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Client satisfaction as perceived by Architects and Civil Engineers

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ABSTRACT

A construction project fulfills both the product design and the service provision functions. There are many stakeholders in these processes. Concurrence among the stakeholders surely affects the success of the project. The most important of the stakeholders is customer/client followed by architects and civil engineers. Both architects and civil engineers are involved in the design phase as well as in the execution phase. Customer/client satisfaction is usually considered one of the success criteria of the project. This criterion, however, is a subjective concept, about which tangible values cannot be easily placed, and is determined by perception at best. Whether this perception vary between civil engineers and architects depending on different criteria, is examined in this study. The results of the questionnaires were evaluated statistically. The agreed upon and the most important issues are working together and sharing information. The behavior of client/customer and qualification of employees are the factors that civil engineers and architects do not have the same views on client satisfaction.

1. INTRODUCTION

Different groups are involved in different processes of a construction project. The fulfillment in each of these processes by these groups plays a part in the success of the project. A comparison between the two groups, who are the most likely to be involved in management of the project may yield useful information. One of these two groups is the architects while the other group is the civil engineers. It is certainly important that these groups fulfill their professions, but it is also desirable to study their affects on project output since these groups can be in managerial positions. A project manager has many responsibilities starting from the planning of the project to its completion. In general, it can be said that architects are involved in a construction project since the project emerges as a concept. The architects' participation in the project can also be as the customer representative in the design and construction stages (Burr and Jones 2010; Berman 2002). In the course of mobilization and implementation, civil engineers undertake more functions compared to architects, including project management (Haltenhoff 1986). It has been shown that the contribution of the project manager is great for the successful completion of a project (Prabhakar 2008). On the other hand, the project manager's perception of success may also differ in the subsequent processes of construction and delivery (Shenhar et al. 1997).

The success of a construction project depends on many criteria. Success can also be expressed or defined using many different criteria. It is natural that every stakeholder involved in the project wants to measure success differently (Khan and Spang 2013). One study has reviewed the literature about the project's success (Ika 2009). According to this study, we are not yet aware of the relationship between customer satisfaction and criteria used by project management. As researchers said that the project management should be subjectively evaluated by all groups involved and at the same time the contribution of all stakeholders should be considered. In another study, concurrent engineering practice in construction projects was evaluated considering stakeholders' involvement. In this context, it was emphasized that the contribution of customer requirements to collaborative team work was important (Kamara et al. 2000). Accordingly, information sharing among stakeholders could be realized, for example, using the virtual reality environment. In one such study, a virtual reality system which could provide information sharing between the office and the construction site has been investigated (Capra 2010). In one other study, a model was developed to at least estimate the results of a

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planning process that would support designers to work together and collaborate (Bletzinger and Lähr 2006).

Collaboration among different groups, including customers, might be expected to increase the level of project performance and satisfaction (Baiden et al. 2006). First, however, it was necessary to know the groups or stakeholders affected by customer satisfaction (Brockmann 2002). It has been argued for that the co-ordination among the groups could be further increased by the clear identification of stakeholders (Aapaoja and Haapasalo 2014). In another study, project performance was assessed based on a comparison of competitive and collaborative working environments (Ruan et al. 2012). In many studies, customer satisfaction has been taken into consideration (Kärnä et al. 2004; Maloney 2002; Capra 2010; Kärnä 2004; Soetanto et al. 2001), meanwhile in some other studies the contractor satisfaction with customer performance has been investigated (Soetanto and Proverbs 2002).

As a measure of success, completion of work within the budget or within the scheduled time period can be considered. Another measure is that the manufactured product meets the needs of the user in the long run. In one study, the contribution of the groups in the project to the realization of the long-term business goals was examined (Rowland 2006). It has been explained that groups and especially project managers should be aware that this contribution was not limited to only time, budget and quality, but also that they had to make as much as possible to realize all business objectives. While the use of the duration or budget limit provides a tangible measure, the satisfaction of the user or the business owner is more abstract concept (Soetanto and Proverbs 2002). Sometimes a project is over-budget and it is completed too late but it may still be considered successful by certain groups. In addition, some other factors such as work safety, legal aspects, effects on environment and productivity can be evaluated for success as well as budget and duration (Chovichien and Nguyen 2013). As pointed out by another study, stakeholder perceptions of success could vary (Chan 2001). Accordingly, the main concerns for architects are aesthetics and functionality rather than costs.

While efforts on customer satisfaction are done in other sectors, the performance evaluation in construction projects is traditionally limited to time, budget, and quality. Nonetheless, the customer satisfaction in construction projects was examined in some research (Kärnä 2009). The client's perception of project success can vary depending on different factors, including the client him/herself, the project, and the stakeholders of the project (Chan 2001). It is also necessary that the project is fully understood by the client (Soetanto et al. 2001). In short, the answer to the question of what success is or how to measure it can be very elusive.

2. PURPOSE OF THE STUDY

Everyone involved in construction of a building want the project be considered successful. Different groups or stakeholders, however, have also their own agendas and measure the outcome or success of the project differently. Client satisfaction during and at the end of a project may be seen as one of the important criteria. Work environment, relationships between different groups, needs, and views affect the success of a project. Because of the difference in perception of different groups, this study focuses especially on client satisfaction as a perception of success instead of how to measure success. In this study, it is desired to examine whether there is a change in the opinions of architects and civil engineers regarding customer/client satisfaction. In particular, the relationship between success perceptions and stakeholder relationships is emphasized. The opinions of the mentioned groups toward work environment are also examined.

3. METHODOLOGY

The data examined in this study were derived from the data of a larger study (Coskun et al. 2016; Genç et al. 2017). The questionnaire were held out to civil engineers and architects asking their perceptions about working conditions and project outcomes. In the survey, civil engineers and architects were asked the similar questions. The cooperative working of stakeholders in a project and the project outputs among which is client/customer satisfaction that could be obtained as a result of this collaborative environment were asked in the survey. The cross-data analyzes were made between the answers they gave about working relations among stakeholders and the customer satisfaction. Thus, the relations between the opinions of the specified groups were tried to be determined.

There were 176 civil engineers and 103 architects responding to the survey. The questions posed in the questionnaire are the likelihood (1: strongly probable, 2: probable, 3: undecided, 4: not likely, 5: very unlikely) of client/customer satisfaction as one of the consequences of the difficulties in collaboration of stakeholders starting from the design stage to the project execution process. People are asked to rank (1: not important, 2: partly important, 3: important, 4: quite important, 5: very important) the different types of difficulties encountered during the implementation of such a cooperative environment from the design phase until completion. The questions require people to express their subjective opinions. There are eight questions about the stakeholders. The factors examined are:

- Fac1: Insufficient use of computer technology in design, manufacturing, and sharing all kinds of information
- Fac2: The lack of participation of the customer to the design process
- Fac3: Lack of participation of professional groups, which will be involved in implementation, to the design team as a result of separation of design and manufacturing phases in projects
- Fac4: Non-developed culture of information sharing and ideas between stakeholders (such as in concurrent engineering)
- Fac5: Attitudes and behavior of owner (such as, changes in production line and specification, and failure in doing timely payments)

•Fac6: Inadequacies of employees (skills, knowledge, personality, honesty, performance, and so on.)

• Fac7: Mistrust, fear and the habit of not saying about the mistakes among the people who worked in the project during both the design and the construction phases

• Fac8: The cultural problems among the professional groups of the project

In the expected project outputs part of the questionnaire, the ratings of customer satisfaction are included. The expected client satisfaction can be the result of the conditions of working environment. Participants are asked that with the favorable or collaborative working conditions how much client/customer satisfaction can be expected.

4. ANALYSIS AND RESULTS

4.1. The Relation between Factor Levels and Perceived Client Satisfaction Levels: Chi-Square Tests

The values given in the tables are found by considering the responses given by one person to both factors (cross-examination). The top rows of the tables show the ratings given for customer satisfaction; they are given as (1: strongly probable, 2: probable, 3: undecided, 4: not likely, 5: very unlikely). In the left side columns of the tables, there are rating values for the examined factor; they are given as (1: not important, 2: partly important, 3: important, 4: quite important, 5: very important). Row and column totals are given in the right column and the bottom row, respectively.

The expected customer satisfaction was compared with each of the eight factors for each level in the cross-examination. Chi-square statistic was used in the analysis. Evaluated null and alternative hypotheses are;

$H_o: p_{ij} = p_{i.} \cdot p_{.j}$

$H_1: p_{ij} \neq p_{i.} \cdot p_{.j}$

where pi. is row probability, p.j is column probability, and pij is the probability value for the cell i and j. This hypothesis is referred to as the "r x c" contingency table (Steel et al. 1997).

In addition to p-values, the level of independence between columns and rows can be specified by the phi-coefficient (Steel et al. 1997). Phi-coefficient is given as equation (1).

$$\Phi = \sqrt{\frac{X^2}{n}} \quad (1)$$

The phi-coefficient can have values between 0 and 1, and values close to 1 indicate strong affinity. The calculated phi-coefficients shown in Table 1 also indicate that the dependencies between columns and rows are not strong.

Table 1. Summary of chi-square tests for in-between groups

	Civil Engineers			Architects	
Items	P Value	Phi Coefficient	Factor	P Value	Phi Coefficient
Fac5	0,943	0,216	Fac6	0,946	0,280
Fac1	0,897	0,231	Fac1	0,819	0,324
Fac7	0,782	0,255	Fac7	0,651	0,359
Fac8	0,727	0,264	Fac8	0,536	0,380
Fac2	0,725	0,264	Fac2	0,524	0,382
Fac3	0,496	0,296	Fac3	0,242	0,436
Fac4	0,482	0,298	Fac5	0,216	0,442
Fac6	0,409	0,308	Fac4	0,204	0,445

Row or column totals and ratios in the tables can be used to calculate the ratio or probability of a cell in the table. In this case, the probabilities in table cells can be calculated as pij = pi. p.j.. The cell probabilities can be calculated in this way since the p-values are not closer to zero than one and the null hypothesis is accepted.

According to Table 1, the dependency (or independence) status between some factors and customer satisfaction among groups is different in some factors while that dependency status is in the same order in some other factors. The greatest difference between the two groups is related to the Fac5 and Fac6 factors. For the civil engineer, the independence situation is more pronounced in Fac5 (inadequacies of employees, such as skills, knowledge, personality, honesty, performance, and so on.) but it is the opposite for architects.

For civil engineers; if Fac5 and the response rates for customer satisfaction are assumed to be as in the table, the table cells can be filled in such a way that they are multiplied. But if the response rates for Fac6 and customer satisfaction are assumed to be as in the table, the table cells cannot be filled in such a way that they will multiply meaning that there is an interaction between these two ratios. The table therefore can only be filled out by thinking that there may be other interactions in the background.

4.2 Difference between Opinions of Civil Engineers and Architects: Comparison of Group Means (Student's t Tests)

While it is shown that there is no relationship between factors and customer satisfaction, there may be a background relationship between the rates for factor levels and the levels of customer satisfaction. Subsequently, it is also tried to determine whether there is a difference in the importance given to the factors that affect customer satisfaction between civil engineers and architects. Using all the data, the arithmetic means of the responses to the ratings given for each customer satisfaction (1: strongly probable, 2: probable, 3: undecided, 4: not likely, 5: very probable) are compared. The hypothesis that the mean of the factors is equal to

one another (student's t-test) (Ho:μ1=μ2) is tested assuming different variances (σ1 ≠ σ2) of two-populations.

When the data were examined, it appeared that there was a difference between the average scores of the two groups at each level. With a few minor differences in mind, these findings could be summarized in the following way as in Table 2.

Table 2. Summary of tests of equality of means tests (t-tests) at each satisfaction level

	1	2	3	4	5
Fac1	same	not same	same	not same	same
Fac2	almost	same	not same	same	same
Fac3	not same	not same	not same	not same	not same
Fac4	not same	not same	not same	not same	not same
Fac5	almost	not same	not same	not same	not same
Fac6	not same	almost	not same	not same	not same
Fac7	same	same	same	same	almost
Fac8	same	same	same	same	same

It can be seen that some factors (Fac1: insufficient use of computer technology in design, manufacturing, and sharing all kinds of information; Fac2: the lack of participation of the customer to the design process; Fac7:mistrust, fear and the habit of not saying about the mistakes among the people who worked in the project during both the design and construction phases; and Fac8:the cultural problems among the professional groups of the project) similarly influence customer satisfaction in varying proportions among both architects and civil engineers.

According to findings, both groups agree that working together of stakeholders and that sharing information during this collaboration is important and also that the problems between groups also affect customer satisfaction.

Since some of the factors (Fac1, Fac2, Fac7, and Fac8) have the same implication by both groups, more attention should be paid to these factors. Paying more attention to these factors may not be challenging at all because it means that both groups think the same. However, when we look at the other factors (Fac3, Fac4, Fac5, and Fac6), there are disagreements. Perhaps the differences develop from the work areas of architects and civil engineers; such as architects have generally closer ties to the client/customer, but civil engineers are more occupied on site and closer to other occupational groups; architects attach more importance to design but civil engineers gives greater consideration to construction. Because of these kinds of differences, the views on working together may be also different.

The influences of some factors (Fac3:lack of participation of professional groups, which will be involved in implementation, to the design team as a result of separation of design and manufacturing phases in projects; Fac4:non-developed culture of information sharing and ideas between stakeholders in concurrent engineering; Fac5:attitudes and behavior of owner, such as, changes in production line and specification, and failure in doing timely payments; and Fac6:inadequacies of employees (skills, knowledge, personality, honesty, performance, and so on.) on customer satisfaction at varying rates can be seen in both the architects' and the civil engineers' opinions.

3. CONCLUSION

According to the results of the contingency tables, it is not possible to determine or estimate customer satisfaction based on the importance ratings given to the factors.

Although not predictable, the opinions of architects and civil engineers differ at least for two factors. For civil engineers, Fac5 based prediction can be made, whereas no prediction based on Fac6 is possible. The opposite is true for architects.

The ratings for some factors ("Fac3", "Fac4", "Fac5", and "Fac6") and client satisfaction ratings were found to be different between civil engineer and architect groups by hypothesis tests of equality of means.

For some factors ("Fac1", " Fac2"," Fac7"," Fac8"), it was seen that the differences were not great (hypothesis tests of equality of means). These two stakeholder groups (architects and civil engineers) have a consensus on these factors, indicating that customer satisfaction may be more likely to be achieved if these factors are focused on. In this case, the more efficient use of computer technology at each step of the construction process may help to increase the client satisfaction. Participation of the client in the design process can also be an effective way to increase client satisfaction. If the disagreement over factor "Fac3" is taken into consideration, the involvement of the client in the design process seems to be more important factor than the other stakeholders' involvement. It can be said that factor "Fac7" is a subgroup of factor " Fac8", in which case it may be appropriate to create a more shared and open working environment, where communication channels work more effectively, among all stakeholders.

The results can also be interpreted as follows: an architect or a civil engineer can be chosen as project manager. If there are differences of approach among these groups and if these differences are recognized or known more precisely then the manager selection can be done more appropriately. If the project specific features (such as work environment, project team, information systems) can be known beforehand, then an architect or a civil engineer can be selected to work with as a project manager to assure a better client satisfaction.

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