

'CROWDING OUT' IN CORPORATE WIKIS: THE EFFECTS OF JOB RESPONSIBILITY AND MOTIVATION ON PARTICIPATION

Jang, Soobaek, IBM Corporation, 150 Kettletown RD, Southbury, CT 06488, USA,
sjang@us.ibm.com

Arazy, Ofer, University of Alberta, 3-21F Business building, Edmonton, Alberta, T6G2R6,
Canada, ofer.razy@ualberta.ca

Nov, Oded, Polytechnic Institute of NYU, LC 401, Six MetroTech Center, Brooklyn, NY,
11201, USA, onov@poly.edu

Brainin, Esther, Rupin Academic Center, Israel, estherb@ruppin.ac.il

Abstract

Wiki is a conversational knowledge management (KM) tool that has the potential to alleviate the bottlenecks in knowledge creation and sharing associated with traditional KM systems. An understanding of the motivational forces driving participation is paramount for the success of such KM initiatives. The inherent tension between traditional managerial practices and wikis' affordances calls for the development of theoretical frameworks tailored to this unique setting. Our study of corporate wikis investigates a wiki-based organizational encyclopedia, Bluepedia. The primary purpose of this study is to provide an account of the motivational dynamics around content contribution evoked in a corporate wiki context. We center our attention on the differences between those who are assigned to edit Bluepedia as part of their job and those who edit Bluepedia outside of their formal job responsibility. An analysis of a large-scale web-survey data from one multi-national firm shows that, in line with the 'crowding out effect', those not formally assigned to the task are driven primarily by intrinsic motivations, while those who contribute content as part of their regular job, however, are primarily driven by extrinsic motivations. The theoretical and practical implications are discussed.

Keywords: Wiki, Participation, Motivation, Job Responsibility, Crowding Out.

INTRODUCTION

Wiki is a conversational knowledge management system (KMS) (Leuf and Cunningham, 2001; Wagner, 2004). It is a web-based application that allows users to collectively author documents, such that the most recent version reflects the cumulative contributions of all authors. Although wikis have the potential to alleviate the knowledge acquisition bottlenecks associated with traditional KMS, (Wagner, 2006), for wikis to succeed it is essential that users share their knowledge and participate in the collaborative authoring process. Indeed, prior studies have identified users' motivation to share knowledge to be a critical factor in the success of wikis (Schroer and Hertel, 2009; Majchrzak et al., 2006).

To date, most research on wikis has focused on their use in the public sphere, and specifically on Wikipedia (Arazy et al., 2011). However, there seems to be an inherent tension between wiki affordances (e.g. open access, transparency, automatic release of changes, peer-based governance) and traditional corporate knowledge management practices (Arazy et al., 2009; Grudin and Poole, 2010). As a consequence, it is not clear that the insights regarding the motivational drivers of participation gained from studying open and public wikis such as Wikipedia would transfer to corporate wikis, highlighting the need to develop a theoretical framework for understanding organizational wiki-based knowledge processes (Majchrzak, 2009).

Wiki is a highly flexible technology which has been used for a variety of KM applications, including: personal information management, document repository, collaboration and project management, maps of experts and organizational knowledge, idea generation, customer relationship management, e-learning, and resource management (Wagner, 2004; Chau & Maurer, 2005; Majchrzak et al., 2006; Arazy et al., 2009; Holtzblatt et al., 2010). We focus here on one specific wiki application: the development of an encyclopedia of organizational knowledge, as this is one of the popular uses of corporate wikis (see Danis & Singer, 2008; Holtzblatt et al., 2010). Another advantage in studying a corporate wiki-based encyclopedia is that it allows us to draw comparison to findings from studies of motivations for wiki participation in the public domain (namely, Wikipedia).

The objective of the present study is, thus, to develop a theoretical explanation for the motivational drivers for participation in corporate wikis. The administration of corporate wikis often combines traditional command-and-control top down management alongside a peer-based collaboration that is typical of public wikis. For example, while the use of wikis is mandated for some projects, other wikis are often deployed in a bottom-up fashion (Chau & Maurer, 2005; Kussmaul & Jack, 2009). The participation in corporate wikis involves a mixture of employees that are assigned to contribute content together with others who contribute outside of their job responsibility. Our goal is, thus, to reveal the differences in motivational processes between these two distinct user classes. We build on Self-Determination Theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2000) that distinguishes between intrinsic and extrinsic motivations, and examine how these motives affect users' content contributions. We demonstrate that intrinsic motivations are the primary driver of participation for those who contribute content outside of their job responsibility, while those who have to edit the wiki as part of their job are driven primarily by extrinsic motives.

1 RELATED WORKS

Prior studies have identified users' motivation to share information to be a critical factor for determining users' decision to contribute in a variety of settings. In online communities, an understanding the motivation of contributors has been viewed as critical for successfully sustaining community projects in a variety of settings (von Krogh & von Hippel, 2006; Ma & Agarwal, 2007; Peddibhotla & Subramani, 2007), including wiki-based projects (Schroer and Hertel, 2009). In organizational setting, knowledge workers' motivation play a critical role in the decision to share tacit and explicit knowledge (Wasko & Faraj, 2005; Bock et al., 2005) and these motivations often

determine the success or failure of knowledge management systems (Stenmark, 2000; Kankanhalli et al., 2005).

We build on Self-Determination Theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2000) that distinguishes between intrinsic and extrinsic motivations, and examine how these motives affect users' content contributions. Intrinsic motivations tend to be terminal in that they emphasize inherent satisfactions, rather than their separable consequence. In stark contrast, extrinsic motivation is fundamentally compliance-based, whereby individuals engage a task in order to achieve a desired outcome (e.g. attainment of external rewards). Often these countervailing motivational forces act in conjunction, such that a person performing a specific task may be driven by a combination of intrinsic and extrinsic factors. SDT views each motivational factor as positioned along a continuum between the extreme "pure" extrinsic and intrinsic motivations. As extrinsic motivations are internalized as personal goals and are integrated with one's self concept, they move closer to the intrinsic motivation end of the continuum (Deci & Ryan, 2000; Ryan & Deci, 2000). Given the controls and reward contingencies that characterize corporate life, extrinsic motivation tends to be predominant in work settings (Meyer et al., 2004). In contrast, intrinsic motivations play a substantial role in community-based projects on the Internet, such as open source software development (Heretl et al., 2003). Studies of Wikipedia reported the highest average rating for intrinsic-oriented motives (including "pure" intrinsic such as enjoyment and internalized-extrinsic such as sharing the project's values); yet, both intrinsic- and extrinsic-oriented motives (e.g. career advancement) positively affected participation levels (Nov, 2007; Schroer & Hertel, 2009).

The few studies on the motivations for participation in corporate wikis describe the effects of a variety of factors. Majchrzak et al. (2006) surveyed 168 corporate wiki users and found the key motivational factors to be (in order of importance): i) makes one's work easier; ii) helps the organization to reuse knowledge, support collaboration, and improve processes; and iii) enhances the contributor's reputation. Patterson et al. (2007) surveyed wiki users at IBM and found that while intrinsic motivation positively affects content quality, extrinsic motives have a negative effect on wiki content quality. Arazy et al. (2009) found intrinsic motives to be the most salient, while extrinsic-oriented motives (direct benefits, learning new skills, social pressure) were reported at lower average levels.

The extent to which an organization decides to assign employees to seed a collaborative KM system is of special importance, especially in the context of conversational tools that have originally served online communities in the public sphere. To the best of our knowledge, the differences – in terms of motivation for contribution – between assigned and unassigned employees have not been explored in prior studies. It is worth noting that the construct of 'job responsibility' under investigation, although bearing some resemblance, is different from 'Voluntariness of Use' (Moore and Benbasat, 1991; Venkatesh et al., 2003). Voluntariness of use refers to a user's perception of the level of autonomy he has, rather than to a formal job assignment, and thus it is possible for a user to feel he is pressured by his peers to use a tool and has little voluntariness, without being assigned to the task.

While previous studies of corporate wikis provide a preliminary insight into motivation for wiki participation, they: (a) do not test the effect of motivational factors on wiki participation and (b) do not distinguish between those who contribute as part of their role and those contributing outside their formal job responsibility. The current study is aimed at addressing these gaps.

2 THEORY DEVELOPMENT

We model our proposed framework after Roberts et al. (2006), who have built on Self-Determination Theory (SDT; Deci & Ryan, 2000) and studied motivations for participation in the Apache open-source software development project. We view Roberts et al.'s work as specifically relevant given the similarity in contexts: employees of corporations that support the Apache development (e.g. IBM) participate in a community-governed project, such that some contributors are motivated by extrinsic rewards while others are intrinsically motivated. We expect a similar motivation structure amongst

corporate employees who contribute to a wiki-based encyclopedia. Roberts et al. (2006) identified four motivations factors situated on a continuum between intrinsic and extrinsic motives, as illustrated in figure 1 below.

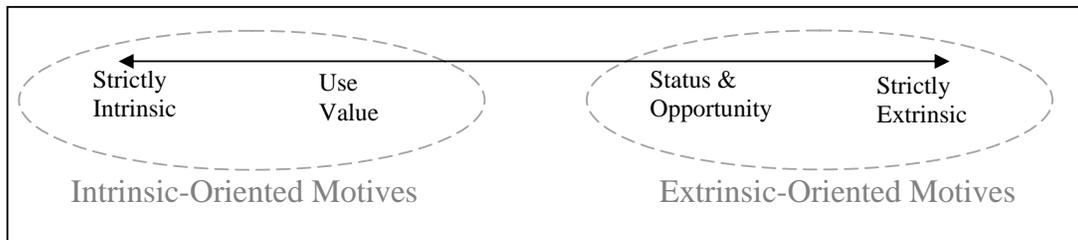


Figure 1. The motivational factors under investigation.

On one extreme, *strictly intrinsic motivation* has been linked to the satisfaction of human needs for autonomy and competence (Deci, 1975), which are readily satisfied in open-source development, given that the task allows individuals substantial opportunities to express their creativity, enjoy their work, and experience a sense of satisfaction (Lakhani and Wolf, 2005), and thus the task is inherently motivating (Roberts et al., 2006). *Use value* refers to the desire to make a contribution with the expectation that it will serve the contributor at a later stage (e.g. in software open source projects, fixing a bug of immediate relevance to the developer). Although use value is extrinsic because of the personal benefit to the user (Markus et al., 2000), from a psychological point of view, use value is internalized as a value of the community, which is transformed into a personally endorsed value (Roberts et al., 2006). *Status and opportunity* factors refer to a contributor's desire to learn new skills, enhance his reputation among peers, or advance his career, and thus are extrinsic in nature (Wasko and Faraj, 2005; Lakhani and Wolf, 2005). Finally, on the other extreme, *strictly extrinsic motivation* refers to the expectation of receiving a direct monetary reward.

For the purpose of this study we propose a simplified framework and have grouped the four factors into two higher-level constructs: *intrinsic-oriented* (strictly intrinsic and use value) and *extrinsic-oriented* (strictly extrinsic and status & opportunity) motives, as illustrated in Figure 1 above. In line with Roberts et al. (2006), we propose that overall both motivational orientations would be positively correlated with participation, and hypothesize:

Hypothesis 1a: Contributors' intrinsic-oriented motivation is positively related to their level of participation in corporate wiki-based encyclopedia.

Hypothesis 1b: Contributors' extrinsic-oriented motivation is positively related to their level of participation in corporate wiki-based encyclopedia.

Additionally, studies of open source software development and other online communities, recent studies of corporate wikis also provide support for these two hypotheses. The evidence for extrinsic-oriented motives is substantial: Danis and Singer (2008) report that employees use wikis primarily when it promotes their career advancement. Arazy et al. (2009) found direct benefit to be an important driver of participation, Kussmaul and Jack (2009) report that in order to participate, people must believe that they will benefit from their contributions, and Holtzblatt et al. (2010) argue that when wiki editing is not related to promotion employees will not contribute. Also, there is evidence for the role of intrinsic-oriented motives in corporate wikis: Patterson et al. (2007) found that intrinsic motivation positively affects content quality and Arazy et al. (2009) found intrinsic motives to be the most salient of all motivational factors; in addition, studies provide evidence for the importance of use value (i.e. adding information that would later be relevant for one's job) in motivating wiki participation (Chau & Maurer, 2005; Majchrzak et al., 2006).

In addition to verifying previously-reported effects in the context of corporate wikis, this study investigates the moderating effects of users' job responsibility on the relationships between

contributors' motivation and participation. In the unique context of community-oriented work within corporate settings there are those that are assigned to the job, while others contribute outside of their job responsibility. In cases where people are assigned a task as part of their job responsibilities (i.e. incentives are contingent upon performance), external incentives undermine characteristics of intrinsic motivation such as free choice behavior and self-reported interest, especially when monetary compensation is perceived to be controlling (Wiersma, 1992), in line with the “crowding-out effect” (Frey and Oberholzer-Gee, 1997; Osterloh & Frey, 2000). This effect has been observed among corporate employees involved in open-source projects (Roberts et al., 2006), and we expect it to carry over to the similar context of corporate wikis. Formally stated:

Hypothesis 2a: Contributors' job responsibility is expected to moderate the relationship between intrinsic-oriented motivation and participation, such that the effect of intrinsic-oriented motivation would be larger for those who edit the corporate wiki-based encyclopedia outside of their formal job responsibility.

Similarly, we expect that extrinsic motivations would become more salient for those assigned to the wiki task, and we propose:

Hypothesis 2b: Contributors' job responsibility is expected to moderate the relationship between extrinsic-oriented motivation and participation, such that the effect of extrinsic-oriented motivation would be larger for contributors that are formally assigned to editing the corporate wiki-based encyclopedia.

Figure 2 below describes our proposed research model.

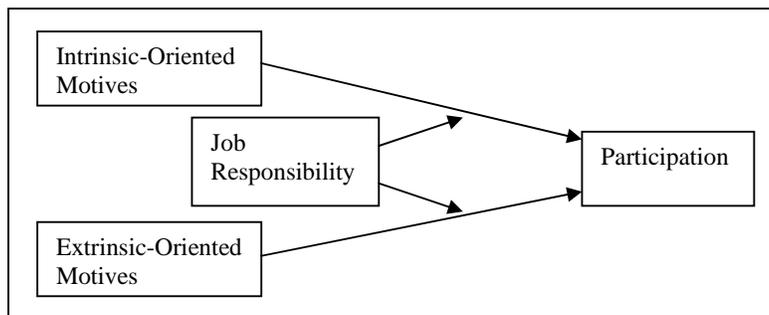


Figure 2. The proposed research model.

3 RESEARCH METHOD

The methodology used in our study involved a web survey among contributors to IBM's wiki-based encyclopedia – Bluepedia. IBM Corporation is a global organization with over 350,000 employees that designs hardware, develops software, and engages in professional services. This corporation was a particularly appropriate research site given that IBM has a very large and growing group of wiki users. Bluepedia was launched in March 2008 as an internal repository of corporate knowledge and provides a space for unrestricted collaboration between IBMers world-wide (Jang, 2009). The web-based survey was administered in 2009. An announcement regarding the survey appeared in the Bluepedia homepage that all active Bluepedia users could have seen, but the exact number of people who read the announcement is unknown. Close to one thousand IBMers participated in the survey, and after removing records with incomplete data we were left with 992 respondents, of which 176 edited Bluepedia as part of their job while the remaining 816 contributed outside their formal job responsibility.

The operationalization of constructs was based on pre-existing scales and used a 5-point Likert scale. We worked closely with IBM's central wiki administration unit in contextualizing the survey items for

this particular technological and organizational context. The central wiki unit consulted their user base to ensure that the statements are well understood, and after several iterations between the research team and IBM an agreement on the exact articulation of the questionnaire was reached. Intrinsic-Oriented Motivation was measured using three items that were adapted from Roberts et al. (2006) 'intrinsic' and 'use value' measures. Extrinsic-Oriented Motivation was measured using three items that were adopted from Bock et al. (2005). Participation was assessed using three items measuring the weekly amount of time spent (Hertel et al., 2003; Lakhani and Wolf, 2005; Nov, 2007; Arazy et al., 2009) with a focus on different types of contributions: adding, rating, and tagging content. *Job responsibility* was measured by asking the respondents whether contributing to Bluepedia was an important part of my primary job responsibility. Please refer to Appendix A for details on measures. Finally, for testing the moderating effect of *job responsibility* on the relation between motivation and *participation* (hypotheses 2a and 2b), we created two interaction variable - *job responsibility x Intrinsic-Oriented Motivation* and *job responsibility x Extrinsic-Oriented Motivation* - by mean-centering indicator items before multiplication.

4 RESULTS

We employed Partial Least Squares (PLS) path-modeling algorithm (Fornell & Cha, 1994; Abdi, 2003) to assess the reliability of our measures, as well as the structural model. The PLS algorithm estimates path models using composite variables, sometimes called latent variables, from a number of indicator items, sometimes referred to as manifest variables. In this respect, the variance-based Partial Least Squares (PLS) path modeling is similar to covariance-based structural equation modeling (SEM; Bollen & Long, 1993), such as LISREL, because both algorithms estimate complex relations between several latent variables simultaneously. Nevertheless, a number of conceptual and formal differences make PLS path modeling especially suited for this study. Although both PLS and SEM may suffer when sample size is very small and with non-normally distributed data (Qureshi and Comepeau, 2009), the PLS algorithm performs better in these conditions and is more robust when assumptions of normality are violated (Cassel et al., 1999; Chin and Newsted, 1999). This was an important consideration for choosing to use PLS in our study, given that participation in wiki (as well as in other types of online activities) is often not normally distributed.

Using PLS, an index of internal consistency was computed for each multi-item scale. Composite reliability values were 0.90-0.93, all item loadings on their relevant construct were 0.83-0.90 (greater than the 0.70 threshold). We followed the procedure outlined by Wixom and Todd (2005) to determine convergent and discriminant validity. While one of the inter-correlations was above 0.5, the items demonstrated satisfactory convergent and discriminant validity. Constructs' AVE was 0.75-0.80 (substantially greater than the suggested minimum of 0.50; Fornell and Larcker, 1981), providing evidence supports the convergent validity of the proposed measurement model. We assessed discriminant validity by comparing the square root of the AVE (RAVE) of a particular construct and the correlation between that construct and other latent constructs. We found that the constructs' RAVE ranges from 0.87 to 0.90, such that the RAVE for every construct is substantially higher than the correlation between that construct and all other constructs. In addition, items for all constructs loaded on their relevant construct substantially higher than any other construct. Details on constructs inter-correlations and RAVE, as well as item loadings, are provided in Appendix B.

Having established reliable and construct valid measures, we tested the research model by specifying paths in the PLS structural model corresponding to the model's hypotheses. The significance of structural path estimates was computed using the bootstrapping re-sampling method (with 500 re-samples; cf. Tenenhaus et al., 2005), and the structural model was evaluated based on both the R^2 for

each composite variable and the statistical significance of structural paths. Figure 3 shows the results of the PLS analysis¹.

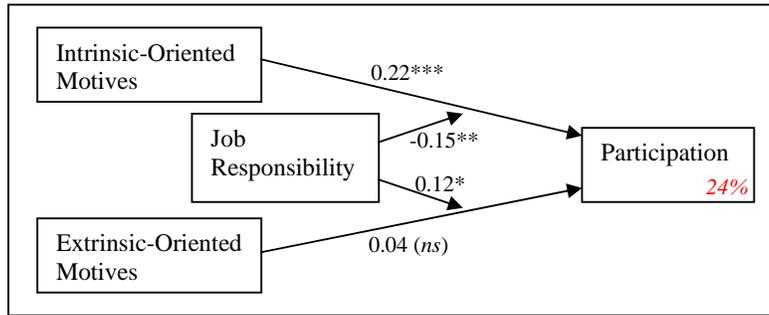


Figure 3. PLS results. Values on arrows represent path significance; ‘*’ indicates significance of $p < 0.05$, ‘**’ signifies $p < 0.01$, ‘***’ indicates significance of $p < 0.001$, and “ns” indicates a non-significant path. R^2 percentages in red.

In order to test the moderating effects of job responsibility, we followed the procedure recommended by Henseler et al. (2009) for testing nominal moderator variables in PLS. We split the data set based on this factor (assigned vs. unassigned contributors) and ran the model twice independently. We found that while intrinsic-oriented motives have a significant effect on participation for those not assigned to the task (0.35, $p < 0.001$; and an insignificant negative effect for assigned contributors), extrinsic-oriented motives have a significant effect on participation for unassigned contributors (0.25, $p < 0.001$; and an insignificant negative effect for those formally assigned to the task). Table 1 below lists effect sizes (and statistical significance).

5 DISCUSSION

Wiki is a collaborative knowledge management tool that promotes peer-based governance (Wagner, 2004). Increasingly, organizations are turning to such tools in an effort to alleviate the bottlenecks in knowledge creation that plague many knowledge management initiatives (Arazy et al., 2009). The primary purpose of our study was to provide an account of the motivational dynamics around content contribution evoked in a corporate wiki context, focusing on the differences between those assigned to the editing task and those who edit the wiki outside their formal job responsibility.

We found that intrinsic-oriented motivation positively (and significantly) affect wiki participation, reinforcing the results regarding wikis’ usage in the public (Nov, 2007; Schroer & Hertel, 2009) and private (Majchrzak et al., 2006; Arazy et al., 2009) domains. However, we found that the effect of extrinsic-oriented motivation was small and insignificant. An analysis of the two different contributor types reveals that extrinsic motivation plays a large positive role (effect size = 0.25; $p < 0.001$) for those who are formally assigned to the task, while it has a negligible effect for those not assigned to edit Bluepedia.

The primary contribution of our study is in demonstrating how job responsibility moderates the relationships between motivations (both intrinsic and extrinsic) and participation in the wiki. While the existing literature on corporate wikis does not make the distinction between those assigned and unassigned to the wiki editing task, our results demonstrate notable differences in motivational

¹ To validate our findings, we also measured the moderation effects of job responsibility by following the procedure recommended by Henseler et al. (2009) for testing nominal moderator variables in PLS. We split the data set based on this factor (assigned vs. unassigned contributors) and ran the model twice independently. We found that the differences in the effects of motivation between the two subsets of the data were statistically significant for both for intrinsic-oriented motivation ($p < 0.001$) and extrinsic-oriented motivation ($p < 0.05$).

dynamics between the two user groups, such that while assigning employees to the wiki task bolsters the effect of extrinsic motivation on participation, it inhibits the positive effects of intrinsic motivation. Our contribution extends beyond the literature on wiki-based KM to the broader field of management. Recent research describes the ‘crowding out effect’ (Frey and Oberholzer-Gee, 1997; Osterloh and Frey, 2000), where the addition of extrinsic controls negatively affects intrinsic motives. Our study adds to the growing body of literature in this area. It should be noted, however, that while the ‘crowding out effect’ has been modelled in previous studies as a (negative) direct path between extrinsic and intrinsic motivation (e.g. Roberts et al., 2006), we believe that a better way for representing this effect is through the moderating effect of job responsibility. Our reformulation of this effect is a secondary contribution of this study.

Our findings have important implications for practice. Managers seeking ways to deploy collaborative knowledge management tools, such as wikis, need to consider whether content contribution would be left to employees’ discretion (as in community-based projects in the public domain) or whether some individuals should be assigned to the task. Our findings suggest that a decision regarding wiki job responsibility has important implications for employees’ motivations, and consequently for the firm’s ability to draw participation and alleviate knowledge creation bottlenecks. Managers have various ways to influence employees’ motivations, and the management of intrinsic and extrinsic motivation is crucial, particularly in the context of knowledge production (Osterloh et al., 2001). Both intrinsic and extrinsic motivation are essential: while intrinsic motivation is indispensable in driving one to share tacit knowledge and have proved vital in community-based projects, often extrinsic rewards are needed in order to complete a large-scale mission-critical organizational endeavor. The key, then, is to identify ways to induce extrinsic motives, without crowding out intrinsic motivations. Some of the ways this could be achieved are: making the activity interesting; encouraging personal relationships between wiki group members, and promoting self-governance.

6 CONCLUSION

This study provides some important findings regarding the motivational dynamics in a corporate wiki context. Still, the study is rather preliminary and it could be extended in various ways in future research. First, the proposed theoretical framework is rather limited in its scope and includes only a small number of motivational factors. In addition, other relevant constructs could be added, such as variables related to task characteristics, individual characteristics, and management approaches. We expect that future research will expand our framework to include additional relevant constructs. Second, in terms of measurement, all the constructs in this study were measured using a survey; future research could validate our findings using multiple data sources (e.g. employing wiki system activity logs for measuring participation). Third, in order to generalize the results, future works could replicate our study in other organizations, at different wiki usages (e.g. when the wiki is used to support project management), and possibly with different types of knowledge management systems. We conclude with a call for further research in this emerging area.

References

- Abdi, H. 2003. “Partial Least Squares Regression,” in *Encyclopedia for Research Methods for the Social Sciences*, M. Lewis-Beck, A. Bryman, T. Futing (eds.), Thousand Oaks, Sage CA, 792-795.
- Arazy O., Gellatly I., Jang S., and Patterson R., 2009, Wiki Deployment in Corporate Settings, *IEEE Technology and Society*, Summer 2009, 28(2), pp. 57-64.
- Arazy O., Nov O., Patterson R., and Yeo L., 2011, Information Quality in Wikipedia: The Effects of Group Composition and Task Conflict, *Journal of Management Information Systems (JMIS)*, 27(4), pp. 73-100.

- Bock G.W., Zmud R.W., Kim Y.G. and Lee J.N., Behavioral intention formation in knowledge sharing: examining the roles of extrinsic motivators, social-psychological forces, and organizational climate, *MIS Quarterly*, 29 (2005) (1), pp. 87-111
- Bollen, K. A., and Long, J. S. (eds.). 1993. *Testing Structural Equation Models*, Sage, Newbury Park, CA.
- Cassel, C., Hackl, P., and Westlund, A. H. 1999. "Robustness of Partial Least-Squares Method for Estimating Latent Variable Quality Structures," *Journal of Applied Statistics*, 26. 435-446.
- Chau T. and Maurer F. 2005. "A Case Study of Wiki-Based Experience Repository at a Medium-Sized Software Company," in Proc. 3rd Int. Conf. on Knowledge Capture, 185-186.
- Chin, W.W. and Newsted, P.R. 1999. "Structural Equation Modeling Analysis with Small Samples Using Partial Least Squares," Hoyle Ed., *Statistical Strategies for Small Sample Research*, 307-341.
- Danis C. and Singer D. 2008. "A Wiki Instance in the Enterprise," Proc. of CSCW'08, 495-504.
- Deci, E. L. 1975. *Intrinsic Motivation*. Plenum Press, New York.
- Deci, E.L., and Ryan, R.M. 2000. "The "what" and "why" of goal pursuits: Human needs and the self-determination of behaviour," *Psychological Inquiry*, 11(4), 227-268.
- Fornell, C., and Cha, J. 1994. "Partial Least Squares," R. P. Bagozzi (Ed.), *Advanced Methods of Marketing Research*, Cambridge, MA: Blackwell, 52-78.
- Fornell, C., and Larcker, D. F. 1981. "Evaluating structural equation models with unobservable variables and measurement error," *Journal of Marketing Research*, 15, 39-50.
- Frey, B.S. and Oberholzer-Gee, F., The Cost of Price Incentives: an Empirical Analysis of Motivation Crowding-out, *American Economic Review*, 1997, 87, pp. 746-755.
- Grudin J. and Poole E.S. 2010. "Wikis at Work: Success Factors and Challenges for Sustainability of Enterprise Wikis," Proc. of WikiSym2009, ACM, NY.
- Henseler J., Ringle C.M., and Sinkovics R. (2009), The Use of Partial Least Squares Path Modeling, in: *Advances in International Marketing*, Vol. 20, pp. 277-320.
- Hertel, G., S. Niedner and S. Herrmann (2003). "Motivation of software developers in open source projects: An internet-based survey of contributors to the linux kernel." *Research Policy* 32(7): 1159.
- Holtzblatt L.J., Damianos L.E., and Weiss D. 2010. "Factors Impeding Wiki Use in the Enterprise: a Case Study," in Proceedings of CHI'10, ACM, 4661-4676.
- Jang S., 2009, Analysis of User Benefits in Interactions with Social Knowledge Bases of an Enterprise Wiki, M.Sc. Thesis, Southern Connecticut State University.
- Kussmaul C. and Jack R. 2009. "Wikis for Knowledge Management," in *Web 2.0: The Business Model*, Lytras M.D. Damiani E., and Ordóñez de Pablos P. (Eds.), 147-165, Springer.
- Lakhani, K., B. Wolf. 2005. Why hackers do what they do: Understanding motivation and effort in free/open source software projects. J. Feller, B. Fitzgerald, S. Hissam, K. Lakhani, eds. *Perspectives on Free and Open Source Software*. MIT Press, Boston, MA.
- Leuf, B. and Cunningham W. 2001. *The wiki way: Quick collaboration on the web*. Addison-Wesley.
- Majchrzak A., Wagner C., and Yates D. 2006. "Corporate wiki users: results of a survey," Proceedings of the international symposium on Symposium on Wikis, pp. 99-104, ACM Press.
- Majchrzak, A. 2009. "Comment: Where is the theory in wikis?" *MIS Quarterly*, 33 (1), 18-20.
- Markus, L., B. Manville, C. Agres. 2000. What makes a virtual organization work? *MIT Sloan Management Rev.* 42(1) 13-26.
- Moore G.C. and Benbasat, I. 1991. Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation, *Information Systems Research* (2:3), 192-222.
- Nov, O. (2007). What Motivates Wikipedians. *Communications of the ACM*, 50 (11) 60-64
- Osterloh M. and Frey B. 2000. Motivation, knowledge transfer, and organizational forms. *Organ. Sci.* 11(5) 538-550.
- Osterloh M., Frey B. and Frost J. 2001. Managing Motivation, Organization, and Governance, *Journal of Management and Governance*, 5: 231-9.

- Patterson R., Gellatly I., Arazy O., and Jang S., 2007, The Effects of Wikis Characteristics on Performance Quality, Proceeding of the 17th Workshop on Information Technologies & Systems (WITS'07), December 2007, Montreal, Canada.
- Qureshi, I. and Compeau, D., 2009, Assessing Between-Group Differences in Information systems Research: a Comparison of Covariance- and Component-Based SEM, *MIS Quarterly*, 33:1, 197-214.
- Roberts, J., Hann, I., and Slaughter, S. 2006. "Understanding the motivations, participation, and performance of open source software developers," *Management Science* , 52 (7), 984-999.
- Ryan, R.M., and Deci, E.L. 2000. "Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being," *American Psychologist*, 55, 68-78.
- Schroer, J., and Hertel, G. 2009. "Voluntary engagement in an open web-based encyclopedia: Wikipedians and why they do it," *Media Psychology*, 12, 1-25.
- Tenenhaus, M.; Vinzi, V. E.; Chatelin, Y. M.; and Lauro, C. PLS path modeling. *Computational Statistics and Data Analysis*, 48 (2005), 159-205
- Venkatesh V. , Morris M.G., Davis G.B., and Davis F.D. 2003. User Acceptance of Information Technology: Toward a Unified View, *MIS Quarterly*, 27(3), 425-478.
- Wagner, C. 2004. "Wiki: A technology for conversational knowledge management and group collaboration." *Communication of the Association for Information Systems*, 13, 265-289.
- Wagner C., 2006. "Breaking the knowledge acquisition bottleneck through conversational knowledge management," *Information Resources Management Journal*, 19 (1), 70-83.
- Wasko, M. M., and Faraj, S. "Why Should I Share? Examining Knowledge Contribution in Networks of Practice," *MIS Quarterly* (29:1), 2005, pp. 35 57.
- Wiersma, U. J. 1992. The effects of extrinsic rewards in intrinsic motivation: A meta-analysis. *J. Occupational Organ. Psych.* 65 101-114.
- Wixom BH, Todd PA. A Theoretical Integration of User Satisfaction and Technology Acceptance. *Information Systems Research*. 2005, 16(1):85-102.

Appendix A

Construct	Code	Item	Source
Intrinsic-Oriented Motivation	Int1	[Intrinsic] I contribute to Bluepedia because it gives me a sense of personal achievement.	Roberts et al., 2006
	Int2	[Use Value] I add content to Bluepedia that I want or need to use for my job	Roberts et al., 2006
	Int3	[Use Value] I correct errors or clarify information on Bluepedia when it is difficult to use the existing information for my job	Roberts et al., 2006
Extrinsic-Oriented Motivation	Ext1	[Extrinsic] I contribute to Bluepedia because I believe my contribution will contribute towards a better annual performance evaluations at IBM	Bock et al., 2005
	Ext2	[Extrinsic] I contribute to Bluepedia because it will give me additional points for promotion	Bock et al., 2005
	Ext3	[Status] Reputation motivates me to contribute to Bluepedia the most (I want to be listed on the top editor/rater on its homepage)	Newly developed
Job Responsibility	JR1	Contributing to Bluepedia is an important part of my primary job responsibility [Yes; No]	Newly developed
Participation	Par1	What is the weekly amount of time you regularly spend CONTRIBUTING CONTENT to Bluepedia?	Arazy et al. 2009
	Par2	What is the weekly amount of time you regularly spend RATING on Bluepedia?	Arazy et al. 2009
	Par3	What is the weekly amount of time you regularly spend TAGGING content on Bluepedia?	Arazy et al. 2009

Appendix B

Construct	<i>Intrinsic-Oriented Motivation</i>	<i>Extrinsic-Oriented Motivation</i>	<i>Job Responsibility</i>	<i>Participation</i>
<i>Intrinsic-Oriented Motivation</i>	0.81			
<i>Extrinsic-Oriented Motivation</i>	0.31	0.85		
<i>Job Responsibility</i>	0.39	0.06	0.82	
<i>Participation</i>	0.33	-0.02	0.35	0.95

RAVE and correlation between the latent constructs for all respondents.

Item	Intrinsic Oriented Motivation	Extrinsic Oriented Motivation	Job Responsibility	Participation
Int1	0.90	0.55	-0.32	0.36
Int2	0.90	0.52	-0.35	0.35
Int3	0.89	0.50	-0.27	0.29
Ext1	0.57	0.89	-0.39	0.31
Ext2	0.47	0.88	-0.29	0.20
Ext3	0.44	0.83	-0.28	0.23
JR1	-0.35	-0.38	1.00	-0.42
Par1	0.38	0.21	-0.40	0.88
Par2	0.31	0.29	-0.33	0.89
Par3	0.29	0.29	-0.37	0.90

Item loadings.