

CUSTOMER CRITERIA ANALYSIS FOR EDUCATIONAL ORGANIZATION DESIGN

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ABSTRACT

Development of the educational institution requires early anticipation by restructuring the organization to establish a better work system. The changes of customer needs in organization requires investigation of customer criteria along with the development of organization. This research presents the customer criteria analysis as one of Axiomatic Design process for educational organization design. This paper will only discuss the Customer Attributes analysis of educational organization. Survey was conducted by deploying questionnaires to employees and students in Industrial Engineering Department, Universitas Islam Indonesia, Yogyakarta. The criteria are grouped using Factor Analysis. There are 4 Customer Attributes based on the result, which are conducive working environment, work satisfaction in organization, an organizational that professional in providing service for students and improvement of teaching – learning method.

Keywords: Educational Organization, Customer Criteria, Axiomatic Design

1. INTRODUCTION

The development in educational institution, especially university, requires early anticipation by restructuring the organization to establish a better work system. Poor design and management of work system may lead to dissatisfaction and work stress for members of organization and customer of university. The changes of customer needs in organization requires investigation of customer needs along with the development of organization.

The case study is conducted in Industrial Engineering Department, Faculty of Industrial Technology, Universitas Islam Indonesia, Yogyakarta. Preliminary study using questionnaires are conducted to identify the performance of the organization in department level. The respondents are the university employees and the university students of Industrial Engineering Department. From the result of preliminary study for employees, there are $\geq 50\%$ answers with the score in a range category of very poor – fairly good of question about overtime, penalty, reward, Standard Operating Procedure (SOP) applied and workload distribution among employees in the organization. While from the result of

preliminary study for students, there are $\geq 50\%$ answers with the score in a range category of very poor – fairly good of question about scholarship program, student's attendance, student's organizations, competition and research program, research grants, laboratory work procedure, cooperation with alumnus, internship policy, thesis policy, process of inputting subjects score, regulation, penalty, key-in procedure, communication with lecturers, communication with employees and standard assessment for students. The results of preliminary study show that there should be an improvement within the current organizational design to fulfill the needs of customer in organization.

The implementation of Axiomatic Design (AD) method was used by Lenz and Cochran (2000) to the design of product development organization. AD also used by Aguilar (2005) for design reuse of Forward – Looking Infrared Systems (FLIRs) in military industry.

Based on the issue above, the study aims to analyze the customer criteria in Industrial Engineering Department that will be used to propose the organizational structure design as the final result for this research.

2. THEORETICAL BACKGROUND

Axiomatic design is a design theory that was created and popularized by Professor Suh of the Massachusetts Institute of Technology. It consists of two axioms. One is the Independence Axiom and the other is the Information Axiom. A good design should satisfy the two axioms. There are four domains in axiomatic design process, which are: Customer Domain, Functional Domain, Physical Domain and Process Domain (Park, 2007).

According to Figure 1, the domains are mapped to one another such that the domain on the left describes “what we want to achieve” and the domain on the right is about “how we are going to achieve it.

As shown in the figure, the domains are defined as follows:

- 1) Customer Domain.
Contains what are the customer needs and attributes (CAs). CAs are transformed into functional requirements (FRs) in the next domain.
- 2) Functional Domain
It entails the functional requirements (FRs) that are needed to define the design goals or “what we want to achieve”. Functional domain can include constraints on the design.
- 3) Physical Domain
Consists of the design parameters (DPs) of the system that satisfy the FRs. The physical domain also contains design constraints.
- 4) Process Domain
Consist of the process variables (PVs) that are used to generate DPs to realize the solution. The process domain also can contain design constraints.

The Axiomatic Design process consists of the following steps:

- 1) Define the customer attributes (CAs)
In this step, the CAs are defined based on the result of customer needs grouping.
- 2) Determine the Functional Requirement (FR), Design Parameter (DP) and Process Variable (PV).
The FR is determined based on the CA of each group. After mapping the CA to FR, the mapping design is continued with determining the DP which is determined in response to the FR at the same level.

Then the mapping design is continued with determining the PV based on assumption the person who responsible for the DP.

The Independence Axiom indicates that the aspects in the proceeding domain should be independently satisfied by the choices carried out in the next domain. Design matrix is made to ensure the independence of each domain.

After making sure that the relationships among domains are independent, the next step is determining the next level of mapping design. The next level mapping design is developed through decomposition process. The DPs are defined according to FRs in the same level and FRs in lower level is determined based on the characteristics of DPs in the upper level. The decomposition process continues until the leaf (bottom) level is reached. And then design matrices of each level are constructed to verify the compliance to Independence Axiom.

3. MATERIAL AND RESEARCH METHOD

3.1. Survey Protocol

Paper-based survey was conducted by deploying 60 questionnaires to respondents who work in the institution of education. First, respondents are explained about the research objectives and then the respondents are instructed to answer the questions about characteristics of respondents and criteria for educational organization design. The case study for this research are conducted in Industrial Engineering Department, Universitas Islam Indonesia.

3.2. Characteristic of Respondents

Respondents who participated in the survey was 30 university employees which as much as 23 persons are administrative workers and 7 lecturers, and 30 university students. The age of respondents is in range between 24 to 55 years old with a mean 37 years old for employees and 17 to 23 years old with a mean 20 years old for students.

3.3. Apparatus

The questionnaire was developed to identify the criteria that customer requires in the educational organization design.

The questionnaire consists of 2 parts. First part was about personal background and the second part was several questions to identify the criteria of educational organization. The answer is in form of ordinal data.

3.4. Statistical Analysis Method

Non Parametric Statistic is used to identify the validity and reliability of the questionnaire data since the data are ordinal (Supriana, 2010). The method that used for conducting the validity test is Spearman's Rank Correlation (Sugiyono, 2003), with the hypothesis if the significance value of the correlation between each question with the total score $< \alpha$, the question is valid. If the significance value $> \alpha$, the question is not valid and should be deleted.

Cronbach's Alpha method is used to conduct the reliability test by comparing the coefficient of reliability with the scale of Cronbach's Alpha (Sugiyono, 2010). If the value is still in range of the scale (0 – 1), then the data are reliable.

Factor Analysis is used to test the hypothesis that the criteria identified is multidimensional. This method also used to group those criteria.

4. RESULT AND DISCUSSION

This section presents the result of criteria grouping using factor analysis and the analysis of formed CAs based on the grouping result.

Based on the result of factor analysis, Figure 2 and Figure 3 show that the question items will form 2 factors/groups. Then, based on the result of rotated component matrix, the Table 1-4 show which question items that will be loaded onto the same group.

Therefore, there are 4 groups of customer needs. These groups will be labelled to form CAs which can represent the customer needs, which are:

1) Conducive working environment

The first CA is a conducive working environment. This CA is covering the needs of employees based on the result of questionnaire spreading, which are about improvement in communication, coordination, standard operating procedure, competition and personal

relationship also the job conformity. According to Sihombing (2004), working environment is both physical and non physical factors in organization. The physical factors include the work equipments, temperature, density, noise and the extensive workspace. While the non physical factors including the working relationship among superior and subordinates, also among employees (Naibaho and Adi, 2012). In this research, the influence of physical work environment is considered as normal. Therefore, the first CA is defined as a harmony relationship among employees.

2) Work satisfaction in organization

The second CA is work satisfaction in organization. A job satisfaction is defined as pleasurable or positive emotional state resulting from appraisal of one's job or job experienced (Locke, 1976). True satisfaction of the workers comes from intrinsic motivators i.e. recognition, achievement, advancement, responsibility, etc (Herzberg, 1966). The CA is defined according to the motivational factors which can lead to job satisfaction stated by Herzberg i.e. achievement, recognition, responsibility, advancement/ career development, and the job itself (job content) (Tietjen and Myers, 1998). This CA is covering the needs of employees based on the result of questionnaire spreading, which are reward, job authority, promotion, performance assessment of employees, regulation implementation, conformity of workload with the salary given, workload distribution, determining policies and regulations, also the member's role in decision making in organization.

3) Organization that professional in providing services for students

The third CA is organization that professional in providing service for students. This means the services that related with student affairs, according to the student needs. This CA is covering the needs of students based on the result of questionnaire spreading, which are about improvement in assessment standard for students, penalty and regulation for students, student activities realization, research grants for students, and internship policy.

4) The educated teaching – learning process

The fourth CA is the educated teaching – learning process. This CA is covering the needs of students based on the result of questionnaire spreading, which are about improvement in key – in and remedial procedure, laboratory work procedure, applied curriculum, communication between lecturers and students, borrowing books and equipments, scholarship program and student organization. There are many factors form the quality of learning. The fourth CA is defined as the factors that influenced the quality of learning process itself i.e. the motivation of individual students, strategies of lecturers, collaborative learning, size and nature of class, assessment process and feedback, curriculum, wider institutional and social context, also learning resources.

5. CONCLUSION

The identified customer criteria or attributes for educational organization design encompass 4 groups which are conducive working environment (CA1), work satisfaction in organization (CA2), an organization that professional in providing service for students (CA3) and the educated teaching – learning process in organization (CA4). In AD, the CAs in customer domain will be used to determine the FRs in functional domain. The mapping design can be continued to determine the DPs in physical domain, and until the process domain. The proposed organizational structure can be designed based on the developed DPs and PVs.

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TABLES AND FIGURES

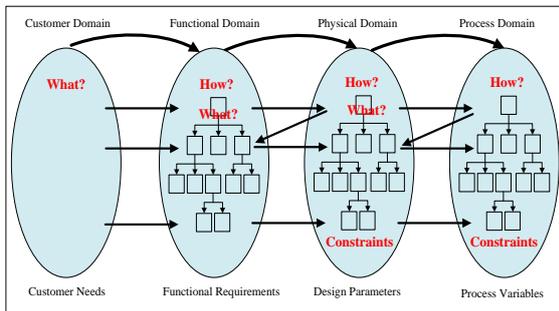


Figure 1. Relationship of domains, mapping and design spaces (Park, 2007)

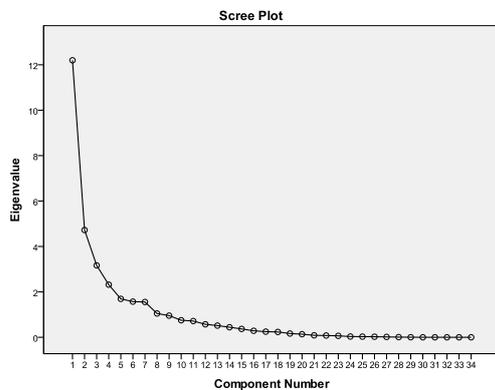


Figure 2. Scree plot of customer needs questionnaire for employees

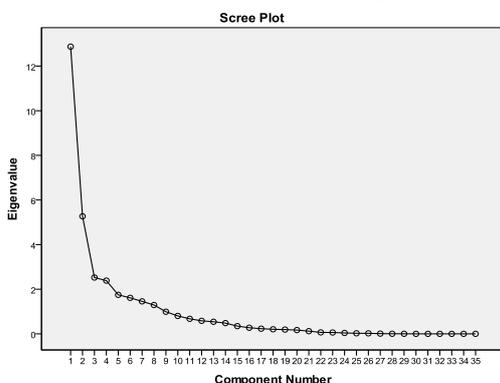


Figure 3. Scree plot of customer needs questionnaire for students

Table 1. Final result of 1st criteria grouping for employees

Question Number	Description	Component	
		1	2
a7	Communication procedures and intensity among employees	0.902	
b7	The same perception about the things that will be communicated	0.894	
c7	Periodical Evaluation about the implementation of communication among employees	0.876	
c6	Periodical Evaluation about the implementation of communication between superior and subordinates	0.861	
b5	The same perception about the things that will be coordinated	0.813	
c11	Information are evenly distributed to all employees, not only to several parties	0.809	
a5	Bureaucracy and procedures in coordination among departments	0.799	
b11	Clear regulations and provisions about performance assessment of employees	0.784	
c5	Periodical evaluation about the implementation of coordination among departments	0.768	
a8	Availability of regulation and SOP documents, and already socialized to all employees	0.75	
b8	All employees have the document of regulations and SOP as a guidance in completing their task	0.704	0.389

Table 1. Final result of 1st criteria grouping for employees

Question Number	Description	Component	
		1	2
c8	Periodical evaluation to measure the conformity of regulations and SOP with its implementation	0.702	
a11	Conflict management among employees	0.685	
b6	Communication intensity between superior and subordinates	0.664	
a6	Communication procedures and bureaucracy between superior and subordinates	0.643	
a10	The task are in accordance with the educational background of employees	0.457	

Table 2. Final result of 2nd criteria grouping for employees

Question Number	Description	Component	
		1	2
c9	Availability of document to measure the conformity of employee's tasks with their job and authority		0.714
a9	Availability of job and authority document and already socialized to all employees		0.678
b14	Socialization about the promotion policy for employees		0.632
b9	Each employees have the document of job and authority as a guidance in completing their task	0.334	0.628
a14	Written document about the promotion requirements		0.617
c4	Periodical evaluation about the implementation of regulations		0.604
a18	Providing reward for employees in form of other than financial		0.518
a12	The bonus given are in accordance with the employee performances		0.501
c13	The tasks are distributed in accordance with the ability of employees		0.44

Table 2. Final result of 2nd criteria grouping for employees

Question Number	Description	Component	
		1	2
c18	Clear socialization about the criteria to obtain reward		0.869
d14	Criteria of promotion based on the achievement that given to the organization (merit based promotion)		0.767
b18	Appraisal from superior to increase work motivation of employees		0.758
c17	Evaluation about the implementation of performance measurement and assessment for employees		0.745

Table 2. Final result of 2nd criteria grouping for employees

Question Number	Description	Component	
		1	2
c1	Coordination among employees. departments also superior and subordinates		0.371
b16	Socialization about the base of decision making in organization		0.35

Table 3. Final result of 1st criteria grouping for students

i	Description	Component	
		1	2
a5	Socialization about the research grants program to all students	0.718	
b19	The attitude of employees in communicate with students	0.711	
b7	Procedural facilitation to cooperate with department in realization of student's activities	0.703	
c5	Procedure to obtain the research grants for students	0.696	
a7	Department's involvement in realization of student's activities	0.691	
b5	Clarity of research criteria and requirements to obtain the research grants from department	0.682	
d5	The amount of research grants that will be distributed to the students	0.620	
c9	Procedural facilitation to obtain the approval about company for conducting internship	0.618	

Table 3. Final result of 1st criteria grouping for students

i	Description	Component	
		1	2
c20	The conformity of assessment standard with student's ability	0.824	0.331
b13	Availability of warning letter before pronouncing penalty for students	0.817	
b12	The conformity of regulations with the implementation	0.813	
b20	Socialization to all students about the assessment standard for students	0.795	
c7	Communication and coordination between department and the committee of student's activities organization	0.792	
a13	Socialization about the penalty of violations that conducted by the students	0.786	
d20	Periodical evaluation about the student's assessment standard accomplishment	0.782	
a12	Socialization about the prevailed regulations to all students	0.782	
c12	Periodical evaluation about the implementation of regulations	0.765	
c13	Periodical evaluation about the conformity of penalty with the violations that conducted by the students	0.743	

Table 4. Final result of 2nd criteria grouping for students

Question Number	Description	Component	
		1	2
c15	Availability of document about the schedule of all subjects and already socialized to all students before key - in and remedial period		0.823
c6	Coordination and communication among head of laboratories. laboratory assistants and students		0.813
b17	Give the students an illustration about the implementation of subjects in the workplace		0.724
b6	Socialization about assessment standard of		0.714

Table 4. Final result of 2nd criteria grouping for students

Question Number	Description	Component	
		1	2
	laboratory work activities to all students		
a18	Communication intensity between students and lecturers		0.704
b14	Socialization about the procedure for borrowing equipments and library books to all students		0.688
c14	Service and communication of laboratory assistants and librarian with the students		0.668
d6	Periodical evaluation about the implementation of laboratory work activities		0.638
a6	Procedural facilitation for the implementation of laboratory work activities		0.631
b15	Directing new students about the subjects that should be inputted for key - in		0.609
a15	Socialization about key - in and remedial period and		0.608

Table 4. Final result of 2nd criteria grouping for students

Question Number	Description	Component	
		1	2
	procedure to all students		
a17	The subjects are in accordance with the needs of workplace		0.588
b16	Periodical evaluation to assess the conformity of curriculum with the demands of workplace		0.587
a14	Efficient bureaucracy and procedure for borrowing instruments and library books		0.567
a1	Socialization to all students about the scholarship program		0.51
c17	Increase the student's involvement in teaching - learning activities. whether in form of discussion forum or study group		0.506
c3	The involvement of student organizations in determining the applied policies		0.482