

A Conceptual Framework of Collaborative-Based Recommender System in Risk Management for Curriculum Management Under the Thai Qualification Framework for Higher Education

**Sarung Tantragul¹,
Veerachai Khonkhoho²**

Faculty of Information Technology,
Phetchaburi Rajabhat University, Thailand

¹tantragul@gmail.com

²vekhon@gmail.com

and Panchit Longpradit³

School of Information and Communication Technology,
University of Phayao, Thailand

³panchit.lo@up.ac.th

Abstract - The aim of this research is to develop a conceptual framework of collaborative-based recommender system in risk management for curriculum management under the Thai Qualification Framework for Higher Education (TFQ:HEd). In this study, the conceptual framework was developed based on the principles and concepts of the Quality Information Technology (QIT). We conducted the 5 following steps in order to develop the framework: 1) Performing organizational analysis and information analysis of organizational systems, 2) Classifying organizations and types of information system, 3) Performing the collaborative risk management, 4) Determining quality improvement models based on the concepts of the Deming cycles by using the PDCA processes, and 5) Performing system analysis by using the System Development Life Cycle integrated with the collaborative-based recommender system. The results of evaluation from questionnaires by using the Index of Item-Objective Congruence (IOC) made by 5 experts on framework development

indicated that the conceptual framework developed in this study was the most suitable for implementation ($\bar{x} = 4.50$, S.D. = 0.37). In conclusion, the conceptual framework of collaborative-based recommender system should be used in risk management for curriculum management under the TQF:HEd.

Keywords - Collaborative Filtering, Risk Management

I. INTRODUCTION

Since the Office of the Higher Education Commission issued the Thai Qualification Framework for Higher Education (TQF:HEd) and its revised edition in 2009 [1], the qualification framework became a tool for systematic implementation of public policies in higher educational institutions in order to improve managerial efficiency of curriculum management and to prevent problems and mistakes that may arise unexpectedly in the future. The framework also acts as a risk management tool that prevents damages and minimizes negative impact toward

universities. Risk management helps to handle activities that may do harm to organizations or their goals.

The recommender system is the technique used to collect information for decision making processes. It can be classified into 3 categories: content-based, collaborative filtering and hybrid approach [2]. However, the collaborative filtering (CF) is the most successful and commonly used method in the present [3-4].

Therefore, in this study, we decided to use the collaborative filtering method to develop the conceptual framework in risk management for curriculum management based on the TQF:HEd. The framework developed in this study can be used to predict risks or negative impacts toward organizations and their goals that may arise in the future. It can also minimize damages to the level that universities can systematically handle, estimate and examine risks that may affect to universities and their goals.

II. LITERATURE REVIEW

A. Collaborative Based Recommender System

The recommender system based on the CF method is used to recommend an object by considering its rating and its similarities between the active users and their neighbors. To conduct the collaborative filtering method, there are 3 steps and can be described as follows [5]:

1. Correlation-based Similarity is the method that finds similarities between users and target users. Similarities were calculated based on rating and similarities between variables i and j is performed in the form of a matrix. In this method, rating of a particular object may be affected by rating of other objects. This method is also called co-rating.

2. Prediction is also used for predicting rating of a particular item by considering affection and similarities between an item and other items. The values of neighbors is also used for predicting values.

3. Recommendation is made after prediction was applied to every items. To recommend the item with the highest rating, the predicted rating were sorted in descending order.

B. Risk Management

Risk management refers to the technique used for managing risk factors, controlling activities and operation that may pose negative impact or damages to organizations, and minimizing damages or negative impact to the level that can be handled by the organizations. Risk management also helps the organizations to systematically estimate, control and examine problems; thus leading the organizations to their objectives and goals [6-7].

Risk identification refers to the processes that executives in each level collaborate and help to identify risks and risk factors that are related to their project or activities by considering both internal and external factors. Methods used in risk identification may depend on the nature of problems and suitability of each organization. For example, it can be performed by using brainstorming, checklists or by analyzing important operational procedures.

C. Deming Cycle and SDLC

The Deming cycle is developed by the US scientist, Dr. Shewhart Deming. The method became successful and well-known after he introduced it in Japan. The Deming cycle consists of the 4 following steps called PCDA or Plan, Do, Check and Act. These are considered the basis and quality of efficient operation [8].

The System Development Life Cycle (SDLC) is the process used in developing information system. The method can be used to solve business problems and answer the needs of end-users. The SDLC process consists of the 5 following steps: Planning phase, Analysis phase, Design phase, and Implementation phase.

III. CONCEPTUAL MODEL

Jaruk Chukittikul [9] suggested that the principles and concepts of the Quality Information Technology (QIT) consists of 3 aspect: Learning management, Information technology, and Quality techniques.

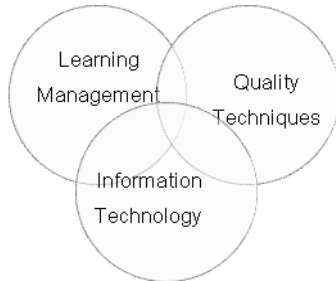


Fig. 1 The body of knowledge of the Quality Information Technology (QIT) and learning resources.

According to the concepts of the QIT, a risk management framework based on the collaborative-based recommender system is developed as follows:

1. Learning management consists of the Thai Qualification Framework for Higher Education, educational institutions' internal qualification system and their risk management frameworks.
2. Information technology consists of the design of information technology for

organizational system, the System Development Life Cycle (SDLC), the Collaborative-based Recommender System by using the Collaborative Filtering method, which has 3 steps as follows: 1) Similarity Computation, 2) Prediction, and 3) Recommendation.

3. Quality techniques consists of the Deming cycle, which was used for analyzing and developing system based on theories and concepts as shown in the Fig. 2.

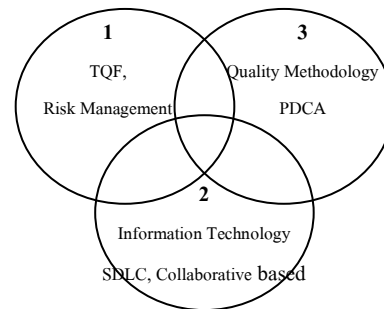


Fig. 2 The concept of developing a model of the collaborative-based recommender system for risk management under the TQF:Hed [10].

According to the concepts of QIT, we developed the conceptual framework of collaborative-based recommender system for risk management under the TQF:Hed as shown in the Fig. 3. There are 6 steps of development as follows:

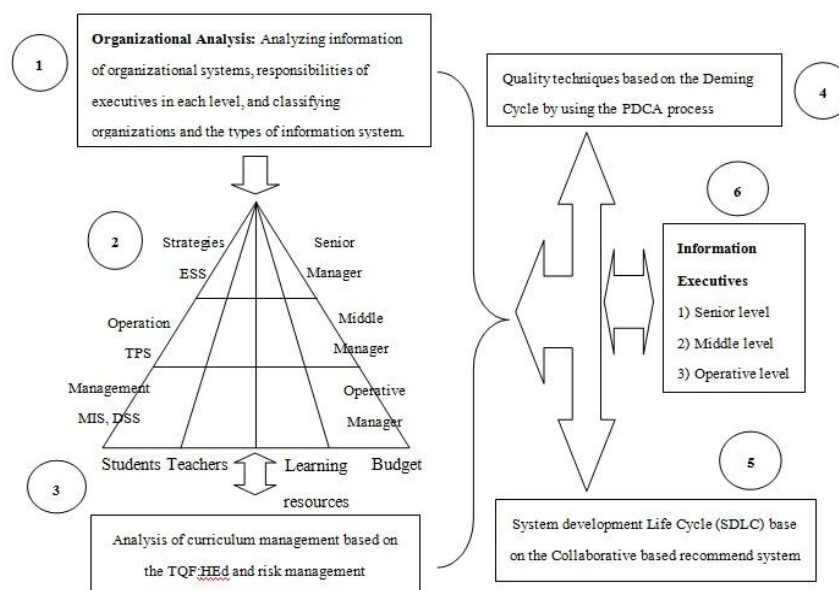


Fig. 3 The Conceptual Framework for Collaborative-Based Recommender System for Risk Management of the TQF:Hed

The 1st step: Performing organizational analysis and information analysis of the organizational system. Identifying responsibilities of the executives in each level, such as: 1) Operational Manager, 2) Middle Manager, and 3) Senior Manager. Classifying organizations and the types of information system, such as: 1) Strategic Level, 2) Management Level, and 3) Operative Level.

The 2nd step: Performing integration organizational analysis and information analysis of the organizational system, responsibilities of the executives in each level according their function and types of information system.

The 3rd step: Analyzing curriculum management according to the Thai Qualification Framework for Higher Education (TQF) and risk management.

The 4th step: Performing quality technique analysis based on the Deming Cycle by using the PDCA processes, which are Planning (P), Do (D), Check (C), and Act (A).

The 5th step: Performing system analysis based on the System Development Life Cycle (SDLC) integrated with the Collaborative-based Recommend System.

The 6th step: Performing information analysis for senior managers, middle managers, and operational managers that are already analyzed by the step 1-5.

IV. EVALUATION

The Index of Item-Objective Congruence (IOC) was used to analyze the framework evaluation from questionnaires made by 5 experts on framework development. We found that the quality of questionnaires, which is classified into most suitable, very suitable, moderate, less suitable and least suitable, is in the range of 0.8 - 1.0 as shown in the Table I.

**TABLE I
RESULTS OF EVALUATION OF THE
COLLABORATIVE-BASED RECOMMENDER
SYSTEM UNDER THE TQF:HED**

Description	\bar{x}	S.D.	Evaluation
Suitability of the concept	5.00	0.00	Most Suitable
Suitability of the tools used in the system	4.20	0.44	Very Suitable
Duty of executives matches with their level	4.60	0.54	Most Suitable
Quality of information used in the study	4.40	0.89	Very Suitable
Suitability of implementation	4.00	0.70	Very Suitable
Overall suitability of the framework	4.80	0.44	Most Suitable
Average Result	4.50	0.37	Most Suitable

V. CONCLUSIONS

The aim of this study is to develop the conceptual framework of collaborative-based recommender system for risk management under the Thai Qualification Framework for Higher Education. We conducted the 6 following steps in order to develop the framework:

1. Performing organizational analysis and information analysis of organizational systems.
2. Classifying organizations, and types of information system.
3. Performing the collaborative risk management.
4. Determining quality improvement models based on the concepts of the Deming cycles by using the PDCA processes.
5. Performing system analysis by using the System Development Life Cycle integrated with the collaborative-based recommender system.
6. Evaluating the suitability of the framework from questionnaires by using the Index of Item-Objective Congruence (IOC) made by 5 experts on framework development.

The results indicated that the conceptual framework developed in this study was the most suitable for implementation ($\bar{x} = 5.00$, S.D. = 0.00), follow by the overall suitability of the framework which has the highest suitability ($\bar{x} = 4.80$, S.D. = 0.44). In conclusion In conclusion, the framework developed in this study has the highest suitability at $\bar{x} = 4.5$, S.D. = 0.37. Therefore, we will improve the conceptual framework reported in this study for further applications.

REFERENCES

(Arranged in the order of citation in the same fashion as the case of Footnotes.)

- [1] Office of Higher Education Commission. (1999). "National Education Act B.E. 2542". <<http://www.mua.go.th/users/he-commission/doc/law/law%20edu%20%202542.pdf>>.
- [2] Chandrashekhar, H. and Bhasker, B. (2011). "Personalized Recommender System Using Entropy Based Collaborative Filtering Technique". *Journal of Electronic Commerce Research*, Vol. 12, No. 3, pp. 214-237.
- [3] Sarwar, B., Karypis, G., Konstan, J., and Riedl, J. (2010). "Item-based collaborative filtering recommendation algorithms". in *Proc. the WWW10*, pp. 285-295.
- [4] Tonary, D.B. and Widyawono, A.A. (2013). "Recommender System in Property Business a Case Study from Surabaya Indonesia". *The Third International Congress on Interdisciplinary Research and Development, Thailand*, pp. 30-31.
- [5] Jariyapoom, T. and Yensiri, C. (2011). "Adevelopment of Information Recommender for Notebook Purchasing by using Collaborative Filtering Technique and Utility Theory". *The 7th National conference on Computing and Information Technology, Thailand*.
- [6] Sumetheeprasit, J. and et al. (2013). "Professional Risk Management". Bangkok: McGraw-Hill.
- [7] Office of Internal Audit Kasetsart University. "Enterprise-wide Risk Management". (3rd Ed). Bangkok: Golden.
- [8] The Key to Lean-Plan. (2016). "Do, Check, Act". <<http://www.allaboutlean.com/pdca/>>.
- [9] Chookittikul, J. (2004). "Concepts and theories of information systems". *Information Technology Management System, Phetchaburi Rajabhat University, Phetchaburi*.
- [10] Laudon, C.K. and Laudon, J. (2006). "Management Information Systems: Managing the Digital Firm". (9th Ed). New Jersey: Pearson Prentice Hall.