

A Conceptual Model of Wiki Technology Diffusion

Andrea J. Hester

*University of Colorado at Denver, Department of Information Systems Management
andrea.hester@cudenver.edu*

Dr. Judy E. Scott

*University of Colorado at Denver, Department of Information Systems Management
judy.scott@cudenver.edu*

Abstract

Wiki technology is an emerging trend making way in organizational environments. Although numerous benefits of using a wiki in applications of collaborative knowledge creation and sharing have been reported, little research on the adoption and diffusion of Wiki technology has been published. The contribution of this paper is the theoretically informed emphasis on the need to consider a variety of contextual factors influencing Wiki technology diffusion. Implementations of Wiki technology should include careful consideration of organizational culture, as well as user perceptions of wiki organizational compatibility, relative advantage, and complexity. Efforts should also be made to achieve and maintain a critical mass of wiki users.

1 Introduction

A website based on Wiki technology (referred to as a “wiki”) is different from other websites in that the content can be created, modified and updated automatically by any user via a web browser. Although wikis may be created and maintained for personal use, social use, or organizational use, the focus of this research is on the latter. In organizational use, the two main functions of Wiki Technology are as a web-based collaboration tool and a knowledge management tool allowing multiple users to capture and interconnect information [1]. Wiki technology improves upon previous methods of conversational technologies by providing many-to-many communication with current knowledge and history [2]. Wikis can take advantage of collective wisdom to create an effective source of knowledge [3-6].

Drawing from literature on wikis and collaboration, a pilot study, and relevant theoretical background, a new model is proposed

for wiki diffusion. The propositions for the model reflect upon Diffusion of Innovation Theory, which was developed to study the willingness of individuals to adopt an innovation. The early work of Rogers focused on innovation in general [7], however, an extensive amount of research has been performed into adoption and diffusion of information systems technology innovation. However, studies involving Wiki technology as an innovation are lacking. We posit that diffusion of Wiki Technology can be increased given the existence of key facilitators. In order to encompass all aspects of technology implementation, these facilitators include a broad range of contextual factors. The processes and products of technological innovation are influenced by user characteristics, organization and organizational environment characteristics, and task and technology characteristics [8]. Combined with the range of contextual factors is the stage model of IT implementation. The stages of implementation include initiation, adoption, adaptation, acceptance, routinization, infusion [8]. Each stage of the model corresponds to different contextual factors. The conceptual model proposed by this paper considers both a variety of factors as well as different stages of implementation. Proper consideration of these items in conjunction with each other will provide for an effective end result of overall diffusion of the technology defined as effective routinized and integrated use of the technology. The conceptual model includes the following key facilitators: an organizational culture conducive to change and innovating; user perceptions of compatibility, relative advantage, and lack of complexity; and achievement of a critical mass of users. Consideration of this model throughout the stages of Wiki technology implementation may result in a higher likelihood of adoption and diffusion of the technology.

2 Background

2.1. Wiki Technology

The word “wiki” means fast or quick in Hawaiian [1]. The father of Wiki technology, Ward Cunningham, coined this word after remembering a trip to Hawaii where a shuttle at the airport was called “Wiki Wiki”, meaning really quick. Wikis allow for multiple users to share in creating, editing, and maintaining content via simple internet technologies. A cornerstone of Wiki technology involves the promotion of meaningful topic associations between different pages by making page link creation almost intuitively easy and by indicating the existence of a target page [1].

Additional features of wikis include simple text formatting, external linking, file uploading, a page history tracking changes, and a “Sandbox” serving as a practice area for new users to experiment with creating and editing pages. The page history also allows for restoring previous versions, thereby serving as a rollback mechanism enabling the community of users to serve as protectors against malicious content. Most wiki software has searching and indexing capabilities. Websites based on Wiki technology may choose whether or not to limit access to registered users. The extent to which modifications are monitored and reviewed also varies from site to site.

The most well known instantiation of Wiki technology is Wikipedia, an immensely popular and successful online encyclopedia. Being the first widespread application of Wiki technology, early research has focused on Wikipedia. Research focused on organizational use of Wiki technology has provided some general informative work; however, substantial theoretical research is still in its infancy.

Wikis allow for collaborative authoring and knowledge management with the incorporation of mechanisms for communicating within the system. Unification of multiple functions into a single tool combined with the ability to access the tool via simple internet technologies provides an innovative product for organizations.

2.2. Diffusion of Innovation Theory

The development of Diffusion of Innovation Theory was established by Everett Rogers in 1962. This early work, focusing on innovations in general, categorized individuals into five basic types: innovators, early adopters, early majority,

late majority, and laggards [7]. Rogers also proposed a basic model for the diffusion of innovations, as well as core constructs. Rogers’ five stage model consists of knowledge, persuasion, decision, implementation and confirmation. The core constructs affecting innovation diffusion include relative advantage, compatibility, complexity, observability and trialability. Another approach reduces Rogers’ model to include only those constructs consistently related to technology adoption behavior (relative advantage, complexity, compatibility) [9]. Because adoption is an important precursor to diffusion, these constructs have been chosen and adapted to reflect Wiki technology as the specific innovation (See Table 1).

Table 1. Constructs of Diffusion of Innovation Theory adapted to wikis

Construct	Definition
Relative Advantage	The degree to which a wiki innovation is perceived as being better than its precursor
Compatibility	The degree to which a wiki innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters
Complexity	The degree to which a wiki innovation is perceived as being difficult to use

Rogers’ Diffusion of Innovation Theory has served as the basis of research focusing on the special case of information technology implementations [9-19]. Moore and Benbasat draw on Rogers’ Theory as well as Technology Acceptance Model to develop eight constructs measuring users’ perceptions of adopting an information technology innovation: voluntariness, image, relative advantage, compatibility, ease of use, result demonstrability, trialability, and visibility. This model transforms the general innovation theory to the specific area of technology innovation. Rogers’ stages of diffusion have also taken on a variety of reinventions with some indicating that certain constructs predict “adoption”, while others predict “diffusion” [10]. To distinguish between the two terms, adoption pertains to initial use of an innovation, whereas diffusion pertains to continued or routinized use.

Fichman provides a guide to innovation adoption and diffusion research focusing on styles of research and proper measurement [14]. The three styles of research described are technology-focused, innovativeness-focused, and factor-focused. This paper focuses on technology-focused research since Wiki technology is serving as the specific IT innovation being analyzed. Measurement in innovation research can be classified by the degree of aggregation. Aggregation can be defined as either aggregating innovative behaviors across innovations or aggregating across the assimilation lifecycle within organizations. Fichman explains that some situations are more favorable for use of aggregative measures. With the objective of this study a single innovation design, aggregative measures are not recommended; instead, secondary characteristics or contagion effects are a better alternative. This recommendation combined with the findings of their pertinence to technology adoption serves as our justification for including the constructs of relative advantage, compatibility, and complexity.

However, it is important to include a variety of contextual factors relating to the many aspects of technology implementation [19]. The constructs proposed by Rogers and Moore and Benbasat mainly focus on user perceptions. Yet innovation adoption can be viewed as a major organizational change requiring consideration of elements of the organizational environment. Consideration of the organizational environment's attitude toward change is most pertinent to the stage of initiation. Hence we also include organizational culture as a factor influencing Wiki technology diffusion.

Furthermore, the uniqueness of Wiki technology should also be considered. Wiki technology can be classified as social software where users engage in community computing [4]. This classification calls for the inclusion of the concept of critical mass.

We propose a new model for Wiki diffusion incorporating the above mentioned constructs (See Figure 1).

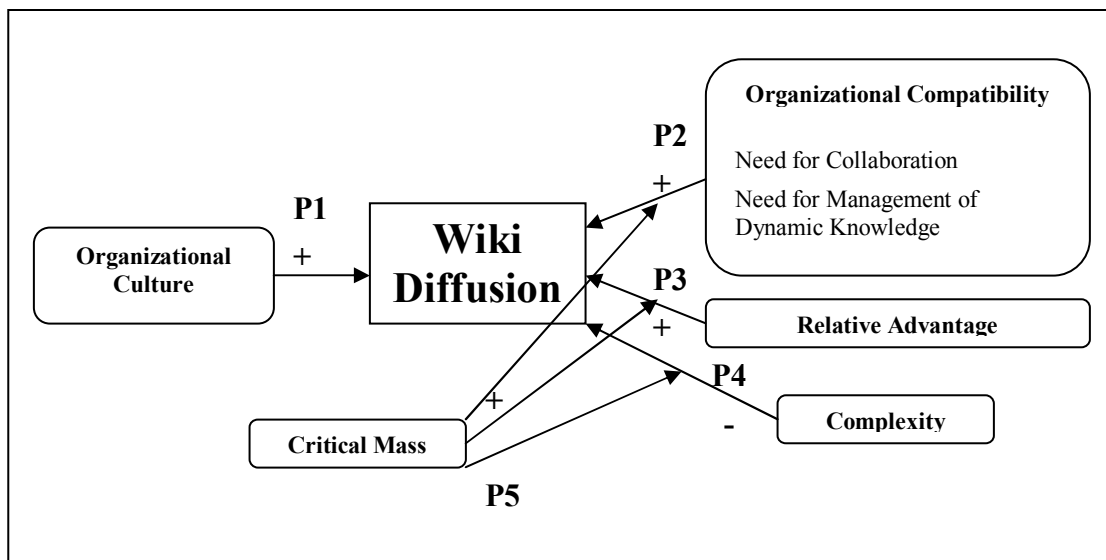


Figure 1. Wiki diffusion model

3 Factors Influencing Wiki Diffusion

An organizational environment encompasses the social, technological, economic and political environment in which a business functions. This environment can be further defined by several factors: purpose and activities of the

organization, overall strategic direction, organizational culture, organization size, staff skills and experience, and marketplace factors [20]. Organizational culture, defined as the attitudes, experiences, beliefs and values of an organization [21], is of particular importance to the environment. Organizational environment and business infrastructure are major factors in

all aspects of an organization, particularly in areas of decision making, strategy formation, and performance. These factors also have an effect on innovation diffusion. In addition to the basic components of the environment, the general stance on innovation [13], or more specifically innovation mindfulness [15, 22] can also influence the adoption and diffusion of innovations.

Support from top management in general is viewed as having a significant, positive impact on innovation adoption [12, 23-26]; further attention should be given to management's role in situations of change. Overcoming resistance to change is a well established management concept in organizational behavior with numerous potential causes for resistance [27]. An extreme organizational change can break down relationships resulting in loss of trust and willingness to share [28]. Implementation of a new technology is viewed as such a change [29]. A change due to innovation can cause a disruption in normal activities that are routine or even habitual [30]. Gallivan develops a change management framework based on a two-step decision process with step one occurring at a management level and step two occurring at the individual level [31]. The primary authority adoption decision involves extensive ongoing participation of management throughout the change process [31, 32]. An organizational environment more propitious to innovation includes management with positive attitudes toward change [14].

Proposition 1 (P1) An organizational culture's attitude toward change affects wiki diffusion.

An innovation is more likely to diffuse when it fits well with an organization's needs, strategies, resources and capabilities. Compatibility is defined as the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters [7]. Compatibility is an important factor for innovation in general, as well as the specific case of Wiki technology. Decisions to adopt technology innovations often suffer from the bandwagon effect, resulting in little or no value to the organization [12, 15, 22]. Taking the time to consider organizational compatibility of an innovation will eliminate the bandwagon effect. In the context of information systems, compatibility includes organizational fit and task-technology fit. Higher performance and effectiveness of information systems can be

realized when appropriate task-technology fit is attained [33-35]. Task-technology compatibility was a major factor in adoption of an innovative material requirements planning system [8] and successful usage of new communication medium [17]. Wiki technology used in organizational settings should first and foremost involve collaborative tasks [1, 2, 6]. Additionally, wikis are most effective for management of ad-hoc, dynamically changing knowledge [2, 36-38]. Wiki technology is a good fit for Project Management, Customer Resource Management, Software Documentation and Collaborative FAQs because tasks are collaborative and involve updating dynamic knowledge, which is often globally distributed [2, 3, 6]. By deploying a wiki to match these task criteria, implementation is more likely to realize increased usage. Wiki technology is also a good fit for emergency preparedness efforts dependent on cross-unit collaboration [5]. An emergency response wiki was developed to integrate the seven member colleges of Claremont University Consortium with the central coordinating entity. The units, which originally used telephone and radio as its means of communication, found that the wiki supports cross-unit collaboration more effectively. The two main benefits achieved by the wiki were enhanced communication and supported knowledge sharing.

Proposition 2 (P2) User perceptions of wiki organizational compatibility result in increased wiki diffusion.

Proposition 2a) Organizations needing collaboration among several persons perceive organizational compatibility with Wiki technology.

Proposition 2b) Organizations needing management of ad-hoc, dynamic knowledge perceive organizational compatibility with Wiki technology.

Relative advantage is described as the degree to which an innovation is perceived as being better than its precursor [7]. Wiki technology may provide perceived benefits compared to other communication technologies such as email or other collaborative tools. Users are more willing to adopt a new technology if they perceive a relative advantage to such use [11, 39, 40]. Wiki technology has boundless accessibility. This benefit will be realized most by so-called far-flung employees, who are members of virtual groups dispersed geographically [3, 41]. Another emerging

benefit to Wiki technology is time saved, allowing for increased focus on content development [3]. In collaborative authoring projects, use of e-mail to send files back and forth takes considerable time as well as confusion regarding the most current version [41, 42]. Wikis enable users to benefit tremendously from reduced turnaround time for updates and revisions. Users may realize that by combining their efforts, the benefit will be having work done, and appreciation of this benefit will facilitate successful wiki applications [4]. With knowledge sharing, users may experience reciprocal benefits, in which case contributing knowledge may lead to receiving knowledge from others when requested [43]. Due to its collaborative nature, engaging in Wiki technology has been called “socially inclusive interactive community computing” [44]. Other research also classifies Wiki technology as social software where users engage in community computing [4, 44-47]. Resources providing valued benefits to participants are essential in social structure sustainability [48]. Benefits specific to online social structures include development of interpersonal relationships, perceptions of affiliation, encouragement of discussion and knowledge sharing, allowing for individuals to access information and quickly disseminate ideas, and enabling collective activities [48]. Furthermore, engaging in social interaction such as collaboration can provide for more effective work processes in the areas of creativity and innovation [49].

Proposition 3 (P3) User perceptions of wiki’s relative advantage compared to other tools result in increased wiki diffusion.

Complexity is a factor in Diffusion of Innovation Theory having a negative relationship with adoption [7, 16]. Complexity is defined as the degree to which an innovation is perceived as being difficult to use [7], and can be compared to the construct of Perceived Ease of Use from TAM [16]. When the innovation is viewed as complex to use, users will be less likely to adopt the new technology [10, 11, 13, 40]. Curtin University Library implemented a wiki to serve as maintenance for policy statements and guidelines, a frequently asked questions knowledge base, and electronic notebooks for personal use [42]. Initially, the editing tools and user interface as well as the processes of creating and editing pages challenged users. These issues proved to be an obstacle to wiki usage. The same problem was encountered with a pilot

study on wiki usage conducted by the authors. In this exploratory study, students required to complete a group project involving business process redesign were encouraged to utilize a wiki to serve as a tool for communication and collaboration. In order to facilitate a speedy and hassle-free adoption of a wiki tool, a free web-based solution was implemented. Participants preferred traditional forms of communication, particularly e-mail. Participants were also discouraged by the user interface and lack of WYSIWYG formatting, indicating that complexity was clearly a factor. Nonetheless, we should point out that numerous versions of wiki software now include WYSIWYG formatting and have made great strides in improving the user interface, reducing the wiki complexity.

Proposition 4 (P4) User perceptions of wiki complexity result in decreased wiki diffusion.

The goal of wiki implementation is to provide a system for collaboration and communication. Therefore, the wiki essentially creates a community of users. The term “critical mass” in the context of group dynamics involves the level of membership required for a mutually beneficial relationship among all members. In a wiki community, members serve as contributors as well as recipients of information. Achieving a critical mass of users is essential for communication systems [17, 50] and groupware [40]. The number of users of communication systems affects the value of the system at initial adoption as well as continued use [17]. Lim, et al. relate the concept of critical mass specifically to innovation diffusion defining critical mass as “the minimal number of adopters of an interactive innovation for the further rate of adoption to be self-sustaining” [18]. In a wiki community, members serve as contributors as well as recipients of information. If there are too few members, adequate contributions will not be made, but as the membership grows, contributions increase thereby providing requisite levels of information for recipients. New members will not join until a threshold in collective behavior is perceived. Lim, et al. define this threshold in collective behavior as the number of people who must be doing the activity before a given individual joins in” [18]. Thus the threshold in collective behavior occurs at the individual level whereas critical mass pertains to the system level [18]. A social community that can provide positive net benefits are better able to attract and retain members, and hence survive

over the long term [48]. However, social structures struggle with balancing the positive and the negative consequences of size and communication activity [48]. When there are too few members, there are not enough contributions, but as membership increases, the community may suffer from information overload. Thus a critical mass must be obtained to achieve a balance of the right number of members. Achieving a critical mass can affect users' perceptions of compatibility, relative advantage and complexity and is therefore included as having a mediating effect.

Proposition 5 (P5) Wiki diffusion depends on communities achieving a critical mass of wiki users.

4 Implications

Additional research is needed to test the propositions outlined above; however implications for practitioners and researchers are available. Wiki technology is an emerging trend making way in organizational environments. For practitioners, Wikis can take advantage of collective wisdom to create an effective source of knowledge [3-5, 38, 51]. Wikis also allow for strong linking of relevant concepts providing for an effectively inter-connected knowledge source. Using a wiki to store, edit and access organizational knowledge can be an effective organizational knowledge management initiative [4, 5]. The contribution of this work is the theoretically informed emphasis on the need to consider a variety of contextual factors influencing technology diffusion: organizational, environmental, task, technology and user-oriented. Practitioners taking heed to the recommended propositions may realize increased diffusion of Wiki technology. Implementations should include careful consideration of organizational culture, as well as user perceptions of organizational compatibility, relative advantage, and complexity. Efforts should also be made to achieve and maintain a critical mass of users.

Researchers can forge the progress initiated by this study which recommends consideration of Diffusion of Innovation Theory in Wiki technology implementations. With Wiki technology research in its infancy, continued effort at revealing theoretical foundations of the adoption and diffusion of Wiki technology will contribute vital insights to both academic and business communities. Extensive studies

involving wiki applications and user involvement will provide valuable knowledge regarding best practices as well as mistakes to avoid. Empirical evidence to substantiate the proposed model will prove to be a prolific contribution.

5 Conclusion

Wiki technology utilization is growing at a dramatic rate. Empirical evidence indicates this technology is sustainable (Majchrzak et al. 2006). Given the numerous benefits of using a wiki in applications of collaborative knowledge creation and sharing, it would be advantageous to continue to study the environments surrounding Wiki technology, including patterns and behavior of users as well as characteristics of the organization. This study marks an important step forward in a theoretical understanding of Wiki technology diffusion. We hope to pave the way for continued research into Wiki technology, bringing the topic to the attention of practitioners and academics. Further research is needed to untangle the interactions between these constructs as well as consideration of additional possible theories applicable to Wiki technology such as Actor-network theory. These issues will be addressed as the research presented in this paper progresses.

6 References

- [1] B. Leuf and W. Cunningham, *The Wiki Way: Quick Collaboration on the Web*. Laflin, PA: Addison-Wesley, 2001.
- [2] C. Wagner, "Wiki: A Technology for Conversational Knowledge Management and Group Collaboration," *Communications of the Association for Information Systems*, vol. 13, pp. 265-289, 2004.
- [3] L. Bean and D. D. Hott, "Wiki: A Speedy New Tool to Manage Projects," *The Journal of Corporate Accounting & Finance*, vol. 16, pp. 3-8, July/August 2005.
- [4] H. Hasan and C. C. Pfaff, "The Wiki: an environment to revolutionise employees' interaction with corporate knowledge," in *Convergence of the computer-human interaction special interest group (CHISIG) of Australia on Computer-human interaction*, Sydney Australia, 2006, pp. 377-380.
- [5] M. Raman, "Wiki Technology as a "Free" Collaborative Tool Within an Organizational Setting," *Information Systems Management*, vol. 3, pp. 59-66, Fall 2006.
- [6] C. Wagner and A. Majchrzak, "Enabling Customer-Centricity Using Wikis and the Wiki Way,"

- Journal of Management Information Systems*, vol. 23, pp. 17-43, Winter 2007.
- [7] E. M. Rogers and M. M. Allbritton, "Interactive Communication Technologies in Business Organizations," *Journal of Business Communication*, vol. 32, pp. 177-195, April 1995.
- [8] R. B. Cooper and R. W. Zmud, "Information Technology Implementation Research: A Technological Infusion Approach," *Management Science*, vol. 36, pp. 123-139, February 1990.
- [9] L. G. Tomatzky and K. J. Klein, "Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings," *IEEE Transactions on Engineering Management*, vol. EM-29, pp. 28-45, 1982.
- [10] R. Agarwal and J. Prasad, "The role of innovation characteristics and perceived voluntariness in the acceptance of information technologies," *Decision Sciences*, vol. 28, 1997.
- [11] R. C. Beatty, J. P. Shim, and M. C. Jones, "Factors influencing corporate web site adoption: a time-based assessment," *Information & Management*, vol. 38, pp. 337-354, 2001.
- [12] R. G. Fichman, "Going Beyond the Dominant Paradigm for Information Technology Research: Emerging Concepts and Methods," *Journal of the Association for Information Systems*, vol. 5, pp. 314-355, August 2004.
- [13] J. Dedrick and J. West, "An Exploratory Study into Open Source Platform Adoption," in *37th Hawaii International Conference on System Sciences*, Hawaii, 2004.
- [14] R. G. Fichman, "The Role of Aggregation in the Measurement of IT-Related Organizational Innovation," *MIS Quarterly*, vol. 25, pp. 427-455, December 2001.
- [15] Fiol and O'Connor, "Waking Up! Mindfulness in the Face of Bandwagons," *Academy of Management Review*, vol. 28, pp. 54-70, 2003.
- [16] G. C. Moore and I. Benbasat, "Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation," *Information Systems Research*, vol. 2, pp. 192-222, 1991.
- [17] R. E. Kraut, R. E. Rice, C. Cool, and R. S. Fish, "Varieties of Social Influence: The Role of Utility and Norms in the Success of a New Communication Medium," *Organization Science*, vol. 9, pp. 437-453, July-August 1998.
- [18] B.-L. Lim, M. Choi, and M.-C. Park, "The late take-off phenomenon in the diffusion of telecommunication services: network effect and the critical mass," *Information Economics and Policy*, vol. 15, pp. 537-557, 2003.
- [19] T. H. Kwon and R. Zmud, "Unifying the Fragmented Models of Information Systems Implementation," in *Critical Issues in Information Systems*, Boland and Hirscheim, Eds. New York: John Wiley, 1987.
- [20] J. Robertson, "Developing a knowledge management strategy," in *KM Column*. Vol. August 2004, 2004, pp. 1-7.
- [21] E. Turban, E. McLean, and J. Wetherbe, *Information Technology for Management*, 3rd ed. New York, NY: John Wiley & Sons, Inc., 2002.
- [22] E. B. Swanson and N. C. Ramiller, "Innovating Mindfully with Information Technology," *MIS Quarterly*, vol. 28, pp. 553-583, December 2004.
- [23] F. J. Carter, T. Jambulingam, V. K. Gupta, and N. Melone, "Technological innovations: a framework for communicating diffusion effects," *Information & Management*, vol. 38, pp. 277-287, 2001.
- [24] A. Meyer and J. Goes, "Organizational assimilation of innovations: a multilevel contextual analysis," *Academy of Management*, vol. 31, pp. 897-923, 1988.
- [25] R. Zmud, "Diffusion of modern software practices: influence of centralization and formulation," *Management Science*, vol. 28, pp. 1421-1431, 1982.
- [26] L. B. Eder and M. Igarria, "Determinants of intranet diffusion and infusion," *International Journal of Management Science*, vol. 29, pp. 232-242, 2001.
- [27] E. B. Dent and S. G. Goldberg, "Challenging "Resistance to Change", " *Journal of Applied Behavioral Science*, vol. 35, pp. 25-41, March 1999.
- [28] C. Armistead and M. Meakins, "Managing Knowledge in Times of Organisational Change and Restructuring," *Knowledge and Process Management*, vol. 14, pp. 15-25, 2007.
- [29] M. L. Markus, "Power, Politics, and MIS Implementation," *Communications of the ACM*, vol. 26, pp. 430-444, June 1983.
- [30] S. Ram and J. N. Sheth, "Consumer Resistance to Innovations: The Marketing Problem and Its Solutions," *The Journal of Consumer Marketing*, vol. 6, pp. 5-14, Spring 1989.
- [31] M. J. Gallivan, "Adoption, diffusion, and infusion of IT: Organizational adoption and assimilation of complex technological innovations: development and application of a new framework," *ACM SIGMIS Database*, vol. 32, pp. 51-85, 2001.
- [32] K. Bodker, J. K. Pors, and J. Simonsen, "Implementation of Web-based Information Systems in Distributed Organizations," *Scandinavian Journal of Information Systems*, vol. 16, pp. 85-116, 2004.
- [33] I. Zigurs and B. K. Buckland, "A Theory of Task/Technology Fit and Group Support Systems Effectiveness," *Management Information Systems Quarterly*, vol. 22, pp. 313-334, September 1998.
- [34] D. L. Goodhue and R. L. Thompson, "Task-Technology Fit and Individual Performance," *Management Information Systems Quarterly*, vol. 19, pp. 213-236, June 1995.
- [35] D. L. Goodhue, "Understanding User Evaluations of Information Systems," *Management Science*, vol. 41, December 1995.

- [36] A. VanDeursen and E. Visser, "The Reengineering Wiki," in *Conference on Software Maintenance and Reengineering*, Budapest, Hungary, 2002, pp. 217-220.
- [37] K. S. K. Cheung, F. S. L. Lee, R. K. F. Ip, and C. Wagner, "The Development of Successful On-Line Communities," *International Journal of the Computer, the Internet and Management*, vol. 13, pp. 71-89, January-April 2005.
- [38] F. Fuchs-Kittowski and A. Kohler, "Wiki Communities in the Context of Work Processes," in *WikiSym*, San Diego, California, 2005, pp. 33-39.
- [39] A. Majchrzak, C. Wagner, and D. Yates, "Corporate Wiki Users: Results of a Survey," in *WikiSym*, Odense, Denmark, 2006, pp. 99-104.
- [40] J. Grudin, "Groupware and Social Dynamics: Eight Challenges for Developers," *Communications of the ACM*, vol. 37, pp. 92-105, January 1994.
- [41] C. Wei, B. Maust, J. Barrick, E. Cuddihy, and J. H. Spyridakis, "Wikis for Supporting Distributed Collaborative Writing," in *Annual Conference for the Society for Technical Communication*, Seattle, Washington, 2005, pp. 204-209.
- [42] C. Wiebrands, "Collaboration and Communication Via Wiki: The Experience of Curtin University Library and Information Service," in *Australian Library and Information Association 2006 Biennial Conference*, Perth, Australia, 2006.
- [43] A. Kankanhalli, B. C. Y. Tan, and K.-K. Wei, "Contributing Knowledge to Electronic Knowledge Repositories: An Empirical Investigation," *Management Information Systems Quarterly*, vol. 29, pp. 113-143, March 2005.
- [44] J. I. Khan, "Emerging Era of Cooperative Empowerment: Grid, Peer-to-Peer, and Community Computing," in *Information and Communication Technologies*, Pakistan, 2005, pp. 45-51.
- [45] J. Gonzalez-Reinhart, "Wiki and the Wiki Way: Beyond a Knowledge Management Solution," in *Information Systems Research Center*, vol. 2007, 2005, pp. 1-22.
- [46] B. Chawner and P. H. Lewis, "WikiWikiWebs: New Ways to Communicate in a Web Environment," *Information Technology and Libraries*, pp. 33-43, March 2006.
- [47] A. Lih, "The Foundations of Participatory Journalism and the Wikipedia Project," in *Association for Education in Journalism and Mass Communications*, Toronto, Canada, 2004.
- [48] B. Butler, "Membership Size, Communication Activity, and Sustainability: A Resource-Based Model of Online Social Structures," *Information Systems Research*, vol. 12, pp. 346-362, December 2001.
- [49] M. Pallot, R. Ruland, S. Traykov, and K. Kristensen, "Integrating Shared Workspace, Wiki and Blog Technologies to Support Interpersonal Knowledge Connection." vol. 2007: VE-Forum.org, 2006.
- [50] S. F. Ehrlich, "Strategies for Encouraging Successful Adoption of Office Communication Systems," *ACM Transactions on Office Information Systems*, vol. 5, pp. 340-357, October 1987.
- [51] C. Wagner, "Breaking the Knowledge Acquisition Bottleneck Through Conversational Management," *Information Resources Management Journal*, vol. 19, pp. 70-83, January-March 2006.