Embedded Selforganizing Systems

Structure Oriented Evaluation Based Study of Students' Feedback About University and its Environment

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Abstract—**This paper describes evaluation and its result of students' satisfaction of four key factors: university environment, library service and environment, teaching at university, and skills of teaching faculty members. The Mongolian University of Pharmaceutical Sciences gives attention to their students and by this study aimed to figure out students' satisfaction by above defined four dimensions. There is can be many different factors which influences to students' satisfaction. But in this study researchers focus only those four directions with believe that most important factors. The structure-oriented evaluation model applied for this study and qualitative and quantitively methods are used both as mixed method for data analyses. Valid 227 responses are collected and by collected data all four dimensions evaluated as important for students' satisfaction, evaluation scores for all four dimensions computed higher that 0.8. But some of sub goals are evaluated less than 0.7 which need to take in attention and look deeply and try to found out reasons. It can help to make better decision to stakeholders of university. This kind of study should continue and later collected results can be compared, which can be really give some hints to stake holders in their better decision.**

Keywords—*component, formatting, style, styling, insert (key words)*

I. INTRODUCTION

Education plays an essential role in the development of countries [1], [2], [3]. More than 40% of persons ages between 25-34 in the European Union had completed tertiary education [4]. In Mongolia, the National Statistics Office data noted that there are 145,345 students studying in higher education institutions, which is around 5% of the population [5]. The population of Mongolia is comparatively young with 32.12% belonging to 14 years of age, and 13.33% are between 15 and 24 [6]. Mongolia is considered to be a special nation with most family expecting that their children should go to get higher education regardless of their financial background. The number of students increase every year with estimated number of students to rise to 210,092 in 2050 [7].

Number of higher education institutions in Mongolia relatively high comparing to number of populations. In 2023 69 universities offer different programs for bachelor, master and doctoral study [8]. There are 50 universities are private institutions, 16 of them public universities and remaining 3 universities counts as religious institutions. Future students have quite big options to select where can study. Therefore universities, especially private universities need to care interest of further students to attract them to own institutions. One of key direction of this attention can be satisfaction of students who is already enrolled to the university. Based on study of students' satisfaction stakeholders can make better decision to develop own university and meantime increase chance to attract new students in coming years. Scholars did study with this focus in different dimensions. In 2019 National University of Mongolia (NUM) collected data from 2141 students relating to satisfaction study [9]. By this study most positive evaluation received the criteria: "Knowledge and experience of professors and lectures". Erdenet branch of NUM studied impact of administration service to students' satisfaction and collected data from 295 students and applied SERVQUAL methodology to process data. Based in collected data found out that quality of administration service highly impact to students' satisfaction about own university, especially attention and empathy from administration employes to students received highest score by survey [10].

The main aim of this study is to figure out and estimate what are the expectations of current students from own university. The focus of the study is divided into four groups, namely: university environment, library service and environment, teaching service and skills of professors. The research team collected feedback from students based on those key directions and analyzed collected data to find out what are the expectations, directions and points based on these four targets.

The main object of study was the Mongolian University of Pharmaceutical Sciences (MUPS). The MUPS is established by "Monos" group as first private pharmacy university in Mongolia. Professor Khurelbaatar Luvsan was the founder of the Monos groups and the MUPS. In 2000, the MUPS began as college with two main study programs [11]. In 2004 opened

its first master courses at MUPS. In 2012, it received the first accreditation certificate from Mongolian Ministry of Education and Science. Nowadays the MUPS applies international standard into administration and management of university like: ISO 21001:2018, ISO 9001:2015.

II. METHODOLOGY

A. Evaluation Model Selection

The researchers selected the structure oriented evaluation (SURE) model. This model is created in 2014 for evaluation of e-learning and educational processes [12]. The core of this model is evaluation structures. The evaluator has to define this before all main and sub goals of the evaluation. Based on those goals, the questionnaire is created. Through the checklist data is collected from students and processed by using the evaluation goal structures. All steps of evaluation process is linked together logically, which makes unique this model.

B. Design of Evaluation Goal Structures

Following the rules of the SURE model and applying it to the main four aspects became the key goals of the evaluation (Fig. 1).

- University environment (B_1)
- Library service and environment (B_2)
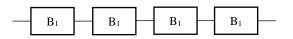- Teaching (B_3)
- Professors/ Lecturers (B_4)

Fig. 1. Key structure of evaluation

Each key goal has several sub goals.

- University environment (B_1)
  - External design of the university, appearance of university (A_{11})
  - Interior design of the university, comfortable environment inside of university (A_{12})
  - High quality of cleaning services (A_{13})
  - Comfortable classrooms (A_{14})
  - Sufficient number of classrooms for study (A_{15})
  - Ability to do sports (A_{16})
  - Comfortable environment for free time (A_{17})
  - Highspeed internet connection (A_{18})
  - Cultural events for students (A_{19})
  - Ability to organize student clubs (A_{10})
  - Ability to have volunteer jobs (A_{111})
  - Ability to have psychological consult (A_{112})
- Library service and environment (B_2)
  - Sufficient number of books and study materials (A_{21})
  - Availability of interesting journals and comics (A_{22})
  - Comfortable environment (A_{23})
  - Professional and friendly communication with librarians (A_{24})
  - Ability of e-service (A_{25})
  - Study rooms for group students (A_{26})
  - Extension opportunity of books at home (A_{27})
  - Opportunity to order books which are not available in library (A_{28})
- Teaching (B_3)
  - Theory and practice combined teaching (A_{31})
  - Teaching technical skills (A_{32})
  - Teaching soft skills (A_{33})
  - Teaching skills which are important later in the jobs (A_{34})
  - Teaching problem solving skills in the daily life (A_{35})
  - Efficient practical lessons (A_{36})
  - Opportunity to study in group in the laboratories (A_{37})
  - Include daily life useful courses into optional course selection (A_{38})
- Professors/Lecturers (B_4)
  - Apply new teaching methodologies in the teaching (A_{41})
  - Use new technical and technological approaches in the teaching (A_{42})
  - Role model through own behavior(A_{43})
  - Professional high communication skills (A_{44})
  - Motivate students and support them (A_{45})
  - Excellent time management and punctuality (A_{46})
  - Open minded and equal communication (A_{47})
  - No private requests to students (A_{48})
  - Good listener (A_{49})

The key and sub goals (Fig. 2) of evaluation were controlled by all groups who are involved in the evaluation process. In this study two lecturers collaborated on this evaluation, additionally some stakeholders from University administration were also involved.

The students were also asked to with two open end questions. Question 1: "Please write down factors to your successful study, which is not listed above". Question 2: "Which kind of skills are you mostly expect from your professors?".

III. DATA COLLECTION

The checklist for data collection was created including the sub goals of evaluation which were formulated as statements for students to check "how important is that statement for students, and for their successful study." The importance is measured from 10% to 90%. The first measure is labelled as "Not important" and maximum score is labelled as "Most important" The created checklist is prepared on Google form.
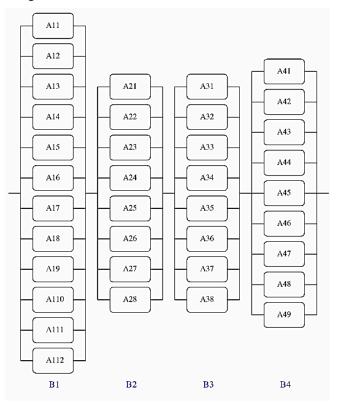

Fig. 2. Sub goals structure of evaluation

The Fig. 3. Shows the checklist in Mongolian in the Google form. This figure shows part of the checklist on questions related to the library (from A_{21} to A_{28}). The first line shows the measure unit based on the importance of question. The left column shows the sub goals of the evaluation as question statements.

Student who is taking part of the evaluation need to use the roll bar to see all units of the measurement on the window and select only one of the possible choices.

IV. DATA PROCESSING

The data collection began with open online form for students of MUPS. The online form was available for all students from all professions and semesters. The form was deployed between 16th January to 23th May 2024. Students are took part of this online evaluation voluntarily.

The data is processed by online tool of the SURE model [13]. The original data is processed by online SURE tool (Fig. 4).

Fig. 4 shows the collected data in the SURE tool, ready for data processing

The data is computed by online SURE tool following the calculation rules of the SURE model [12]. The main core of the calculation rules of the SURE model is the logical structures of the evaluation objects (Fig. 1 and Fig. 2

Fig. 3. The google for data collection
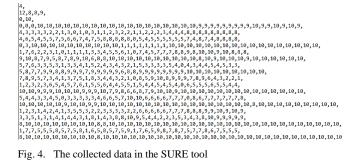

Fig. 4. The collected data in the SURE tool

Fig. 6 shows the final evaluation scores after data processing without data in the table. Explanation:
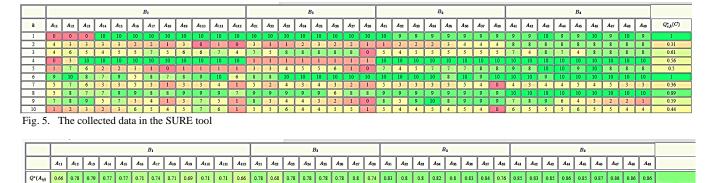
- First row shows the key goals

- Second row shows the sub goals

- Third row shows the evaluation scores for the sub goals

- Last row shows the evaluation scores for key goals

- The score in the last right cell shows the final general evaluation score.

k	A11	A12	A13	A14	A15	A16	A17	A18	A19	A110	A111	A112	A21	A22	A23	A24	A25	A26	A27	A28	A31	A32	A33	A34	A35	A36	A37	A38	A41	A42	A43	A44	A45	A46	A47	A48	A49	$Q^*_{e,k}(C)$
1	0	0	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	9	9	9	9	9	9	9	9	10	9	9	10	9	10	9	1
2	4	3	3	3	3	2	2	1	3	0	1	0	3	1	1	2	3	2	2	1	1	2	2	2	3	4	4	4	8	8	8	8	8	8	8	8	8	0.31
3	4	6	5	4	5	5	7	5	6	6	7	4	7	5	8	8	8	8	8	0	4	5	5	5	5	5	5	5	7	4	8	7	4	8	8	8	8	0.61
4	0	3	10	10	10	10	10	10	10	10	10	10	1	1	1	1	1	1	1	1	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	0.56
5	1	7	6	2	2	3	1	0	1	1	1	1	3	3	4	5	5	6	1	0	7	4	5	7	7	8	8	8	8	9	8	10	10	9	10	8	8	0.5
6	9	10	8	7	9	5	8	7	8	9	10	6	8	8	10	10	10	10	10	10	10	10	10	10	8	10	9	10	10	9	10	10	10	10	10	10	10	
7	5	7	6	3	3	5	3	1	3	3	4	1	5	2	4	3	4	3	2	1	5	3	3	3	3	5	4	0	4	3	4	4	5	4	5	3	3	0.36
8	5	7	7	7	9	8	8	9	9	9	9	1	9	9	9	9	9	9	6	8	9	9	9	9	9	9	9	9	10	10	10	10	10	10	10	9	9	0.89
9	7	8	9	5	7	3	4	1	3	7	5	1	8	3	4	4	3	2	1	0	8	5	9	10	9	9	9	9	7	8	9	6	4	3	2	2	1	0.59
10	1	2	3	2	3	6	5	4	5	7	6	1	5	5	6	4	4	5	5	1	5	4	4	5	4	5	4	0	6	5	5	5	6	5	5	4	4	0.44

Fig. 5. The collected data in the SURE tool

	A11	A12	A13	A14	A15	A16	A17	A18	A19	A110	A111	A112	A21	A22	A23	A24	A25	A26	A27	A28	A31	A32	A33	A34	A35	A36	A37	A38	A41	A42	A43	A44	A45	A46	A47	A48	A49	
$Q^*(A_{ij})$	0.66	0.78	0.79	0.77	0.77	0.71	0.74	0.71	0.69	0.71	0.71	0.66	0.78	0.68	0.78	0.78	0.78	0.78	0.8	0.74	0.83	0.8	0.8	0.82	0.8	0.83	0.84	0.76	0.85	0.83	0.85	0.86	0.85	0.87	0.86	0.86	0.86	$Q_2(C) = 0.8152$
$Q_2(B_i)$	0.81												0.81								0.85								0.87									

Fig. 6. The computed evaluation scores

The Fig. 7 shows computation of confidence interval for general evaluation score: $Q^*_e(C)$.

$1 - \alpha$	$q^*_{e,0}$	$Q^*_e(C)$	$q^*_{e,1}$	σ^*_e
0.90	0.7892		0.8412	
0.95	0.7842	0.8152	0.8462	0.2382
0.99	0.7744		0.8559	

Fig. 7. Asymptotic confidence intervals

By the Fig.7 can see that final evaluation score is significant by confidence interval computation. Table I shows analyse on the evaluation scores of sub goals. Four sub goals are evaluated less than 0.7. Six sub goals are bigger than 0.7 but less than 0.75. Nine sub goals are bigger than 0.75 but less than 0.8. Remaining seventeen sub goals are all equal or bigger than 0.8.

TABLE I. Achievement of sub goals

Sub goals	Evaluation score
A11, A19, A112, A22	< 0.7
A16, A17, A18, A110, A111, A28	< 0.75
A12, A13, A14, A21, A23, A24, A25, A26, A38	< 0.8
A27, A31, A32, A33, A34, A35, A36, A37, A41, A42, A43, A44, A45, A46, A47, A48, A49	>=0.8

V. THE RESULTS AND DISCUSSION

In total, there was a total of 227 responses registered by Google form. There are 93% (211) female and 7% (16) male students who responded. Age of students ranged between 19 to 44 years old. Most responses came from students who are studying for more than 7 semesters with 36.6%. There are only 1.3% (13) new students who were in first semester who responded.

By the Fig. 6 can see that result of the key goals are all over than 0.80.

- University environment: $B_1 = 0.81$

- Library service and environment: $B_2 = 0.81$

- Teaching: $B_3 = 0.85$

- Professors/ Lecturers: $B_4 = 0.87$

If transfer these scores into to percents then students valued all four directions a bit similar. But from the result can see that fourth direction "Professors/Lecturers" received highest score 0.87. In general by 227 students feedback all four directions are important as 81% from the 100%.

Table II shows lowest and highest scores of sub goals in term of corresponding key goal. Results are confirms that professors who teach the course play key role in teaching and learning and students expect cooperation and support from them.

TABLE II. LOWEST AND HIGHEST SCORES

Sub goals	Evaluation score
"External design of the university, appearance of university" - (A11)	0.66
"Ability to have psychological consult" - (A112)	0.66
"Availability of interesting journals and comics" - (A22)	0.68
"Extension opportunity of books at home" - (A27)	0.74
"Include daily life useful courses into optional course selection" - (A38)	0.76
"To use new technical and technological approaches in the teaching" - (A42)	0.83
"Excellent time management and punctuality" (A46)	0.87

The students were also asked to list down the other factors that affect their study and the skills they expect from their professors. Some of their answers are found below.

On the missing factors:

"The international relations should be open for students, to their exchange, we need more information about student exchange opportunities" – Student N16.

"Ability to apply for some grants or scholarships" – Student 143.

On the skills of the Professors: *"Some professors stand on their opinion and tries to make pressure to students, which is not really good. We expect respect in both side from professors" – Student N16.*

"Motivate students, support them with constructive hints" – Student N5, N8, N11, N12, N14, N17 etc.

"Explain complex topics in easy way which is suitable for generation Z" – Student N81, N114, N139, N156.

To sum it up, the main findings of this study are: all four aspects are important for students. But most attention is related to teaching and professors' skills. This is followed by the university environment and library service. This study confirms that excellent professors make students happy to study. For further studies, the researches will need to collect more data again in next semester. Moreover, there is a need to re-work on the evaluation goal structures to make more meaningful of the evaluation goals.

VI. COCNLUSION

In this paper, authors studied the importance of defined four aspect for the study achievement of students. The study showed that all four aspects are play important role for their successful study at university. But not all detailed points are equal important. This confirmed by quantitative results of the SURE scores. The qualitative results showed that students are willing to get open information about students exchange, international relation of university and they also expect to receive grant and scholarship offers at the university. Even Z generation students also expect different soft skills from their professors as showed by the reflections of students to open end questions.

Another conclusion of this study is the need for Universities for to conduct continuous self-evaluation, . The results of study needs to be compared by semesters and by sub and key goals to figure out variance of the scores for sub goals. The results and analysis can provide some recommendations to decision makers and stakeholders of the university to for planning and management in future.

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