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Article info:

Received 23.08.2021.

Accepted 21.08.2022.

UDC – 006.015.5

DOI – 10.24874/IJQR17.01-12



IDENTIFICATION OF FACTORS FOR PROVIDING THE HIGHER EDUCATION QUALITY ASSURANCE FOR STUDENTS

Abstract: *The goal of this paper is to estimate the factors for providing the higher education quality assurance for students through ICT and to increase motivation of students to learn the disciplines. European Foundation for Quality Management Excellence Model helps to develop business process for quality assurance. At the same time, ADKAR (Awareness, Desire, Knowledge, Ability, Reinforcement) Model explains how to implement these changes. We estimated the impact of relevant factors on satisfactory level of students. Among the factors are duplications in the topics of disciplines, taking into account surveys for disciplines, transparency of evaluation criteria and feedback on students' work. The model helps determine the individual impact of each relevant factor on quality assurance and to prepare recommendations from implementation to institutionalization phase for providing the higher education quality assurance for students through ICT.*

Keywords: *Quality assurance, ICT, Feedback, Academic integrity, Institutionalization phase*

1. Introduction

Institutional aspects of integrated quality assurance include governmental authority versus institutional autonomy, lack of an internal quality assurance mechanism for high education institutions as performance evaluation (Bertram & Drinan, 2006; Kobets et al., 2020). Integrated information systems of Higher education institutes (HEI) include information and feedback both students and staff that focus on learning and management (Martins et al., 2019; Babichev et al., 2022).

The data-gathering instrument used by the authority of HEI is used to make decision about procedure and rules to enhance of necessary business processes for quality assurance of education (Eilouti, 2020).

The change of higher education structure, development of quality assurance systems

and mechanisms enabling the dimension of study programs, which based on the relationship between institutional rules, learning process, and learning outcomes (Sanchez-Puchol et al., 2017). A needs assessment focuses on determining the current state and the desired state and the type of business process to bridge that gap (Kravtsov et al., 2018).

The **goal** of this paper is to estimate the factors for providing the higher education quality assurance for students through ICT.

We organise the remainder of our paper as follows: in part 2, we consider related works. In part 3, we present models of quality assurance. Section 3 is devoted to the methods for processing of experimental data. Finally, the last section concludes.

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2. Literature review

The activities of the International and National Organization for Quality Assurance in Higher Education (The International Network for Quality Assurance Agencies in Higher Education; The CHEA International Quality Group; National Agency for Higher Education Quality Assurance) testify to the relevance and timeliness of research on these important issues (INQAAHE, 2021; International Quality Group, 2021; NAHEQA, 2021).

The European Foundation for Quality Management (EFQM) was founded to promote self-evaluation as a key business process improvement. The EFQM Excellence Model is a diagnostic tool, with a set of criteria generally accepted across Europe (Suarez et al., 2017; EFQA, 2021; NIST, 2021), which can be used by HEI to prepare SWOT analysis and to evaluate the progress of strategic actions (Figure 1).

Analytic tools help managers of HEIs identify courses and programs that more closely match the students' needs and preferences, considering the requirement of the labor market and feedbacks of all stakeholders (Hota et al., 2020; Doneva et al., 2020; Kobets et al., 2020b; Kobets et al., 2021). The development of feedback evaluation is a complementary tool towards heightening the comprehensiveness of existing quality

assurance mechanisms (Endut, 2014). A strong correlation between technical/engineering SPs and good quality assurance results were found by authors (Marra et al., 2018), probably because quality expertise is particularly developed in these disciplines. These reviews should lead to the continuous improvement of the program (Kooli, 2019; Kravtsov & Kobets, 2019). The information collected is analyzed, and the program is adapted to ensure that it is up-to-date (Tiziana et al., 2019).

EFQM Excellence Model helps to develop business process for quality assurance. At the same time, Awareness, Desire, Knowledge, Ability, Reinforcement (ADKAR) Model explains how to implement these changes (Figure 2). ADKAR model explains that in order to change human behavior, it needs to realize the need for change and the benefits of it (Bertram, 2017).

Awareness is a way to raise awareness that requires multi-level communication using a variety of forms of information.

Desire for change: When awareness of the need for change is already present, administrations need to make people want to implement or support the changes that are being offered. Ideally, people who are most affected by these changes are involved in planning for change.

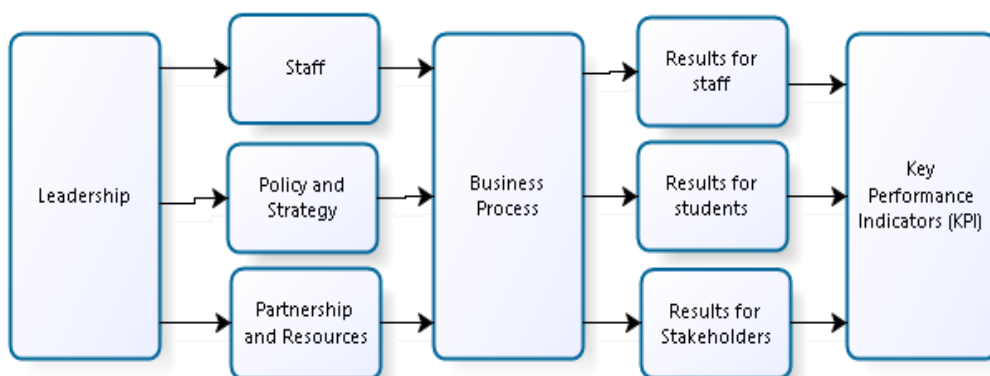


Figure 1. EFQM Excellence Model

It is possible to evoke a desire for change by actively listening to and understanding students' goals, removing barriers that prevent them from changing their behavior, showing how they will benefit personally from the changes, and offering various forms of rewards for using new behavior.

Knowledge. When people are aware of the need for change and are willing to support it, the administration should help them gain the knowledge necessary to make the changes. Without knowledge, awareness and desire for change are useless. These can be trainings, courses, face-to-face coaching, and opportunities to practice new techniques. Keeping in mind the need to build knowledge, the administration will be able to avoid mistakes when it starts demanding too much and too quickly from faculty, students and support staff.



Figure 2. ADKAR Model

Ability. When there is awareness, desire and knowledge, people need new patterns of behavior and skills that will allow them to make the necessary changes. It means that administrations need to implement curricula that will provide students, faculty and staff with the tools they need to change. It is important that there is constant access to the necessary training programs - so people will feel support and know that they are not alone in these changes (which is especially important during the first year of change).

Reinforcement

Finally, when there is an awareness and desire for change, the knowledge and ability needed to implement it, people need reinforcement to make change lasting. It means that within a one or two years, the authority have to keep its attention on the changes and collect the data about the progress. This will help the administration identify gaps, resistance or skills shortages and make appropriate adjustments or training so that people can continually improve and develop their skills. It is important to welcome successes and wins. Only by making sure that people have the necessary support in their efforts to change, and that their successes are noticed and welcomed, administration can achieve a stable change in the institution of higher education (Kobets et al., 2021).

To measure the success of quality assurance we have to combine 5 factors: leadership, practices, communications, structures, policies and procedures (Figure 3).



Figure 3. Institutionalization of quality assurance (Bertram & Drinan, 2006)

Leadership is a feature of formal authority who have the resources to commit to the initiative. Practices are the daily activities that reflect member's attitudes and behavior. Communication is the settings of

expectations and the feedback. Structure means hierarchy that supports the initiative and the desired state. Policies include articulated rules, parameters and principles that guide the desired behavior and responses to undesired behavior. Procedures consist of detailed step-by-step instructions for enacting the policies (Bertram & Drinan, 2006).

We can consider transition from implementation phase (developed and articulated procedures) to institutionalization one (the majority of individual members comply with procedures and view them as fair). At the same time, there are obstacles to achieve these goals (Table 1)

Table 1. Obstacles for Institutionalization of Integrity (Bertram et al., 2006)

Factors	Obstacles
Leadership	Lack of support from administration
Practices	Faculty and students do not follow policy/procedures Disparate implementation across HEI
Communications	Lack of or difficulties in educating and informing
Structures	Lack of central authority High turnover in people
Policies	Policy is not backed up by 'the right' procedure
Procedures	Procedures do not follow/support policy

Paper (Dzimińska et al., 2018) proposes a new Conceptual model of quality culture, based on trust for higher education institutions, loyalty and reputation.

Experts in the field of higher education quality pay great attention to the issue of students' feedback. So, in (Nair & Mertova, 2011), the problems of practice and theory of assessing the quality of higher education, practical application are considered, and a directory of resources for the higher education sector has been created.

Traditional methods of analyzing students' reviews are based on the collection and analysis of data based on questionnaires.

Paper (Asghar et al., 2019) presents a new approach that calculates a mood score based on expressing students' feedback on social media on the Internet. The fuzzy logic module is used to analyze and quantify student satisfaction.

An overview of the methods used to study feedback in empirical studies examining the processes in the provision and influence of feedback, the strengths and weaknesses of each of them are presented in (Brown & Harris, 2018). The work illustrates both the methods used to collect data in the framework of feedback studies, and the methods used to analyze this data. An approach is used to collect data that links quantitative and qualitative methods.

Measures of institutionalization for HEI have the following KPI:

- 1) Members have confidence in each other's honesty.
- 2) All members act in ways to ensure academic integrity.
- 3) All members comply with the requirements in all aspects of studying process.

To determine the level of students' satisfaction with the chosen specialty, a survey was conducted using Likert scale - a set of statements with which the respondent agrees or disagrees with the proposed scale. 1057 students of Kherson State University took part in the survey developed by Academic IQ project (Academic IQ project, 2021).

Objectives of the survey:

- Changing practices of HEI (What to change or not to change next year)
- Changing student behavior (because students need to change themselves, not just demand it from teachers)
- Informing the stakeholders outside the HEI.

To achieve the objectives above, we proposed the following multiple regression model in the next section.

3. Experimental Model

During Academic Integrity and Quality Initiative project (<https://academiq.org.ua/pro-proekt>), each student of Kherson State University (KSU) got a link on SurveyMonkey platform to take the questionnaire, which was prepared with project organizers. Results of survey were sent to authority of KSU who is responsible for quality assurance of study programs. After our preliminary analysis of the answers to completeness and taking into account the time spent on these answers (formal answers), 242 students were eliminated after arithmetic control (2-4 minutes - fictitious passing the survey) and logical control (no answer or general phrases in the open answers).

After preliminary analysis, 815 students left in the final sample of Kherson State University (Ukraine). For the number of

4,000 students, the sufficient sample size is 364 people (Lapach et al., 2002), so 815 students is a sufficient number to obtain statistically significant result for general population.

The dependent variable (Y) and 10 relevant explanatory variables (X_i) were selected to achieve the survey objectives. The results showed that 114 students (14%) would choose another specialty at another university, 101 students (12.4%) would choose a similar specialty at another university, 134 students did not decide on the answer (16.4%) and 94 students (11.5%) would choose another specialty at KSU. At the same time, 372 students (45.6%) would choose a similar specialty at the same university where they are currently studying (Figure 4).

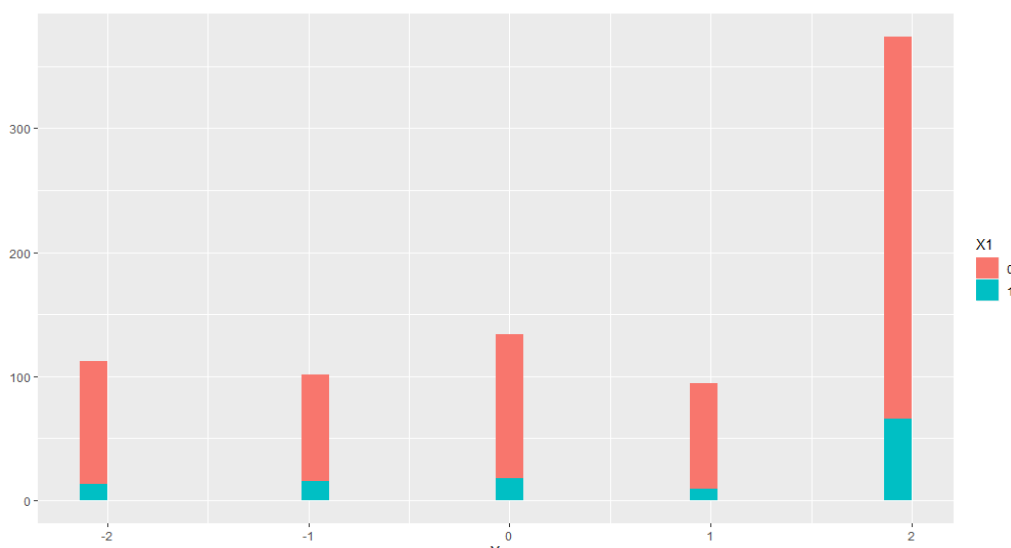


Figure 4. Distribution of students by the level of satisfaction with the chosen specialty in HEI

In Figure 4 for each version of the survey "0" means women, "1" - men. This reflects the general trend that more women than men study at the university. By the years of studying, the distribution of participants survey is shown in Figure 5. Students of 3rd and 4th years of bachelor's programs took the

largest part in the survey.

121 male students (15%) and 694 female students (85%) took part in the survey. The dominant attendance of students during 2020-2021 academic year was 75% -100% (Figure 6).

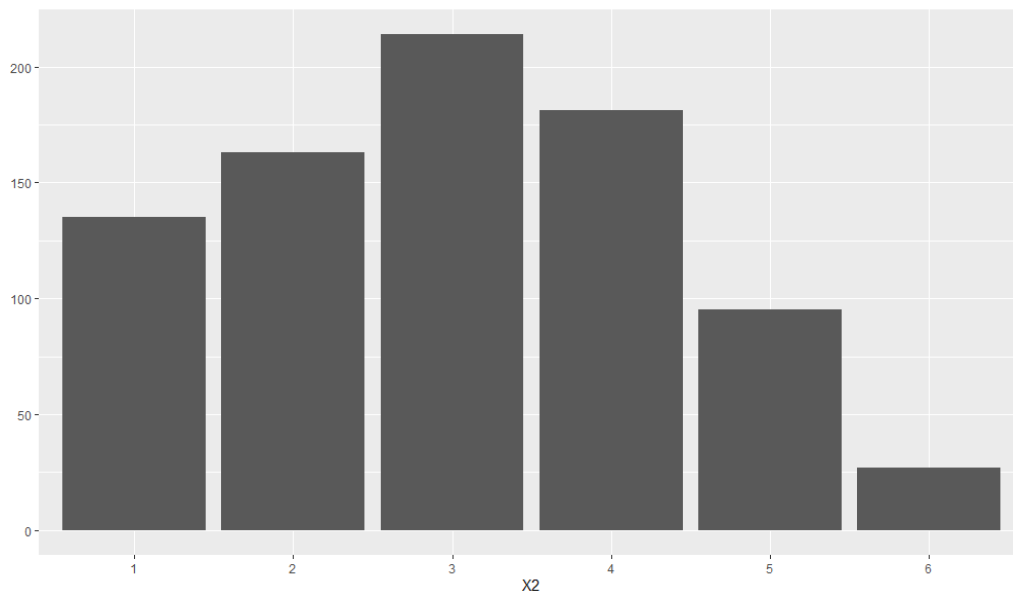


Figure 5. Distribution of students by the years of studying in HEI

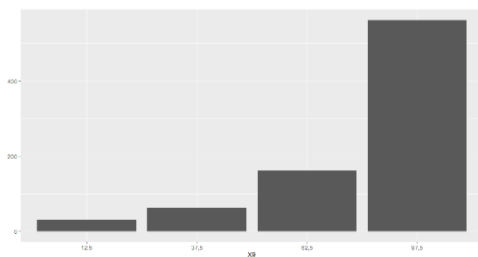


Figure 6. Distribution of students by the share of attended classes in HEI

Questionnaire for students

Y (dependent variable describes satisfaction

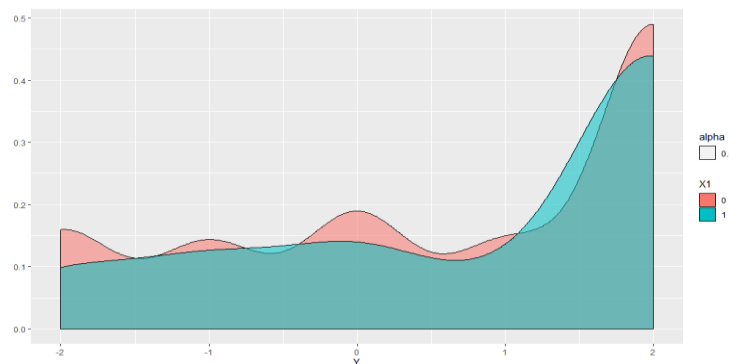


Figure 7. Students' preferences in the chosen specialty for women and men in HEI ("0" - women, "1" - men)

Explanatory variables (X) were chosen as follows:

X_1 - Your gender (0 - female, 1 - male), dummy-variable

X_2 - What course (year of studying) are you studying at? (1, 2, 3, 4, 5, 6, where 1, 2, 3, 4 - years of bachelor's degree, 5, 6 - years of master's degree)

X_3 - In which institute / faculty are you studying? (0 - in all specialties, except economic, 1 - in economic specialties)

X_4 - Estimate how often you had to meet duplication of topics in different disciplines (on a scale from 1 to 5, where 1 - not at all, 5 - very often).

X_5 - How do you choose elective courses? I choose independently (2), We make group choice (1), Department chooses instead of us (0), In general, I do not have such possibility (-1)

X_6 - Do your HEI conduct surveys on the level of satisfaction with the completed academic discipline? Yes (1), Don't know (0), No (-1)

X_7 - Assess how clear the criteria for evaluating your work in the disciplines is (on a scale from 1 to 5, where 1 - not clear at all, 5 - absolutely clear).

X_8 - Have you ever asked teachers to comment on your work? Yes, received an answer (1), Yes, but did not receive a response (0), No (-1)

X_9 - What percentage of classes this semester did you attend (both online and in classrooms)? 12.5% (0% -25%); 37.5% (25% -50%); 62.5% (50% -75%); 87.5% (75% - 100%)

X_{10} - Do you combine studying with work? Yes, I work full time (2), Yes, I work part time (1), I do not work now, but worked before (0), No, I do not work and did not work before (-1)

Using software package R, we need to calculate regression parameters of multiple regression and verify its statistical significances to reveal variables, which ensure satisfaction level of students with chosen specialty:

$$Y = b_0 + \sum_{i=1}^{10} X_i$$

Our task is to reveal statistically significant factors from and to eliminate statistically insignificant factors using hypothesis testing of multiple regression.

According to the results of statistical data processing in the software package R, we obtain parameters of multiple regression:

$$Y = -0.031 + 0.214 \cdot X_1 - 0.065 \cdot X_2 - 0.387 \cdot X_3 - 0.212 \cdot X_4 + 0.001 \cdot X_5 + 0.281 \cdot X_6 + 0.295 \cdot X_7 + 0.135 \cdot X_8 + 0.205 \cdot X_9 + 0.064 \cdot X_{10} \quad (1)$$

Explanation of regression parameters:

$b_1 = 0.214$ indicates how much the satisfactory level of an average student will increase for male as opposed to female. It means that male students have higher satisfactory level than female ones;

$b_2 = -0.065$ indicates how much the satisfactory level of a student will decrease due to the transfer of a student to each subsequent course;

$b_3 = -0.387$ indicates how much the satisfactory level of an average student of

economic specialty will decrease in contrast to non-economic specialties;

$b_4 = -0.212$ means how much the satisfactory level of an average student will decrease with the growth of the duplication of topics in different disciplines;

$b_5 = 0.001$ indicates how much the satisfactory level of a student will increase with the growth of the independent choice of elective courses by a student;

$b_6 = 0.281$ indicates how much the satisfactory level of an average student will

increase if HEI conducts surveys concerning the level of satisfaction by students with the completed academic discipline;

$b_7 = 0.295$ indicates how much the satisfactory level of an average student will increase due to increasing of transparent criteria for evaluating students' work in the disciplines;

$b_8 = 0.135$ indicates how much the satisfactory level of an average student will increase if teachers comment on the results of students' work;

$b_9 = 0.205$ indicates how much the satisfactory level of an average student will increase with the growth of attended classes by students;

$b_{10} = 0.064$ indicates how much the satisfactory level of an average student will increase if a student combines studying and work.

4. Results

Let's estimate 3 models: 1) with all explanatory variables; 2) with statistically insignificant variables; 3) with statistically significant variables (Figure 8):

```
model_0 <- lm(data=f, Y~.)
```

```
model_1 <- lm(data=f, Y~X1+X2+X3+X5+X9+X10)
```

```
model_2 <- lm(data=f, Y~X4+X6+X7+X8)
```

We obtain the following results:

```
model_0: lm(formula = Y ~ ., data = f)
```

```
model_1: lm(formula = Y ~ X1 + X2 + X3 + X5 + X9 + X10, data = f)
```

```
model_2: lm(formula = Y ~ X4 + X6 + X7 + X8, data = f)
```

The first and third multiple regression models have a similar level of adequacy and reflect statistically significant explanatory variables. Wald's test confirms this result.

	model_0	model_1	model_2
(Intercept)	0.310 (0.401)	0.779* (0.342)	-0.989 (0.277)
x2: 1	0.244 (0.140)	0.245 (0.147)	
x2: 2/1	-0.271 (0.175)	-0.281 (0.183)	
x2: 3/1	-0.355* (0.167)	-0.371* (0.176)	
x2: 4/1	-0.327** (0.173)	-0.586*** (0.181)	
x2: 5/1	-0.159 (0.212)	-0.058 (0.224)	
x2: 6/1	-0.295 (0.299)	-0.262 (0.314)	
x3: 1/0	-0.312 (0.286)	-0.209 (0.281)	
x4: 2/1	-0.225 (0.143)		-0.247 (0.143)
x4: 3/1	-0.353* (0.148)		-0.411*** (0.146)
x4: 4/1	-0.408* (0.195)		-0.511*** (0.192)
x4: 5/1	-0.829*** (0.240)		-0.989*** (0.237)
x5: 0/-1	-0.184 (0.270)	-0.382 (0.284)	
x5: 1/-1	0.104 (0.241)	0.178 (0.254)	
x5: 2/-1	0.018 (0.235)	0.235 (0.248)	
x6: 0/-1	0.202 (0.178)		0.157 (0.176)
x6: 1/-1	0.555*** (0.154)		0.474*** (0.151)
x7: 2/1	0.086 (0.272)		0.072 (0.272)
x7: 3/1	0.347 (0.254)		0.336 (0.253)
x7: 4/1	0.515* (0.256)		0.574* (0.255)
x7: 5/1	0.957*** (0.257)		1.015*** (0.255)
x8: 0/-1	-0.184 (0.231)		-0.157 (0.231)
x8: 1/-1	0.279** (0.103)		0.283** (0.102)
x9: 37,5/12,5	-0.247 (0.312)	-0.100 (0.327)	
x9: 62,5/12,5	-0.398 (0.283)	-0.327 (0.296)	
x9: 87,5/12,5	-0.147 (0.270)	0.028 (0.283)	
x1: 00	-0.253 (0.140)	-0.231 (0.148)	
x1: 01	0.145 (0.150)	0.210 (0.157)	
x1: 02	0.107 (0.173)	0.164 (0.181)	
R-squared	0.177	0.055	0.144
N	815	815	815

significance: *** = $p < 0.001$; ** = $p < 0.01$; * = $p < 0.05$

Figure 8. Parameters of regressions

The first model shows that the following factor variables are statistically significant:

1) Reduction of satisfaction with studying in the chosen specialty for 3 and 4 years in comparison with the first year (X2: 3/1, X2: 4/1).

2) Duplications in the subject of disciplines significantly reduces students' interest in learning (X4: 3/1, X4: 4/1, X4: 5/1). The motivation to repeat topics in the 1st year at the master's level is reduced the most compared to the 1st year of the bachelor's level.

3) Students' satisfaction significantly increases with learning if they participate in surveys compared to those who do not participate in them (X6: 1 / -1)

4) Clear assessment criteria in syllabuses significantly increase the motivation to study in the chosen specialty for the 4th year of undergraduate and 1st year of master's degree compared to the 1st year students of bachelors' programs (X7: 4/1, X7: 5/1).

5) Significantly increases student satisfaction if they receive feedback on their work, compared to those students who do not receive such feedback (X8: 1 / -1)

After checking the explanatory variables for statistical significance, we give their

interpretation.

Statistically significant factors:

1. Duplications in the topics of disciplines (X4). The more repetitions of topics in different disciplines, the less the desire of students to study in this specialty - a drop in interest in learning by 0.2 points on a 5-point scale (Figure 9).

2. Taking into account surveys for disciplines (X6). Subject to the conduct of surveys and their consideration by teachers based on the results of studying the discipline, the more motivation students have to study in this specialty: increase interest by 0.28 points on a 3-point scale (Figure 10).

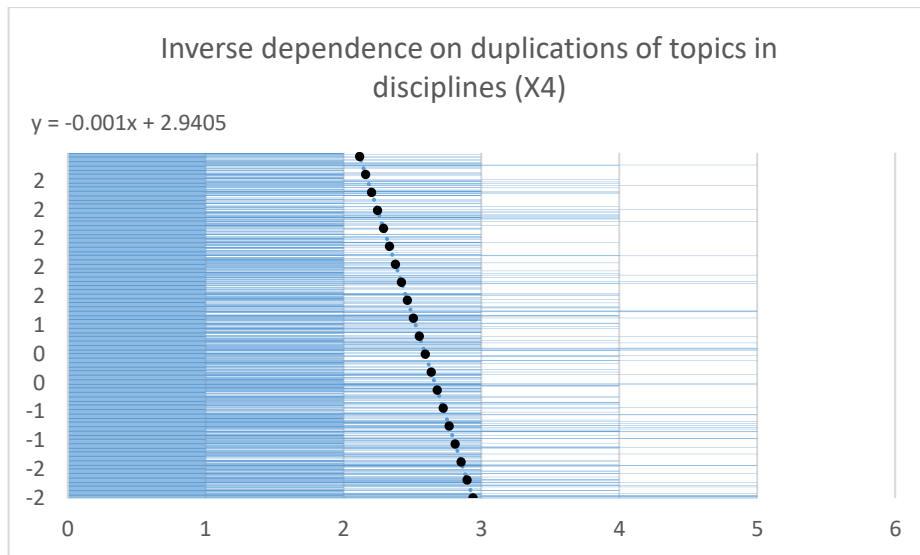


Figure 9. Inverse dependence on duplications of topics in disciplines (X4)

Satisfaction with study is not affected by:

1) Course of study (X2). Satisfaction with learning process decreases slightly with each course, but it is not a statistically significant factor.

2) The procedure for optional disciplines (X5). The main thing is to have this anonymous selection procedure.

3) Percentage of attended classes (X9). With the increase in the share of attended classes, student satisfaction with learning process increases, but is not a statistically significant factor. If the student has not attended some classes, but is interested in acquiring the chosen specialty, he/she is able to study the topics of the discipline on their own with the appropriate provision of electronic educational resources.

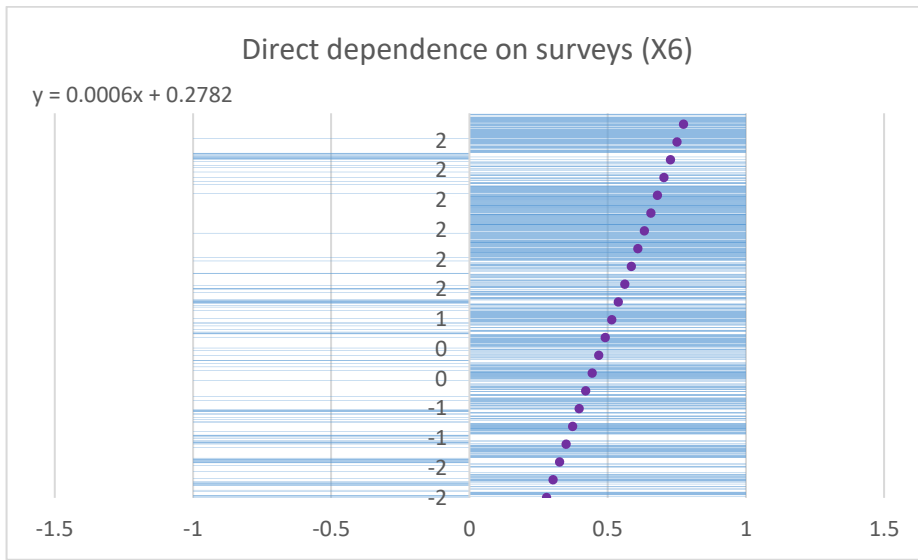


Figure 10. Direct dependence on surveys (X6)

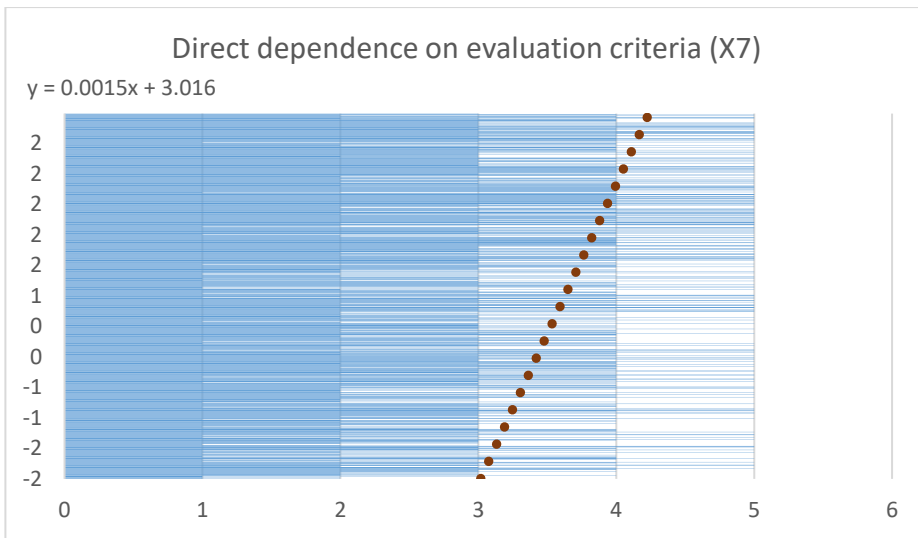


Figure 11. Direct dependence on evaluation criteria (X7)

4) Combining studying and work (X10). Having part-time or full-time employment slightly increases interest in learning (the student understands what disciplines he/she needs to work on), but it is not a statistically significant factor.

If we compare how definite factors affect the level of quality assurance of the educational process for students of economic specialties, we obtain the following result:

$$Y = -1.816 + 0.12 \cdot X_1 - 0.144 \cdot X_2 + 0.374 \cdot X_4 + 0.442 \cdot X_5 + 0.329 \cdot X_6 + 0.745 \cdot X_7 + 0.191 \cdot X_8 - 1.982 \cdot X_9 - 0.274 \cdot X_{10} \quad (2)$$

Among all the factors, only one is statistically significant for students of economic specialties - the clarity of assessment criteria. The clearer the criteria are, the greater is the satisfaction of students of economic specialties with the educational process (Figure 12). Repetitions in the topics of disciplines, taking into account the surveys and response to the work of students of

economics are not statistically significant. The reasons are the following: a significant difference in disciplines due to the systematic review of study programs, low involvement of students of economics in surveys and the presence of feedback from teachers for the students, respectively.

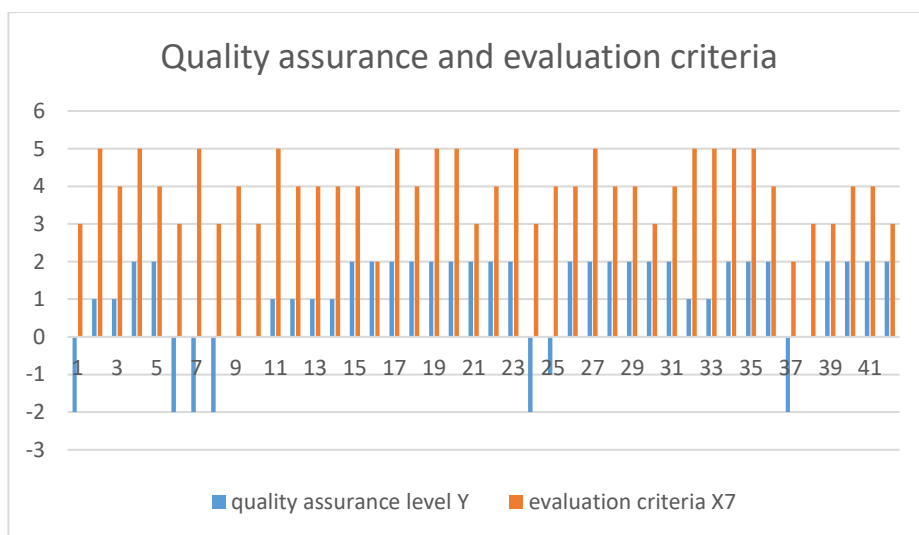


Figure 12. The level of quality assurance of the educational process from the evaluation criteria (X7) for students of economic specialties

Taking into account the results obtained by explanatory variable X7, the following measures are proposed:

- 1) hold meetings of scientific and methodological councils of faculties and the university to review best practices regarding the objectivity and clarity of the criteria prescribed in the syllabus to increase students' confidence in the grades given by the teacher;
- 2) prepare tests to provide automated verification of answers to send the correct answers or comments to the student so that he / she remembers where the mistake was made and does not repeat it;
- 3) for tasks (problems) with an open answer to provide a short response (oral or written) to focus the attention of students to the

evaluation criteria and the objectivity of the assessment.

5. Conclusion

Conclusion should present one or more conclusions that have been drawn from the results and subsequent discussion.

Taking into account the results of our research we can make the following conclusions:

1. Guarantors of study programs based on the results of reviewing the content of disciplines are to update the content of disciplines in order to increase their uniqueness for students and their motivation to study.
2. Heads of departments together with the guarantors of study programs are to inform

about the results of surveys of students and graduates after reviewing the study program to stakeholders through official communication channels.

3. Teachers are to revise the assessment criteria in syllabus to increase their transparency and objectivity for students.

4. Teachers of disciplines are to provide a response to the work of students in an automated mode.

It is necessary to convince teachers that the survey is not a punitive, but an auxiliary tool for them, which will gradually form a culture of quality assurance in education process. To

achieve this, the administration needs to allocate resources within the HEI to implement the necessary procedures to ensure the institutionalization of a quality assurance culture.

Acknowledgment: This research was prepared through participation in the project Academic Integrity and Quality Initiative co-funded by American Councils, grant number: 4491 (Institutionalization of Academic Integrity at Ukrainian Universities) FUNDREF: <http://dx.doi.org/10.13039/100001936>.

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