Knowledge sharing and educational technology acceptance in online academic communities of practice

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Abstract

Purpose – Online programs rely on the use of educational technology for knowledge sharing in academic virtual communities of practice (vCoPs). This poses the question as to which factors influence technology acceptance. Previous research has investigated the inter-relationship between educational technology acceptance (ETA) and the vCoP context insufficiently. Therefore, the paper at hand aims to propose a conceptual model of ETA in the vCoP frame.

Design/methodology/approach – To validate the proposed model, a correlation study was conducted in an academic vCoP at a German university. A sample of n = 72 faculty members was surveyed regarding attitudes and perceptions towards knowledge sharing in vCoPs.

Findings – A regression analysis confirms the expected correlation between technology use intention and corresponding behavior. Further, participation in a vCoP influences technology use intention, and, in turn, is influenced by participants' experience with technology.

Research limitations/implications – Against expectations, participants' attitudes towards technology are weakly correlated with most model variables, thus warranting further research.

Practical implications – Virtual mentoring in online universities can be supported relying on central vCoP participants, who may be helpful initiators of knowledge sharing.

Originality/value – The proposed conceptual model enlarges the scientific understanding of technology-enhanced learning in vCoPs.

Keywords Communities of practice, Educational technology acceptance, Knowledge sharing, E-learning, Online mentoring, Online learning

Paper type Research paper

Introduction

Virtual communities of practice (vCoPs) are increasingly used in formal and informal learning (Boylan, 2010; Brown, 2001; Kienle and Wessner, 2006; Thompson and MacDonald, 2005). Anecdotal evidence shows that while vCoPs potentially result in
improvement of academic participation and learning success, only a relatively small number of students and faculty take part in available vCoPs regularly. Consequently, it is necessary to investigate the acceptance and use of educational technology in the context of vCoPs. Educational technology acceptance (ETA) has been extensively investigated in the past decade, but not yet sufficiently within vCoPs. Therefore, this paper briefly reviews the current research literature on communities of practice (CoPs) and on the acceptance of educational technologies. Then, this paper proposes a research model combining CoPs and the ETA approach and explains the use of technology for academic knowledge sharing. Next, the paper presents the results of a preliminary case study that was performed at a German university. This pilot study was conducted to investigate whether the proposed research model may prove useful for further research or if fundamental changes of the model or the methodology have to be made before the model can be applied to a larger sample. The paper concludes with recommendations for a follow-up study.

Theoretical background

The following is a brief review of the current research literature on communities of practice (CoPs) and on the acceptance of educational technologies.

Communities of practice

Communities of practice (CoPs) are groups of people sharing goals, activities, and experiences in the frame of a given practice (Lave and Wenger, 1991; Wenger, 1998). Wenger (1998) defined the term “community” as “a way of talking about the social configurations in which our enterprises are defined as worth pursuing and our participation is recognizable as competence”. He defined “practice” as “a way of talking about the shared historical and social resources, frameworks, and perspectives that can sustain mutual engagement in action” (p. 5). This particular practice continues over lengthy periods of time and their termination is often neither planned nor foreseen. Numerous communities are found in schools (Bonsen and Rolff, 2006), universities (Brown, 2001; Rovai, 2002; Thompson and MacDonald, 2005), and research institutes (Kienle and Wessner, 2006). In online environments, the probably best known vCoP is the Linux community. Linux is a free operating system of professional quality. The software is developed and improved by the members. This vCoP provides an ongoing practice of high complexity including conceptual work, source code development, the coordination of individual activities, and quality assurance (Lee and Cole, 2003). Participation in a CoP leads to the accumulation of experience, stimulates the social construction of knowledge and the development of expertise (Bereiter, 2002; Boylan, 2010; Engeström and Sannino, 2010; Fuller et al., 2007; Paavola et al., 2004), hence making it particularly interesting for educational research on formal learning.

For Wenger (1998), the theory of situated learning best describes the factor “expertise” in CoPs, beginning with the premise that “knowledge is a matter of competence with respect to valued enterprises – such as singing in tune, discovering scientific facts, fixing machines, writing poetry, being convivial, growing up as a boy or a girl, and so forth” (p. 4). Wenger’s views of knowledge correspond to the generally accepted definition of expertise, as advanced and reproducible knowledge and skills in a specific domain. As Ericsson (2006a) formulated, expertise “refers to the characteristics, skills, and knowledge that distinguish experts from novices and less
experienced people” (p. 3). Ericsson continued that specific and objective criteria for finding experts exist in some domains. These experts have to consistently exhibit superior performance whereby this consistency would be demonstrated through superior expertise for approximately ten years of intensive, intentional, reflective study and training (“deliberate practice”) in a given domain (Ericsson, 2006b). The longer the time-on-practice becomes, the more experience is acquired and the more individual expertise develops. In other words, “competence may drive experience; experience may drive competence” (Wenger, 1998, p. 138).

For Wenger (1998), “participation” “refers not just to local events of engagement in certain activities with certain people, but to a more encompassing process of being active participants in the practices of social communities and constructing identities in relation to these communities” (p. 4). This definition is completed by the numerous examples of CoPs described in the research literature (e.g. Bonsen and Rolff, 2006; Brown, 2001; Kienle and Wessner, 2006; Lave and Wenger, 1991; Thompson and MacDonald, 2005), which reveal differences in the intensity of participation, depending on the members’ individual expertise. Members with higher expertise are involved in more activities, including those with a higher degree of difficulty and responsibility.

In a CoP, the expert status defines the identity of the CoP members. Lave and Wenger (1991) distinguished between full and peripheral community members. The full members of a CoP are identified as experts who possess superior knowledge and skills – for example intrinsic expertise – and are socially recognized as such. Thus, expert identity is the result of the interaction with and recognition of other CoP members, which takes place in the context of participation. “We conceive of identities as long-term, living relations between persons and their place and participation in communities of practice. Thus identity, knowing, and social membership entail one another” (Lave and Wenger, 1991, p. 53).

Recent research (Nistor and August, 2010; Nistor and Schustek, 2011) proposed a causal model in which the expert status in a CoP results from participation. The influence of expertise (including domain knowledge and the time spent in the CoP) on expert status is mediated by participation.

Acceptance and use of educational technologies
The first prerequisite to successful online learning and participation in vCoPs is the acceptance of the learning technology used. Several efforts have been made to understand the factors contributing to, or reducing, learning technology acceptance, resulting in ETA models established in the past decades in the domain of information systems (e.g. Davis, 1989) with several applications in technology-enhanced learning (e.g. Teo, 2010). ETA models are mostly based on the view of acceptance as an attitude towards technology. As stated by the theory of reasoned action and its expanded version, the theory of planned behavior (Ajzen and Fishbein, 2000), human action is guided by three categories of attitudes – i.e. behavioral beliefs, normative beliefs, and control beliefs – which, in combination, lead to the behavioral intention.

When the theory of reasoned action and the theory of planned behavior are applied for the use of technology, several theories emerged, from which the most representative is the unified theory of acceptance and use of technology (UTAUT) formulated by Venkatesh et al. (2003). UTAUT describes technology use under the influence of use intention, further determined by performance expectancy, effort expectancy and social
influence. Additionally, the facilitating conditions directly determine technology usage. In a recent study, Nistor et al. (2010) reported on findings that are consistent with Venkatesh et al. (2003).

**Aims of the case study and methodology**

When educational technologies are used as a means of communication and interaction in vCoPs, participants’ corresponding use intention and use behavior will probably be influenced not only by the acceptance factors described by UTAUT, but also by the intensity of participation in vCoPs. Furthermore, expertise will influence not only participation, but probably the acceptance factors, as well. These assumptions are integrated in a combined model represented in Figure 1, which has to be validated by empirical evidence. A first attempt at this validation was conducted at a German university through a correlational study. The subjects were approximately 450 faculty members of the Departments of Psychology and Educational Sciences. The setting was a vCoP that was newly initiated as an environment for knowledge sharing about the use of software in the specific context of psychological and educational research. For example, statistics packages such as SPSS have specific applications in psychology that differ from other domains, for example statistics in economics. In other words, this vCoP was supposed to provide guidance above and beyond the generic knowledge of statistics and statistics packages. Faculty in this vCoP could raise issues and ask questions that require specific knowledge of empirical research in their field of psychology, where a generic knowledge of statistics would be insufficient to answer these questions. The vCoP was created to allow knowledge sharing within the faculty in the specific field. The vCoP was technologically initiated and supported by an intranet-based FAQ interface where faculty members could participate by posting specific questions and answers (in the following addressed as “content development”) or could simply search for information and could read the available material (“use”).

The independent variables in this pilot study were:

- participants’ technology related expertise, in particular experience with software in the frame of psychological and educational research; and
- participants’ performance expectancy, effort expectancy, perceived social influence, and facilitating conditions.

![Figure 1. Proposed research model](image-url)
The dependent variables were
- participation in the software users’ vCoP, expert status;
- participants’ intention to use the vCoP (i.e. technology use intention);
- the corresponding technology use behavior; and
- participants’ intention to develop content and their content development behavior.

The independent variables performance/effort expectancy, social influence, facilitating conditions, and technology use intention were measured using the UTAUT questionnaire (Venkatesh et al., 2003), whereas the remaining independent variables were self-reported. All variables (excepting time in the software users’ CoP) were measured on a five-point Likert scale from 1 = low to 5 = high experience/expectancy/influence/participation/status/acceptance. All subscales displayed values of Cronbach’s $\alpha$ over 0.70, indicating satisfactory internal consistency.

An e-mail including a link to an online questionnaire was sent to all approximately 450 faculty members in the Departments of Psychology and Education Sciences. As participation in the study was voluntary, 72 questionnaires were returned. From these 72 participants, four had a technical profession (IT helpdesk staff), 58 had a non-technical profession (faculty, social sciences), and ten had both technical and non-technical professions. A call for participation was sent to the entire faculty by e-mail. The collected data were processed using the statistics software package IBM SPSS Version 18.

**Results**

The measured independent variables had moderate values indicating a good acceptance of the proposed knowledge sharing system. The lowest value ($M = 2.29$, $SD = 0.88$) was displayed by the perceived social influence. The time spent by the study participants in the technology users community typically ranged between zero and ten years. The values of the dependent variables “participation in the technology users’ community”, “technology use intention/behavior”, and “technology development intention/behavior” were in the lower range. All values are shown in Table I.

The hypothesized research model required several changes in order to be verified by regression analysis. First, two different models were tested to analyze the use and the development behavior of the study participants. Second, some of the initial relationships were disregarded since the corresponding regressions did not reach statistical significance. The variable expert status was disregarded as well because of the low correlation with the other model variables. The resulting model of use behavior is represented in Figure 2, and the model of development behavior in Figure 3. Both models could explain the dependent variables to a high percentage, i.e. $R^2 = 0.45$ for use intention, $R^2 = 0.46$ for use behavior, $R^2 = 0.48$ for development intention, and $R^2 = 0.68$ for development behavior.

The participants’ use behavior was strongly influenced by their use intention ($\beta = 0.52$, $p < 0.001$). Similarly, the development behavior was influenced by the development intention ($\beta = 0.38$, $p < 0.001$). Participation in the technology users community had a central position in the model as an important predictor of the use
intention \( (β = 0.31, p < 0.01) \), of the development intention \( (β = 0.34, p < 0.01) \), and of the development behavior \( (β = 0.26, p < 0.01) \). Contrary to the expectations, the acceptance variables had little influence on the use intention \( (β = 0.26, p < 0.10 \) for effort expectancy, \( β = 0.17, p < 0.10 \) for social influence), and only performance expectancy had a significant and direct influence on development behavior \( (β = .24, \)
Regression coefficients ranging between 0.20 and 0.60 are evidence that users' technology-related expertise predict the acceptance variables “performance expectancy”, “effort expectancy”, “perceived social influence”, and “perceived facilitating conditions”. There was no significant influence of the perceived facilitating conditions in the use intention and behavior model. In the development intention and behavior model, however, the perceived facilitating conditions had a significant influence on both development intention \((\beta = 0.24, p < 0.05)\) and development behavior \((\beta = 0.22, p < 0.05)\). Furthermore, there were significant moderating effects of the time spent in the technology users community on the relationship between social influence and use intention, and of participants' interest in technology on the relationship between participation in the community and use intention. The complete results of the regression analysis are provided in Figures 2 and 3.

**Summary and suggestions for further research**

To summarize the empirical results, the study participants accepted the vCoP to a moderate degree, as expressed by both their technology use intention and their corresponding behavior. The content development intention and behavior were relatively low due to the fact that the vCoP was newly initiated and not yet well established. The study confirmed to a large part the hypothesized correlations. In both cases of technology use and content development, participants’ intention had a significant effect on their behavior (Ajzen and Fishbein, 2000; Venkatesh et al., 2003). Participation in the software users’ CoP proved to be an additional predictor of technology use and content development, demonstrating thus the meaningfulness of the proposed model (Figure 1). Unlike the previous UTAUT studies (Nistor et al., 2010; Venkatesh et al., 2003), from the acceptance factors only performance expectancy and facilitating conditions had significant influences on participants’ content development. Finally, participants’ technology related expertise significantly influenced both their participation in vCoP (Nistor and August, 2010; Nistor and Schustek, 2011) and all acceptance factors, i.e. performance and effort expectancy, social influence, and
facilitating conditions, confirming thus once again that the CoP model and the acceptance model can be combined. The proposed model explained a large part of the dependent variables’ variance. Surprisingly, the impact of the acceptance variables (performance/effort expectancy and social influence) on the other model variables was weak. This may be due to the setting as vCoP were not yet established as common.

To further validate the model, a study is recommended in a setting where vCoP are commonly used, so that participants’ familiarity with it should be used as a control variable. Follow-up research is planned at Walden University, one of the leading for-profit online universities in the USA, where an EdD program serves approximately 4,600 enrolled doctoral students who are supported by less than 20 full-time faculty and approximately 450 faculty on a part-time basis. For the students, participation in vCoP provides a valuable resource of practical experiences worldwide. On the other hand, for the program leadership building the EdD program on a vCoP creates the challenge of including part-time faculty into the EdD program’s culture and community. Even though the university makes all pertinent information available in form of handbooks, overviews, training materials, FAQs, practice modules, etc., faculty tend to use personal relationships to find the information they need (e.g. Cross et al., 2002). The conceptual model presented in this pilot study and combining CoP and ETA may enlarge the scientific understanding of knowledge sharing in vCoPs, and suggest practical possibilities of supporting technology-mediated collaboration between scholars and students (e.g. virtual mentoring) in the frame of vCoPs at online universities.

References


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