

Liudmyla Zhurakhovska

AUTOMATION OF THE COMPLIANCE MATRIX «DISCIPLINE – COMPETENCE» (BY EXAMPLE OF THE EDUCATIONAL MASTERS PROGRAM «FINANCIAL INTERMEDIATION»)

The object of this research is the automation of the compliance matrix «Disciplines – Competences», which are the links between the list of compulsory and elective disciplines of the educational program according to the curriculum and the set of competencies of the graduate required by the Standard of higher education. The development of the educational program includes a combination of disciplines with «Program Learning Outcomes», which is listed in the Standard.

One of the most problematic places is time-consuming of the process of «drawing-up» the links from «General Competencies» (GC) and «Professional Competencies» (PC) of disciplines to «Program Learning Outcomes» (PO). This problem is considered on the basis of the Educational and Professional Program (OPP) «Financial Intermediation» Academic Degree «Master» specialty 072 «Finance, Banking and Insurance» in the field of science 07 «Management and Administration» of the Department of Banking of Kyiv National University of Trade and Economics (KNUTE, Ukraine).

The research methods are to use the design of relationships between logical elements («entities») of the data model (Entity-Relationship Model). To develop a compliance matrix «Disciplines – Competences» in the paper the author proposed a software application based on Excel (hereinafter «Application»), which allows to automate the construction of such links.

There is a significant reduction in the time-consuming of preparing educational programs by guarantors and support groups. This is due to the fact that the proposed application has a number of features of use, in particular automates the construction of matrices of correspondence «Discipline – Competence».

The method of automation of the compliance matrix «Disciplines – Competences» proposed in the research was successfully tested by the author in the development of educational and professional programs of KNUTE, namely «Financial Intermediation», «Management of Banking Business» and «Financial Brokerage». Thus, the application is universal and can be used by guarantors and support groups to build Compliance Matrices of the educational programs of other specializations and specialties.

Keywords: compliance matrix «Disciplines – Competences», relational database model, logical elements of the model, many-to-many relationship type.

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1. Introduction

The introduction of qualification requirements for university graduates makes it necessary to build links between the set of disciplines taught and the set of competencies of the graduate [1–3].

One of the most laborious stages of the process is «drawing-up» the links from «General Competencies» (GC) and «Professional Competencies» (PC) of disciplines to «Program Learning Outcomes» (PO) in the formation of an educational program as a the Higher Education Standard (hereinafter «Standard») [4] requires.

Given the above, the relevance of the study is that the time-consuming of the formation of educational and professional program according to the Standard is unacceptably high. Therefore, the object of this research is the automation of the compliance matrix «Disciplines – Competences», which are the links between the list of compulsory and elective disciplines of the educational program according to the curriculum and the set of competencies of the graduate required by the Higher Education Standard. As an example, let's consider the Educational and Professional Program (OPP) «Financial Intermediation» Academic Degree «Master» (hereinafter «Program») [5]

specialty 072 «Finance, Banking and Insurance» in the field of science 07 «Management and Administration» of the Department of Banking of Kyiv National University of Trade and Economics (KNUTE, Ukraine) (hereinafter «Specialty»). The purpose of the study is to consider the possibility of automating of the Compliance Matrix «Discipline – Competence» as a link between the list of compulsory and elective disciplines of the educational program according to the curriculum and the set of competencies required by the Higher Education Standard. This will help educational program guarantors and members of support groups to reduce the time and complexity of educational programs and focus on their quality.

2. Methods of research

The following scientific methods were used in the research:

- Method of analysis (in the study of published works and regulations relevant to the topic of this research);
- Method of classification (when grouping published works according to research topics);
- Modeling method (when considering the possibility of automating of the Compliance Matrix «Discipline – Competence»).

The published works related to the topic of this study are generally devoted to theoretical issues of competence, competence approach, as well as the priority of information factors in the structure of sources of competitive advantage. Thus, among the latter, the most famous are the studies of Nobel Prize winners in information economics [1, 6, 7], which the hypothesis of a significant impact of information asymmetry on the development of markets and their participants is formulated and proved. «Promotion of the necessary European standards» on the basis of certain competencies as the main direction of higher education development was mentioned in a joint statement of the conference of the European Council in Bologna (June 19, 1999) [2].

Among other works, it is possible to note those where the fact of inconsistency of quantitative and qualitative parameters of training to the actual needs of the national economy is argued [8]. A number of studies are devoted to the need for the formation of digital competencies for the global trend of digital transformation of society development [3], content analysis of the concepts of «competence» [9]. A significant part of the works considers the theory of competence approach to the training of future specialists in economics and finance [10–12]. There are also scientific publications that explore the content and structure of professional competencies of future professionals in economics, finance and banking [13–15].

The author does not know the publications on the automation of the Compliance Matrix «Discipline – Competence» for the formation of the educational program. Educational and methodical directories also do contain neither software applications nor information on their use [16].

The research considers the possibility of automating of the Compliance Matrix «Discipline – Competence» as a link between the list of compulsory and elective disciplines of the educational program according to the curriculum and the set of competencies required by the Standard. This task is solved on the basis of the Program of the specified Specialty [5], and the author of this work is the Program guarantor and the support group member.

The material for the study are the materials of the Bologna Process [2], the Standard of the Ministry of Education and Science of Ukraine [4], normative documents of KNUTE [5], scientific publications of researchers in information economics [1, 6, 7]. As well as research on the development of digital transformation of society and analysis of the compliance of training parameters to the needs of the economy [3, 8]. The author also relied on works on the analysis of the concept of «competence» [9], the competence approach to the training of future professionals in economics and finance [10–12], as well as the study of the content and structure of professional competencies of these specialists [13–15]. The research methods are to use methods of design connections between logic elements («entities») of the data model (Entity-Relationship Model) [17].

3. Research results and discussion

The introduction of qualification requirements for university graduates causes changes in approaches to the formation of the content of the curriculum. This is especially important for financial specialties in connection with the expectations of the state to significantly increase the financial literacy of citizens [18].

Therefore, the key areas of the Law of Ukraine «On Education» [19] are the focus on educational outcomes, which should be observed and measured. The units of measurement are the competencies of the graduate. For the specialty 072 «Finance, Banking and Insurance» these competencies are set out in the Standard.

Higher education institutions are faced with the task of building links between the set of disciplines taught and the set of graduate competencies required by the Standard. In this paper, this problem is considered on the example of the Program of the specified Specialty [5].

The development of the educational program includes a combination of disciplines with «Program Learning Outcomes (PO), which are listed in the Standard. One of the most time-consuming stages of the process is the «drawing-up» the links from «General Competencies» (GC) and «Professional Competencies» (PC) of disciplines to «Program Learning Outcomes» (PO). This paper describes a software application based on Excel (hereinafter «Application»), which allows to automate such a links in the form of the compliance matrix «Disciplines – Competences». Thus, educational program developers can focus on the content of the program, translating formal calculations into software.

Harmonization of the higher education system in Ukraine with European standards requires, in particular, codification of specialties according to the International Standard Classification of Occupations (ISCO-08) [20]. The specialty «Finance, Banking and Insurance» corresponds to the following hierarchy of ISCO-08 units:

1. Managers.
12. Administrative and Commercial Managers.
121. Business Services and Administration Managers.
1211. Finance Managers [20].

Based on this, universities form disciplines and curricula for the training of specialists in the specialty. In this case, great attention should be paid to the fullest possible (ideally – one hundred percent) coverage of all relevant PO. This will ensure that all GCs and PCs are covered by the disciplines, as the links between PO with GCs and PCs

is defined in the Standard in the «Matrix of Conformity of Learning Outcomes and Competencies Defined by the Standard».

The standard states that higher education institutions may introduce additional competencies and program learning outcomes [4]. Table 1 shows the list of additional PO for the educational degree «Master» (PO14-PO16). The latter were additionally identified by the author as specific to the specified Program. Numbers PO14, PO15 are also used in the Standard, but for educational-scientific (postgraduate) programs, so it should not cause confusion.

Table 1

Additional «Program Learning Outcomes», formed for the educational and professional program «Financial Intermediation» of the educational degree «Master» of the Department of Banking of Kyiv National University of Trade and Economics (KNUTE, Ukraine) [5]

PO14(*)	Carry out diagnostics and planning of financial institution activities, selection of tools for assessment and control of financial risks; substantiate the directions of anti-crisis management strategy of financial institution
PO15(*)	Be able to analyze financial instruments and forecast their investment characteristics
PO16(*)	Justify management decisions in portfolio investment, institutional investor asset management, insurance management and evaluate their effectiveness

The standard also defines the «General Competencies» (GC1 – GC9) and «Special (Professional) Competencies» (PC1 – PC10) for the educational degree «Master».

Additionally, the author has formed a list of «Professional competencies» PC10-PC12, which are specific to the specified Program (Table 2).

Table 2

Additional «Professional Competencies», formed for the educational and professional program «Financial Intermediation» of the educational degree «Master» of the Department of Banking of Kyiv National University of Trade and Economics (KNUTE, Ukraine) [5]

PC10(*)	Ability to conduct research on financial institution risk assessment and controlling
PC11(*)	Ability to study the investment characteristics of financial instruments in domestic and global markets
PC12(*)	Ability to apply theoretical and methodological tools for making informed decisions on asset management and portfolio management

According to the Standard, the curriculum of the Program [5] includes compulsory disciplines, which act as «Compulsory components» of the Program (CC1-CC7), and optional disciplines, which are «Optional Components» (OC1-OC19).

The model of the subject area to be modeled in the Application is provided in Fig. 1.

The formula used in the Application to find many-to-many relationships type is as follows:

$$=IF(SUMPRODUCT(OFFSET(Process_7_VK_PR!\$B\$4:\$B\$21,0,U\$2), OFFSET(Process_PR_ZK_SK!\$C\$4:\$C\$21,0,\$A26))>0, "+", "") \tag{1}$$

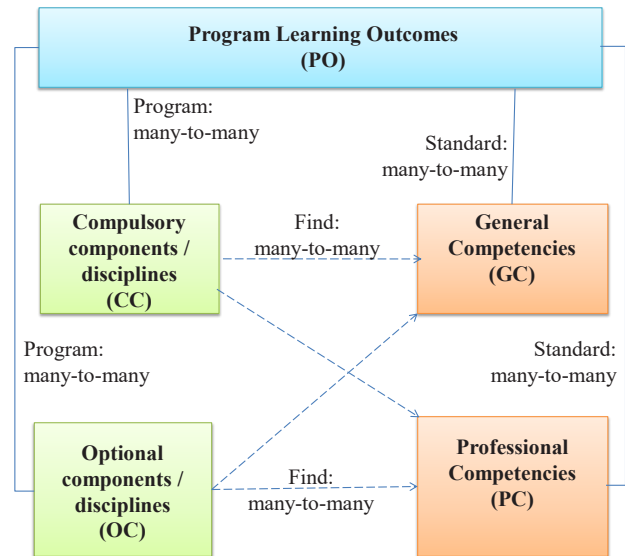


Fig. 1. The model of the subject area to be modeled in the Application

The method of automation of the compliance matrix «Disciplines – Competences» proposed in the research was also successfully tested in the development of other educational and professional programs of this Specialty, namely «Management of Banking Business» and «Financial Brokerage».

4. Conclusions

The automation of the compliance matrix «Disciplines – Competences» for the development of educational programs is offered. The research methods are to use the design of relationships between the logical elements («entities») of the data model (Entity-Relationship Model).

An algorithm has been developed and an Excel-based software application has been implemented to develop a compliance matrix «Disciplines – Competences» of the Educational and Professional Program (OPP) «Financial Intermediation» Academic Degree «Master» specialty 072 «Finance, Banking and Insurance» in the field of science 07 «Management and Administration» of the Department of Banking of Kyiv National University of Trade and Economics (KNUTE, Ukraine).

The specified algorithm was tested in the development of educational and professional programs of the master’s degree in specialty 072 «Finance, Banking and Insurance» in the field of knowledge 07 «Management and Administration» of the Department of Banking KNUTE, namely «Financial Intermediation», «Management of Banking» and «Financial brokerage».

The results showed that the application is universal and will allow guarantors and support groups to reduce the time-consuming of the Compliance Matrices of educational programs of other specializations and specialties.

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Liudmyla Zhurakhovska, PhD, MBA, Associate Professor, Financial Intermediation Master Program Guarantor, Department of Banking, Kyiv National University of Trade and Economics, Kyiv, Ukraine, e-mail: lzhurakhovska@gmail.com, ORCID: <https://orcid.org/0000-0003-3745-0155>