Towards a Template-Driven Approach to Documenting Teaching Practices

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Abstract. An attractive approach to sharing knowledge in Higher Education Institutions (HEIs) is offered by Best Teaching Practices (BTPs), which results from the accumulation of academics' experiences gained through years of teaching. Many universities still struggle in documenting, sharing and applying the knowledge gained by instructors. Low quality BTP documentation can deter the successful implementation of teaching expertise, and this can affect instructors' teaching performance and may result in lower levels of learner achievement than could otherwise be achieved. In order to address this issue, this paper proposes a comprehensive and practical Computer-based Teaching Practices Management System (TPMS) for supporting the capturing of instructors' BTPs. A design science research methodology was adopted in order to understand how instructors share their knowledge, and in order to map instructors' behavior to system features. A mixed-methods evaluation of the users' experiences of using the system has shown that the instructors were satisfied with the BTP Document Template (a key element of the TPMS) and were mostly positive about its attributes. The results of this evaluation were promising but also highlighted some drawbacks of the system.

Keywords: Design science · Knowledge sharing · Knowledge management system · Higher education institutions · Best practices · User experience

1 Introduction and Related Work

According to knowledge-based theory [1], knowledge is considered as the most strategically significant asset and a significant determinant of competitive advantage and organizational goal achievement. In today's knowledge-based economy, Knowledge Management (KM) plays a vital role in any organization by facilitating the capture, storage, sharing and dissemination of knowledge [2]. While KM has been implemented in a large number of sectors and organizations [3], universities and the higher education sector are yet to take full advantage of the capabilities offered by KM. Rowley [4] believes that HEIs are part of the knowledge business, since they are involved in knowledge creation, dissemination and learning. Therefore, they need to adopt a proactive approach to KM to enhance the sharing of teaching experience amongst academics.

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In conducting this research, we have focused on best teaching practices (BTPs) that develop instructor capabilities and improve overall learning in higher education environments. In the context of this study, BTPs can be defined as representing the knowledge related to the delivery of curricula that has resulted from the accumulation of academics' experience gained through years of teaching. Managing BTPs has the capacity to facilitate access to published knowledge sources within the academic community, improve overall teaching quality, enhance the academics' professional development efforts, and assist in the spread of best practice [5, 6]. The knowledge represented by BTPs is not transmitted directly to learners, but is inherent in the methods and skills used for delivering content knowledge to students, including pedagogical methods, problem-solving abilities, and appropriate uses of available technologies.

BTPs can offer many benefits; however, there remains a risk that universities may fail in terms of the BTPs sharing process [7]. An instructor's daily routine is typically a very busy one due to their involvement in teaching and administrative responsibilities which often take priority over their professional development activities. Therefore, it is essential to create and provide an appropriate environment and technical conditions whereby instructors can create, transfer, share and then apply knowledge effectively [8]. This should include improving and managing the existing BTP knowledge of university instructors.

Therefore, the focus of this paper is to design and demonstrate a Teaching Practices Management System (TPMS) which supports the capturing of BTPs. The system will employ a Best Teaching Practice Document Template, the structure of which has been designed based on instructors' expressed requirements for describing BTPs in a detailed and systematic way. Its structure is that of a set of pre-specified attribute fields which act as a form of guidance when creating the BTP. The system can help users to capture and navigate BTP descriptions very easily. The system can also save employees' time and effort when retrieving and reading BTP documents - because of the clear structure organizing the knowledge content.

2 Research Approach

Since the primary goal of our research is to derive appropriate design features for a web-based system that will enhance the documentation of BTPs among university instructors, design science is deemed suitable in this case [9]. The research process which was involved in the design and evaluation of the TPMS is depicted in Fig. 1; this shows the three methods that were used for gathering the data required to meet the needs of the present study.

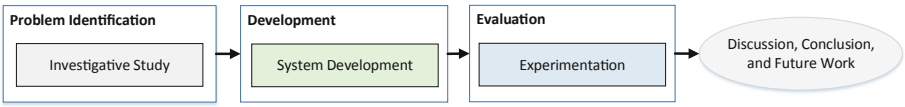

Fig. 1. Research approach

3 Problem Identification

An investigative study was conducted by the first author [10] with instructors working in universities to help explore academics' requirements for a new knowledge capture tool. The interviews were conducted with 22 academics (five heads of department, five assistant professors, eight lecturers and four teaching assistants) who work in Saudi universities. These participants worked in various faculties and disciplines, but they represented a homogeneous participant group in that all of them were academics. The findings from the interviews were used to develop the following functional requirements of the new knowledge-capturing tool.

Functional Requirement 1: The system will enable users to document and express their BTPs in an easy and convenient manner.

The user should be able to use the template easily in order to achieve their particular goals. A clear documentation structure will organize the information available about a BTP into a Best Teaching Practice Document (BTPD) that is easy to use [11].

Functional Requirement 2: The system will enable users to document their BTPs in an understandable format.

The Best Teaching Practice Document (BTPD) will be capable of being used to record a complete, clear and consistent set of BTP attributes. The complete, clear and consistent documentation of a BTP is vital in order that people will be able to apply it successfully [12].

4 Design and Development of the BTP Document Template

In order to design the structure of BTP Document Template that ensures the recording of a complete, clear and consistent BTP, a set of pre-specified attribute fields which act as a form of guidance when creating the BTP needs to be identified. The process which was followed in order to design the BTP Document Template structure is outlined below.

The *first* step was to study the results of the literature review, which focused on examining best practice documentation and the attributes of such. The first author's experience as an instructor working in a university formed the basis of the "own experience" input. In addition, the results from the investigative study – whose participants were instructors who work in universities – also informed the design of the BTP Document Template.

The *second* step was to design a medium-fidelity prototype of the BTP Document Template using Balsamiq 11 (a computer-based prototyping tool) based on the functional requirements presented in Sect. 3.

The *third* step was to refine the tentative BTP Document Template by conducting a workshop with four expert academics who work in Saudi universities. The participants were purposefully selected with various roles from the Computer Science Department who have academic experience for more than ten years. The researcher walked through the mockups to present the different features of the design to one academic expert (professor) at a time. The experts were asked to evaluate and refine the template and

comment as this was underway. Then, in an open discussion, each participant was asked to provide feedback on the refined mockups, and based on their input, attributes were added, deleted or amended.

The modifications based on the outcomes of the experts' feedback were addressed and coded into the implementation of a high-fidelity prototype.

The completed BTP Document Template which emerged from this process is structured around 14 attributes, as shown in Table 1.

Table 1. BTP document template attributes

Component	Attribute	Description
Knowledge description	Title	The name of the BTP as given by its creator
	Keywords	Tags describing the BTP topic
	BTP type	Classification of the BTP by its application (e.g., teaching experience, lessons learned, teaching material)
	Applies in	Where to apply BTP (e.g., lecture, lab, and seminar)
	Area	The specific purpose of the BTP (e.g., formative assessment, summative assessment, pedagogy knowledge, content knowledge)
	Description	Textual description of the BTP's content
	Outcome	The main outcomes which can be expected from applying the BTP
Course information	Discipline	The branch of knowledge to which the BTP belongs (e.g., computer science, engineering, mathematics)
	Course name	The name of the course that includes the BTP's topic
	Level of course	Study level of course that includes the BTP's topic
Technical information	Attachment	Related file/s (e.g., MS word, PowerPoint, PDF)
	Media format	Data type of the learning object (image, audio, video)
	Rights	Terms of use of the KO
	Contributor	Person responsible for contributing the content

5 Evaluation

The evaluation of the proposed BTP Document Template was carried out based on a field experimental design involving the assistance of 30 participant academics from the Department of Computer Science at the University of Princess Nourah in Saudi Arabia. The participant academics were asked to use the system for the duration of an experiment which was conducted during Semester 1 of the 2019/2020 academic year. Following the recommendations made by [13], it was hypothesized that the system would satisfy the participants' needs in this context and motivate them to capture their BTP effectively through the BTP Document Template.

5.1 Participants Demographics

Of the 30 registered participants who took part in the experiment, 80% (n = 24) were female, while only 20% (n = 6) were male. The age of participants ranged from 25–60 years at the time of recruitment. In terms of the level of academic rank, half of the respondents (50%) were Lecturers, while the third were working as Assistant Teachers. The rest were Professor, Associate Professor, and Assistant Professor, with 3%, 7% and 10% respectively. Half of the respondents had 2–5 years' experience teaching in the university, 27% had 6–10 years' experience, while 17% had work experience for more than 10 years.

These results indicate that both male and female academics whom their experience range between novice and experts were involved in the evaluation process to effectively evaluate both sides of the needs and interaction, and ensure the obtaining of accurate and comprehensive results for this study.

5.2 Usage Data

After tracking the users' actions, it emerged that all the academics (100% of the sample) registered to use the system, indicating that all the recruited academics were interested in testing the new system. All these academics logged onto the system at least once during the experiment. The number of users logging onto the system increased gradually after the first week of the experimental period. The right line chart in Fig. 2 represents the number of academics who accessed the system. Using click-stream data, we were able to observe that the number of users increased steadily from the start until it reached a peak (of 66 clicks). This continuous accessing of the system indicates that the BTP Document Template was indeed considered to be useful.

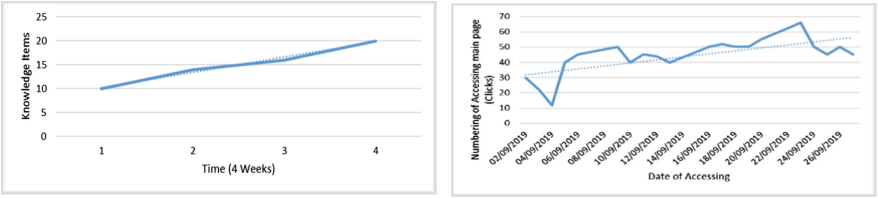

Fig. 2. Posting behavior pattern against time/number of academics accessing TPMS

Furthermore, in the course of the evaluation period, a Pearson Time-knowledge Correlation Coefficient was computed to assess the relationship between the amount of knowledge items posted and the experiment period by weeks. It can be seen from Table 2 that there was a strong positive correlation between the two variables, r = .992, n = 4, p = .000.

The left line chart in Fig. 2 shows the number of knowledge items posted during the experiment period. It is noticeable that the number of knowledge items posted in the system was continuously increasing throughout the experiment period, which indicates

that participants were actively engaged in knowledge capturing. This continuous increment during the study can be referred to the positive impact of using TPMS for capturing teaching practices.

Table 2. BTP document template attributes

		Knowledge items	Time (Weeks)
Knowledge items	Correlation Coefficient	1.000	.992**
	Sig. (2-tailed)	.	.000
Time (Weeks)	Correlation Coefficient	.992**	1.000
	Sig. (2-tailed)	.000	.

**. Correlation is significant at the 0.01 level (2-tailed).

Additionally, a professor who had prior experience teaching computer science courses and was not aware of the research design and hypotheses, served as an independent rater, and was asked to rate the overall quality of knowledge shared. Quality referred to the usefulness of the knowledge shared in terms of the degree of completeness, clarity and consistency. Of the 60 knowledge items taken via the system, 48 were labelled by the expert rater as representing useful or very useful information, which represents a percentage of 80%.

5.3 Interviews

At the end of the experiment, 25 interview sessions were conducted (with the same academics who had actually logged onto the system in the course of the experiment). This was in order to provide qualitative feedback so that it could be assessed whether or not the artifact addressed the practical problem and fulfilled its stated objectives. The questions were primarily concerned with the benefits and drawbacks of the BTP Document Template as well as with asking for suggestions regarding possible additions, removals and modifications relating to the BTP attributes.

Benefits of the BTP Document Template for Knowledge Capture. The academics remarked that the template was a useful approach which could be employed in the university for capturing teaching practices, as a senior participant stated: *"it was very useful, it saved an enormous amount of time for me to record my knowledge in a safe place"*.

The participants also indicated that the template represents an effective foundation on which to structure and articulate clear teaching practices: *"the template gives you a proper structure for what things you have to document, and it makes a teaching practice a lot easier to read and reuse"*.

The academics highlighted that the BTP Document Template encouraged them to ensure that their teaching practices were documented in a uniform and consistent way. *"Standard format makes capturing teaching practices easy and facilitates the ability to analyze and understand the knowledge content posted by others"*. The academics further stated that: "*The template's attributes are consistent with the vocabulary used in the teaching domain which achieves success in its application"*.

Additionally, the academics agreed that the template is detailed enough to address a complete and understandable teaching practice which could be applied by others. *"The template covers almost all the needed attributes for recording a teaching practice. It ensures that you covered the entire picture of the teaching practice to be understandable by others"*.

The academics also noted the usefulness of the template's attribute fields; these make it easier for the user to apply the teaching practices represented: *"The template helps academics learn about when to apply, where to apply, who to apply, and how to apply a teaching practice"*. *"The description of the template's attributes is exhaustive, clear and straightforward"*.

Drawbacks of the BTP Document Template for Knowledge Capture. Despite the usefulness of the BTP Document Template as an authoring tool for capturing teaching practices, one academic (only) commented that: *"The negative side of the template is that someone may look at a long list of a criteria or guidelines and just say 'I am not going to take the time to make a submission into the system'"*. This identified drawback could form a basis for future research.

6 Conclusion

The literature review highlighted the problem of ineffective knowledge capturing among higher education academics. Thus, a solution to the underlying issues was sought. In this paper, we use the design science methodology to propose a system called TPMS, which enhances the capture of teaching expertise amongst university instructors. This system is based on a BTP Document Template, for which we systematically propose functional requirements and design features. An experiment was undertaken to assess whether the use of the system was useful in terms of supporting the capture of BTPs.

With regard to usage behavior, there was an increase in overall knowledge capture activities for the duration of the experiment; this indicated that the BTP Document Template was perceived as a useful means of capturing teaching practices. The data from the activity log file showed that instructors used the system constantly during the four-week experimental period, which suggests that most of the instructors were satisfied that the BTP Document Template more than adequately supported their knowledge capture activities. The outcomes of the expert's evaluation show that the overall quality of the knowledge is high. This could be considered a sign that the design of the BTP document Template as an authoring tool is useful for supporting the capturing of complete, clear and consistent teaching practices. The insights gleaned from the interviews indicate that despite the one reported negativity, most participants were satisfied with the completeness, clarity and consistency of the BTP Document Template.

This study extends the current literature on knowledge sharing in online communities by providing evidence that design features are important affordances to support the documentation of teaching practices. This research contributes by showing that the proposed BTP Document Template is an important authoring tool in the setting of

online communities that focus on knowledge building in higher education institutions. The BTP Document Template took into consideration the needs and preferences of the end-users in order to ensure its acceptability and utilization. This was achieved by including user participation from the initial stages of the design process.

From a practical point of view, the BTP Document Template can be used as a guide for designers when designing and implementing any new best practice management system. It supports designers in their facilitating of the creation of high-quality BP descriptions. Furthermore, it could help managers in evaluating BTPs. Also, the BTP template is structured in such a way that users can more easily understand and apply the BTPs which are thus recorded. Hence, the BTP Document Template can be useful to BP designers, BP managers and BP users as well.

For future work, there are a few directions we would like to explore. In order to increase the overall level of user satisfaction with the system's functionality, there is a need for a future iteration to overcome the one identified drawback. We would also extend the TPMS's design to also include BTP retrieval functions that meet users' requirements. We plan to explore how BTP retrieval functions may impact instructors' knowledge sharing behavior.

References

1. Grant, R.M.: Toward a knowledge-based theory of the firm. Strateg. Manage. J. **17**, 109–122 (1996)
2. Agarwal, N.K., Poo, D.C., Goh, J.M.: Managing quality of information retrieval for effective knowledge management. In: Proceedings of the 3rd World Conference for Software Quality (3WCSQ), pp. 205–214 (2005)
3. O'Dell, C., O'Dell, C.S., Hubert, C.: The New Edge in Knowledge: How Knowledge Management is Changing the Way We Do Business. John Wiley, Hoboken (2011)
4. Rowley, J.: Is higher education ready for knowledge management? Int. J. Educ. Manage. **14**, 325–333 (2000)
5. Fullwood, R., Rowley, J., Delbridge, R.: Knowledge sharing amongst academics in UK universities. J. Knowl. Manage. **17**, 123–136 (2013)
6. Samoilenko, N., Nahar, N.: Knowledge sharing and application in complex software and systems development in globally distributed high-tech organizations using suitable IT tools. In: 2013 Proceedings of PICMET 2013: Technology Management in the IT-Driven Services (PICMET), pp. 1280–1294. IEEE (2013)
7. Davies, A.J., Kochhar, A.K.: Manufacturing best practice and performance studies: a critique. Int. J. Oper. Prod. Manage. **22**, 289–305 (2002)
8. Hautala, J.: International academic knowledge creation and ba a case study from Finland. Knowl. Manage. Res. Pract. **9**, 4–16 (2011)
9. Offermann, P., Levina, O., Schönherr, M., Bub, U.: Outline of a design science research process. In: Proceedings of the 4th International Conference on Design Science Research in Information Systems and Technology, pp. 1–11 (2009)
10. Author: Author paper (2019)

11. Niwe, M., Stirna, J.: Examining knowledge capture for the B2B domain. Int. J. Inf. Soc. (IJI) **3**, 353–362 (2010)
12. Dinur, A., Hamilton III, R.D., Inkpen, A.C.: Critical context and international intrafirm best-practice transfers. J. Int. Manage. **15**, 432–446 (2009)
13. Jivet, I., Scheffel, M., Specht, M., Drachsler, H.: License to evaluate: preparing learning analytics dashboards for educational practice. In: Proceedings of the 8th International Conference on Learning Analytics and Knowledge, pp. 31–40 (2018)