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건축프로젝트에 있어서 프로세스 질 관리의 개선에 관한연구

An Improvement Scheme of Process Quality in The Korean Building Projects

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요 약

본 연구의 목적은 한국건축프로젝트의 경영적 특성을 파악하는데 있다. 본문은 건축프로젝트의 주요 세 요소인 디자인, 건설, 유지관리의 프로세스 질 관리에 영향을 미치는 요소들을 조사한다. 설문조사는 건축관련 대학원생 및 교수, 설계자, 시공자들의 건축프로젝트에 있어서 프로세스 질 관리에 대한 상이한 시각을 보여주고 있다. 이러한 요소들을 분석함으로써 현재 국내의 질 관리 시스템과 프로그램 내용을 교정하고 개선하는데 도움이 될 것이다. 프로세스 질 관리에 있어서 여러 요소 중 설계자와의 협조가 가장 주요 요소로써 부각되었다.

Abstract

The object of this study is to examine the managerial characteristics of the Korean building projects. The study in this paperproposes to investigate the factors that affect process quality not only in the construction phase but also in all three phases (design, construction, and operation) of the whole life cycle of a building project. A questionnaire survey is conducted to investigate the differences in the perceptions of graduate students, professors, designers and practitioners with regard to process quality in building projects. Analyzing these factors helps in revising and improving the Korean existing quality control system and programs. The findings indicate that cooperation of designer's professionals, level of management leadership in promoting quality, ability to operate the facility within design limits are important factors. Theparticipation percentage of "quality"treated in any course/seminar shows only 45%. It is recommended that college programs include courses that treat the administrative aspects involved in the building project and that continuing education programs cover quality training.

키워드: 건설경영특징, 빌딩프로젝트, 질관리
Keywords: Managerial Characteristics, Building Projects, Process Quality, Whole Life Cycle

1. INTRODUCYION

1.1 General

The construction industry is developing at a rapid pace. Quality is considered one of the key transformation elements of project management techniques. And value effects on construction industry are higher than the other industries on aspect of products, hiring and added value. Recently, in construction industry, obvious changes on construction environment are showing as aspects of construction demands, systems of construction markets, and conditions of competition. Today's construction industry crisis is originally because of the lack of management: For some organization, certification has become an end itself, rather than a means of implementing on-going quality system, which seeks the objective of sustainable and continuous improvement. This study will provide

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a basis for discussion of possible directions for he quality control problems in the Korean building projects.

2. METHOLOGY OF STUDY

2.1 Aims and Objectives

According to Juran (1988), quality can be defined in terms of (1) conformance to the agreed requirements of the customer and (2) a product or service free deficiencies. In terms of function, a high quality building project can be described by such terms as ease in understanding drawings, level of agreement in drawings and specifications, economics of construction, ease of operation, ease of maintenance, and energy efficiency. A case study conducted by Chrest (1993) shows that quality-improvement team, education, continuous improvement, communications, company performance feedback from clients and employees, and statistical process control are very important factors that affect quality.

2.1.1 The Major factors in Design Phase

The quality control in design means the well-balanced design standard that combines the quality demand of the client and the construction ability of the contactor. Especially, the construction budget for the competitive bidding and negotiation is determined by drawing. Drawing represents not only the quality and the shape of work performed by the contractor.

1) Project specification : Specifications are documents that provide technical information on materials, performance, and quality requirements (Ferguson and Clayton 1988). Inadequate translation means loss of valuable owner information. In case change, the specifications should be updated thoroughly and promptly for all parties.

2) Selection of designer : Each project is unique and therefore, the selection of an appropriate design firm for a project may contribute to the quality.

3) Communication with owner The main purpose of communication with owner is not for the owner to only define the project requirements but also to transmit those requirements effectively to the other parties involved in the process.

4) Construct ability Construct ability is one of the major factors that affect the quality of design. Like codes, construction techniques vary in different geographical areas. In addition, design professionals must clearly and adequately communicate the design intent to the constructor.

2.1.2 The Major factors in Construction phase

The quality control of construction means the reflection of quality in the process of construction. Owners and the representatives, designers and supervisors inspect the suitability of construction about the design and extra contract conditions. The quality of construction is quite affected by the ability of the engineers.

1) Supervision by contractor : Supervision by contractor is important especially if work is subcontracted to a variety of subcontractors. According to Shtub (1995), a distributed database for project control may improve the quality of supervision.

2) Selection of contractor The contractor's expertise, technical staff, financial situation, equipment ownership, workload, and reputation may directly affect the quality of the project.

3) Drawings and specification Drawing and specifications are the two sets of documents given to the constructor that provide technical information on materials, performance of the constructed facility, and quality requirement.

2.1.3 The Major factors in Operation Phase

Traditionally, the operation phase has been treated separately from the design and construction phase. The building industry should adapt process-oriented approaches for total quality control.

1) Maintenance manual : The maintenance manual contains information about building specifications and periodic maintenance schedules. In the long run appropriate maintenance can save money because of less rehabilitation needs.

2) Operation budget Operation budget originates from building programs. Low operation budgets will no doubt be very desirable for owners but low operation budgets can be achieved partly through higher investments for more efficient buildings.

3.2 Questionnaire Survey

3.2.1 Questionnaire Survey

The survey is designed to analyze the factors thataffect quality in the design, construction, and operation phases. A 1-5 scale of importance is used in the questionnaires. The issues investigates are listed in Table3.1, respectively, for the design, the construction, and the operation phases. The factors are organized in three different questionnaires that are administered to the following four different parties.

Design firms, Construction companies, Property management and Professors and students will receive all three questionnaires. (Design phase, construction phase, and operation phase)

The arbitrary Korean 100 construction firms, design firms, property management firms, and professors and students were selected to be survey groups. The surveys were sent out to these 400 companies and persons with letters and e-mail. After one month, another interview by the phone and face-to-face interview was made to companies and persons that had not responded.

〈Table 1〉 Investigation Factors

PHASES	FACTORS
Design	Cooperation of parties, Project specifications, Teamwork in design firm, Management leadership, Selection of design firm, Management commitment, Communication with owner, Construct ability, Design budget, Feedback system, Drafting practices, Codes and standards, Designer's training, Office practices, Personalities, Designer's education, Statistical methods.
Construction	Management leadership, Supervision by contractor, Cooperation of parties, Management commitment, Selection of contractor, Teamwork in construction firm, Drawing and spec, Employee training, construction budget, Management techniques, Shop drawings, Personalities, Technologies used, Feedback system, Supervision by owner, Supplier involvement, Contract forms, Statistical methods
Maintenance	Personnel training, Management leadership, Management commitment, Maintenance manual, Operation budget, Operation within design limits, Automation of building services, Personalities.

4. FINDINGS AND ANALYSIS

4.1 The General Factors

The general factors that affect quality, namely, management commitment and leadership, training, teamwork, statistical methods, and suppliers/ customer involvement as well as building industry-specific factors were investigated. Out of the 400 questionnaires mailed to the four parties (Design office, Construction company,University, Maintenance company) 178 were returned (44.5%). The number of responses and corresponding rates of return for each group of respondents are presented in <Table 2>.

〈Table 2〉 Rate of return

Party(1)	Number of Questionnaires	Number of response Received	Rates of return (%)
Design firms	100	71	71
Construction firms	100	35	35
Maintenance firms	100	13	13
Universities	100	59	59
TOTAL	400	178	44.5

Table 3, 4 and 5 show the comparisons of major factors' rank between each party (Design firm and University, Design firm and Construction company, Construction company and University).

〈Table 3〉 Comparisons between Design Firms and Universities

Rank	Design Firms	Universities
1	Team work in design firms	Team work in design firms
2	Cooperation of parties (design)	Commitment (construction)
3	Management leadership (design)	Management leadership (design)
4	Commitment (construction)	Technologies used
5	Leadership (construction)	Management leadership (construction)
6	Technologies used	Selection of appropriate contractor
7	Operation within design limits	Construction budget
8	Teamwork in construction firm	Construct ability
9	Selection of appropriate contractor	Cooperation of parties
10	Commitment (maintenance)	Briefing of owner

〈Table 4〉 Comparisons between Design Firms and Construction Companies

Rank	Design Firms	Construction Firms
1	Teamwork in design firms	Team work in design firms
2	Cooperation of parties (design)	Construct ability
3	Management leadership (design)	Cooperation of parties (design)
4	Commitment (construction)	Operation within design limits
5	Leadership	Management leadership
6	Technologies used	Selection of appropriate contractor
7	Operation within design limits	Existence of a operation manual
8	Teamwork (construction firm)	Construction budget
9	Selection of appropriate contractor	Teamwork in construction firm
10	Commitment (maintenance)	Level of the contractor's personnel

〈Table 5〉 Comparisons between Construction Firms and Universities

Rank	Construction Firms	Universities
1	Team work in design firms	Team work in design firms
2	Construct ability	Commitment (construction)
3	Cooperation of parties (design)	Management leadership (design)
4	Operation within design limits	Technologies used
5	Management leadership (design)	Management leadership (construction)
6	Selection of appropriate contractor	Selection of appropriate contractor
7	Existence of a operation manual	Construction budget
8	Construction budget	Construct ability
9	Teamwork (construction firm)	Cooperation of parties
10	Level of the contractor's personnel	Briefing of owner

Table 6 shows rank of factors in design phase with mean and standard deviation

〈Table 6〉 Rank of Factors that Affect Quality in Design Phase

Rank (1)	Factors (2)	Mean (3)	Standard deviation(4)
1	Cooperation of parties	4.53	0.48
2	Management leadership	4.34	0.75
3	Teamwork in design firms	4.33	0.47
4	Construct ability	4.09	2.84
5	Design budget	4.04	0.61
6	Communication with owner	4.01	0.96
7	Designer's training	4.00	3.83

8	Selection of design firm	3.96	0.56
9	Drafting practices	3.90	0.79
10	Project specifications	3.86	0.71
11	Feedback system	3.75	0.75
12	Codes and standards	3.75	0.91
13	Office practices	3.75	0.45
14	Personalities	3.54	0.71
15	Statistical method	3.52	1.61
16	Designer's education	3.05	1.27

Scoring system scale of 1-5: 1 not important, 5 very important (Average career: 6.72 year Mean: 3.94)

Table 7 shows rank of factors in construction phase with mean and standard deviation

〈Table 7〉 Rank of Factors that Affect Quality in Construction Phase

Rank (1)	Factors (2)	Mean (3)	Standard deviation(4)
1	Management commitment	4.27	1.91
2	Management leadership	4.19	1.01
3	Technologies used	4.16	1.04
4	Construction budget	4.16	3.6
5	Teamwork	4.08	0.87
6	Selection of Contractor	4.08	0.9
7	Cooperation of parties	4.06	2.35
8	Supervision by contractor	3.92	0.55
9	Drawings and specs	3.89	0.39
10	Supplier involvement	3.87	0.94
11	Personalities	3.86	0.22
12	Contract forms	3.85	0.89
13	Management techniques	3.85	0.32
14	Employee training	3.83	1.52
15	Shop drawings	3.81	1.62
16	Feedback system	3.81	0.92
17	Statistical methods	3.47	1.95
18	Supervisor by owner	3.29	2.38

Scoring system scale of 1-5: 1 not important, 5 very important (Average career: 10.03 year Mean: 3.83)

Table 8 shows rank of factors in maintenance phase with mean and standard deviation)

Scoring system scale of 1-5: 1 not important, 5 very important (Average career: 11.93 years Mean: 3.97)

〈Table 8〉 Rank of Factors that Affect Quality in Maintenance Phase

Rank (1)	Factors (2)	Mean (3)	Standard deviation (4)
1	Operation within design limits	4.10 4.05	0.93 0.99
2	Management commitment	4.02	0.79
3	Management leadership	3.94	0.49
4	Personalities	3.94	0.41
5	Personnel training	3.90	0.42
6	Operation budget	3.90	1.48
7	Maintenance manual	3.55	1.85
8	Automation of building services		

Table 9 shows top ten factors in all phases.

〈Table 9〉 shows top ten factors in all phases.

Rank (1)	Factors (2)	Mean (3)	Phase (4)
1	Cooperation of parties	4.53	Design
2	Management Leadership	4.34	Design
3	Teamwork in design firms	4.33	Design
4	Management commitment	4.27	Construction
5	Management leadership	4.19	Construction
6	Technologies used	4.16	Construction
7	Construction budget	4.16	Construction
8	Operation design limits	4.10	Maintenance
9	Construct ability	4.09	Design
10	Teamwork in construction firm	4.08	Construction

Scoring system scale of 1-5 : 1 not important, 5 very important

5. CONCLUSIONS

1) To identify the reasons for the effectiveness of the attributes of quality management

Perceptions of professionals in the construction

industry were investigated. Cooperation of parties, Management commitment and leadership, teamwork, technologies used, budget, construct ability are the generally accepted factors that are effective in achieving high process quality. There are also similar agreements between all parties. For example, each party ranked the use of statistical methods at the very bottom of the importance list. It is very clear that management leadership in promoting process quality issues in all three phases of the building project is the top priority.

2) To identify the major factors that affect process quality in building process

Management participation on promoting quality issues (ranked 7th in design phase, 1st in construction phase, and 2nd in operation phase) is very important in every phase of the building process.

At the corporate level, efficient teamwork to improve quality (ranked 3rd in design phase, 5th in construction phase) appears to be of importance.

Statistical methods (ranked 15th in design phase, 17th in construction phase) are essential problem-solving tools and play an important role in improving quality in manufacturing industries. Because of the unique nature of a building project, professionals participating in this study do not support the use of statistical methods in the building process.

3) To rank factors by degree of importance in each phase.

The quality-specific factors that are perceived by the respondents to enhance significantly the quality of the building design process include the cooperation parties; management leadership; teamwork in design firms; design budget; and an emphasis on combination engineering and construction knowledge this way allowing construct ability input in the design effort.

The quality-specific factors that are perceived by the respondents to enhance significantly the quality of the building construction process include management commitment; management leadership; technologies used; construction budget; and teamwork in construction firm.

The quality-specific factors that are perceived by the respondents to enhance significantly the quality of the building operation and maintenance process include operation within design limits; management commitment; management leadership; and personnel training for operating the building.

4) To recommend generic guideline for achieving improved quality management in the building project

The objective of this research is to be explored and identify the differences between the perceptions of each group from entry-level graduate student to long-time practitioners with regard to process quality in the building construction project. Differences in the perceptions of experienced practitioners and novice professionals in relation to process quality in the building project are also to be expected given the differences in their background, expectations, and experience. It also helps with developing continuing education programs and short courses that highlight process quality for the experienced professionals.

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