Develop Knowledge Adoption and Aggregation Models for Universities

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Abstract: The Knowledge management is necessary for any organization to increase the products and services competitiveness over other organizations. The services and products quality is very depending on the ways that the employees complete their working tasks using their tacit knowledge. The explicit knowledge is the main resources to develop the tacit knowledge of employees. The main challenge of knowledge management is the difficulty of share the right explicit knowledge to right employees at right time in right context to support the employees working activities. The employees face difficulty in retrieve and pull the right knowledge from large number of sources based on their need of knowledge according to their working tasks context. The main aim of this paper is to develop knowledge adoption model to share the right knowledge to right employee at right time based on matching between the levels of explicit and tacit knowledge. Another objective is to develop knowledge aggregation model to retrieve focused parts from various explicit resources and aggregate it in one file before deliver single document to employee as final retrieving result that contain the needed parts of knowledge that could serve the working activities of employees which save the knowledge retrieving efforts and time. This research data collected supporting qualitative data collecting method using interview with four experts of knowledge management. The construction of the models development focuses on the university academic staff as tacit knowledge and the research articles as explicit knowledge sources.

Key words: Knowledge Management · Knowledge Sharing · Knowledge Retrieving · Knowledge measurement · Knowledge matching · Knowledge Aggregation

INTRODUCTION

The knowledge defined as the information insight in working environment of organizations [1]. Thus, the knowledge is deeper layer than the information and data. There are two main types of knowledge; (1) tacit knowledge which represent the stored knowledge in employees minds and applied as a skills in working environments and (2) explicit knowledge which documented as may physical forms such as books and online articles [2]. The organizations focus on develop tacit knowledge using various efficient sources to ensure accurate working activities in order to maximize the businesses profits and reduce the expenses of working mistakes [3]. The explicit knowledge considered as main source of tacit knowledge development [4]. Therefore, the employees could be retrieved useful explicit knowledge to develop their tacit skills continually. The rapid increasing of explicit knowledge sources and the dynamic changes of working environments maximize the difficulty of retrieve accurate explicit knowledge to satisfy the employees' need of knowledge based on their tacit levels [5]. The employees expense efforts and time to find the suitable explicit knowledge that matched with their levels and support their working activities [2].

The main aim of this research is to develop sharing and retrieving models based knowledge measurement in order to push useful contents of explicit knowledge that compatible with academic staff tacit level and universities strategies of teaching and researching activities.

Literature Review: Figure 1 illustrates the knowledge management conceptual framework (The outside aspects represent the knowledge enablers or successes factors of KM while the internal steps represent the effective KM processes). There are two main aspects of knowledge management which are the enablers and the processes [6,7].

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Fig. 1: Knowledge Management Conceptual Framework

Knowledge management enablers are the important factors to drive the businesses to success or failure [7]. There are four major KM success factors present. Firstly, culture or the people culture i.e. workers is important for facilitating sharing, learning and knowledge creation. Secondly, organizational objectives which plays a major role in create and manage the knowledge in the organization, therefore the organizational goal of knowledge management for competitive advantage is facilitated by the practices that leadership implements i.e. The organization failure to leverage knowledge is due to the lack of commitment of top leadership in sharing organizational knowledge. Thirdly, technology is a powerful enabler of knowledge management success. It is generally consists of databases, intranets, knowledge platforms and networks to support knowledge management. Fourthly, the measurement of knowledge

resources is a vehicle for organizations' effectiveness and competitiveness. The successful evaluation of knowledge resources enables a firm to become innovative, harmonize its efforts better, commercialize new products quickly, foresee surprises and become more responsive to market change [8,9,10].

On the other hand, KM is psychoanalysis of knowledge that is created on part of the employees who work on the current information as a departure point. KM organization basically is used for enhancing the sharing of knowledge that controls the working procedures in a firm. KM is different from other activities as it is a systematic way to identify, acquire, refine, retrieve, share and reuse the knowledge. KM is used for the development of relevant application of various types of knowledge through certain rules and protocols. Generally, knowledge management is used for ideas for different

firms like sharing of procedures and operations to sustain consistent knowledge learning. Moreover, it helps employees gain experiences and learn from past mistakes, it helps them enhance the implementation of the orient and the future tasks and helps them make efficient working decisions. Hence, the chief purpose of knowledge management is sharing the correct knowledge with the appropriate worker to enhance the competitive advantages of products and services [11, 12, 13].

Knowledge Measurement: Measurement of knowledge is the approach use to evaluate the organization knowledge resources. Knowledge measurement has direct effects on the KM implementations. [8] and [9] mentioned that knowledge measurement is the process of evaluate the knowledge resources in order to understand the power keys of the organization. The organization's strategies are changing dynamically to achieve the organization competitive advantage over others. Therefore, the knowledge resources required to improve frequently to ensure sufficient level of knowledge can achieve the organization's strategies. In order to improve the businesses outcomes, the organizations need to know the level of workers tacit knowledge and explicit knowledge levels to increase the performance of knowledge sharing [9,13, 14, 15].

The explicit knowledge level could be measured depend the organizations working strategies in order to ensure the businesses outcomes based on organizations missions and visions i.e. leadership evaluations [16, 17]. On the other hand, the employees could evaluate the explicit knowledge level based on the gained knowledge befits through many methods such as knowledge ranking or feedbacks using surveys [18, 19]. Moreover, the general characteristics of the articles sources such as the journal ranking and ages are important indicators of the articles knowledge level [18, 19, 20]

The tacit knowledge level could be measured through two main approaches that used in order to assess the tacit knowledge of employees; (i) formal assessments using fixed forms to evaluate the lecturers such as quizzes and tests and (ii) informal assessment such as observing the individuals skills through their working activities [21, 22, 23, 24] On the other hand, there are many dimensions can reflect the current levels of employees' tacit knowledge such as qualification levels and years of experiences [24, 25, 26, 27]. Table 4.3 shows the measurement methods of employees' tacit knowledge.

Knowledge Sharing: The rapid increasing of explicit knowledge sources and the dynamic changes of working environments maximize the difficulty of share accurate explicit knowledge to satisfy the employees' need of knowledge based on their tacit levels and working activities [28]. The knowledge sharing methods depend on the keywords matching i.e. search engine to pass the explicit knowledge sources for the employs. The candidates knowledge shared depend on the employee inquires using searching keywords. However, the shared explicit knowledge may not compatible with the employees tacit levels which increase the difficulty of share the right knowledge to right employee at right time [10]. Therefore it is necessary to develop additional specifications or new model of knowledge sharing to increase the matching possibility between the shared explicit knowledge level and employees' tacit level. This requires useful measurement processes (measurement enabler as main success factor of KM implementations) for both explicit and tacit knowledge levels to ensure the knowledge levels matching via sharing process.

Knowledge Retrieving: The retrieving methods are based on the processes of retrieve knowledge from warehouse that collect the knowledge from different sources i.e. explicit sources to support the people activities within specific filed [29]. The organizations are responsible about provide focused and valuable explicit knowledge for their employees through the processes of knowledge retrieving [14]. The knowledge retrieved in an abstract form - without editing or formatting - before shared to users [16]. The knowledge retrieved as list of sources i.e. list of articles. However, the employees may need specific parts of knowledge sources rather than the entire source. The main drawback of the knowledge retrieving is the efforts and time requirements to manage the retrieved knowledge sources in order to extract exact knowledge that could satisfy the employee need of knowledge [14]. Thus, it is necessary to develop a new retrieving method to retrieve parts of explicit knowledge sources based on employee needs rather than entire sources which reduce the time and efforts to find the needed knowledge.

Research Method: The construction of the proposed methods is based on the feedback from the experts in Jordanian universities. The experts were chosen based on their working experiences and the position held in Jordanian universities and who frequently access knowledge resources. The interview was conducted to identify the specifications of tacit and explicit measurement equations. Table 1 illustrates the panel profiles.

Table 1: Profiles of Expert Panel

Name	Position	Experience Years
Prof. Saleh Irshed	Vice president of Alblqaa university	30 years
Dr. Hyam Nesor	IT college member in applied science technology	8 years
Associate prof. Farid Alqwasmeh	Chairperson of business department in Jadara University	7 years
Dr. Mohammad Hijazi	Aljouf University	4 years

The Proposed Environment of Knowledge Adoption and Aggregation Models: This research focuses on the universities as main environment for the purpose of knowledge adoption and aggregation development. The activities the provided by universities such as researching and teaching activities is very important to support the industry of various domains like health, financial and engineering [30]. Both of teaching and researching activities represent the main services that provided by universities employees. Mostly, the teaching and researching activities are accomplished by academic staff in universities. Therefore, the knowledge adoption and aggregation development is focused on the tacit knowledge development of academic staff in universities. On the other hand, the articles are the most important explicit knowledge source that used to support the academic staff teaching and researching activities [31]. Thus, the articles represent the explicit knowledge sources for the purpose of knowledge adoption and aggregation development.

Development of Knowledge Adoption and Aggregation Models: This research focuses on two main processes of KM which are the knowledge retrieving and sharing based on knowledge measurement enabler.

Knowledge Adoption Model (KADM): The knowledge adoption can be defined as the adaptive sharing of articles sources for academic staff based on the matching between articles knowledgably levels and academic staff tacit knowledgeably levels. The main questions here are how to evaluate or measure the knowledge levels of articles and academic staff? And how to share the articles for academic staff depend on these measurements i.e. adaptive sharing?.

As mentioned in research Method section, the construction of the proposed KADM is based on the feedback from the experts in knowledge management filed. The interview was conducted to identify the specifications i.e. variables and formulas of explicit knowledge level of articles (MOU1) and tacit knowledge level measurement of academic staff (MOU2).

Development of Articles Knowledge Levels Measurement Module (MOU1): The results of the interview that designed based on the analyzed measurement directions of explicit knowledge levels are as the following:

First of all, the experts confirm that the articles considered as the main explicit sources to support the academic staff researching and teaching activities in the university working environment.

Secondly, the articles could be measured using three variables; (1) manger ranking: articles knowledgeably levels could be evaluated by universities mangers such as chairpersons, deans, or professional knowledge workers based on the compatibility between articles contents and businesses strategies. (2) Employees' ranking as institutive measurement method: the employees' can evaluate of the gained value from articles through rank the knowledgably level. The feedback depend on ranking variable is useful due to short required time that needed for evaluation and (3) Other important variables are journal ranking and publishing ages as articles general characteristics. However, these variables can be ensured through the knowledge acquiring and storing processes. The Scopus and ISI is useful journal ranking for teaching and researching activities and the publishing age of article should be less than 5 years.

Thirdly, the managers could be ranked the articles based on scale values from 2-10 (2 is the minimum value) based on the compatibility between their working and explicit knowledge contents. On the other hand, the employees could be ranked the retrieved explicit knowledge based on scale values from 2-10 (2 is the minimum value) based on the gained benefits of the explicit knowledge.

Fourthly, the managers have more expertise of articles evaluations than the employees due to clear vision of universities strategies of researching and teaching activities. Thus, the manager ranking is more important than the employees ranking. The given importance coefficient of manager ranking is around 0.6 comparing with 0.4 as importance coefficient for employees ranking.

Fifthly, the following Equation could be useful to calculate the overall measurement variables of articles knowledgably level:
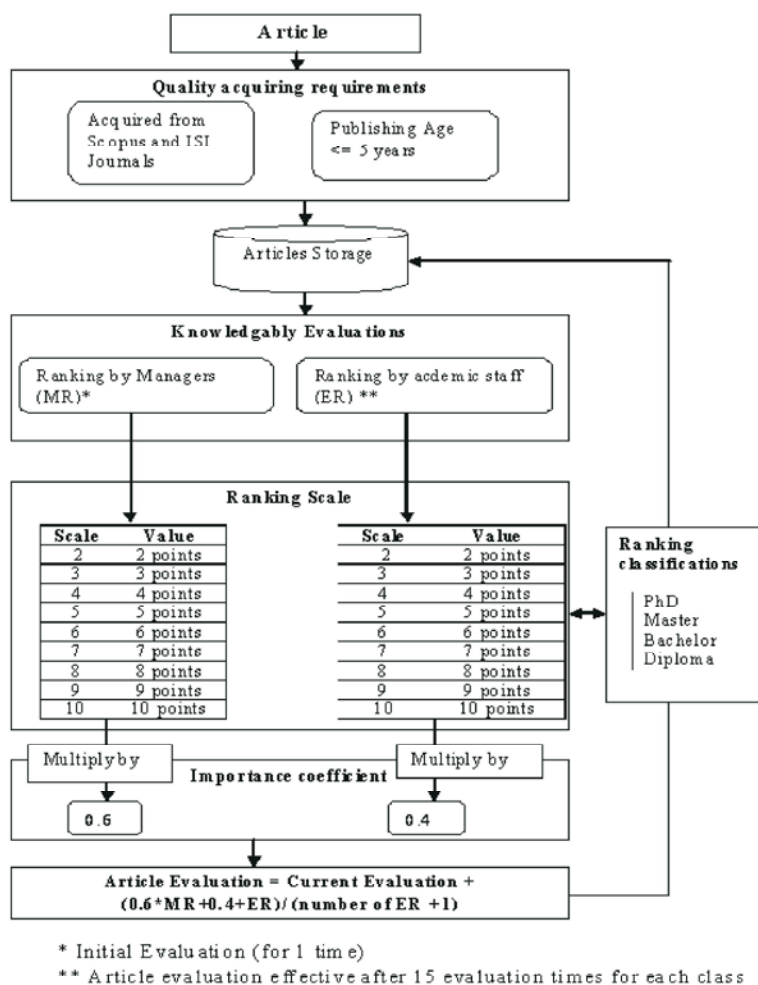
Fig. 2: Measurement of Articles Knowledge Level (MOU1)

*Articles knowledgably Level = ime*ER+ imm* MR*

where, ER: employees ranking, MR: managers ranking. 2<ER<=10, 2<MR<=10. ime is the importance coefficient of the employees evaluations of artivles knowledge levels. imm is the importance coefficient of the managers evaluations of articles knowledge levels.

Lastly, for better evaluation of articles the managers could be evaluate the articles knowledgeably as initial evaluation for one time and the articles evaluation could be effective after 15 employees' ranking. The managers have not free time to evaluate the same article continually and the articles evaluation based on small number of employees' ranking will be not effective.

Figure 2 illustrates the measurement module tasks of articles knowledgeably levels. There are two important conditions to ensure the quality of acquired and stored articles; (1) the articles should belong to high ranking journal i.e. ISI or Scopus and (2) the article age must 5 years of less. The managers i.e. knowledge experts can evaluate the stored articles for one time as initial time and the academic staff can evaluate the articles frequently. To better evaluation the articles knowledgeably evaluations will activated after 15 academic staff evaluations. However, the managers and employees evaluations of articles are classified based on the academic staff qualification levels. Thus, each manager evaluate the articles according to their knowledgeably for PhD, Master, Bachelor and diploma classes. On the other hand, the employee evaluation who qualified as PhD level will be counted as PhD class evaluation separately of other evaluation classes such as master and diploma. Consequently, each article evaluation will be active for PhD employees after 15 evaluations from the employees who qualified as PhD level plus 1 evaluation come from the managers and so on for other qualification classes.

The managers and academic staff can evaluate the articles knowledgeably using ranking scale from 2-10 (2 is the minimum scale) and each scale has specific evaluation value. The importance of manager evaluation assigned to 0.6 as importance coefficient comparing with 0.4 as importance coefficient for employees evaluation. Therefore, the overall evaluation of the article knowledgably level can be calculated using the following formula:

Article Evaluation = CE + (0.6*MR+0.4+ER)/ (number of ER +1)

where, CE is the current stored evaluation level of the article, MR is the manger ranking, ER is the employee ranking. The overall all evaluations divided on the number of the employees of the same qualification class that evaluate the articles plus 1 (the manager initial ranking) in order to ensure that the overall evaluation of article is between 2-10 for the purpose of knowledge adoption sharing depend on the academic staff tacit evaluation level (the tacit evaluation results also will be between 2-10 scale).

Development of Academic Staff Knowledge levels Measurement Module (MOU2): The results of the interview that designed based on the analyzed measurement directions of tacit knowledge levels are as the following:

First of all, the experts confirm that the academic staffs are the main workers that responsible about the researching and teaching activities in the universities.

Secondly, Based on the gathering data of expert panel the tacit knowledge of employees could be measured using three responsible variables which are:

- Academic staff characteristics: the qualification levels such as PhD and master reflect the variance of tacit knowledge levels qualification levels. The employees should develop projects and research to upgrade their qualification levels which enhance their levels of tacit knowledge. On the other hand, the experience years are another important variable that belong to academic staff characteristics. The employees could be developed their tacit levels based on the gained value of their working experience.
- Supervisor assessment: The employees' supervisor or manager assessment is useful informal measurement method to evaluate the academic staff based on their working performance.

Table 2: Experience year specifications

Experience years	Scaled value
<2 years	2
2-4 years	4
5-7 years	7
>7 years	10

Importance coefficient = 0.2

Table 3: Qualification level specifications

Qualification level	Scaled Value
Prof	10
Assoc Prof	9
Assist Prof	8
Master (instructor)	6
Master (Assist teacher)	5
Bachelor	3
Diploma	2

Importance coefficient = 0.2

Table 4: Assessment using quiz specifications

Assessment level	Scaled Value
0-2 points	2
3-5 points	4
6-8 points	7
9-10 points	10

Importance coefficient = 0.4

Table 5: Observing Assessment specifications

Observing level	Scaled Value
1-2 points	2
3 points	3
4 points	4
5 points	5
6 points	6
7 points	7
8 points	8
9 points	9
10 points	10

Importance coefficient = 0.2

- Assessment based quiz: The tacit knowledge of employees can be evaluated using formal assessment approach. The quiz is the most suitable method for this purpose due to short time that required completing it.

Thirdly, the experience years could be classified as many classes and each class assigned to scaled value. The importance coefficient is the importance of experience year's variable to measure the tacit knowledge comparing with other variables such as qualification levels and assessment. Table 2 presents the findings of experience year specifications.

On the other hand, the qualification level could be classified as many classes and each class assigned to value. The importance coefficient is the importance of qualification level variable to measure the tacit knowledge comparing with other variables such as experience year and assessment. Table 3 presents the findings of qualification level specifications.

Moreover, the assessment level using quiz can be classified as many classes and each class assigned to value. The importance coefficient is the importance of assessment level variable to measure the tacit knowledge comparing with other variables such as experience year. Table 4 shows the assessment level specifications.

Additionally, the observing level can be classified as many classes and each class assigned to value. The importance coefficient is the importance of observing level variable to measure the tacit knowledge comparing with other variables such as experience year. Table 5 shows the specifications of observing level.

Finally, the experts' responses show that the following equation is useful to calculate the Overall variables of tacit level of academic staff in universities:

Academic staff tacit level = 0.2*EY + 0.2*QL+ 0.2*OL+ 0.4*AL

where EY: Experience year, QL: Qualification Level, OL: observing level, Al: Assessment level.

Figure 3 shows that the tacit knowledgably levels of academic staff can be evaluated using four variables; (1) experience years of employee, (2) qualification levels of employees, (3) observing assessments that provided by supervisors based on employees working performance and (4) the assessments using quiz after share the articles for employees. Each measurement variable of tacit knowledgably levels will be evaluated using ranking scale from 2-10 (2 is the minimum scale) and each scale has specific evaluation value. The importance of assessment using quiz variable assigned to 0.4 as importance coefficient comparing with 0.2 as importance coefficient for qualification level, experience of years and observing assessments respectively. Therefore, the overall evaluation of the article knowledgably level can be calculated using the following formula:

Tacit Knowledgably Evaluation = A+B+C+D

where, A is the qualification level evaluation, B is the experience of years evaluation, C is the observing

assessment evaluation and D is the evaluation of assessment using quiz. Thus, the overall employee tacit evaluation result will be between 2-10 scales (same scale of articles evaluation).

Adaptive Sharing Based MOU1 and MOU2: The benefits of explicit knowledge measured through the extent of the actual enrichment that is a result of enhancing the tacit knowledge [25, 26, 27]. Thus, the explicit knowledge could be shared adaptively depend on the measurement processes of MOU1 and MOU2.

The expert responses show that the measurement variables of articles and academic staff knowledgeably levels are strongly interrelated. Thus, the adaptive sharing based on the matching between the articles evaluation and academic staff evaluation could be addressed usefully through the interrelationships between MOU1 and MOU2 processes.. The main interrelationships are as the following:

- The Observing assessment and assessment using quiz (MOU2) reflect how much the academic staff earn knowledge value from articles as tacit knowledge. Therefore, the articles sources will be evaluated depend on the happen enhancements on tacit knowledge levels. On the other hand, the feedbacks from employees i.e. employees evaluation variable (MOU1) is depending on the matching between the explicit knowledge levels of articles with the employees needs of knowledge. In other words, both MOU1 and MOU2 measurement processes are depending on each other.
- The assessment using quiz of tacit knowledge (MOU2) reflects the gained benefits from the shared explicit sources. Therefore, this method could be adopted to support the explicit sources measurement using feedback evaluation from employees (MOU1).
- The evaluation of explicit knowledge sources based on the compatibility with organizations strategies (MOU1) could be accomplished based on the characteristics of the employees. The employees' characteristics are one from the main methods of tacit knowledge measurement (MOU2).
- The explicit knowledge sources using the sources characteristics i.3 article ranking and publishing age (MOU1) supporting the compatibility with organizations strategies depend on the characteristics of employees tacit knowledge characteristics (MOU2).
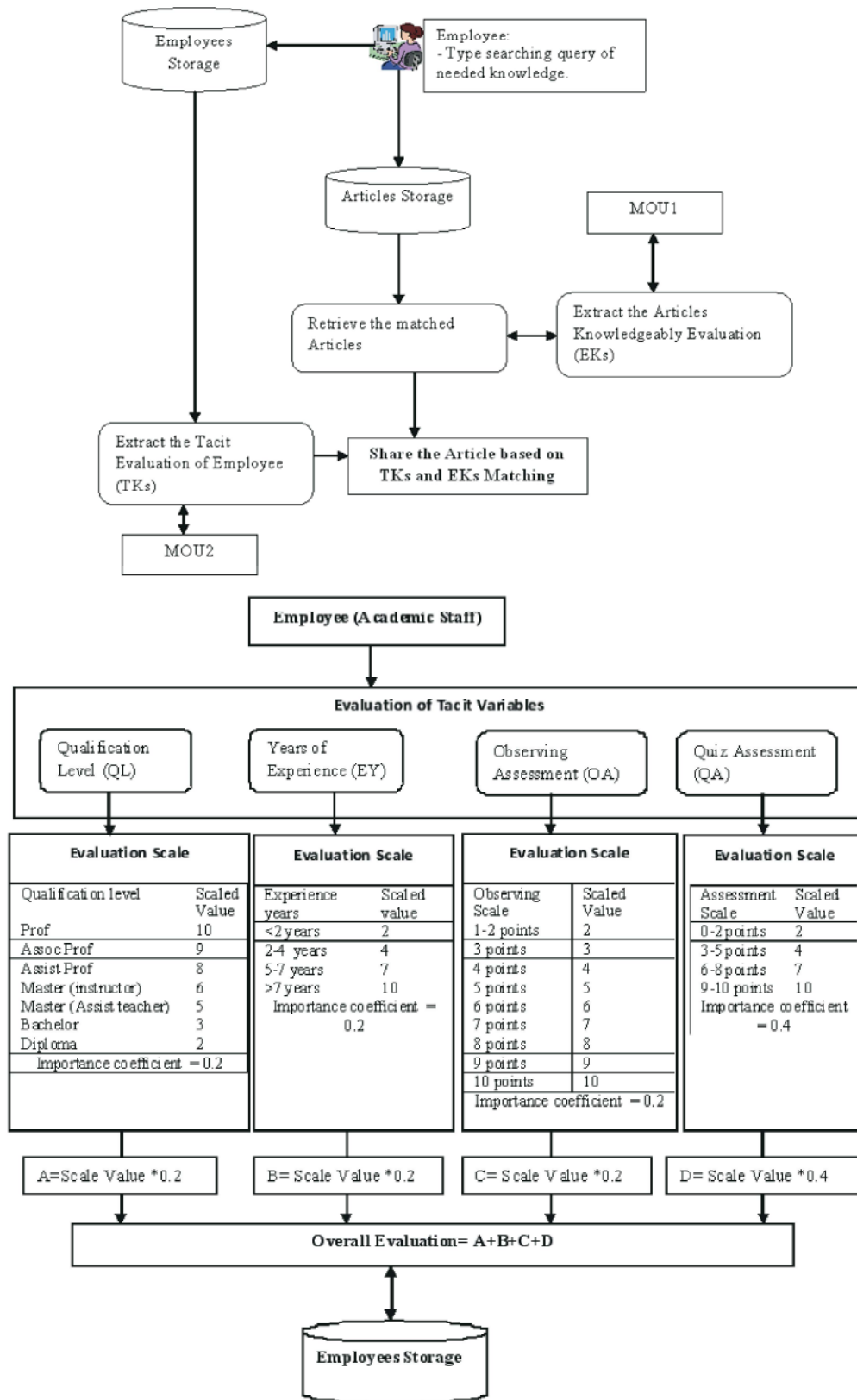
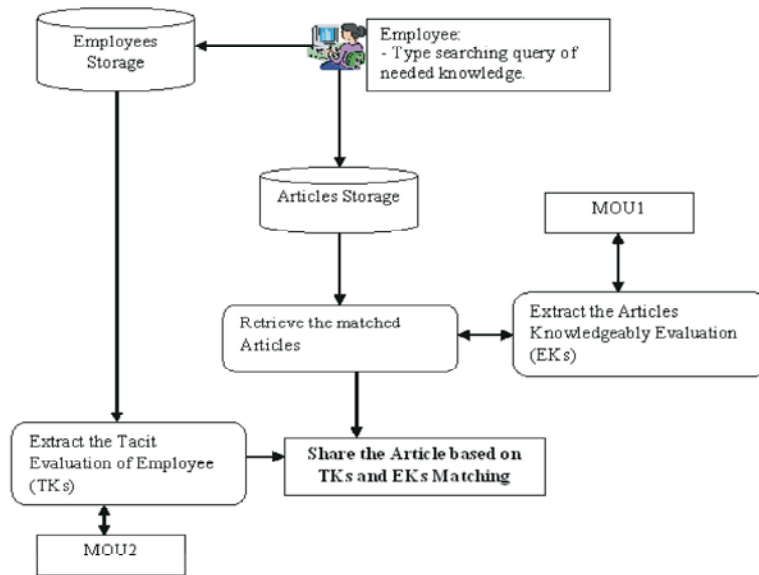Fig. 3: Academic Staff Knowledge Level Measurement (MOU2)

Fig. 4: Adaptive Knowledge Sharing based MOU1 and MOU2

Consequently, the experts argued that the he articles could be shared adaptively based on the matching level between the explicit and tacit evaluation levels if |TKs – EKs| = X, where TKs is the academic staff evaluation level, EKs is the articles evaluation level. The experts mentioned that the X value could be around 0.1 in order to share the articles adaptively depend on accurate matching between knowledge levels.

In the same context, the expert panel argued that the qualification levels is the main variance variable of researching and teaching activities that accomplished by the academic staff. For better evaluation of articles knowledgably levels the evaluation should be categorized based on the academic staff qualifications. Thus, each PhD, master, bachelor and diploma employees have their own ranking of articles to ensure the efficiency of knowledge levels matching. For example, the same article may be ranked as 10 from PhD employees and 5 from diploma employees. On the other hand, the managers' evaluation can be categorized based on the compatibility between explicit contents and employees qualification levels. Thus, each category of PhD, master, bachelor and diploma employees have their own ranking of explicit knowledge to ensure the efficiency of knowledge levels matching. For example, the same article may be ranked as 8 for master employees and 5 for bachelor employees.

Figure 4 illustrates the proposed KADM for the purpose of adaptive knowledge sharing based on the matching between articles and academic staff knowledgeably levels using MOU1 and MOU2

respectively. Once the employee type his/her searching query of the needed knowledge the tacit evaluation level of this employee will be extracted from the employees' storage. The articles that match with the employees' queries will be retrieved with its own evaluation levels. Thus, the articles evaluation levels that match with academic tacit level will be shared for employee. The article considered as matched source if the difference between its evaluation level and employee tacit evaluation level is small i.e. 0.1.

Knowledge Aggregation Model: The knowledge aggregation can be defined as aggregate specific parts of various articles in one document based on the academic staff needs of knowledge. The main questions here are how to categorize the article as many specific parts? And how to manage the knowledge aggregation according to articles categories or parts?

As mentioned in research method section, the construction of the proposed KAGM is based on the feedback from the experts in knowledge management filed. The interview was conducted to identify the specifications and variables KAGM.

The experts' panel responses confirm that to best knowledge of the authors, knowledge retrieving Knowledge should satisfy the individual's needs at a particular time and context. Consequently, they strongly agree that the main idea of the KAGM is useful to generate more specific knowledge by combining the retrieval parts knowledge from diverse sources in one document.
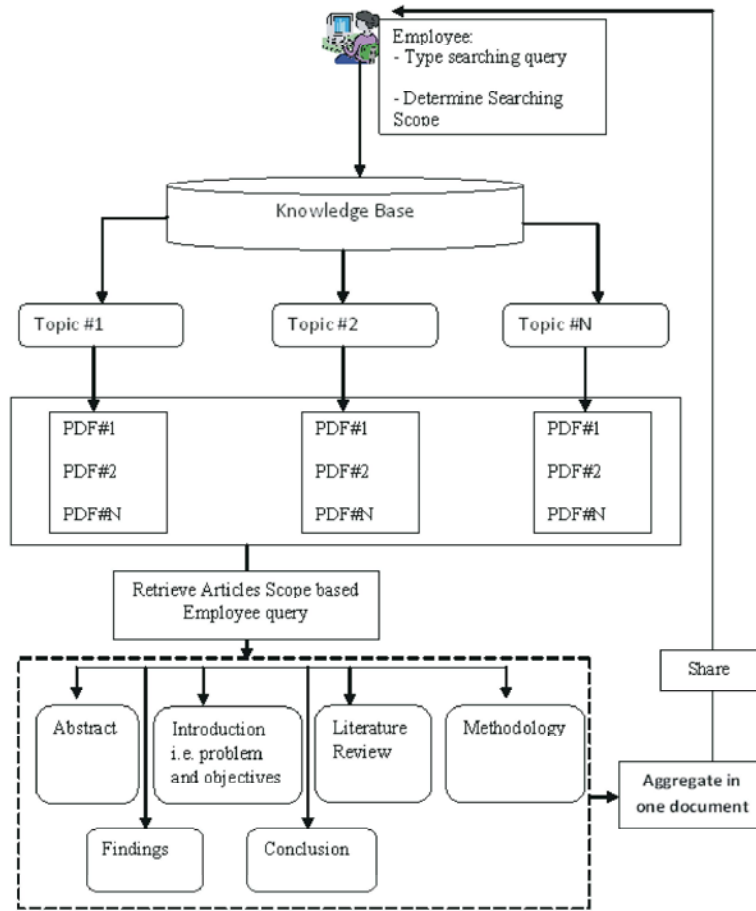
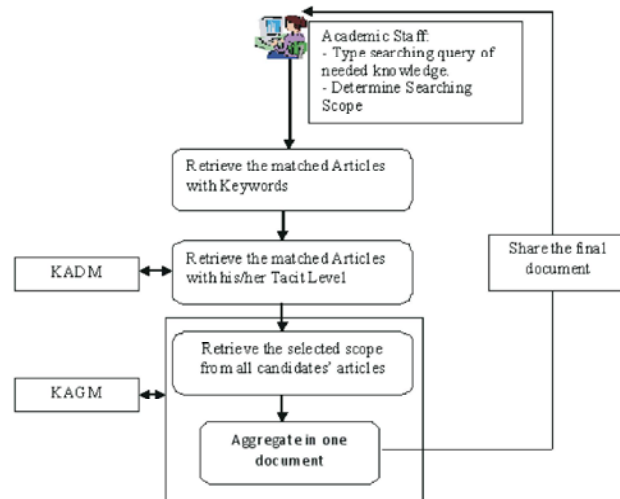Fig. 5: Knowledge Aggregation Model (KAGM)

Fig. 6: Interrelation between KADM and KAGM

On the other hand, the experts agreeing that the retrieved knowledge can be selected based on articles parts classification that already categorized in storage.

The suitable classification of article as many parts namely; introduction (problem statement and objectives), literature review, methodology, findings and conclusion.

Moreover, the articles could be classified according to its contents matching with the teaching and researching fields such as IT, Mathematic and health fields in order to increase the management performance of the retrieving processes i.e. retrieving time. The most suitable form of the articles is PDF extension due to ability of review the articles contents in simple and structure format based PDF files. Additionally, the aggregation is reliable idea to retrieve specific parts i.e. literature review from various articles according to academic staff needs of knowledge.

Figure 5 presents the overall directions of the proposed KAGM. The articles in knowledgebase categorized as many topics based on university teaching and researching fields i.e. IT files. Each topic in knowledgebase consists of many articles of PDF extension. The academic staff type his/her searching query and identify the needed searching scope that prefers to retrieve from articles i.e. problem statement or objectives. All matched articles with searching Keywords could be retrieved. The scope the selected by academic staff using their quires aggregated from all candidates articles in one file. The final single document that contains the aggregated parts will share to the academic staff.

Relation between Knowledge Adoption and Aggregation Models: Figure 6 clarifies the interrelationship between the proposed KADM and KAGM that discussed in the previous two sections. The articles that match with employee tacit level and searching query will be retrieved as explained in KADM. Nevertheless, the articles will not be shared directly after the knowledge adoption processes. The aggregation model will handle the matched articles and aggregate the searching scope (introduction, literature review, methodology, findings, or conclusion) that identified through employee query in one file before share the final document to employee. Thus, the employee will pull one documents that include the needed parts from all articles that match with the searching keywords, scope and his/her tacit level.

CONCLUSION

In this research we discuss the development of knowledge adoption and aggregation models. The main standpoint of the development is depending on the relation between the knowledge measurement enabler and knowledge retrieving and sharing processes. Thus the processes of knowledge retrieving and sharing are conducted based on evaluation of knowledge resources either the explicit and tacit resources. The explicit knowledge levels evaluated based on three main variables which are the knowledge quality indicators, employees' ranking and managers' ranking. The tacit knowledge levels evaluated based on 4 main variables which are qualification level, experience years, supervisor observing assessment and assessment using quiz. The sharing of the knowledge is depending on the matching levels of tacit and explicit resources. On the other hand, the knowledge is retrieved through aggregate specific parts from various explicit knowledge sources in one file. The adaptive sharing based knowledge levels matching and the knowledge retraining based aggregation approach could offer many advantages of KM such as reduce the efforts and time of knowledge searching and retrieving, share the knowledge in the context of working environments and share the right knowledge to right employee at right time.

In the future, the proposed Knowledge adoption and aggregation models could be prototyped to clarify the expected benefits of these models for the universities working environment.

REFERENCES

1. Maryam Alavi and Dorothy E. Leidner, 2001. Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues, MIS Quarterly, 25(1): 107-136.

2. Adolph, B., 2005. Learning how to do things differently: Challenges in sharing tacit knowledge for agricultural and rural development (with examples from India and Namibia). In Symposium on Learning Alliances for scaling up innovative approaches in the water and sanitation sector, 7-9 June 2005, Delft, the Netherlands IRC International Water and Sanitation Centre, pp: 1-10.

3. Bollinger, A.S. and R.D. Smith, 2001. Managing organizational knowledge as a strategic asset, Journal of Knowledge Management, 5(1): 8-18.

4. Debowski, S., 2006. Knowledge Management, John Wiley & Sons, Milton, Queensland, Australia.

5. Hana, U., 2013. Competitive advantage achievement through innovation and knowledge, Journal of Competitiveness, 5(1): 82-96.

6. Earl, M., 2001. Knowledge management strategies: toward a taxonomy, Journal of Management Information Systems, 18(1): 215-34.

7. Lee, H. and B. Choi, 2003. Knowledge management enablers, processes and organizational performance: An integrative view and empirical examination. Journal of Management Information Systems, 20(1): 179-228.

8. Mathi, K., 2004. Key success factors for knowledge management. University of Applied Sciences, Offenburg, thesis, Master of Business Administration in International Business Management and Consulting.

9. Monavvarian, A. and Z. Khamda, 2010. Towards successful knowledge management: people development approach. Business Strategy Series, 11(1): 20-42.

10. Yaghoubi, N.M. and N. Maleki, 2012.Critical Success Factors of Knowledge Management.

11. Demarest, M., 1997. Understanding Knowledge Management. Long Range Planning, 30(3): 374-384.

12. Nonaka, I. and H. Takeuchi, 1995. The Knowledge Creating Company, New York, Oxford University Press,

13. Wiig, K., 1995. Knowledge Management Methods, Schema Press.

14. Warwick, C., R. Siemens and S. Ruecker, 2009. and the INKE team, New Knowledge Environments, ACM 17th Conference on Information and Knowledge Management, New York.

15. Al-oqaily, A.T., Z.B. Hassan, A.M. Rashid and Z.A. Al-sulami, 2014. Success Factors of Knowledge Management in Universities (A Case Study: Jordanian Private Universities). Middle-East Journal of Scientific Research, 22(7): 994-1002.

16. Wu, S., 2103. A model for assessing the quality of Gene Ontology, iConference 2013 Proceedings, pp: 953-956.

17. Al-oqaily, A.L.I., Z.B. Hassan, N.A. Ali and Z.A. AL-sulami, 2015. Proposed Models of Adaptive Knowledge Aggregator. Journal of Theoretical & Applied Information Technology, 72(1).

18. OECD, 2013. New Sources of Growth: Knowledge-based Capital – Key Analyses and Policy Conclusions, Synthesis Report.

19. AACSB, 2012. Impact of ResearchTask Force, Final Report of the AACSB International, South Harbour Island Boulevard.USA.

20. Huang, K., Y. Lee and R. Wang, 1999. Quality information and knowledge", Upper Saddle River, N.J.: Prentice Hall.

21. European Commission, 2013. Analysis and mapping of innovative teaching and learning for all through new Technologies and Open Educational Resources in Europe", Brussels, 25.9.2013 SWD(2013), 341.

22. Garcia-Perez, A. and A. Mitra, 2008. Tacit knowledge elicitation and measurement in research organisations: a methodological approach.

23. Hoffman, J.J., M.L. Hoelscher and K. Sherif, 2005. Social capital, knowledge management and sustained superior performance. Journal of Knowledge Management, 9(3): 93-100.

24. Al-oqaily, A.L.I., Z.B. Hassan, A.A.H. Al-dala'ien and A.M. Rashid, 2015. Develop Practical Methods of Knowledge Measurement in Universities, Journal of Theoretical & Applied Information Technology, 73(2).

25. Robert S., 2013. Parametric Explicit Knowledge Mapping in a Learning Environment, Management and learning international conference 2013. Zadar, Croatia.

26. Ko, R.K., S.S. Lee and E. Wah Lee, 2009. Business process management (BPM) standards: a survey. Business Process Management J., 15(5): 744-791.

27. Busch, P.A., D. Richards and C.N. Dampney, 2001. Visual mapping of articulable tacit knowledge. In Proceedings of the 2001 Asia-Pacific symposium on Information visualisation-. Australian Computer Society, Inc., 9: 37-47.

28. Hana, U., 2013. Competitive advantage achievement through innovation and knowledge. Journal of Competitiveness, 5(1): 82-96.

29. Malet, G., F. Munoz, R. Appleyard and W. Hersh, 1999. A model for enhancing Internet medical document retrieval with, medical core metadata, Journal of the American Medical Informatics Association, 6(2): 163-172.

30. Mollett, A., D. Moran and P. Dunleavy, 2011. Using Twitter in University Research, Teaching and Impact Activities.

31. Ellis, R., 2004. The definition and measurement of L2 explicit knowledge. Language Learning, 54(2): 227-275.