	Engineering Systems	4.67		
	Performance	4.50		
	MEAN	**4.47**	**0.40**	**1.79**
Functionality	Access	4.67		
	Space	3.50		
	Use	4.75		
	MEAN	**4.31**	**0.20**	**0.86**
			TOTAL SCORE	**4.38**

4.3. Discussion

As the process of designing and constructing a building are dominated by the activities of the design and construction professionals, the program, in general, defines the process in stages that correspond to the professionally designated phases of a project: pre-design, design/documentation, construction, and post-construction. Architectural programming offers value management discussions that should be undertaken through the life of the project, typically at these stages: -

- Design and pre-construction: to identify individual and collective objectives, agree on roles and responsibilities, set measurement/targets, define accountabilities, determine how cost savings will be shared, and produce an action plan;

- Construction period: to review action plans and revisit objectives; and
- Post-construction period: to review success and learn lessons from experience at the end of the project.

The architect underlined that PDRI Checklist could be used to monitor the overall process; however, it did not involve much evaluation criteria on design requirements. He indicated that the DQI questionnaire seemed to be focused on the design process as it was a general statement list of values. The project manager indicated that as a tool for thinking, these checklists in current forms were useful as a starting point for discussion. It could not provide an absolute measure of the design quality of a building. Nonetheless, both the architect and the project manager agreed that tools for thinking could be used to elicit and represent knowledge about design in order to initiate conversations about facility priorities, design possibilities and consequences. This is possible because essentially these tools aim at capturing lessons from current project as well as initiate discussions involving project participants during the design stage of the current project. Results from different participants can be compared and contrasted during design and subsequent evaluation processes.

It is generally essential for project participants to understand the responsibilities and limitations of their professions. Moreover, the client contribution to the design process is aimed by using tools like DQI and PDRI. The architect mentioned that an institution or an individual person could be client of a construction project. He believed that although the individual person as the client in Turkey was not active or informed enough to be involved in or influence the design process, applying a questionnaire like DQI would have a negative effect on the discussions held with the client and the participants. It might extend the time required for pre-design activities. As the only interference by the client was at the detailed scale of the project; for instance, requesting a similar application shown in a journal, it was the architect who interprets the client's requirements and represents those in the design. It was not about drawing everything the client specifies; however, it was also not about emphasizing the architect's values and concerns only. It was about finding out what lay within and fit the project objectives.

The architect, additionally, stated that the institution as the client had much experience and information that could influence the design of construction project. For that reason, he pointed out that institutions should hold these checklists such as DQI and PDRI, and deliver it when an architect was assigned on such a project.

In addition, the contents of the questionnaires were discussed. The architect mentioned that the questions in the first and the third parts of the DQI tool, impact and functionality, include the issues that affect the value judgment of the client and himself. The second part of the questionnaire, on the other hand, contains the subjects that he discusses with the construction company. He also mentions that the decisions on the build quality have been changing during the design process. Furthermore, both the architect and the project manager suggested that the checklist should have been flexible and the architect should be allowed to change, add and remove some of the questions.

Finally, the architect declared that during his academic training, he had studied issues that influence design of a construction project; hence he was aware of the values listed in the checklists. Although he was not willing to use these checklists at pre-design stage of the process, he advised that apprentice architects could use these checklists. However, he mentioned that architects should not limit themselves with these lists of values; they should question and develop these supporting tools. Moreover, he mentioned that he might prefer to use these tools during post-occupancy evaluations.

CHAPTER 5

CONCLUSION

This study aimed at examining the effects of architectural programming in order to achieve value added design. Therefore, it was also the purpose of studying the development of architectural programming in the literature survey. Architectural programming starts at the pre-design stage. The program is the process by which project requirements are defined and prepared for execution. It is at this crucial stage where values associated with the project are analyzed, early designs are formulated, critical decisions are made and the specific project execution approach is defined. The information is used to identify design direction, major constraints, critical schedule issues, budgets and more.

The aim of architectural programming is to provide necessary information to project participants. In addition, it assists the architect to extract values and concerns from these information or documents. Furthermore, architectural programming, promotes better value by encouraging the participants to work together as an integrated project team to: -

- Improve design, including operational efficiency and health and safety performance;
- Minimize the need for costly design changes;
- Identify ways of driving out inefficiency in the construction process;
- Repeat good practice learned on earlier projects;
- Minimize the risk of costly disputes;
- Identify incentives to deliver tangible improvements in the quality of the construction and reductions in time and whole-life cost; and

- Integrate the whole process.

In summary, architectural programming is a method for identifying the project participants and extracting their values and goals in order to achieve design quality. on the other hand, in this study, the project manager and the client had merely prepared a list of general project requirements, and generated financial feasibility during the pre-design stage of the project. The project participants were not clearly identified at the early stages of the process. The pre-design activities were concluded as the first meeting held with the architect; and the design stage had begun. Since the project manager and the architect did not prepare a detailed program for entire process of the hotel project, the architect determined the values of the project and indicated the areas where more information was needed from relevant consultants. As a result, changes in schedule and budget of the project were required by the project participants.

This author observed that the design group (architects, mechanical engineers, structural engineers, etc.) had an important role to play in developing better quality buildings, and that they designed buildings within particular social, political and cultural context. The analysis of values of the participants, particularly the architect and the project manager’s concerns, provided an understanding for finding solutions of design problem and of communication gaps. These also helped to examine the conflicts that arise between different profession groups in the design process.

Design quality, however, is hard to quantify as it consists of both objective and subjective components. Whilst some indicators of design can be measured objectively, others depend on the subjective views, experiences and preferences of the project participants. For that reason, measuring the quality of design poses major conceptual and practical problems. Designers of buildings have long been interested in the overall value added through their efforts and the legacy of design decisions on future generations of users.

All the tools presented in this research addressed the architect and the project participants' perspectives on the entire building project process. These tools measured a range of subjective and objective indicators of quality. They were considered as tools for thinking. However, it should be indicated that the different tools support the factors in different perspectives. A combination of tools would be preferred to better ensure that the architectural programming had considered the effects of all factors.

The architect underlined that PDRI Checklist could be used to monitor the overall process while the DQI questionnaire seemed to be focused on the design process as it was a general statement list of values. The PDRI results showed that the pre-design activities had not been adequately defined; as a result, problems occurred during the construction stage. Project schedule and project cost estimate were the elements within basis of the project decision that should be re-examined.

In this case study, the project manager, the architect and the mechanical engineer were asked to fill out DQI questionnaire. The results showed that the project manager believed that the activities in build quality and impact sections were more important while the architect weighted all the sections equally. One month later, they were asked to fill out the DQI questionnaire. It was observed that the values and concerns were not changed; however, with the development of the project, the information on unknown areas was also acquired. For that reason, it was determined that the DQI tool could be used as a tool for monitoring process of construction projects.

Unfortunately, none of these tools worked without a motivated and conscientious project participants. In this study, the mechanical engineer had too little information on design of the building. He was merely capable of evaluating the mechanical systems. It pointed out that the groups, involved in the building project process, needed to keep themselves updated and respect the operational and individual concerns. This work can be greatly simplified with architectural programming as it organizes the information flow among the participants, and the extraction of their values and goals. By programming, architects know where and how to gain necessary information for defining project requirements.

Finally, the architect declared that he was aware of the values listed in the checklists, but, he was not willing to use them at the pre-design stage of the process since he did not consider them useful. However, he preferred to use these tools during post-occupancy evaluations. On the other hand, he advised that apprentice architects could use these checklists. He added that architects should not limit themselves with these lists of values; they should question and develop these supporting tools.

It should be underlined that results and discussions may change as every construction project is a unique problem that is influenced by different social and environmental contexts, location, building program, clients and investors.

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APPENDICES

APPENDIX A

PROJECT SCORE SHEET (UNWEIGHTED)

Source: Construction Industry Institution (1996) [Accessed: 16.05.2005]

SECTION I - BASIS OF PROJECT DECISION							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
A. BUSINESS STRATEGY							
A1. Building Use							
A2. Business Justification							
A3. Business Plan							
A4. Economic Analysis							
A5. Facility Requirements							
A6. Future Expansion/Alteration Considerations							
A7. Site Selection Considerations							
A8. Project Objectives Statement							
B. OWNER PHILOSOPHIES							
B1. Reliability Philosophy							
B2. Maintenance Philosophy							
B3. Operating Philosophy							
B4. Design Philosophy							
C. PROJECT REQUIREMENTS							
C1. Value-Analysis Process							
C2. Project Design Criteria							
C3. Evaluation of Existing Facilities							
C4. Scope of Work Overview							
C5. Project Schedule							
C6. Project Cost Estimate							

Definition Levels

0 = Not Applicable
1 = Complete Definition
2 = Minor Deficiencies
3 = Some Deficiencies
4 = Major Deficiencies
5 = Incomplete or Poor Definition

Continuation of the PDRI Questionnaire

SECTION II - BASIS OF DESIGN							
CATEGORY Element	**Definition Level**						**Score**
	0	**1**	**2**	**3**	**4**	**5**	
D. SITE INFORMATION							
D1. Site Layout							
D2. Site Surveys							
D3. Civil/Geotechnical Information							
D4. Governing Regulatory Requirements							
D5. Environmental Assessment							
D6. Utility Sources with Supply Conditions							
D7. Site Life Safety Considerations							
D8. Special Water and Waste Treatment Req'mts							
E. BUILDING PROGRAMMING							
E1. Program Statement							
E2. Building Summary Space List							
E3. Overall Adjacency Diagrams							
E4. Stacking Diagrams							
E5. Growth & Phased Development							
E6. Circulation and Open Space Requirements							
E7. Functional Relationship Diagrams/Room by Room							
E8. Loading/Unloading/Storage Facilities Req'mts							
E9. Transportation Requirements							
E10. Building Finishes							
E11. Room Data Sheets							
E12. Furnishings, Equipment, & Built-Ins							
E13. Window Treatment							
F. BUILDING/PROJECT DESIGN PARAMETERS							
F1. Civil/Site Design							
F2. Architectural Design							
F3. Structural Design							
F4. Mechanical Design							
F5. Electrical Design							
F6. Building Life Safety Requirements							
F7. Constructability Analysis							
F8. Technological Sophistication							

Definition Levels

0 = Not Applicable
1 = Complete Definition
2 = Minor Deficiencies
3 = Some Deficiencies
4 = Major Deficiencies
5 = Incomplete or Poor Definition

Continuation of the PDRI Questionnaire

SECTION II - BASIS OF DESIGN							
CATEGORY Element	**Definition Level**						**Score**
	0	**1**	**2**	**3**	**4**	**5**	
G. EQUIPMENT							
G1. Equipment List							
G2. Equipment Location Drawings							
G3. Equipment Utility Requirements							

Definition Levels

0 = Not Applicable
1 = Complete Definition
2 = Minor Deficiencies
3 = Some Deficiencies
4 = Major Deficiencies
5 = Incomplete or Poor Definition

Continuation of the PDRI Questionnaire

SECTION III - EXECUTION APPROACH							
CATEGORY Element	**Definition Level**						**Score**
	0	**1**	**2**	**3**	**4**	**5**	
H. PROCUREMENT STRATEGY							
H1. Identify Long Lead/Critical Equip. & Materials							
H2. Procurement Procedures and Plans							
J. DELIVERABLES							
J1. CADD/Model Requirements							
J2. Documentation/Deliverables							
K. PROJECT CONTROL							
K1. Project Quality Assurance and Control							
K2. Project Cost Control							
K3. Project Schedule Control							
K4. Risk Management							
K5. Safety Procedures							
L. PROJECT EXECUTION PLAN							
L1. Project Organization							
L2. Owner Approval Requirements							
L3. Project Delivery Method							
L4. Design/Construction Plan & Approach							
L5. Substantial Completion Requirements							

Definition Levels

0 = Not Applicable **2 = Minor Deficiencies** **4 = Major Deficiencies**
1 = Complete Definition **3 = Some Deficiencies** **5 = Incomplete or Poor Definition**

APPENDIX B

PROJECT SCORE SHEET (UNWEIGHTED - TURKISH)

BİRİNCİ KISIM - PROJE KARAR AŞAMASI							
KATEGORİ	Tanımlama						Sonuç
	0	1	2	3	4	5	
A. İŞ STRATEJİSİ							
A1. Bina Kullanımı							
A2. İş Şartları/Zorlayıcı Sebepler							
A3. İş Planı							
A4. Ekonomik Analizler							
A5. İşletme Gereksinimleri							
A6. Olabilecek Genişlemeler/Değişim Alternatifleri							
A7. Arazi Seçimi							
A8. Projenin Amaca Uygunluğu							
B. MÜŞTERİ STRATEJİSİ							
B1. Bina Emniyeti/Güvenilirliği							
B2. Bakım/Harcamalar Planı							
B3. İşletme Planı							
B4. Tasarım Anlayışı							
C. PROJE GEREKSİNİMLERİ							
C1. Değer Analizi Süreci							
C2. Proje Tasarım Kriterleri							
C3. Mevcut İşletme Değerlendirmesi							
C4. Genel Faaliyet Alanı							
C5. Proje Takvimlenmesi							
C6. Proje Maaliyet Tahmini/Keşif Hesapları							

Tanımlanma

0 = İlgili Değil **1 = Tamamen Tanımlandı** **2 = Çoğunlukla Tanımlandı**

3 = Tanımlandı **4 = Çoğunlukla Tanımlanmadı** **5 = Tanımlanmadı**

Continuation of the PDRI Questionnaire in Turkish

İKİNCİ KISIM - TASARIM AŞAMASI							
KATEGORİ	Tanımlama						Sonuç
	0	1	2	3	4	5	
D. ARAZİ BİLGİLERİ							
D1. Arazi Planı							
D2. Arazi Teftişi							
D3. İnşaat/Jeoteknik Bilgiler							
D4. Devlet İnşaat Düzenlemeleri							
D5. Çevresel Değerlendirme							
D6. Hizmet Kaynakları/Bakımı							
D7. Arazi Emniyeti İçin Dikkate Alınanlar							
D8. Özel Tesisat Sistemi Gereksinimleri							
E. BİNA PROGRAMI							
E1. Program							
E2. Gerekli Alanların Listesi							
E3. Genel Alan Şeması							
E4. Stok Şeması							
E5. Büyüme ve Değişme Evreleri							
E6. Dolaşım ve Açık Alan Gereksinimleri							
E7. İşlevsel İlişkiler Şeması/Oda Oda							
E8. Yükleme/Yük Boşaltma/Depolama Gereksinimleri							
E9. Nakliye Gereksinimleri							
E10. Bina Bitirme İşleri							
E11. Oda Veri Raporları							
E12. Mobilya, Ekipman ve İnşaat Aletleri							
E13. Pencere/Kapı Yerleştirmeleri							
F. BİNA/PROJE TASARIM PARAMETRELERİ							
F1. İnşaat/Arazi Tasarımı							
F2. Mimari Tasarım							
F3. Taşıyıcı Sistem Tasarımı							
F4. Mekanik Sistem Tasarımı							
F5. Elektrik Sistem Tasarımı							
F6. Bina Emniyet Gereksinimleri							
F7. İnşa Edilebilirlik Analizi							
F8. İnşaat Teknolojisi							

Tanımlanma

0 = İlgili Değil **1 = Tamamen Tanımlandı** **2 = Çoğunlukla Tanımlandı**

3 = Tanımlandı **4 = Çoğunlukla Tanımlanmadı** **5 = Tanımlanmadı**

Continuation of the PDRI Questionnaire in Turkish

İKİNCİ KISIM - TASARIM AŞAMASI							
KATEGORİ	**Tanımlama**						**Sonuç**
	0	**1**	**2**	**3**	**4**	**5**	
G. EKİPMAN							
G1. Ekipman Listesi							
G2. Ekipman Yerleşim Çizimleri							
G3. Ekipman Kullanım Şartları							

Tanımlanma

0 = İlgili Değil **1 = Tamamen Tanımlandı** **2 = Çoğunlukla Tanımlandı**

3 = Tanımlandı **4 = Çoğunlukla Tanımlanmadı** **5 = Tanımlanmadı**

Continuation of the PDRI Questionnaire in Turkish

ÜÇÜNCÜ KISIM - İNŞAAT AŞAMASI							
KATEGORİ	Tanımlama						Sonuç
	0	1	2	3	4	5	
H. MAL TEDARİK STRATEJİSİ							
H1. Uzun Dönem Kullanılacak Ekipman ve Malzemelerin Belirlenmesi							
H2. Tedarik Prosedürü ve Planı							
J. MAL TESLİMİ							
J1. CADD/Model Gereksinimleri							
J2. Dökümantasyon/Teslim							
K. PROJE KONTROLÜ							
K1. Proje Kalite Güvencesi ve Kontrolü							
K2. Proje Maliyet Kontrolü							
K3. Proje Takvimi Kontrolü							
K4. Risk Yönetimi							
K5. Güvenlik Prosedürleri							
L. PROJE İNŞAAT PLANI							
L1. Proje Organizasyonu							
L2. Mal Sahibinin Onay Şartları							
L3. Proje Teslim Metodu							
L4. Tasarım/İnşaat Planı							
L5. Önemli İş Bitirme Şartları							

Tanımlanma

0 = İlgili Değil **1 = Tamamen Tanımlandı** **2 = Çoğunlukla Tanımlandı**

3 = Tanımlandı **4 = Çoğunlukla Tanımlanmadı** **5 = Tanımlanmadı**

APPENDIX C

PROJECT SCORE SHEET (WEIGHTED)

Source: Construction Industry Institution (1996) [Accessed: 16.05.2005]

SECTION I - BASIS OF PROJECT DECISION							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
A. BUSINESS STRATEGY (Maximum = 214)							
A1. Building Use	0	1	12	23	33	44	
A2. Business Justification	0	1	8	14	21	27	
A3. Business Plan	0	2	8	14	20	26	
A4. Economic Analysis	0	2	6	11	16	21	
A5. Facility Requirements	0	2	9	16	23	31	
A6. Future Expansion/Alteration Considerations	0	1	7	12	17	22	
A7. Site Selection Considerations	0	1	8	15	21	28	
A8. Project Objectives Statement	0	1	4	8	11	15	
CATEGORY A TOTAL							
B. OWNER PHILOSOPHIES (Maximum = 68)							
B1. Reliability Philosophy	0	1	5	10	14	18	
B2. Maintenance Philosophy	0	1	5	9	12	16	
B3. Operating Philosophy	0	1	5	8	12	15	
B4. Design Philosophy	0	1	6	10	14	19	
CATEGORY B TOTAL							
C. PROJECT REQUIREMENTS (Maximum = 131)							
C1. Value-Analysis Process	0	1	6	10	14	19	
C2. Project Design Criteria	0	1	7	13	18	24	
C3. Evaluation of Existing Facilities	0	2	7	13	19	24	
C4. Scope of Work Overview	0	1	5	9	13	17	
C5. Project Schedule	0	2	6	11	15	20	
C6. Project Cost Estimate	0	2	8	15	21	27	
CATEGORY C TOTAL							
Section I Maximum Score = 413 **SECTION I TOTAL**							

Definition Levels

0 = Not Applicable **2 = Minor Deficiencies** **4 = Major Deficiencies**
1 = Complete Definition **3 = Some Deficiencies** **5 = Incomplete or Poor Definition**

Continuation of the PDRI Score Sheet weighted version.

SECTION II - BASIS OF DESIGN							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
D. SITE INFORMATION (Maximum = 108)							
D1. Site Layout	0	1	4	7	10	14	
D2. Site Surveys	0	1	4	8	11	14	
D3. Civil/Geotechnical Information	0	2	6	10	14	19	
D4. Governing Regulatory Requirements	0	1	4	8	11	14	
D5. Environmental Assessment	0	1	5	9	12	16	
D6. Utility Sources with Supply Conditions	0	1	4	7	10	13	
D7. Site Life Safety Considerations	0	1	2	4	6	8	
D8. Special Water and Waste Treatment Req'mts	0	1	3	6	8	11	
CATEGORY D TOTAL							
E. BUILDING PROGRAMMING (Maximum = 162)							
E1. Program Statement	0	1	5	9	12	16	
E2. Building Summary Space List	0	1	6	11	16	21	
E3. Overall Adjacency Diagrams	0	1	3	6	8	10	
E4. Stacking Diagrams	0	1	4	7	10	13	
E5. Growth & Phased Development	0	1	5	8	12	15	
E6. Circulation and Open Space Requirements	0	1	4	7	10	13	
E7. Functional Relationship Diagrams/Room by Room	0	1	3	5	8	10	
E8. Loading/Unloading/Storage Facilities Req'mts	0	1	2	4	6	8	
E9. Transportation Requirements	0	1	3	5	7	9	
E10. Building Finishes	0	1	5	8	12	15	
E11. Room Data Sheets	0	1	4	7	10	13	
E12. Furnishings, Equipment, & Built-Ins	0	1	4	8	11	14	
E13. Window Treatment	0	0	2	3	4	5	
CATEGORY E TOTAL							
F. BUILDING/PROJECT DESIGN PARAMETERS (Maximum = 122)							
F1. Civil/Site Design	0	1	4	7	11	14	
F2. Architectural Design	0	1	7	12	17	22	
F3. Structural Design	0	1	5	9	14	18	
F4. Mechanical Design	0	2	6	11	15	20	
F5. Electrical Design	0	1	5	8	12	15	
F6. Building Life Safety Requirements	0	1	3	5	8	10	
F7. Constructability Analysis	0	1	4	8	11	14	
F8. Technological Sophistication	0	1	3	5	7	9	
CATEGORY F TOTAL							

Definition Levels

0 = Not Applicable **2 = Minor Deficiencies** **4 = Major Deficiencies**

1 = Complete Definition 3 = Some Deficiencies 5 = Incomplete or Poor Definition

Continuation of the PDRI Score Sheet weighted version.

SECTION II - BASIS OF DESIGN							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
G. EQUIPMENT (Maximum = 36)							
G1. Equipment List	0	1	5	8	12	15	
G2. Equipment Location Drawings	0	1	3	5	8	10	
G3. Equipment Utility Requirements	0	1	4	6	9	11	
CATEGORY G TOTAL							
Section II Maximum Score = 428 SECTION II TOTAL							

Definition Levels

0 = Not Applicable **2 = Minor Deficiencies** **4 = Major Deficiencies**
1 = Complete Definition **3 = Some Deficiencies** **5 = Incomplete or Poor Definition**

Continuation of the PDRI Score Sheet weighted version.

SECTION III - EXECUTION APPROACH							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
H. PROCUREMENT STRATEGY (Maximum = 25)							
H1. Identify Long Lead/Critical Equip. & Materials	0	1	4	7	10	14	
H2. Procurement Procedures and Plans	0	1	3	6	9	11	
CATEGORY H TOTAL							
J. DELIVERABLES (Maximum = 11)							
J1. CADD/Model Requirements	0	0	1	2	3	4	
J2. Documentation/Deliverables	0	1	2	4	6	7	
CATEGORY J TOTAL							
K. PROJECT CONTROL (Maximum = 63)							
K1. Project Quality Assurance and Control	0	1	3	4	6	8	
K2. Project Cost Control	0	1	4	7	10	13	
K3. Project Schedule Control	0	1	4	8	11	14	
K4. Risk Management	0	1	6	10	14	18	
K5. Safety Procedures	0	1	3	5	7	9	
CATEGORY K TOTAL							
L. PROJECT EXECUTION PLAN (Maximum = 60)							
L1. Project Organization	0	1	3	5	8	10	
L2. Owner Approval Requirements	0	1	4	6	9	11	
L3. Project Delivery Method	0	1	5	8	12	15	
L4. Design/Construction Plan & Approach	0	1	4	8	11	15	
L5. Substantial Completion Requirements	0	1	3	5	7	9	
CATEGORY L TOTAL							
Section III Maximum Score = 159 SECTION III TOTAL							

PDRI TOTAL SCORE

(Maximum Score = 1000)

Definition Levels

0 = Not Applicable **2 = Minor Deficiencies** **4 = Major Deficiencies**
1 = Complete Definition **3 = Some Deficiencies** **5 = Incomplete or Poor Definition**

APPENDIX D

ELEMENT DESCRIPTIONS

The following descriptions have been developed to help generate a clear understanding of the terms used in the Project Score Sheets located in Appendices A and C. Some descriptions include checklists to clarify concepts and facilitate ideas when scoring each element. Note that these checklists are not all-inclusive and the user may supplement these lists when necessary.

The descriptions are listed in the same order as they appear in the Project Score Sheet. They are organized in a hierarchy by section, category, and element. The Project Score Sheet consists of three main sections, each of which is broken down into a series of categories which, in turn, are further broken down into elements. Scoring is performed by evaluating the levels of definition of the elements, which are described in this attachment. The sections and categories are organized as follows:

SECTION I **BASIS OF PROJECT DECISION**

This section consists of information necessary for understanding the project objectives. The completeness of this section determines the degree to which the project team will be able to achieve alignment in meeting the project's business objectives.

CATEGORIES:

- **A - Business Strategy**
- **B - Owner Philosophies**
- **C - Project Requirements**

SECTION II **BASIS OF DESIGN**

This section consists of space, site, and technical design elements that should be evaluated to fully understand the basis for design of the project.

CATEGORIES:

- **D - Site Information**
- **E - Building Programming**
- **F - Building/Project Design Parameters**
- **G - Equipment**

SECTION III **EXECUTION APPROACH**

This section consists of elements that should be evaluated to fully understand the requirements of the owner's execution strategy.

CATEGORIES:

- **H - Procurement Strategy**
- **J - Deliverables**
- **K - Project Control**
- **L - Project Execution Plan**

The following pages contain detailed descriptions for each element in the Project Definition Rating Index (PDRI).

SECTION I - BASIS OF PROJECT DECISION

A. BUSINESS STRATEGY

A1. Building Use

Identify and list building uses or functions. These may include uses such as:

- ❑ Retail
- ❑ Institutional
- ❑ Instructional
- ❑ Medical
- ❑ Research
- ❑ Multimedia
- ❑ Office
- ❑ Light manufacturing
- ❑ Storage
- ❑ Food service
- ❑ Recreational
- ❑ Other

A description of other options which could also meet the facility need should be defined. (As an example, did we consider renovating existing space rather than building new space?) A listing of current facilities that will be vacated due to the new project should be produced.

A2. Business Justification

Identify the driving forces for the project and specify what is most important from the viewpoint of the owner including both needs and expectations. Address items such as:

- ❑ Possible competitors
- ❑ Level of amenities
- ❑ Location
- ❑ Sales or rental levels
- ❑ Market capacity
- ❑ Use flexibility
- ❑ Other
- ❑ Need date
- ❑ Target consumers
- ❑ Building utilization justification
- ❑ Number of lessors/occupant types
- ❑ Support new business initiatives
- ❑ Facility replacement/consolidation

A3. Business Plan

The overarching project strategy should be defined that supports the business justification in relation to the following items:

- ❑ Cost and financing
- ❑ Schedule milestones (including known deadlines)
- ❑ Other
- ❑ Funding availability
- ❑ Types and sources of project funds
- ❑ Related/resulting projects

A4. Economic Analysis

An economic model should be developed to determine the viability of the venture. The model should acknowledge uncertainty and outline the boundaries of the analysis. It should acknowledge items such as:

- ❑ Design life
- ❑ Tax implications of investment including length of ownership
- ❑ Resale/lease potential or in the case of institutional buildings, long term use plans
- ❑ Other
- ❑ Building Ownership
- ❑ Long-term operating and maintenance costs
- ❑ Analysis of capital and operating cost versus sales or occupancy and profitability

A5. Facility Requirements

Facility size requirements are many times determined by applicable code and are often driven by occupancy. Note that this analysis is at the macro level. Some considerations are listed below:

- ❑ Number of occupants
- ❑ Net and gross square footage by area uses
- ❑ Classroom size
- ❑ Occupant accommodation requirements (i.e., number of hospital beds, number of desks, number of workstations, on-site child care, on-site medical care, cot space, etc.)
- ❑ Volume
- ❑ Support infrastructure
- ❑ Linear feet of display space
- ❑ Number of laboratory stations
- ❑ Other

A6. Future Expansion/Alteration Considerations

The possibility of expansion and/or alteration of the site and building should be considered for facility design. These considerations consist of a list of items that will facilitate the expansion or evolution of building use including adaptability/flexibility. Evaluation criteria may include:

- ❑ Provisions for site space in case of possible future expansion up or out
- ❑ Technologically advanced facility requirements
- ❑ Are departments or functional areas intended to "grow in place" during the future phase?
- ❑ If there will not be a future expansion of the building, how will departments or areas expand?
- ❑ Are any functional areas more likely than others to move out of the building in the future to allow others to expand or move in?
- ❑ Who will occupy the building in 5, 10, 15, 20 years?
- ❑ Flexibility or adaptability for future uses.
- ❑ Future phasing plan
- ❑ Other

A7. Site Selection Considerations

Evaluation of sites should address issues relative to different locations (i.e., global, country, or local). This evaluation may take into consideration existing buildings or properties, as well as new locations. The selection criteria include items such as:

- ❑ General geographic location
- ❑ Local availability and cost of skilled labor (e.g., construction, operation, etc.)
- ❑ Available utilities
- ❑ Economic incentive zones
- ❑ Land availability and developed costs
- ❑ Unusual financing requirements in region/locality
- ❑ Community relations
- ❑ Government relations
- ❑ Safety and health considerations
- ❑ Symbolic and aesthetic
- ❑ Other
- ❑ Access to the targeted market area
- ❑ Permitting Schedule
- ❑ Weather/climate
- ❑ Existing facilities
- ❑ Tax
- ❑ Legal constraints
- ❑ Domestic culture vs. international culture
- ❑ Education/training
- ❑ Labor relation
- ❑ Political issues/constraints
- ❑ Environmental issues
- ❑ Historic preservation

A8. Project Objectives Statement

This statement defines the project objectives and priorities for meeting the business strategy. It should be clear, concise, measurable, and specific to the project. It is desirable to obtain total agreement from the entire project team regarding these objectives and priorities to ensure alignment. Specifically, the priorities among cost, schedule, and value-added quality features should be clear. The objectives also should comply with any master plans if applicable.

B. OWNER PHILOSOPHIES

B1. Reliability Philosophy

A brief description of the project intent in terms of reliability should be defined. A list of the general design principles to be considered to achieve optimum/ideal operating performance from the facility/building should be addressed. Considerations may include:

- ❑ Critical systems redundancy
- ❑ Mechanical/electrical/plumbing reliability
- ❑ Architectural/structural/civil durability
- ❑ Other

B2. Maintenance Philosophy

A list of the general design principles to be considered to meet building maintenance requirements should be identified. This evaluation should include life cycle cost analysis of major facilities. Considerations may include:

- ❑ Maximum building occupancy requirements
- ❑ Equipment monitoring requirements
- ❑ Selection of materials & finishes
- ❑ Other
- ❑ Daily occupancy loads
- ❑ Energy conservation programs
- ❑ Requirements for building finishes

B3. Operating Philosophy

A list of the general design issues that need to be considered to support routine operations should be developed. Issues may include:

- ❑ Operating schedule/hours
- ❑ User finish out philosophy
- ❑ Provisions for building rental or occupancy assignments (i.e., by room, floor, suite) including flexibility of partitioning
- ❑ Future renovation schedule
- ❑ Flexibility to change layout
- ❑ Other

B4. Design Philosophy

A listing of design philosophy issues should be developed. These issues should be directed at concerns such as the following:

- ❑Aesthetic requirements
- ❑Compatibility with master plan
- ❑Image
- ❑Quality of life
- ❑Other
- ❑Design life
- ❑Theme
- ❑Environmentally sustainable design (internal/external)

C. PROJECT REQUIREMENTS

C1. Value-Analysis Process

A structured value analysis approach should be in place to consider design and material alternatives in terms of their cost effectiveness. Items that impact the economic viability of the project should be considered. Items to evaluate include issues such as:

- ❑ Discretionary scope issues
- ❑ Life-cycle analysis of construction methods and structure
- ❑ Expensive materials of construction
- ❑ Other

C2. Project Design Criteria

Project design criteria are the requirements and guidelines which govern the design of the project. Any design review board or design review process should be clearly articulated. Evaluation criteria may include:

- ❑ Level of design detail required
- ❑ Climatic data
- ❑ Codes & standards
  - ❑ Local
  - ❑ Owner specific
  - ❑ National
  - ❑ International
- ❑ Utilization of design standards
  - ❑ Owner's
  - ❑ Designer’s
  - ❑ Contractor's
  - ❑ Mixed
- ❑ Level of design detail required
- ❑ Donor or benefactor requirements
- ❑ Sole source requirements for equipment or systems
- ❑ Insurance underwriter requirements
- ❑ Cultural preferences
- ❑ Other

C3. Evaluation of Existing Facilities

If existing facilities are available, then a condition assessment must be performed to determine if they will meet facility requirements. Evaluation criteria may include:

- ❑ Capacity
  - ❑ Power
  - ❑ Fire water
  - ❑ Sanitary sewer
  - ❑ Security
  - ❑ Utilities (i.e., potable water, gas, oil, etc.)
  - ❑ Waste treatment/disposal
  - ❑ Telecommunications
  - ❑ Storm water containment system/filtration
- ❑ Access
  - ❑ Rail
  - ❑ ADA or local standards
- ❑ Roads
- ❑ Parking areas
- ❑ Type and size of buildings/structures
- ❑ Amenities
- ❑ Food service
- ❑ Ambulatory access
- ❑ Medical facilities
- ❑ Recreation facilities including public outdoor spaces
- ❑ Change rooms

- ❑Condition assessment of existing facilities and infrastructure
- ❑Other

C4. Scope of Work Overview

This work statement overview is a complete narrative description of the project that is discipline-oriented and supports development of the project schedule and project cost estimate. It sets the limits of work by each involved party and generally articulates their financial, task, and contractual responsibilities. It clearly states both assumptions and exclusions used to define the scope of work.

C5. Project Schedule

Ideally, the project schedule should be developed by the project team (owner, A/E, and construction contractor). It should include milestones, unusual schedule considerations and appropriate master schedule "contingency" time (float), procurement of long lead or critical pacing equipment, and required submissions and approvals.

C6. Project Cost Estimate

The project cost estimate should address all costs necessary for completion of the project. This cost estimate may include the following:

- ❑ Professional fees
- ❑ Land cost
- ❑ Administrative costs
- ❑ Cost escalation for elements outside the project cost estimate
- ❑ Construction contract estimate
- ❑ Furnishings
- ❑ Contingencies
- ❑ Startup costs including installation
- ❑ Miscellaneous expenses including but not limited to:
- ❑ Specialty consultants
- ❑ Bidding costs
- ❑ Bringing utilities to the site
- ❑ Local authority permit fees
- ❑ Utility costs during construction (if paid by owner)
- ❑ Availability of construction laydown & storage at site or in remote or rented facilities
- ❑ Inspection & testing services
- ❑ Site clearance
- ❑ Environmental impact mitigation measures
- ❑ Occupant moving & staging costs
- ❑ Interest on borrowed funds (cost of money)
- ❑ Site surveys, soils tests
- ❑ Other

SECTION II - BASIS OF DESIGN

D. SITE INFORMATION

D1. Site Layout

The facility should be sited on the selected property. Layout criteria may include items such as:

- ❑ Climate, wind, and sun orientation for natural lighting views, heat loss/gain, energy conservation, and aesthetic concerns
- ❑ Access transportation parking, delivery/service, & pedestrian circulation considerations
- ❑ Construction access
- ❑ Historical/cultural
- ❑ Trees and vegetation
- ❑ Access (e.g., road, rail, marine, air, etc.)
- ❑ Open space, street amenities, "urban

- ❑ Site massing and context constraints or guidelines (i.e., how a building will look in 3-dimensions at the site)

concerns"

- ❑ Other

D2. Site Surveys

The site should be surveyed for the exact property boundaries, including limits of construction. A topography map with the overall plot and site plan is also needed. Evaluation criteria may include:

- ❑ Legal property descriptions with property lines
- ❑ Rights-of-way
- ❑ Deeds
- ❑ Benchmark control systems
- ❑ Access & curb cuts
- ❑ Known below grade structures and utilities (both active and inactive)
- ❑ Existing facility locations and conditions
- ❑ Other
- ❑ Easements
- ❑ Drainage patterns
- ❑ Definition of final site elevation
- ❑ Setbacks
- ❑ Proximity to drainage ways and flood plains
- ❑ Trees & vegetation
- ❑ Solar/shadows

D3. Civil/Geotechnical Information

The civil/geotechnical site evaluation provides a basis for foundation, structural, and hydrological design. Evaluations of the proposed site should include items such as:

- ❑ Depth to bedrock
- ❑ Expansive or collapse potential of soils
- ❑ Fault line locations
- ❑ Spoil area for excess soil (i.e., location of on-site area or off-site instructions)
- ❑ Flood plain analysis
- ❑ Ground water flow rates and directions
- ❑ Description of foundation design options
- ❑ Pier/pile capacities
- ❑ Overall site analysis
- ❑ General site description (e.g., terrain, soils type, existing structures, spoil removal, areas of hazardous waste, etc.)
- ❑ Seismic requirements
- ❑ Water table elevation
- ❑ Soil percolation rate & conductivity
- ❑ Need for soil treatment or replacement
- ❑ Allowable bearing capacities
- ❑ Paving design options
- ❑ Other

D4. Governing Regulatory Requirements

The local, state, and federal government permits necessary to construct and operate the facility should be identified. A work plan should be in place to prepare, submit, and track permit, regulatory, re-zoning, and code compliance for the project. It should include items such as:

- ❑ Construction
- ❑ Unique requirements
- ❑ Environmental
- ❑ Structural calculations
- ❑ Building height limits
- ❑ Setback requirements
- ❑ Other
- ❑ Fire
- ❑ Building
- ❑ Occupancy
- ❑ Special
- ❑ Signage
- ❑ Historical issues
- ❑ Accessibility
- ❑ Demolition
- ❑ Solar
- ❑ Platting
- ❑ Air/water
- ❑ Transportation

The codes that will have a significant impact on the scope of the project should also be investigated and explained in detail. Particular attention should be paid to local requirements. Regulatory and code requirements may affect the defined physical characteristics and project cost estimate. The project schedule may be affected by regulatory approval processes. For some technically complex buildings, regulations change fairly often.

D5. Environmental Assessment

An environmental assessment should be performed for the site to evaluate issues that can impact the cost estimate or delay the project. These issues may include:

- ❑ Archeological
- ❑ Location in a wet lands area
- ❑ Environmental permits now in force
- ❑ Location of nearest residential area
- ❑ Downstream uses of ground water
- ❑ Past/present use of site
- ❑ Air/water discharge requirements and options evaluated
- ❑ Discharge limits of sanitary and storm sewers Identified
- ❑ Location in an EPA air quality non-compliance zone
- ❑ Existing contamination
- ❑ Ground water monitoring in place
- ❑ Existing environmental problems with the site
- ❑ Noise/vibration requirements
- ❑ Detention requirements
- ❑ Endangered species
- ❑ Erosion/sediment control
- ❑ Other

D6. Utility Sources with Supply Conditions

The availability/non-availability of site utilities needed to operate the facility with supply conditions of quantity, temperature, pressure, and quality should be evaluated. This may include items such as:

- ❑ Potable water
- ❑ Drinking water
- ❑ Cooling water
- ❑ Fire water
- ❑ Sewers
- ❑ Electricity (voltage levels)
- ❑ Special requirement (e.g., deionized water or oxygen)
- ❑ Instrument air
- ❑ Facility air
- ❑ Heating water
- ❑ Gases
- ❑ Steam
- ❑ Communications (e.g., data, cable television, telephones)
- ❑ Other

D7. Site Life Safety Considerations

Fire and life safety related items should be taken into account for the selected site. These items should include fire protection practices at the site, available firewater supply (amounts and conditions), special safety requirements unique to the site, etc. Evaluation criteria may include:

- ❑ Wind direction indicator devices (e.g., wind socks)
- ❑ Access and evacuation plan
- ❑ Security considerations (site illumination, access control, etc.)
- ❑ Fire monitors & hydrants
- ❑ Flow testing
- ❑ Available emergency medical facilities
- ❑ Other

D8. Special Water and Waste Treatment Requirements

On-site or pretreatment of water and waste should be evaluated. Items for consideration may include:

- ❑ Wastewater treatment
  - ❑ Process waste treatment
  - ❑ Sanitary waste
- ❑ Waste disposal
- ❑ Storm water containment &
- ❑ Other

E. BUILDING PROGRAMMING

E1. Program Statement

The program statement identifies the levels of performance for the facility in terms of space planning and functional relationships. It should address the human, physical, and external aspects to be considered in the design. Each performance criteria should include these issues:

❑ A performance statement outlining what goals are to be attained (e.g., providing sufficient lighting levels to accomplish the specified task safely and efficiently)
❑ A measure that must be achieved (e.g., 200 foot-candles at surface of surgical table)
❑ A test which is an accepted approach to establish that the criterion has been met (e.g., using a standard light meter to do the job)
❑ Other

E2. Building Summary Space List

The *summary* space list includes *all* space requirements for the entire project. This list should address specific types and areas. Possible space listings include:

- ❑ Building population
- ❑ Administrative offices
- ❑ Lounges
- ❑ Food Service Cafeteria
- ❑ Conference rooms
- ❑ Vending alcoves
- ❑ Janitorial closets
- ❑ Elevators
- ❑ Stairs
- ❑ Loading docks
- ❑ Dwelling units
- ❑ Special technology considerations
- ❑ Classrooms
- ❑ Laboratories
- ❑ Corridors
- ❑ Storage facilities
- ❑ Mechanical rooms
- ❑ Electrical rooms
- ❑ Parking space
- ❑ Entry lobby
- ❑ Restrooms
- ❑ Data/computer areas
- ❑ Other considerations

A room data sheet should correspond to each entry on the summary space list. Room data sheets are discussed in element E11. The room data sheet contains information that is necessary for the summary space list. This list is used to determine assignable (usable) and non-assignable (gross) areas.

E3. Overall Adjacency Diagrams

The overall adjacency diagrams depict the layout of each department or division of the entire building. They show the relationship of specific rooms, offices, and sections. The adjacency diagrams must adequately convey the overall relationships between functional areas within the facility. Note that these diagrams are sometimes known as “bubble diagrams” or “balloon diagrams.” They are also commonly expressed in an adjacency matrix.

E4. Stacking Diagrams

A stacking diagram portrays each department or functional unit vertically in a multi-story building. Stacking diagrams are drawn to scale, and they can help establish key design elements for the building. These diagrams are easily created with space lists and adjacency (or bubble) diagrams. Critical vertical relationships may relate to circulatory (stairs, elevators), structural elements, and mechanical or utility shafts.

Stacking diagrams can establish building elements such as floor size. This type of diagram often combines functional adjacencies and space requirements and also shows how the project is sited.

E5. Growth and Phased Development

Provisions for future phases or anticipated use change must be considered during project programming. A successful initial phase necessitates a plan for the long term phases. The following phasing issues may be addressed.

- ❑ Guidelines to allow for additions (i.e., over-design of structural systems, joist layout, column spacing, etc.)
- ❑ Technology needs as facility grows and expands or changes (e.g., mechanical systems, water demands, etc.)
- ❑ Compare the additional costs involved with making the building "expandable" versus the probability of the future expansion occurring as envisioned.
- ❑ Provisions for infrastructure that allow for future expansion
- ❑ Other

E6. Circulation and Open Space Requirements

An important component of space programming is common-area open spaces, both interior and exterior. These areas include the items listed and considerations such as:

- ❑ Exterior
  - ❑ Service dock areas and access
  - ❑ Passenger drop-off areas
  - ❑ Courtyards, plazas, or parks
  - ❑ Unbuildable areas (e.g., wetlands or slopes)
- ❑ Bicycle facilities
  - ❑ Lobbies and entries
  - ❑ Snow removal plan
  - ❑ Postal and newspaper delivery
  - ❑ Fire and life-safety circulation considerations
- ❑ Interior
  - ❑ Vertical circulation (i.e., personnel & material transport including elevators and escalators)
- ❑ Other

- ❑ Circulation to parking areas
- ❑ Pedestrian walkways
- ❑ Landscape buffer areas
- ❑ Sidewalks or other pedestrian routes
- ❑ Security considerations (e.g., card access or transmitters)
- ❑ Waste removal
- ❑ Interior aisle ways and corridors
- ❑ Directional and location signage

E7. Functional Relationship Diagrams/Room by Room

Room by room functional relationship diagrams show the structure of adjacencies of a group of rooms. With these adjacency diagrams (also known as bubble diagrams), the architect can convert them into a floor plan with all the relationships. Each space detail sheet should have a minimum of one functional relationship diagram. Rooms are often represented by circles, bubbles, squares, or rectangles. Larger rooms are represented with bigger symbols. They are also commonly expressed in an adjacency matrix.

E8. Loading/Unloading/Storage Facilities Requirements

A list of requirements identifying materials to be unloaded and stored and products to be loaded along with their specifications. This list should include items such as:

- ❑ Storage facilities to be provided and/or utilized
- ❑ Mail/small package delivery
- ❑ Recycling requirements
- ❑ Refrigeration requirements and capabilities
- ❑ Other

E9. Transportation Requirements

Specifications for implementation of facility transportation (e.g., roadways, conveyers, elevators, etc.) as well as methods for receiving and shipping of materials (e.g., air, rail, truck, marine, etc.) should be identified. Provisions should be included for items such as:

- ❑ Facility access requirements based on transportation
- ❑ Extended ramps for low clearance trailers
- ❑ Loading docks
- ❑ Other
- ❑ Drive-in doors
- ❑ Rail car access doors
- ❑ Service elevators
- ❑ Temporary parking

E10. Building Finishes

Levels of interior and exterior finishes should be defined for the project. For example, the finishes may include categories such as:

Interior Schedule:

- ❑ Type A
  - ❑ Floor: vinyl composition tile
  - ❑ Walls: painted
- ❑ Type B
  - ❑ Floor: direct glue carpet
  - ❑ Walls: vinyl wall covering
- ❑ Type C
  - ❑ Floor: carpet over pad
  - ❑ Walls: wood paneling

Exterior Schedule:

- ❑ Type 1
  - ❑ Walls: brick
  - ❑ Trim: brick
- ❑ Type 2
  - ❑ Walls: overlapping masonry
  - ❑ Trim: cedar

Finishes and local design standards are further defined in category F.

E11. Room Data Sheets

Room data sheets contain the specific requirements for each room considering its functional needs. A room data sheet should correspond to each room on the building summary space list. The format of the room data sheet should be consistent. Possible issues to include on room data sheets are:

❑ Critical dimensions
❑ Technical requirements (e.g., fireproof, explosion resistance, X-ray, etc.)
❑ Finish type
❑ Environmental issues
❑ Audio/visual (A/V) data and communication provisions
❑ Life-safety
❑ Furnishing requirements
❑ Equipment requirements
❑ Lighting requirements
❑ Utility requirements
❑ Acoustics/vibration requirements
❑ Security needs including access/hours of operation
❑ Other

E12. Furnishings, Equipment, and Built-Ins

All moveable furnishings, equipment, and built-ins should be listed on the room data sheets. Moveable and fixed in place equipment should be distinguished. Building modifications, such as wide access doors or high ceilings, necessary for any equipment also need to be listed. Long delivery time items should be identified and ordered early. It is critical to identify the utility impact of equipment (e.g., electrical, cooling, special water or drains, venting, radio frequency shielding, etc.). Examples may include:

❑ Furniture
❑ Kitchen equipment
❑ Medical equipment
❑ Material handling
❑ Partitions
❑ Other

New items and relocated existing items must be distinguished in the program. The items can be classified in the following categories.

New Items:
❑ Contractor furnished and contractor installed
❑ Owner furnished and contractor installed
❑ Owner furnished and owner installed
❑ Other

Existing Items:
❑ Relocated as is and contractor installed
❑ Refurbished and installed by contractor
❑ Relocated as is and owner installed
❑ Refurbished and installed by owner
❑ Other

E13. Window Treatment

Any special fenestration window treatments for energy and/or light control should be noted in order to have proper use of natural light. Some examples include:

❑ Blocking of natural light
❑ Exterior louvers
❑ Other
❑ Glare reducing windows
❑ Interior blinds

F. BUILDING/PROJECT DESIGN PARAMETERS

F1. Civil/Site Design

Civil/site design issues should be addressed to provide a basis for facility design. Issues to address may include:

❑ Service and storage requirements
❑ High point elevations for grade, paving, and foundations
❑ Storm drainage system
❑ Location and route of underground utilities
❑ Elevation and profile views
❑ Location of equipment
❑ Minimum overhead clearances
❑ Site utilities
❑ Earth work

❑ Subsurface work
❑ Landscape/xeriscape
❑ Other
❑ Paving/curbs
❑ Fencing/site security

F2. Architectural Design

Architectural design issue should be addressed to provide a basis for facility design. These issues may include the following:

❑ Determination of metric (hard/soft) versus Imperial (English) units
(Note: The term "hard" metric means that materials and equipment are identified on the drawings and have to be delivered in metric-sized unit dimensions such as 200mm by 400mm. "Soft" metric means that materials and equipment can be delivered using sizes that approximate the metric dimensions given on the drawings, such as 3 inch length instead of 8 cm. It is important to set these dimensions and not "mix and match.")
❑ Requirements for building location/ orientation horizontal & vertical
❑ Nature/character of building design
(e.g., aesthetics, etc.)
❑ Planning & zoning review boards
❑ American with Disabilities Act requirements or other local access requirements
❑ Furniture, furnishings, and accessories criteria
❑ Design grid
❑ Other
❑ Access requirements
❑ Construction materials
❑ Architectural Review Boards
❑ Acoustical considerations
❑ Color/material standards
❑ Seismic design considerations
❑ Circulation considerations
❑ Hardware standards
❑ Floor to floor height

F3. Structural Design

Structural design considerations should be addressed to provide a basis for the facility design. These considerations may include the following:

❑ Structural system
(e.g., construction materials, constraints, etc.)
❑ Corrosion control requirements/required protective coatings
❑ Client specifications (e.g., basis for design loads, vibration, deflection, etc.)
❑ Other
❑ Seismic requirements
❑ Foundation system
❑ Future expansion/flexibility considerations
❑ Functional spatial constraints
❑ Design loading parameter (e.g., live/dead loads, design loads, collateral load capacity, equipment/material loads, wind/snow loads, uplift)

F4. Mechanical Design

Mechanical design parameters should be developed to provide a basis for facility design. Items to consider include:

❑ Special ventilation or exhaust requirements
❑ Equipment/space special requirements with respect to environmental conditions
(e.g., air quality, special temperatures)
❑ Outdoor design conditions (e.g., minimum and maximum yearly temperatures)
❑ Utility support requirements
❑ Building emissions control
❑ Energy conservation and life cycle costs
❑ Acoustical requirements
❑ Zoning and controls
❑ Air circulation requirements

❑ Indoor design conditions (e.g., temperature, humidity, pressure, air quality, etc.)
❑ Special piping requirements
❑ Other
❑ System redundancy requirements
❑ Plumbing requirements
❑ Seismic requirements

F5. Electrical Design

Electrical design parameters provide the basis for facility design. Consider items such as:

❑ Power sources with available voltage & amperage
❑ Special lighting considerations (e.g., lighting levels, color rendition)
❑ Voice, data, and video communications requirements
❑ Uninterruptable power source (UPS) and/or emergency power requirements
❑ Energy consumption/conservation and life cycle cost
❑ Ability to use daylight in lighting
❑ Seismic requirements
❑ Lightning/grounding requirements
❑ Other

F6. Building Life Safety Requirements

Building life safety requirements are a necessity for building operations. They should be identified at this stage of the project. Possible safety requirements are listed below:

❑ Explosion resistant requirements
❑ Area of refuge requirements in case of catastrophe
❑ Fire detection and/or suppression requirements
❑ Safety showers
❑ Fume hoods
❑ Isolation facilities
❑ Emergency equipment access
❑ Egress
❑ Data or communications protection in case of disaster or emergency
❑ Other
❑ Fire resistant requirements
❑ Safety and alarm requirements
❑ Eye wash stations
❑ Deluge requirements and foam
❑ Handling of hazardous materials
❑ Sterile environments
❑ Personnel shelters
❑ Public address requirements
❑ Fall hazard protection
❑ Gas hazard detection

F7. Constructability Analysis

CII defines constructability as, "the optimum use of construction knowledge and experience in planning, design, procurement, and field operations to achieve overall project objectives. Maximum benefits occur when people with construction knowledge and experience become involved at the very beginning of a project."

Is there a structured approach for constructability analysis in place? Have provisions been made to provide this on an ongoing basis? This would include examining design options and details of construction that minimize construction costs while maintaining standards of safety, quality, and schedule. Elements of constructability during pre-project planning include:

❑ Constructability program in existence
❑ Construction knowledge/experience used in project planning
❑ Early construction involvement in contracting strategy development
❑ Developing a construction-sensitive project schedule
❑ Considering major construction methods in basic design approaches
❑ Developing site layouts for efficient construction
❑ Early identification of project team participants for constructability analysis

❑ Usage of advanced information technologies
❑ Other

F8. Technological Sophistication

The requirements for "intelligent" or special building systems should be evaluated. Examples of these systems may include:

❑ Video conferencing
❑ Advanced audio/visual (A/V) connections
❑ Computer docking stations
❑ Intercommunication systems
❑ Communication systems
❑ Internet connections
❑ Personnel sensing
❑ "Smart" heating or air-conditioning
❑ Security systems
❑ Conveyance systems
❑ Other

G. EQUIPMENT

G1. Equipment List

Project-specific equipment should be defined and listed. (Note: Building systems equipment is addressed in element F4, Mechanical Design, and F5, Electrical Design). In situations where owners are furnishing equipment, the equipment should be properly defined and purchased. The list should define items such as:

❑ Process
❑ Medical
❑ Food service/vending
❑ Trash disposal
❑ Distributed control systems
❑ Material handling
❑ Existing sources and characteristics of equipment
  - ❑ Relative sizes
  - ❑ Location
  - ❑ Materials of construction
  - ❑ Insulation and painting requirements
  - ❑ Weights
  - ❑ Capacities
  - ❑ Equipment related access
  - ❑ Equipment delivery time, if known
  - ❑ Vendor, model, and serial number once identified

❑ Other

G2. Equipment Location Drawings

Equipment location/arrangement drawings identify the specific location of each item of equipment in a project. These drawings should identify items such as:

❑ Plan and elevation views of equipment and platforms
❑ Location of equipment rooms
❑ Physical support requirement (e.g., installation bolt patterns)
❑ Coordinates or location of all major equipment
❑ Other

G3. Equipment Utility Requirements

This evaluation should consist of a tabulated list of utility requirements for all major equipment items such as:

❑ Power and/or all utility requirements
❑ Design temperature and pressure
❑ Flow diagrams
❑ Diversity of use

- ❑ Gas
- ❑ Water
- ❑ Other

SECTION III - EXECUTION APPROACH

H. PROCUREMENT STRATEGY

H1. Identify Long Lead/Critical Equipment and Materials

Identify engineered equipment and material items with lead times that will impact the design for receipt of vendor information or impact the construction schedule with long delivery times.

H2. Procurement Procedures and Plans

Procurement procedures and plans include specific guidelines, special requirements, or methodologies for accomplishing the purchasing, expediting, and delivery of equipment and materials required for the project. Evaluation criteria may include:

- ❑ Who will perform procurement?
- ❑ Listing of approved vendors, if applicable
- ❑ Client or contractor purchase orders
- ❑ Reimbursement terms and conditions
- ❑ Guidelines for supplier alliances, single source, or competitive bids
- ❑ Guidelines for engineering/construction contracts
- ❑ Who assumes responsibility for owner-purchased items?
    - ❑ Financial
    - ❑ Shop inspection
    - ❑ Expediting
- ❑ Tax strategy
    - ❑ Depreciation capture
    - ❑ Local sales and use tax treatment
    - ❑ Investment tax credits
- ❑ Definition of source inspection requirements and responsibilities
- ❑ Definition of traffic/insurance responsibilities
- ❑ Definition of procurement status reporting requirements
- ❑ Additional/special owner accounting requirements
- ❑ Definition of spare parts requirements
- ❑ Local regulations (e.g., tax restrictions, tax advantages, etc.)
- ❑ Incentive/penalty strategy for contracts
- ❑ Storage
- ❑ Other

J. DELIVERABLES

J1. CADD/Model Requirements

Computer Aided Drafting and Design (CADD) requirements should be defined. Evaluation criteria may include:

- ❑ Software system required by client (e.g., AutoCAD, Intergraph, etc.)

- ❑ Will the project be required to be designed using 2D or 3D CADD? Will rendering be required?
- ❑ If 3D CADD is to be used, will a walk-through simulation be required?
- ❑ Owner/contractor standard symbols and details
- ❑ How will data be received and returned to/from the owner?
  - ❑ Disk
  - ❑ Electronic transfer
  - ❑ Tape
  - ❑ Reproducibles
  - ❑ Full size mock-ups

Physical model requirements depend upon the type needed for analysis, such as study models or design checks.

J2. Documentation/Deliverables

Documentation and deliverables required during project execution should be identified. If electronic media are to be used, format and application packages should be outlined. The following items may be included in a list of deliverables:

- ❑ Drawings & specifications
- ❑ Permits
- ❑ Record (as-built) documents
- ❑ Project data books (quantity, format, contents, and completion date)
- ❑ Facility keys, keying schedules, and access codes
- ❑ Procuring documents/contract documents
- ❑ Certificates of inspection
- ❑ Bonds
- ❑ Project correspondence
- ❑ Maintenance and operating information/startup procedures
- ❑ Project signage
- ❑ Quality assurance documents
- ❑ Guarantees/warranties
- ❑ Inspection documents
- ❑ Shop drawings and samples
- ❑ Distribution matrix
- ❑ Equipment folders (quantity, format, contents, and completion date)
- ❑ Design calculations (quantity, format, contents, and completion date)
- ❑ Spare parts and maintenance stock (special forms)
- ❑ Other

K. PROJECT CONTROL

K1. Project Quality Assurance and Control

Quality assurance and quality control procedures need to be established. Responsibility for approvals needs to be developed. Electronic media requirements should be outlined. These issues may include:

- ❑ Communication documents (e.g., RFI's, RFQ's, etc.)
- ❑ Responsibility during design and construction
- ❑ Inspection reporting requirements
- ❑ Reviewing changes and modifications
- ❑ Lessons-learned feedback
- ❑ ISO 9000 requirements
- ❑ Testing of materials and workmanship
- ❑ Submittals and shop drawing approach
- ❑ Progress photos
- ❑ Commissioning tests
- ❑ Other

K2. Project Cost Control

Procedures for controlling project cost need to be outlined and responsibility assigned. Electronic media requirements should be identified. These may include cost control requirements such as:

- ❑ Financial (client/regulatory)
- ❑ Phasing or area sub-accounting

- ❑ Capital vs. non-capital expenditures
- ❑ Cash flow projections/draw down analysis
- ❑ Cost code scheme/strategy
- ❑ Change order management procedure, including scope control
- ❑ Report requirements
- ❑ Payment schedules and procedures
- ❑ Costs for each project phase
- ❑ Periodic control check estimates
- ❑ Other

K3. Project Schedule Control

The project schedule is created to show progress and ensure that the project is completed on time. The schedule is necessary for design and construction of the building. A schedule format should be decided on at the beginning of the project. Typical items included in a project schedule are listed below.

- ❑ Milestones
- ❑ Required submissions and/or approvals
- ❑ Required documentation and responsible party
- ❑ Long lead or critical pacing equipment delivery
- ❑ Permitting or regulatory approvals
- ❑ Liquidated damages/incentives
- ❑ Unusual schedule considerations
- ❑ Baseline vs. progress to date
- ❑ Critical path activities
- ❑ Contingency or "float time"
- ❑ Activation and commissioning
- ❑ other

The owner must also identify how special project issues will be scheduled. These items may include:

- ❑ Selection, procurement, and installation of equipment
- ❑ Design of interior spaces (including furniture and accessory selection)
- ❑ Stages of the project that must be handled differently than the rest of the project
- ❑ Tie-ins, service interruptions, and road closures
- ❑ Other

K4. Risk Management

Major project risks need to be identified, quantified, and management actions taken to mitigate problems developed. Pertinent elements may include:

- ❑ Design risks
  - ❑ Expertise
  - ❑ Work load
  - ❑ Communication
  - ❑ Other
  - ❑ Experience
  - ❑ Teamwork orientation
  - ❑ Integration and coordination
- ❑ Construction risks
  - ❑ Availability of craft labor and construction materials
  - ❑ Differing/unforeseen/difficult site conditions
  - ❑ Inflation
  - ❑ Other
  - ❑ Weather
  - ❑ Long lead item delays
  - ❑ Strikes
  - ❑ Scope growth
- ❑ Management risks
  - ❑ Availability of designers
  - ❑ Bidders
  - ❑ Cost & schedule estimates
  - ❑ Team chemistry
  - ❑ Critical quality issues
  - ❑ Human error
  - ❑ Timely decisions
  - ❑ Other
- ❑ Insurance considerations

K5. Safety Procedures

Safety procedures and responsibilities must be identified for design consideration and construction. Safety issues to be addressed may include:

- ❑ Hazardous material handling
- ❑ Working at elevations/fall hazards
- ❑ Drug testing
- ❑ Accident reporting & investigation
- ❑ Safety orientation & planning
- ❑ Other special or unusual safety issues
- ❑ Interaction with the public
- ❑ Evacuation plans & procedures
- ❑ First aid stations
- ❑ Pre-task planning
- ❑ Safety incentives

L. PROJECT EXECUTION PLAN

L1. Project Organization

The project team should be identified including roles, responsibilities, and authority. Items to consider include:

- ❑ Core team members
- ❑ Approval responsibilities/responsibility matrix
- ❑ Working relationships between participants
- ❑ Communication channels
- ❑ Project manager assigned
- ❑ Organizational chart
- ❑ Project sponsor assigned
- ❑ Other

L2. Owner Approval Requirements

All documents that require owner approval should be clearly defined. These may include:

- ❑ Milestones for drawing approval by phase
    - ❑ Comment
    - ❑ Bid issues (public or private)
    - ❑ Approval
    - ❑ Construction
- ❑ Durations of approval cycle compatible with schedule
- ❑ Individual(s) responsible for reconciling comments before return
- ❑ Types of drawings/specifications
- ❑ Purchase documents/general conditions & contract documents
    - ❑ Data sheets
    - ❑ Bid tabulations
    - ❑ Inquiries
    - ❑ Purchase orders
- ❑ Vendor information
- ❑ Other

L3. Project Delivery Method

The methods of project design and construction delivery, including fee structure should be identified. Issues to consider include:

- ❑ Owner self-performed
- ❑ Designer and constructor qualification selection process
- ❑ Selected methods (e.g., design/build, CM at risk, competitive sealed proposal, bridging, design-bid-build, etc.)
- ❑ Contracting strategies (e.g., lump sum, cost-plus, etc.)
- ❑ Design/build scope package considerations
- ❑ Other

L4. Design/Construction Plan and Approach

This is a documented plan identifying the specific approach to be used in designing and constructing the project. It should include items such as:

- ❑ Quality assurance/quality control (QA/QC) plan
- ❑ Work week plan/schedule
- ❑ Work Breakdown Structure (WBS)
- ❑ Site logistics plan
- ❑ Identification of critical activities that have potential impact on facilities (i.e., existing facilities, crane usage, utility shut downs and tie-ins, testing, etc.) schedule
- ❑ Design and approvals sequencing of events
- ❑ Furnishings, equipment, and built-ins responsibility
- ❑ Subcontracting strategy
- ❑ Organizational structure
- ❑ Construction sequencing of events
- ❑ Safety requirements/program
- ❑ Equipment procurement and staging
- ❑ Alternative dispute resolution
- ❑ Partnering or strategic alliances
- ❑ Contractor meeting/reporting
- ❑ Responsibility matrix
- ❑ Other

L5. Substantial Completion Requirements

Substantial Completion (SC) is defined as the point in time when the building is ready to be occupied. The following may need to be addressed:

- ❑ Have specific requirements for SC responsibilities been developed?
- ❑ Have warranty, permitting, insurance, tax implications, etc., been considered?
- ❑ Commissioning
  - ❑ Equipment/systems startup and testing
  - ❑ Final code inspection
  - ❑ Verification
  - ❑ Training
  - ❑ Occupancy phasing
  - ❑ Calibration
  - ❑ Documentation
  - ❑ Acceptance
- ❑ Landscape requirements
- ❑ Punchlist completion plan and schedule
- ❑ Substantial completion certificate
- ❑ Other

APPENDIX E

PDRI EVALUATIONS

Table E.1 Section One of PDRI Score Sheet Evaluations of Project Manager. The darkened numbers represent the responses of the project manager. These were compared with the weighted PDRI Score Sheet and the scores were identified.
Adopted from: Construction Industry Institution (1996)

SECTION I - BASIS OF PROJECT DECISION									
CATEGORY	Definition Level								Max
Element	0	1	2	3	4	5	Level	Score	Score
A. BUSINESS STRATEGIES (Maximum Score = 214)									
A1. Building Use	0	1	12	23	33	44	1	1	44
A2. Business Justification	0	1	8	14	21	27	1	1	27
A3. Business Plan	0	2	8	14	20	26	2	8	26
A4. Economic Analysis	0	2	6	11	16	21	2	6	21
A5. Facility Requirements	0	2	9	16	23	31	2	9	31
A6. Future Expansion/Alteration Considerations	0	1	7	12	17	22	3	12	22
A7. Site Selection Considerations	0	1	8	15	21	28	2	8	28
A8. Project Objectives Statement	0	1	4	8	11	15	1	1	15
	CATEGORY A TOTAL							46	214
B. OWNER PHILOSOPHIES (Maximum Score =68)									
B1. Reliability Philosophy	0	1	5	10	14	18	1	1	18
B2. Maintenance Philosophy	0	1	5	9	12	16	2	5	16
B3. Operating Philosophy	0	1	5	8	12	15	2	5	15
B4. Design Philosophy	0	1	6	10	14	19	1	1	19
	CATEGORY B TOTAL							12	68
C. PROJECT REQUIREMENTS (Maximum Score = 131)									
C1. Value-Analysis Process	0	1	6	10	14	19	2	6	19
C2. Project Design Criteria	0	1	7	13	18	24	1	1	24
C3. Evaluation of Existing Facilities	0	2	7	13	19	24	1	2	24
C4. Scope of Work Overview	0	2	5	9	13	17	1	2	17
C5. Projcet Schedule	0	2	6	11	15	20	3	11	20
C6. Projcet Cost Estimate	0	2	8	15	21	27	3	15	27
	CATEGORY A TOTAL							37	131
Section I Maximum Score = 413							**SECTION I TOTAL**	95	413

Table E.2 Section Two of PDRI Score Sheet Evaluations of Project Manager. The darkened numbers represent the responses of the project manager. These were compared with the weighted PDRI Score Sheet and the scores were identified.
Adopted from: Construction Industry Institution (1996)

SECTION II - FRONT END DEFINITION									
CATEGORY	Definition Level								Max
Element	0	1	2	3	4	5	Level	Score	Score
D. SITE INFORMATION (Maximum Score = 109)									
D1. Site Location	0	1	4	7	10	14	2	4	14
D2. Site Surveys	0	1	4	8	11	14	1	1	14
D3. Civil/Geotechnical Information	0	2	6	10	14	19	1	2	19
D4. Governing Regulatory Requirements	0	1	4	8	11	14	1	1	14
D5. Environmental Assessment	0	1	5	9	12	16	2	5	16
D6. Utility Sources with Supply Conditions	0	1	4	7	10	13	1	1	13
D7. Site Life Safety Considerations	0	1	2	4	6	8	1	1	8
D8. Special Water and Waste Treatment Requirements	0	1	3	6	8	11	1	1	11
	CATEGORY D TOTAL							16	109
E. BUILDING PROGRAMMING (Maximum Score = 162)									
E1. Program Statement	0	1	5	9	12	16	2	5	16
E2. Building Summary Space List	0	1	6	11	16	21	1	1	21
E3. Overall Adjacency Diagrams	0	1	3	6	8	10	1	1	10
E4. Stacking Diagrams	0	1	4	7	10	13	1	1	13
E5. Growth & Phased Development	0	1	5	8	12	15	2	5	15
E6. Circulation and Open Space Requirements	0	1	4	7	10	13	1	1	13
E7. Functional Relationship Diagrams/Room by Room	0	1	3	5	8	10	1	1	10
E8. Loading/Unloading/Storage Facility Requirements	0	1	2	4	6	8	1	1	8
E9. Transportation Requirements	0	1	3	5	7	9	1	1	9
E10. Building Finishes	0	1	5	8	12	15	2	5	15
E11. Room Data Sheets	0	1	4	7	10	13	1	1	13
E12. Furnishings, Equipment, & Built-Ins	0	1	4	8	11	14	2	4	14
E13. Window Treatment	0	1	2	3	4	5	2	2	5
	CATEGORY E TOTAL							29	162

Table E.3 Continue of Section Two of PDRI Score Sheet Evaluations of Project Manager. The darkened numbers represent the responses of the project manager. These were compared with the weighted PDRI Score Sheet and the scores were identified. Adopted from: Construction Industry Institution (1996)

SECTION II - FRONT END DEFINITION									
CATEGORY Element	Definition Level 0	1	2	3	4	5	Level	Score	Max Score
F. BUILDING/PROJECT DESIGN PARAMETERS (Maximum Score = 122)									
F1. Civil/Site Design	0	1	4	7	11	14	1	1	14
F2. Architectural Design	0	1	7	12	17	22	2	7	22
F3. Structural Design	0	1	5	9	14	18	1	1	18
F4. Mechanical Design	0	2	6	11	15	20	2	6	20
F5. Electrical Design	0	1	5	8	12	15	2	5	15
F6. Building Life Safety Requirements	0	1	3	5	8	10	1	1	10
F7. Constructability Analysis	0	1	4	8	11	14	1	1	14
F8. Technological Sophistication	0	1	3	5	7	9	1	1	9
	CATEGORY F TOTAL							23	122
G. EQUIPMENT (Maximum Score = 36)									
G1. Equipment List	0	1	5	8	12	15	3	8	15
G2. Equipment Location Drawings	0	1	3	5	8	10	3	5	10
G3. Equipment Utility Requirements	0	1	4	6	9	11	3	6	11
	CATEGORY G TOTAL							19	36
Section II Maximum Score = 429	**SECTION II TOTAL**							87	429

Table E.4 Section Three of PDRI Score Sheet Evaluations of Project Manager. The darkened numbers represent the responses of the project manager. These were compared with the weighted PDRI Score Sheet and the scores were identified. Adopted from: Construction Industry Institution (1996)

SECTION III - EXECUTION APPROACH									
CATEGORY Element	Definition Level 0	1	2	3	4	5	Level	Score	Max Score
H. PROCUREMENT STRATEGY (Maximum Score = 25)									
H1. Identify Long Lead/Critical Equip. & Mat.	0	1	4	7	10	14	2	4	14
H2. Procurement Procedures and Plans	0	1	3	6	9	11	2	3	11
	CATEGORY H TOTAL							7	25
J. DELIVERABLES (Maximum Score = 11)									
J1. CADD/Model Requirements	0	0	1	2	3	4	2	1	4
J2. Documentation/Deliverables	0	1	2	4	6	7	2	2	7
	CATEGORY J TOTAL							3	11
K. PROJECT CONTROL (Maximum Score = 62)									
K1. Project Quality Assurance and Control	0	0	3	4	6	8	2	3	8
K2. Project Cost Control	0	0	4	7	10	13	3	7	13
K3. Project Schedule Control	0	0	4	8	11	14	3	8	14
K4. Risk Management	0	0	6	10	14	18	3	10	18
K5. Safety Procedures	0	1	3	5	7	9	1	1	9
	CATEGORY K TOTAL							29	62
L. PROJECT EXECUTION PLAN (Maximum Score = 60)									
L1. Project Organization	0	1	3	5	8	10	1	1	10
L2. Owner Approval Requirements	0	1	4	6	9	11	1	1	11
L3. Project Delivery Method	0	1	5	8	12	15	3	8	15
L4. Design/Construction Plan & Approach	0	1	4	8	11	15	3	8	15
L5. Substantial Completion Requirements	0	1	3	5	7	9	2	3	9
	CATEGORY L TOTAL							21	60
Section III Maximum Score = 158	**SECTION III TOTAL**							60	158

APPENDIX F

Design Quality Indicators (DQI) Questionnaire

Source: Construction Industry Council

taken from: http://www.ncw.org.uk/competition/worksheets/worksheets.html

[Accessed: 16.05.2005]

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A Competition for Schools

Design Quality Indicator 1 In Use

Construction Industry Council

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	Not Applicable
Impact includes a building's ability to delight, to intrigue, to create a sense of place, and uplift the local community and environment. Also the design's contribution to the arts and science of building and architecture.						
Question 1 **Visitors like coming here** Consider how inviting you think the building is for visitors.	○	○	○	○	○	○
Question 2 **The building makes you think** Does the building's design interest you?	○	○	○	○	○	○
Question 3 **The building's design and construction has contributed to development of new knowledge** Do you think the building will encourage people to design like this in the future?	○	○	○	○	○	○
Question 4 **The form and materials are well detailed** Consider here whether or not you feel that the shape of the building and the materials used have been well thought through.	○	○	○	○	○	○
Build Quality stems from how well the building is constructed: its structure, fabric, finishes and fittings, its engineering systems, the co-ordination of all these and how well they perform.						
Question 5 **The building withstands wear and tear in use** Think about the effect of everyday use especially on well used areas, including moving parts like doors, windows locks and handles.	○	○	○	○	○	○
Question 6 **The building's structure is efficient** Does the structural design of the building achieve the most with the least use of materials?	○	○	○	○	○	○

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Continuation of DQI Questionnaire

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Design Quality Indicator 1 In Use

Construction Industry Council

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	Not Applicable
Question 7 **The building is energy efficient** Consider here whether or not you feel the building's design has accounted for efficient use of energy.	O	O	O	O	O	O
Question 8 **The layout, structure and engineering systems are well integrated** Consider here how well you feel structure and the engineering systems like heating and water have been built in to the layout of the building? Or do they feel "bolted on".	O	O	O	O	O	O
Functionality is concerned with the arrangement, quantity and inter-relationship of spaces, and how the building is designed to be useful.						
Question 9 **The building works well** Overall does the building do what it is supposed to do?	O	O	O	O	O	O
Question 10 **The layout allows for changes of use** Could the layout of the building change, if its purpose were to change?	O	O	O	O	O	O
Question 11 **The structure allows for changes of use** The structural design will have a major impact on how easy it is to change the layout and sizes of spaces in the future - has it been thought through from this point of view?	O	O	O	O	O	O
Question 12 **The building's layout and the relationships between rooms work well** The way spaces are set out should match the needs of the user.	O	O	O	O	O	O

Name	Team

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Continuation of DQI Questionnaire

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Design Quality Indicator 2
The Design Brief

Construction Industry Council

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	Not Applicable
Impact includes a building's ability to delight, to intrigue, to create a sense of place, and uplift the local community and environment. Also the design's contribution to the arts and science of building and architecture.						
Question 1 **The building should have character** Should the building have any features that make it stand out in its surroundings?	O	O	O	O	O	O
Question 2 **The building should be well composed** Should the building look good?	O	O	O	O	O	O
Question 3 **The materials used in the building should add to its quality** Consider here the materials the building could be made of and whether you feel they will improve the overall standard of the building.	O	O	O	O	O	O
Question 4 **The use of colour and texture should enhance the enjoyment of the building** Consider that simplicity and lack of colour in one building can be as valuable as richness and different colours in another.	O	O	O	O	O	O
Build Quality stems from how well the building is constructed: its structure, fabric, finishes and fittings, its engineering systems, the co-ordination of all these and how well they perform.						
Question 5 **The building should be easy to clean** Consider here whether or not you feel the design should account for ease of cleaning the building.	O	O	O	O	O	O
Question 6 **The building should weather well** Consider how well the building's exterior should cope with wind, rain, sun and pollution?	O	O	O	O	O	O

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Continuation of DQI Questionnaire

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Design Quality Indicator 2
The Design Brief

Construction Industry Council

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	Not Applicable
Question 7 **The building's finishes should be durable** Consider whether the internal surfaces of the building should be designed to last well?	O	O	O	O	O	O
Question 8 **The materials should be appropriate for the building's purpose** Should the materials used inside and outside suit the intended use over its intended life?	O	O	O	O	O	O
Functionality is concerned with the arrangement, quantity and inter-relationship of spaces, and how the building is designed to be useful.						
Question 9 **The building should enhance the activity of people who use it regularly** Should people who use the building feel good after visiting?	O	O	O	O	O	O
Question 10 **The layout should be intelligible** Consider whether the organisation of the parts of the building should be sensible and reasonably visible to the visitor?	O	O	O	O	O	O
Question 11 **The signage should be clear** Consider whether signs should be clear and easy to follow by all users.	O	O	O	O	O	O
Question 12 **The circulation space should work well** The corridors and hallways must connect the rooms and main spaces in usable, suitable ways but in the best designs they often accommodate certain functions themselves - such as informal meeting, sitting and waiting.	O	O	O	O	O	O

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Design Quality Indicator 2
The Design Brief

How important are the three building criteria?

You have now looked at the **Functionality**, **Build Quality** and **Impact** of the area you're looking at but do you think that these three criteria are all as important as each other?

Do you think that the criteria used to think about the building, i.e. the use of the building (functionality) is more important than how well it has been built (build quality) or how it looks and feels in its environment (impact)?

The blank chart at the bottom of this page is divided into 100%. Give 'marks out of 100' for the 3 criteria.

For example, If you think that the functionality of your building is more important than build quality and impact, your chart might look like this:-

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Functionality	Build Quality	Impact

Or maybe you think that functionality and impact could both be more important than build quality,

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Functionality	Build Quality	Impact

But then you might think that all three could be equally important,

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Functionality	Build Quality	Impact

Now think of your own priorities. Don't forget to mark up which cell equals:- Functionality, Build Quality and Impact.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Name	**Team**

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Continuation of DQI Questionnaire

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Design Quality Indicator 3
Mid Design

Construction Industry Council

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	Not Applicable
Impact includes a building's ability to delight, to intrigue, to create a sense of place, and uplift the local community and environment. Also the design's contribution to the arts and science of building and architecture.						
Question 1 **Visitors will like to come here** Consider how inviting you think the building will be for visitors.	O	O	O	O	O	O
Question 2 **The building will have character** Will the building have any features that makes it stand out in its surroundings, if that is desired?	O	O	O	O	O	O
Question 3 **The building will make you think** Consider here whether the building will be different than what you might normally expect. Are there any interesting things that appeal to you in some other way?	O	O	O	O	O	O
Question 4 **There is a clear vision behind the building** Will your vision show through to the final building?	O	O	O	O	O	O
Question 5 **The building's design and construction is likely to contribute to development of new knowledge** Are there any aspects of the building you believe to be 'cutting edge' design that will aid future development?	O	O	O	O	O	O
Question 6 **The building is well composed** Will the building look good?	O	O	O	O	O	O

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Continuation of DQI Questionnaire

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Design Quality Indicator 3
Mid Design

Construction Industry Council

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	Not Applicable
Question 14 **The people in the neighbourhood are likely to enjoy the building** Do you think that people will like the building?	○	○	○	○	○	○
Question 15 **The building is likely to contribute to the neighbourhood** Consider here whether or not you feel the building will improve the quality of the local environment.	○	○	○	○	○	○
Build Quality stems from how well the building is constructed: its structure, fabric, finishes and fittings, its engineering systems, the co-ordination of all these and how well they perform.						
Question 16 **The building should be easy to clean** Consider here whether or not you feel the building's design will account for ease of cleaning.	○	○	○	○	○	○
Question 17 **The building should withstand wear and tear in use** Think about the effect of everyday use will have on well used areas, especially including moving parts like doors, windows, locks and handles.	○	○	○	○	○	○
Question 18 **The building should be easily maintained** Will the building's design accounted for easy maintenance: minor repairs and redecoration?	○	○	○	○	○	○
Question 19 **The building should weather well** How well will the building's exterior cope with wind, rain and sun and pollution?	○	○	○	○	○	○

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Continuation of DQI Questionnaire

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Design Quality Indicator 3 Mid Design

How important are the three building criteria?

We have looked at this before in DQI 2. Have a look at this again and then compare it with your answers for DQI 2.

Just to remind you this is about looking at the 3 criteria; Functionality, Build Quality, Impact and if they should be considered as having equal or non equal value in the results from the questionnaire.

Now try to think of the priorities again. Don't worry if you think differently now or even if you still think the same.

Do you consider Functionality more important than Build Quality and Impact less important than both of them?

Or is Functionality less important than the other two?

Don't forget to mark up which cell equals:- Functionality, Build Quality and Impact.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

If you can't remember how to do this have a look at what you did for DQI 2.

So, now try to answer the following questions:

What are the differences in your results for this between DQI 2 and DQI 3 above?

If different, why do you think this is?

If the same, why do you think this is?

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Creative Spaces
A Competition for Schools

Design Quality Indicator 3
Mid Design

Construction Industry Council

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	Not Applicable
Question 20 **The building's structure will be efficient** Does the structural design of the building achieve the most with the least use of materials?	O	O	O	O	O	O
Question 21 **The building's finishes are likely to be durable** Are the internal surfaces of the building designed to last well?	O	O	O	O	O	O
Question 22 **The building should be easy to operate** Consider how easy it will be to operate the building in general: e.g. opening and locking of doors, moving furniture, taking deliveries of different things.	O	O	O	O	O	O
Question 23 **The building is likely to produce a low number of complaints/faults reported by users** Consider here if the building will function well for its users.	O	O	O	O	O	O
Question 24 **The building will be energy efficient** Consider here whether or not you feel the building's design has accounted for efficient use of energy.	O	O	O	O	O	O
Question 25 **The engineering systems are likely to work well** Will the building's services in general (Lighting, Heating, Plumbing, Lifts etc) serve their purpose well?	O	O	O	O	O	O
Question 26 **The engineering systems are likely to be easy to operate** Consider how easy it will be for both the users and those responsible for managing the building to run and adjust as necessary the building's water and heating.	O	O	O	O	O	O

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Continuation of DQI Questionnaire

Creative Spaces
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Design Quality Indicator 3
Mid Design

Construction Industry Council

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	Not Applicable
Question 27 **The engineering systems are likely to operate quietly** Have the noisy things like water pumps and boilers been dealt with in the design?	O	O	O	O	O	O
Question 28 **The materials are designed to be appropriate for the building's purpose** Will the materials used inside and outside likely to suit the intended use over its intended life?	O	O	O	O	O	O
Question 29 **Are the materials used inside and outside likely to suit the intended use over its intended life?** Have things like the order of construction, ease of construction, minimising material wastage and scaffolding been considered in the design?	O	O	O	O	O	O
Question 30 **The building is being designed so that it can be safely constructed** Construction can be dangerous. Have such dangers been minimised by the design?	O	O	O	O	O	O
Question 31 **The building is being designed for demolition and recyclability** Design can minimise the danger, difficulties and waste when taking down buildings.	O	O	O	O	O	O
Question 32 **The layout, structure and engineering systems are well integrated** Consider here how well you feel structure and the engineering systems will be built in to the layout of the building? Or do they feel "bolted on".	O	O	O	O	O	O
Question 33 **The building's fittings and finishes will be well integrated** Will the finishes and fittings look good in the layout and the structure?	O	O	O	O	O	O

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Creative Spaces
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Design Quality Indicator 3
Mid Design

Construction Industry Council

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	Not Applicable
Functionality is concerned with the arrangement, quantity and inter-relationship of spaces, and how the building is designed to be useful.						
Question 34 **The building will work well** Overall, will the building do what it is supposed to do?	O	O	O	O	O	O
Question 35 **The building will accommodate the users' needs** Think of all the potential users: visitors, pupils, staff, operators etc.	O	O	O	O	O	O
Question 36 **The building is likely to enhance the activity of people who use it regularly** Will the people who use the building feel good after visiting?						
Question 37 **The layout will allow for changes of use** Could the layout of the building change, if its purpose were to change?	O	O	O	O	O	O
Question 38 **The structure will allow for changes of use** The structural design will have a major impact on how easy it is to change the layout and sizes of spaces in the future - has it been thought through from this point of view?	O	O	O	O	O	O
Question 39 **There will be / is good access to public transport**	O	O	O	O	O	O
Is public transport within easy walking reach? How well is it connected to the rest of the country?						
Question 40 **The layout will be intelligible** Will the organisation of the parts of the building sensible and reasonably visible to the visitor?	O	O	O	O	O	O

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	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	Not Applicable
Question 41 **The signage will be clear** Will the signs be clear and easy to follow by all users?	O	O	O	O	O	O
Question 42 **The building will be the right size for its functions** Will the overall areas be the right size, are the areas of the main parts of the building the right size?	O	O	O	O	O	O
Question 43 **The building's layout and the relationships between rooms will work well** The way spaces are set out should match the needs of the user.	O	O	O	O	O	O
Question 44 **The circulation space will work well** The corridors and hallways must connect the rooms and main spaces in usable, suitable ways but in the best designs they often accommodate certain functions themselves - such as informal meeting, sitting and waiting.	O	O	O	O	O	O

Now let's look again at the importance of the Functionality, Build Quality and Impact building criteria.

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Continuation of DQI Questionnaire

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How important are the three building criteria?

We have looked at this before in DQI 2. Have a look at this again and then compare it with your answers for DQI 2.

Just to remind you this is about looking at the 3 criteria; Functionality, Build Quality, Impact and if they should be considered as having equal or non equal value in the results from the questionnaire.

Now try to think of the priorities again. Don't worry if you think differently now or even if you still think the same.

Do you consider Functionality more important than Build Quality and Impact less important than both of them?

Or is Functionality less important than the other two?

Don't forget to mark up which cell equals:- Functionality, Build Quality and Impact.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

If you can't remember how to do this have a look at what you did for DQI 2.

So, now try to answer the following questions:

What are the differences in your results for this between DQI 2 and DQI 3 above?

If different, why do you think this is?

If the same, why do you think this is?

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APPENDIX G

DESIGN QUALITY INDICATORS (TURKISH)

TASARIM KALİTE GÖSTERGESİ

Design Quality Indicators (DQI)

ETKİ

Bu bölüm binanın görünümünü, mekan anlayışını, yerel çevreye ve insanlara olan etkisini kapsar. Ayrıca tasarımın sanata, mimarlığa ve yapı bilimlerine katkısını sorgular.

Soru 1 Gelen ziyaretçiler binayı beğenecekler.

Binanın davetkar bir etkisi var mı?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 2 Binanın bir karakteri olacak.

Binayı bulunduğu çevre içinde öne çıkaran bir özellik var mı?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 3 Bina sizi düşündürüyor.

Bina tasarımı sırasında görev aldınız mı? Fikir bildirdiniz mi?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Continuation of DQI Questionnaire in Turkish.

Soru 4 Bina tasarımı ve inşası yeni teknolojik uygulamalara uygun. Tasarım sırasında inşaat sektöründeki teknolojik gelişmeler göz önünde bulunduruldu mu? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil
Soru 5 Bina, içinde yapılacak aktivitelerdeki teknolojik gelişmeye uyum sağlayabilir. Yeni ekipman, yeni aktiviteler ile birlikte bina değişmeye uygun mu? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil
Soru 6 Bina estetik bir değere sahip. Sizce bina güzel görünecek mi? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil
Soru 7 Bina bulunduğu çevrenin avantajlarına uygun tasarlandı. Binanın arazideki yerleşimini göz önünde bulundurarak, bina sizce arazinin avantajlarından yararlanıyor mu? (örn. Güneş ve rüzgarın etkileri) ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil
Soru 8 Bina formu ve malzemeleri iyi detaylandırılmış. Sizce binanın formu ve kullanılan malzemeler binanın amacına uygun olarak mı seçildi? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil

Continuation of DQI Questionnaire in Turkish.

Soru 9 Binada kullanılan/kullanılacak malzemeler binaya bir değer katacak.

Malzeme tercihleri sırasında, kullanıcıya sağlanan genel standardın arttırılması hedeflendi mi?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 10 Bina kullanımı rahat olacak.

Siz, binayı kullanan olarak, rahat edecek misiniz?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 11 Renk, doku, vb bina estetiğini arttıracak.

Sadelik ve az renk kullanımının da bina estetiğine katkısı olduğunu göz önünde bulundurun.

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 12 Bina çevresiyle uyumlu.

Bina tasarlanırken çevresiyle uyumuna dikkat edildiğini düşünüyor musunuz?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 13 Binanın yakın çevresi memnuniyet verici.

Arazi içinde, bina etrafını ve tasarımını göz önünde bulundurun.

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 14 Yerel çevre binadan memnun olacak.

Sizce bölgedeki insanların bina hakkındaki düşünceleri olumlu olacak mı?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 15 Bina estetik açıdan çevreye katkıda bulunuyor.

Binanın çevreye etkisi olumlu mu? Bulunduğu mahallenin görüntüsüne olumlu katkısı var mı?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

İNŞAAT KALİTESİ

Bu bölüm bina taşıyıcı sistemini, inşasını, tesisat ve bitirişlerini ve bunların etkilerini sorgular.

Soru 16 Binanın temizliği kolay olmalı.

Sizce bina tasarımında temizlik ve bakım göz önünde bulunduruldu mu?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 17 Bina, kullanım sırasındaki yıpranma ve zararlara karşı dayanıklı.

Günlük aktivitelerin bina üstündeki etkilerini göz önünde bulundurun. (mesela kapı, pencere kol ve kilitleri)

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Continuation of DQI Questionnaire in Turkish.

Soru 18 Bina hava şartlarına karşı dayanıklı.

Binanın dışı rüzgar, yağmur, güneş ve kirliliğin etkilerine karşı dayanıklı mı?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 19 Bina taşıyıcı sistemi tasarıma uygun.

Bina taşıyıcı sistemi az malzeme kullanımı ile en iyi hizmeti sunuyor mu?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 20 Bina bitirişleri/ince işleri dayanıklı.

Bina iç mekanlarında dayanıklı malzemeler kullanıldı mı?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 21 Bina kullanımı kolay olmalı.

Farklı kullanıcı kesimlerinin olduğunu göz önünde bulundurarak, bina kullanımını genel olarak kolay buluyor musunuz? (örn. Ziyaretçilerin ve ya görevlilerin yarattığı trafiği düşünün.)

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 22 Bina enerji verimliliğine uygun tasarlandı.

Sizce bina tasarımı enerji tasarrufunu sağlıyor mu? (örn. Gün ışığının kullanımını sağlayarak aydınlatma tasarrufunu yapılması)

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Continuation of DQI Questionnaire in Turkish.

Soru 23 Tesisat sistemleri yeterli hizmeti sunuyor/sunacak. Aydınlatma, ısıtma, su tesisatı gibi sistemler ihtiyaçlar için yeterli mi? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil
Soru 24 Tesisat sistemlerinin kullanımı kolay olacak. Sizce binadakilerin sistemleri işletmeleri ve ayarlamaları kolay olacak mı? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil
Soru 25 Tesisat sistemlerinin sesi binadakilere rahatsızlık vermeyecek. Tasarım ile su pompası gibi gürültü kaynakları izole ediliyor mu? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil
Soru 26 Malzeme seçimi bina kullanımına uygun. İç ve dış mekanlarda kullanılan malzemeler bina ömrünü arttırıyor mu? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil
Soru 27 Malzeme seçimi bina inşaatına uygun. İnşaat programı, kolaylığı, malzeme sarfiyatı tasarım sırasında düşünüldü mü? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil

Continuation of DQI Questionnaire in Turkish.

Soru 28 Bina inşa edilmeye uygun. İnşaat sistemleri pahalı ve tehlikeli olabilir. Sizce tasarım sırasında bunlar düşünüldü mü? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil
Soru 29 Bina yıkım/yenilenme göz önünde bulundurularak tasarlandı. Bina, yıkılırken oluşan tehlike, sorunlar vb. Azaltacak şekilde tasarlanabilir. Sizce tasarım sırasında bu ileriki aşamalar düşünüldü mü? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil
Soru 30 Bina taşıyıcı sistemi, tesisat sistemleri ve mekan düzenlemesi bir arada tasarlandı. Sizce bina bir bütün olarak mı tasarlandı, yoksa ekleme gibi mi duruyorlar? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil
Soru 31 Bina teçhizat ve ekipmanları tasarıma uygun seçildi. Binada kullanılan araçlar ve malzemeler bina kullanımına uygun mu? Tasarım sırasında alınan kararları malzeme seçimine etkisi oldu mu? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil

Continuation of DQI Questionnaire in Turkish.

İŞLEVSELLİK *Bu bölüm mekan ayarlamalarını, gereksinimlerini ve ilişklerini incelemek içindir. Binanın kullanıcıya sağladı imkanları sorgular.*					
Soru 32 Bina amacına uygun çalışıyor. Genel olarak bina istenen aktiviteye ev sahipliği yapabiliyor mu?					
☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil
Soru 33 Bina kullanıcıların ihtiyaçlarını karşılıyor. Tüm kullanıcı kesimlerini göz önünde bulundurun: Ziyaretçiler, görevliler, işletmeciler vb.					
☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil
Soru 34 Bina kullanıcıların günlük yaşamına bir değer katıyor. Günlük aktiviteleri destekleyici bir planı var mı? (örn. Aktivitelerin yarattığı bina içi trafiğini destekliyor/düzenliyor mu?)					
☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil
Soru 35 Bina planı kullanım değişikliğine olanak veriyor. Binanın kullanım amacı değişirse plan gerekli değişikliklerin yapılmasına olanak sağlar mı?					
☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Continuation of DQI Questionnaire in Turkish.

Soru 36 Bina planı düzenli.

Sizce bina içindeki aktivitelerin/işletmelerin ayırımı belli mi? Gelen ziyaretçiler tarafından açıkça anlaşılabilir mi?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 37 Bina taşıyıcı sistemi kullanım değişikliğine olanak veriyor.

Bina taşıyıcı sistemi ileride yapılabilecek plan değişikliğini ve mekan büyümelerini etkiler. Sizce tasarım bu bilgi göz önüne alınarak mı yapıldı?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 38 Binaya ulaşım kolay.

Sizce binaya geliş gidişin yaratacağı dış trafik düşünüldü mü? Binanın yakın çevresinde oluşabilecek yoğun trafik, arazi planını etkiledi mi?

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Soru 39 Bina içinde kullanılan uyarı işaretleri kolay görülür ve anlaşılır şekilde yerleştirildi/planlandı.

Acil durumları ve daha önce binada bulunmamış ziyaretçileri de göz önünde bulundurun.

☐	☐	☐	☐	☐	☐
Tamamen Katılıyorum	Katılıyorum	Katılmıyorum	Hiç Katılmıyorum	Bilgim Yok	İlgili Değil

Continuation of DQI Questionnaire in Turkish.

Soru 40 Bina, amacı için gereken mekanları ve metrekareyi sağlıyor. Bina içindeki aktiviteler için gerekli mekan sağlanabildi mi? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil
Soru 41 Bina planı ve mekanlar arasındaki ilişki bina amacına uygun. Mekan yerleşimi kullanıcı ihtiyaçlarına uygun mu? ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil
Soru 42 Bina içi dolaşım alanı yeterli. Koridorlar ve holler bekleyen, konuşan insan yoğunluğu ile bina içindeki trafiği kaldırabilecek kapasitede olmalıdır. ☐ Tamamen Katılıyorum ☐ Katılıyorum ☐ Katılmıyorum ☐ Hiç Katılmıyorum ☐ Bilgim Yok ☐ İlgili Değil

Continuation of DQI Questionnaire in Turkish.

ÜÇ BİNA KRİTERİNİN DEĞERLENDİRMESİ

Anketi cevaplandırırken görmüş olduğunuz gibi sorular üç başlık altında toplanmıştır. Bunlar **ETKİ, İNŞAAT KALİTESİ ve İŞLEVSELLİK**tir. Bu üç kriterin eşit olarak değerlendirileceği durumlar olduğu gibi, projeye bağlı olarak öne çıkan bir kriter de olabilir.

Sizce bu projede bu üç kriter eşit olarak mı değerlendirilmeli? Tasarım veya inşaat sırasında öne çıktığını düşündüğünüz bir kriter var mı?
Örneğin, eğer üç kriterin de öneminin eşit olduğunu düşünüyorsanız:

ETKİ	50
İNŞAAT KALİTESİ	50
İŞLEVSELLİK	50
TOPLAM	**150**

Sırasıyla işlevselliğin ve etkinin daha önemli olduğunu düşünüyorsanız:

ETKİ	50
İNŞAAT KALİTESİ	30
İŞLEVSELLİK	70
TOPLAM	**150**

Aşağıdaki tabloyu kendi önceliklerinizi düşünerek doldurunuz. Değerlendirmeyi daha kolay yapabilmek için **toplamda 150** üzerinden notlandırmaya özen gösterin.

ETKİ	
İNŞAAT KALİTESİ	
İŞLEVSELLİK	
TOPLAM	**150**

Zaman ayırdığınız için teşekkür ederim.

APPENDIX H

DQI RESPONSES

Table H.1 DQI responses of key project participants who had influence on design of the building. Scores involves:

0 – Not Applicable	1 – Don't Know	2 – Strongly Disagree
3 – Disagree	4 – Agree	5 – Strongly Agree

DQI Questions	Architect (June 2005)	Project Manager (June 2005)	Mechanical Engineer (June 2005)	Architect (July 2005)	Project Manager (July 2005)
Question 1	3	3	4	3	4
Question 2	3	4	0	3	4
Question 3	5	4	4	5	4
Question 4	4	5	4	4	5
Question 5	4	4	5	4	4
Question 6	4	3	4	4	4
Question 7	3	3	4	4	5
Question 8	2	4	4	5	4
Question 9	3	5	5	5	5
Question 10	4	3	4	4	5
Question 11	4	3	0	4	5
Question 12	3	4	0	4	4
Question 13	4	3	0	5	5
Question 14	3	4	0	3	4
Question 15	3	3	0	4	3
Question 16	5	5	4	5	5
Question 17	3	4	4	5	4
Question 18	3	4	3	5	4
Question 19	4	5	0	5	5
Question 20	3	4	4	4	5
Question 21	5	5	4	5	5
Question 22	4	4	5	5	4
Question 23	4	5	5	5	5
Question 24	4	5	5	4	5
Question 25	5	3	5	5	4
Question 26	3	4	3	4	4

Question 27	4	5	4	4	5
Question 28	5	5	4	5	5
Question 29	4	2	0	4	2
Question 30	5	4	5	5	5
Question 31	3	4	5	4	5
Question 32	5	4	4	5	5
Question 33	4	5	5	4	5
Question 34	5	4	4	5	4
Question 35	3	2	0	3	2
Question 36	4	4	5	5	5
Question 37	2	2	0	2	2
Question 38	4	4	0	4	4
Question 39	5	5	5	5	5
Question 40	3	5	4	5	5
Question 41	5	4	4	5	4
Question 42	5	5	5	5	5

Table H.2 Weighting the sections of DQI checklist by key project participants who had influence on design of the building.

DQI Sections	Architect (June 2005)	Project Manager (June 2005)	Mechanical Engineer (June 2005)	Architect (July 2005)	Project Manager (July 2005)
Functionality	50	30	60	50	30
Impact	50	60	30	50	60
Build Quality	50	60	60	50	60
TOTAL	150	150	150	150	150