

Exploring the Impact of Web 2.0 on Knowledge Management

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ABSTRACT

Web 2.0 and Knowledge Management (KM) have a considerable overlap. It appears promising to apply Web 2.0 applications for supporting and improving sharing and creation of knowledge. Yet, little research examining the impact of Web 2.0 on KM has been conducted.

This chapter presents research examining the suitability and impact of Web 2.0 applications on KM in organizations. Two extensive exploratory case studies were conducted involving 11 interviews with key personnel of two student-run organizations.

It is demonstrated how Web 2.0 applications can be used for a number of KM practices mostly related to the areas “asset management” and “knowledge creation and innovation”. Moreover, they suggest that among all the Web 2.0 principles “User-Generated Content” and “Unbounded Collaboration” exert the biggest influence on creating and sharing of knowledge within organizations.

The study contributes to the general understanding of how Web 2.0 and KM practices can be interlinked with each other.

INTRODUCTION

Today, an increasing amount of organizations recognize the importance of their workforces’ knowledge as assets leveraging competitive advantage (Drucker, 1999). This development gave rise to the emergence of Knowledge Management (KM). The KM discipline describes how knowledge-intensive organizations can develop a strategy and design an approach to manage the creation, sharing and application of knowledge in order to perform better and reach their overall strategic goals (Dalkir, 2005).

After the dot-com crash in 2001, a new trend emerged on the Web that is often referred to as “Web 2.0” (O’Reilly, 2007). Although the name suggests a new release in a technical sense it is rather a new approach of how users and developers face the Web. The key idea of Web 2.0 is putting the user in the center. It enables people to participate, collaborate and interact with each other. Web 2.0 has become a mass phenomenon. The social-networking site Facebook counts more than 400 million active users (Facebook, 2010), exceeding the population of USA, and the collaborative encyclopedia Wikipedia contains more than 15 million articles (Wikipedia, 2010) created by a collective of internet users.

As Web 2.0 applications have brought about significant change to how we use the Internet nowadays, companies have begun adopting Web 2.0 applications such as wikis and social networking for leveraging and improving their core processes often referred to as “Enterprise 2.0” (Chui, Miller, & Roberts, 2009). McAfee states “Enterprise 2.0 tools have the potential to usher in a new era” (McAfee, 2006). As more than half of the 2,800 executive surveyed 2007 by McKinsey indicate that they are satisfied with their companies’ return on investment in Web 2.0 technologies, adopting Web 2.0 applications also seems to be interesting from a financial point of view.

One of KM's key aspects is also concerned with fostering interaction and collaboration, commonly referred to as "Socialization" (Nonaka, 1994). According to Levy (2009) KM and Web 2.0 are considerably close to each other. Therefore, it seems interesting to apply Web 2.0 principles to KM. Could this potentially lead to a new era of KM, a "Knowledge Management 2.0" that changes our understanding of it in a similar way a Web 2.0 changed our understanding of the Web?

A literature research revealed some publications describing the implications of Web 2.0 on KM (Hustad & Teigland, 2008; Levy, 2009). However, none of them has systematically studied the impact of Web 2.0 applications on KM. This is where this research joins in. By conducting two extensive exploratory case studies in organizations that use Web 2.0 applications for KM, we would like to shed light on the following research question:

How can organizations use Web 2.0 applications for managing knowledge and which impact can they have on organizational KM?

The research contributes to the general understanding of how Web 2.0 applications can be used to support or enable KM. The results are captured in a framework of Web 2.0 applications, the KM 2.0 Spectrum, and an impact model, the KM 2.0 Impact Model. The KM 2.0 Spectrum can be used as an orientation by organizations that are interested in bolstering up their KM practices by adopting Web 2.0 applications. It provides an overview of the KM aspects that may benefit from Web 2.0 applications. They are provided with suggestions and insights into which Web 2.0 applications can be used for KM. From a scientific point of view, the research contributes to the general understanding of Web 2.0 by proposing a model that relates different aspects of Web 2.0 with each.

BACKGROUND

This section introduces the main concepts related to the research question: KM and Web 2.0. Furthermore, related literature on Web 2.0 in the context of KM is summarized and discussed. Finally, we introduce some literature dealing with the impact of technology on organizations that we use as a basis for the impact model that will be introduced later on.

Knowledge management

In today's economy increasingly more companies base their competitive advantage on what they know and how efficiently they use what they know and how quickly new knowledge can be acquired and used (Davenport & Prusak, 1998). These developments have led to emergence of the KM discipline that can be defined as follows:

Knowledge management is the effective learning process associated with exploring, exploitation and sharing of human knowledge that use the appropriate technology and cultural environments to enhance an organization's intellectual capital and performance. (Jashapara 2004)

Although its name may suggest something else, KM is not so much about managing knowledge but rather about managing knowledge-related processes. Knowledge management is more than information or document management. Additionally, it is not only focused on technology but also involved with cultural aspects.

A general goal of KM is "to leverage knowledge to the organization's advantage" (Nichols, 2000 cited by Dalkir, 2005, p. 4). KM programs aim at retaining knowledge in organizations when people retire (DeLong, 2004) and manage those processes effectively that help the organization to create and share knowledge.

Knowledge

Knowledge is more than data or information. A common distinction of three notions is that data is directly observable content, information consists of analyzed data and knowledge is a result of interpreting information based on individual values, perceptions and experience (Dalkir, 2005, p. 7). Nonaka (1994) stresses the importance of justification of knowledge. He sees knowledge “as a dynamic human process of justifying personal belief as parts of an aspiration for the ‘truth’” (Nonaka, 1994) rather than a static object of non-human nature.

Many scholars distinguish between two types of knowledge: explicit and tacit knowledge (Nonaka, 1994; Polanyi, 1966). Explicit knowledge can be easily expressed in numbers and words. It can be easily formalized and shared within an organization. Tacit knowledge, in contrast, encompasses experiences, insights, and intuition. It is difficult to formalize and share this kind of knowledge.

In order to better response to the needs of organizational KM, Alavi and Leidner (2001) stress that it is important to take on a broader perspective of different knowledge types. They distinguish between declarative knowledge (know-about), procedural knowledge (know-how), causal knowledge (know-why), conditional knowledge (know-when), relational knowledge (know-with). Furthermore, they point out that knowledge can be created by the individual (individual knowledge) or in collective actions of a group. As a last view point they refer to pragmatic knowledge which only encompasses knowledge that is useful for an organization.

Knowledge Management processes and practices

There are numerous models that describe the major steps in the capturing, creation, codification, sharing, accessing, application and reuse of knowledge within and between organizations (Dalkir, 2005, p. 25). Based on the KM cycles of Bukowitz and Williams (1999), McElroy (1999), Meyer and Zack (1996) and Wiig (1993) and her experience in the KM field Dalkir (2005) proposes an integrated KM cycle that is shown in Figure 1.

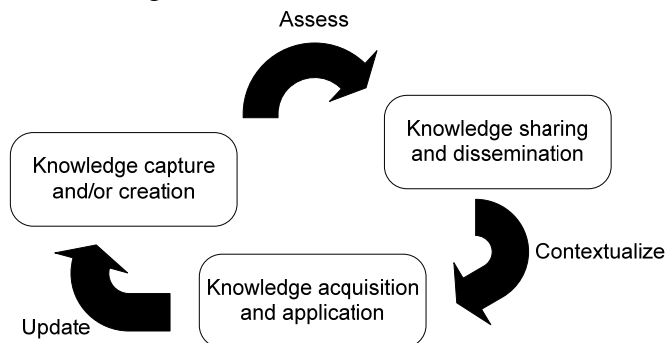


Figure 1: An integrated KM cycle (Dalkir, 2004, p. 43)

After knowledge has been captured from internal or external knowledge sources (previously unknown knowledge or know-how) and/or has been created, it has to be assessed according to the relevancy for the organization. Subsequently, knowledge is shared within the organization. Before it can be used by people it has to be contextualized in order to correspond to their needs. As people make use of the knowledge, the KM cycle will be restarted and people may contribute new insights and signal if the knowledge is not applicable anymore and needs to be updated.

There are a number of KM practices related to the major KM processes. Binney (2001) came up with a framework that brings together various KM theories, tools and techniques discussed in literature. Binney refers to his framework as the KM Spectrum and it is depicted in Figure 2.

	Transactional	Analytical	Asset Management	Process	Developmental	Innovation and Creation
KM Practices	<ul style="list-style-type: none"> ▪ Case Based Reasoning ▪ Help Desk Applications ▪ Customer Service Applications ▪ Order Entry Applications ▪ Service Agent Support Applications 	<ul style="list-style-type: none"> ▪ Data Warehousing ▪ Data Mining ▪ Business Intelligence ▪ Management Information Systems ▪ Decision Support Systems ▪ Customer Relationship Management ▪ Competitive Intelligence 	<ul style="list-style-type: none"> ▪ Intellectual Property ▪ Document Management ▪ Knowledge Valuation ▪ Knowledge Repositories 	<ul style="list-style-type: none"> ▪ Total Quality Management ▪ Benchmarking ▪ Best practices ▪ Quality Management ▪ Business Process (Re-) Engineering ▪ Process Improvement ▪ Process Automation ▪ Lessons Learned ▪ Methodology ▪ SEI/CMM, ISO9000, Six Sigma 	<ul style="list-style-type: none"> ▪ Skills Development ▪ Staff Competencies ▪ Learning ▪ Teaching ▪ Training 	<ul style="list-style-type: none"> ▪ Communities ▪ Collaboration ▪ Discussion Forums ▪ Networking ▪ Virtual Teams ▪ Research and Development ▪ Multi-disciplined Teams

Figure 2: Spectrum of KM applications (Binney, 2001)

The KM Spectrum contains the following elements that each group a number practices (as many of them are rather technology-oriented he refers to them as KM applications):

- *Transactional KM* deals with knowledge that is embedded in the use of technology. Knowledge is presented to the user in the course of an interaction with a system. As an example, Binney refers to Davenport and Klahr (1998)'s description of case-based reasoning in a customer service application where a customer problem can be solved by retrieving information about a similar situation in the past.
- *Analytical KM* allows for creating new knowledge from vast amounts of data or information by providing certain interpretations. Analytical KM applications allow for deriving trends and patterns from data. As an example, business intelligence solutions create intelligence on customers and competitors from a range of data collected inside an organization and complemented by external data.
- *Asset management* involves the process of managing knowledge assets, i.e. is explicit codified knowledge, and making them available to people when they are needed. In addition, it deals with the process of intellectual property management. The difference to analytical KM is that knowledge assets are often more complex and there is a smaller number of them.
- *Process-Based KM* deals with the codification and improvement of processes in order to come up with 'engineered assets'. This often involves using methodologies stemming from other disciplines such as Total Quality Management.
- *Developmental KM* aims at improving and developing the competencies or capabilities of an organization's knowledge workers including both explicit and tacit knowledge. This may include training and skill development programs focusing on explicit knowledge but also the development of learning programs focusing on tacit knowledge.
- *Innovation and creation KM* fosters an environment in which knowledge workers, preferably with different backgrounds, can come together to create new knowledge. Innovation and creation of new knowledge is facilitated by virtual teams, networking and communities.

Many of the KM practices that Binney refers to are rather technical. One might even argue that some of them, especially the ones on the left hand side of the spectrum, are more data analysis or information management applications. One of Binney's own observations is that there is a tendency in the spectrum that reaches from a technologist viewpoint to an organizational theorist viewpoint. This goes along with a focus on explicit knowledge on the left hand side and more tacit knowledge on the right hand side. As pointed out in the definition of KM that we referred to earlier, KM is about both technology and culture. It is important to that technology should merely be a mean and not a goal in itself. In the context

of KM, technology should support different KM practices in order to help an organization achieve its ultimate goal.

As Binney's KM spectrum provides an extensive overview of possible KM practices, we will use it as a starting point for examining the KM functions of the case organizations and then determine in which way Web 2.0 applications can be used for facilitating these practices.

Web 2.0

A glance at Google's search history shows an increasing interest for the term "Web 2.0" since its emergence in the early 2000s. This shows the term's popularity but what does it actually stand for? Musser and O'Reilly introduce it as "a set of economic, social, and technology trends that collectively form the basis for the next generation of the Internet" (Musser & O'Reilly, 2006). However, some scholars argue that Web 2.0 is merely a meaningless marketing buzzword (Brodin, 2007). It seems necessary to further illuminate it and its context in order to come up with a clearer definition of the concept.

Web 2.0 principles

In 2004, the term gained popularity when O'Reilly Media and MediaLive initiated the first Web 2.0 conference (O'Reilly, 2007). O'Reilly and others (Hoegg, Meckel, Stanoevska-Slabeva, & Martignoni, 2006; McAfee, 2006; Vossen & Hagemann, 2007) came up with a number of general principles describing the properties of Web 2.0. Knol, Spruit and Scheper (2008) compared the principles proposed by different authors and proposed a generic set of Web 2.0 principles (they refer to them as Social Computing Principles). They further point out that those generic principles are either technology-oriented or socially-oriented.

The four technology-oriented principles are:

- *Intuitive usability* describes the ease of use of Web services. It is about offering rich user experiences as they can be found in desktop applications (O'Reilly, 2007). Today's Web 2.0 services offer similar features as desktop applications do. The first full Web 2.0 application was Gmail, Google's email service (O'Reilly, 2007). It offered comparable features as desktop email applications and was fully web-based. Since then many more Web 2.0 applications have emerged. Many of these Web 2.0 applications are based on technologies as those embraced by AJAX, which stands for "asynchronous JavaScript and XML". It is a combination of different technologies that allow creating client-site interactive applications (Garrett, 2005). With this set of technologies it is possible to develop applications that solely run in a web browser.
- *Enabling services* are Web services that can be flexibly combined with each other in order to enrich user experiences (Knol et al., 2008) whereas a web service is "a software system designed to support interoperable machine-to-machine interaction over a network" (Haas & Brown, 2004). Web 2.0 should be understood as a platform for various web-services. This new orientation brings along a shift of focus from product management to operations management (O'Reilly, 2007). Services are not published in releases but in a continuous stream of upgrades. O'Reilly introduces the term "perpetual beta" to indicate that services are not only deployed when they are fully developed but will be developed while users already use them. This also allows them to be customized to user's needs.
- *Lightweight models* are preferred over heavy technical solutions that can be found in traditional software development. Instead web-services are loosely coupled systems that can be flexibly

adjusted and combined with each other. This combination of web-services is often referred to as “mash-ups” (Benslimane, Schahram, & Sheth, 2008). O’Reilly (2007) notes that even a simple reassembling of web-services can create new value.

- An *open platform* is open for access and emerges over time when it is used (Knol et al., 2008). In the Web 2.0 era the Web evolves into an open platform that is accessible from a number of devices that are connected to it. It delivers a number of services that evolve with the platform over time.

The five socially-oriented principles are:

- *User-generated content* is one of the principal characteristics of Web 2.0. It breaks with the traditional way of publishing where spreading content was limited to professionals. In a Web 2.0 world, instead, users are enabled to create content and share it with each other. Consequently, large amounts of content are generated and available on the Internet.
- *Network effects* apply to services that get better the more users use them. Since the Web 2.0 is characterized by user-generated content, it greatly benefits from network effects. O’Reilly (2005) notes that successful Web 2.0 companies heavily depend on their ability to harness networking effects from user contributions. He also argues that real Web 2.0 companies and their services do not rely on advertising. Instead, their popularity stems from viral marketing - that is one user recommends the products to another and so forth.
- *Collective intelligence* describes the presumption that a large collective (of users) can develop more than a small number of experts (Knol et al., 2008). O’Reilly (2007) notes that one key enabler of the Web has been the use of hyperlinks that indicate which documents are interlinked with each other. By analyzing hyperlinks a considerable amount of intelligence can be created. O’Reilly indicates that in the Web 2.0 era hyperlinks have been complemented by additional mechanisms that analyze the behavior of users. One prominent example is an automatic suggestion system as that of Amazon.com. From a content perspective Web 2.0 benefits from applications such as wikis and blogs that enable users to post and interact with each other. One of the most prominent examples of a wiki system is certainly Wikipedia, a large encyclopedia that allows everyone to edit it.
- *Unbounded collaboration* indicates that users in the Web 2.0 world can collaborate with each other without boundaries in terms of time and location (Knol et al., 2008). In addition, Knol et al. note, users have an active role in the development of Web 2.0 applications by providing feedback or even delivering the content that would have traditionally been delivered by experts. One prominent example of such as collaboration would be social-tagging approaches (also referred to as folksonomies) that let users assign tags to content resulting in a categorization that strongly reflects the users’ needs.
- *Leverage the long tail* is a concept that allows for reaching out to the huge number of users and customers that represent a niche market. Thanks to approaches such as customer self-service and automatic data management in the Web 2.0 era, it becomes possible to leverage these markets. O’Reilly (2007) notes that successful Web 2.0 companies base a great deal of their businesses on the long tail of customers. This indicates a major change in understanding of e-business models.

The phenomenon of Web 2.0, i.e. what you can see about it, can be mainly related to the socially-oriented principles that are enabled by a set of Web 2.0 Technologies. Therefore, we propose the following definitions based on the Web 2.0 principles:

Web 2.0 is the reorientation of the Web that promotes unbounded interaction, collaboration and participation of people. It is characterized by the emergence of a large amount of content generated by a collective of Internet users. It harnesses networking effects and leverages the long tail.

Web 2.0 Technologies are technologies that transform the Web into a platform spanning all connected devices. They enable the creation of web-services and applications, constructed from lightweight models, and can be used intuitively.

In the following sub-section we review some generic Web 2.0 applications.

Web 2.0 applications

The Internet is a very dynamic place where nearly every day new services and applications appear and others disappear. As things change so quickly, we decided to refer to generic types of services and applications instead of specific ones in the following. A general difficulty that we encountered while reviewing literature like Chui et al. (2009) and (Andersen, 2007) is finding a good scope of looking at these services and applications. Chui et al. list a number of “Web 2.0 technologies” which encompass both web-services (e.g. social networking, wikis) but also function sub-aspects of them (e.g. commenting, tagging, polling etc.). Andersen speaks about “Web 2.0 services and applications” and describes its main characteristics. For the sake of simplicity, we will refer to these applications, services and technologies solely as “Web 2.0 applications” in the following.

Table 1: List of generic Web 2.0 applications

Table 1 lists a number of Web 2.0 applications that we derived from Andersen (2007) and Chui et al. (2009) and some examples of these applications.

Table 1: List of generic Web 2.0 applications

Chui et al.	Andersen	Generic Web 2.0 application	Examples
Wikis	Wikis	Wiki	www.wikimedia.org www.twiki.org
Shared workspaces	Collaborating Replicate office-style software	Shared workspace	docs.google.com
Blogs	Blogs	Blogging	www.blogspot.com www.wordpress.com
Tagging social bookmarking	Tagging and social bookmarking	Social bookmarking	www.digg.com del.icio.us
Social networking	Social Networking	Social networking	www.facebook.com www.orkut.com www.myspace.com www.twitter.com
Podcasts Videocasts	Multimedia sharing Audio blogging and podcasting	Media sharing	www.youtube.com www.picassa.com www.flickr.com

McAfee (2006) made an attempt to break down some common features of Web 2.0 applications into a number of components that he refers to as SLATES. The synonym stands for the first letters of the components which are:

- *Search.* McAfee points out that search technology is essential for an information platform. Although navigation aids might help the user to find information, keyword searches are the most popular way of finding information.
- *Links.* Links are the basis of all web-based systems and give a good indication of what is important and really matters to the users.
- *Authoring.* The popularity of sites like Wikipedia and blogs show people’s interest in authoring and publishing to a broad audience. Blogs are means for publishing by an individual and wikis let a group of people publish collaboratively.
- *Tags.* Tagging lets users assign tags to important pieces of information like intranet pages and links. According to McAfee tagging is a way to “outsource” the categorization of content to a system’s users. The corresponding categorization system is called a “folksonomy” and contrasts taxonomies, which are up-front categorizations by experts.
- *Extensions.* These are components that assist users by automating some categorization work. A prominent example referred to by McAfee is Amazon’s recommendation system that suggests users based on their previous action what they could be interested in.
- *Signals.* These are applications that signal users when content on pages of interest has been updated. A key technology used for this is RSS (short form of “Really Simple Syndication”), which is a protocol that allows users to aggregate updates from a numerous websites in one single place.

Towards the Web 2.0 Layer Model

In order to determine the importance of the socially-oriented Web 2.0 principles for each type of Web 2.0 application, we associated them with each other. The result of this matching is shown in Table 2.

Table 2: Web 2.0 applications and principles (reasons indicated if associated)

	1 – Unbounded Collaboration	2 – Collective Intelligence	3 – User- Generated Content	4 – Network Effects	5 – Leverage the Long Tail
<i>Wiki</i>	Time and location not important for contributions	Snippets from many contributors	Content from users	Many contributors necessary to produce high quality	
<i>Social Bookmarking</i>	Time and location of people is not important	Generates intelligence from users’ contributions	Users share bookmarks	Many contributors necessary to benefit from automatic suggestions etc.	
<i>Shared Workspace</i>	Collaboration independent from time and space possible		Used for generating content by user		
<i>Blogging</i>	Linking and commenting on each other’s posts independently from time and space		Enables every user to publish	People may only write a blog if others do as well and the blog is read by many	
<i>Media Sharing</i>	Time and location not important		Enables every user to publish	People may only share media content if others do as well and the content is viewed by many	

	1 – Unbounded Collaboration	2 – Collective Intelligence	3 – User-Generated Content	4 – Network Effects	5 – Leverage the Long Tail
<i>Social Networking</i>	Interaction independent from time and space		User may contribute and share content	Many users necessary to make it work	Each post may add a micro value for people

In Figure 3 the Web 2.0 Layer Model is shown. This model combines the three principal aspects of Web 2.0 with each other by depicting them in different layers.

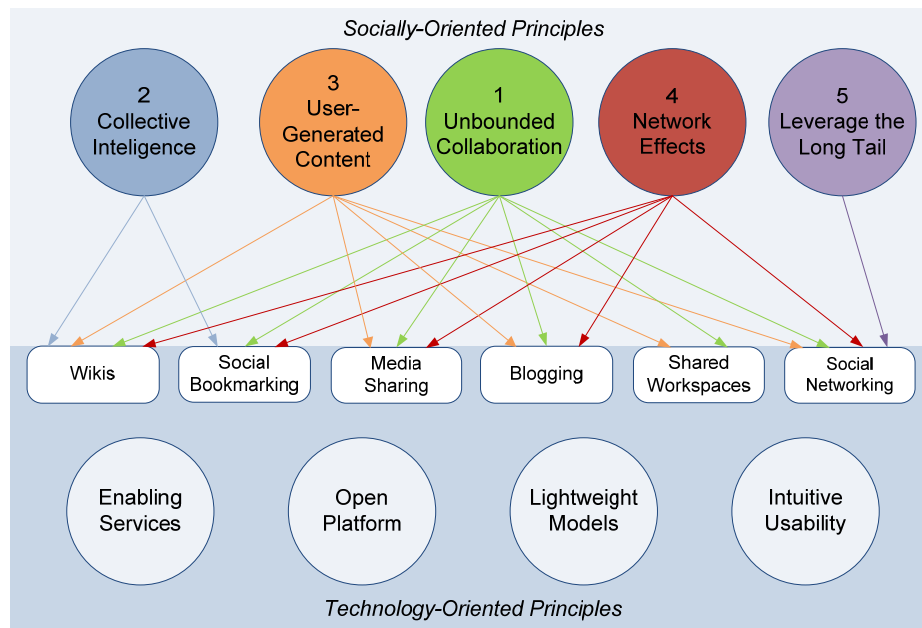


Figure 3: Web 2.0 Layer Model

The technology-oriented Web 2.0 principles represent the fundament of Web 2.0 and therefore are depicted in the bottom. Based on these principles a number of Web 2.0 applications, as depicted in the middle layer of the model, have emerged. The socially-oriented Web 2.0 principles are related to social behavior that is enabled by Web 2.0 applications. Different colors are used to make clear which socially-oriented Web 2.0 principles describe the characteristics of each Web 2.0 application.

Related Literature on Knowledge Management 2.0

We conducted a systematic literature research with Google Scholar, ISIS Web of Knowledge and the library search engine Omega in order to familiarize ourselves with the domain and identify related literature. The used keywords were deducted from the concepts raised by the search question (KM and Web 2.0, Knowledge Management 2.0) and complemented by some synonyms and related keywords (“wiki”, “social media” etc.).

In the following we summarize some of the major related publications:

- Based on a literature review and qualitative interviews with employees of a multinational organization, Baltatzis et al. (2008) examine the prospects of implementing social networking technology for internal communication amongst staff of large organizations. They identified a

number of possible benefits, such as improved collaboration and fostering a climate of trust. On the other hand, they also point to a number of risks and barriers when introducing social network technologies caused by protective policies within organizations.

- By conducting an exploratory study Hustad and Teigland (2008) investigate how multinational companies use social networking and Web 2.0 for sharing and creation of knowledge and what challenges they face. In addition to examining how Web 2.0 applications can be used for internal knowledge networking, they also show how inter-organizational knowledge networking can be facilitated by Web 2.0 applications. Among the challenges related to the implementation of Web 2.0 in organizations are poor top management support and potential for knowledge leakage.
- Lee and Lan (2007) elucidate how wikis may initiate a transformation of organizational KM approaches from conventional knowledge repository containing knowledge from a stakeholders of business competencies to a conventional KM system harnessing collective intelligence of a large group of contributors. They point out that it is important for organizations to identify their current state and consider a number of critical success factors in order to benefit from this new approach.
- Levy (2009) provides a literature review of Web 2.0 related articles and reflects on the implications of Web 2.0 on KM. Her findings suggest that Web 2.0 principles and attributes match quite well with those of KM. However, she points out that organizations have to be careful with adopting Web 2.0 for KM purposes as it has to be assured that the respective organization is ready for this approach. Levy sees the main contribution to KM in applications such as wikis and blogs.
- Based on a case study encompassing 11 in-depth interviews Paroutis & Al Saleh (2009) present a number of reasons for and barriers to people's participation in Web 2.0 platforms. They indicate that the history of a KM program, people's outcome expectations, perceived support by the organization / management and trust play important roles for people participation.
- By reviewing literature on KM and Web 2.0 Scherp et al. (2009) propose an alignment of the four traditional KM processes "creation", "transfer", "storage" and "retrieval" with a number of Web 2.0 processes and its applications. They apply these findings by examining KM applications in the field of emergency response. Finally, they present how they used their insights for designing and a Web 2.0-based KM application for emergence response.
- Tredinnick (2008) provides a general introduction to applying Web 2.0 technologies to intranets of organizations and discusses their implication. He concludes that Web 2.0 in this context is not a technological innovation, but as "it is changing the understanding of the status of information, knowledge and the role of the user" (Tredinnick, 2008), it may eventually lead to "a more democratic, and more evaluative phase in the exploitation of information within organizations" (Tredinnick, 2008).

The summarized publications indicate that there is a considerable interest in the topic of applying Web 2.0 to KM. Among them the article by Hustad and Teigland (2008) can be considered the closest to our research idea as they also describe how Web 2.0 applications may be used by organizations. However, our research goes one step further by investigating the impact of Web 2.0 applications on KM. In addition, the fact that the case studies are conducted in a different type of organization (multinational companies vs. student-run NPOs) sheds a new light on the topic.

TOWARDS AN IMPACT MODEL OF KNOWLEDGE MANAGEMENT 2.0

This section explains how we determined the impact of Web 2.0 applications on KM practices in case studies in two student-run organizations. In addition, it introduces the KM 2.0 Spectrum, an overview of Web 2.0 applications for KM, and the KM 2.0 Impact Model that is based on the findings from the two case studies.

Assessing the impact of technology on organizations

By applying (Giddens, 1976, 1979, 1984) theory of structuration to the specific context of technology in organizations, (Orlikowski, 1992) presents a theoretical model that conceptualizes the interaction between technology and organizations. In contrast to previous works that tried to conceptualize this relation, she introduces two important notions; the duality of technology, i.e. technology is not only shaped by humans but also shapes humans' actions, and the interpretive flexibility of technology, i.e. the outcome of applying technology depends on the actors and the social-historical context it is applied to. Orlikowski argues that technology is often developed by and applied in different organizations. She therefore distinguishes between a "design mode" and a "use mode" of technology. Her model, shown in Figure 4, generally distinguishes between four types of influences:

- a. *Technology as a Product of Human Action.* Technology is an outcome of human actions such as design, development, appropriation and modification.
- b. *Technology as a Medium of Human Action.* Technology facilitates and constraints human action through the provision of interpretive schemes, facilities and norms.
- c. *Institutional Conditions of Interaction with Technology.* Institutional properties influence humans in their interaction with technology.
- d. *Institutional Consequences of Interaction with Technology.* Interaction with technology influences the institutional properties of organizations.

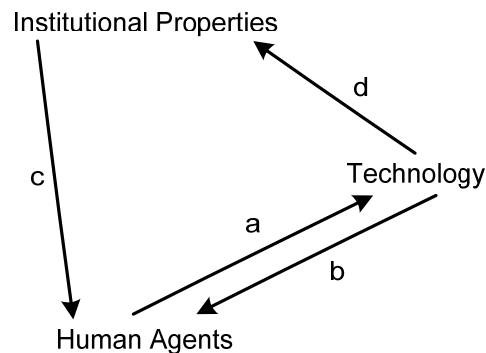


Figure 4: Structuration Model of Technology (Orlikowski, 1992)

DeSanctis and Poole (1994) further developed Structuration Theory to provide a set of concepts to examine technology induced change, which they call Adaptive Structuration Theory (AST). They argue that between the two opposing perspectives of the decision-making school, which assumes that technology is there to increase productivity and efficiency and therefore necessarily leads to organizational change, and the institutional school, which assumes that technology is a product of human constructs and therefore solely provides an opportunity for change, a new integrative perspective is necessary that incorporates both views.

This new school, referred to as Social Technology School, considers technology as affecting structures but also being impacted by social practices. AST is one of the theories associated with this school. According to DeSanctis and Poole (1994) AST extends Structuration Theory for technological impact by considering the mutual influence of technology and social processes. They propose a model that summarizes the major constructs and propositions of AST and apply it to analyze the impact of group decision support systems on small group's decision making processes but "the concepts and relations posited [there] could be applied to other advanced technologies and other organizational contexts" (DeSanctis & Poole, 1994).

After exploring which Web 2.0 applications are used for KM (sub-research question 5) and formalizing the findings by mapping them to Binney's (2001) KM spectrum, we used some of DeSanctis and Poole's (1994) propositions and constructs to design my research, which is expressed by the questions of the case study protocols (see appendix). These questions are used to derive some factors describing the potential impact of Web 2.0 applications on organizational KM practices. In addition, we determined a number of situational factors that have an influence on how Web 2.0 applications impact KM.

In the following the aspects of AST that are used in this research are introduced. The primary objective was to identify a number of impacts related to using Web 2.0 applications for KM. In addition, the theory should be used to determine a number of situational factors that may influence the impacts of Web 2.0 applications on KM practices.

Determining impact factors

AST proposes that the use of advanced information technologies has two types of impacts on organizations. First, it has an impact on process outcomes and second, it leads to the creation of new social structures, i.e. rules and resources, within in the organization.

In the case studies we determined how using Web 2.0 applications impacted process outcomes in the context of KM. The different aspects of KM are captured by Binney's (2001) KM spectrum that we used for analyzing each case organization's KM function. In addition, we identified new social structures that have emerged as a consequence of using Web 2.0 applications for a specific KM aspect.

Process outcomes

According to DeSanctis and Poole it is difficult to make "clear-cut predictions about how advanced information technology structures will be appropriated, or what the ultimate outcomes of that appropriation will be" (DeSanctis & Poole, 1994). They assume that the expected outcomes are more likely to be found under ideal circumstances. Although it cannot be expected that ideal outcomes are found for adopting Web 2.0 application in KM, we think that interviews with key personnel can give a good indication of how these applications impact certain process outcomes.

As AST proposes to look at the process outcomes (1) efficiency, (2), quality and (3) commitment, we adopted these and investigated for each aspect of the KM spectrum that is facilitated by Web 2.0 applications whether there is an increase in efficiency, an improvement of quality and/or an increased commitment towards the KM aspect.

New social structures

DeSanctis and Poole define structuration as "the act of bringing the rules and resources from an advanced information technology or other structural source into action" (DeSanctis & Poole, 1994). In the context of this research structuration takes place when people use Web 2.0 applications for specific aspects of KM (as summarized in Binney's (2001) KM spectrum). It could be assumed for instance that the appropriation of Web 2.0 applications reduces the number of physical meetings and leads to new ways of coming together to share information and ideas.

For each KM aspect that is facilitated by Web 2.0 applications we determined if new social structures had emerged. For instance, this could be new types of behaviors (rules), or new resources that can be used for the respective aspect of KM. Table 3 sums up the potential impacts that we look at for each practice of KM that we identified in the case organizations.

Table 3: List of potential impact factors of using Web 2.0 applications for different KM aspects

Impact	Description
--------	-------------

Efficiency	In which way has efficiency of the respective KM practice increased?
Quality	In which way has the quality of the respective KM practice's outcome improved?
Commitment	In which way have people become more committed towards the KM practice?
New social structures	Which new social structures (rules and/or resources) have emerged?

Determining situational factors

According to DeSanctis and Poole (1994) there are a number of factors that influence the way an advanced information technology impacts an organization. These are: the structure of the technology itself, a group's internal systems and other sources of structure such as the external environment and the specific tasks a technology is used for.

Structure of Web 2.0 applications

The structure of a technology is determined by its structural features and its spirit. Structural features encompass "the specific rules and resources, or capabilities offered by the system" (DeSanctis & Poole, 1994). The spirit of an advanced information technology is its "general intent with regard to values and goals underlying a given set of structural features" or "the 'official line' which the technology presents to people regarding how to act when using the system" (DeSanctis & Poole, 1994).

Group's internal systems

A group's internal systems reflect "the nature of members and their relations inside the group" (DeSanctis & Poole, 1994). As I examine the impact of Web 2.0 applications on two case organizations' KM practices, the whole organization is considered as the group of interest.

Some of the aspects that influence the appropriation of structures are according to DeSanctis and Poole (1) the style people interact with each other, (2) the degree of knowledge and experience people have with the structures embedded in technology, (3) the degree to which people believe that others know and accept the use of structures, and (4) the degree to which members agree on which structures are going to be appropriated. I adopt these aspects to get an understanding of the case study organizations' internal systems by conducting interviews with key personnel and basing it on one of the authors' own experience (in one of the case organizations).

Other sources of structure

One fundamental idea of AST is that next to advanced information technology there are other sources of structures. According to DeSanctis and Poole these sources can be related to "the content and constraints of a given work task" (DeSanctis & Poole, 1994) and the organizational environment.

Case Studies

In order to answer the research question case studies were conducted two of Germany's largest student-run organizations: AIESEC in Germany and MARKET TEAM. The case studies involved a number of semi-structured interviews with key personnel, a study of internal documents and a review of the used information systems.

Case studies have become a common research instrument used in social sciences (Yin, 2008) but also in information systems research (Benbasat, Goldstein, & Mead, 1987; Darke, Shanks, & Broadbent, 1998). A definition often referred to is that by Yin:

A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between object of study and context are not clearly evident. It copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result benefits from the prior development of theoretical propositions to guide data collection and analysis. (Yin, 2003, p. 13-14 as cited by Dul & Hak, 2008, p. 4)

As pointed out by Dul and Hak (2008, p. 4), case study research (CSR) generally involves only one single instance or sometimes a small number of instances. CSR is a research method that is applicable in situations where a number of variables are to be observed in a real life context and where this observation cannot simply be limited to an analysis of data points (Yin, 2008, p. 18). It can involve both qualitative and quantitative evidence and is especially applicable to real-life situations that are too complex for survey and experimental research (Yin, 2008, p. 19).

A recent study published by Pew Research Institute shows that the largest group of people (30%) using the Internet, in fact, consists of people born between 1977 and 1990 (Jones & Fox, 2009). In a 2009 article on Web 2.0's implications on KM, Levy (2009) proposes to use people in this age as pioneers of Web 2.0 in organizations to leverage KM practices since "the younger generation finds the changes natural and or probably even waiting for the Web 2.0 tools to be available in the enterprise." (Levy, 2009)

Obviously, the generation of today's students is the most active group of Internet users and thus most familiar with the new technologies of Web 2.0. We therefore think that student-run organizations are an interesting subject for researching the implications of Web 2.0 on KM practices.

General characteristics of non-profit organizations

Both organizations are non-profit organizations (NPOs) and are run by student volunteers on the local level and students working fulltime on the national level. In general, people change position every year which makes knowledge retention a key challenge. As in the NPO domain in general, knowledge in the two organizations can be classified into accounting / administrative, managerial / organizational, teaching / training, fund raising / public relation management / marketing, operational and miscellaneous knowledge (Lettieri et al., 2004).

According to Hume and Hume (2007) a NPOs KM approach is characterized by its size. Based on a study of the Australian non-profit sector Hume and Hume developed a KM implementation planning framework. They distinguish between small, medium and large organizations. A number of key differences between these organizations are shown in Table 4.

Table 4: A comparison of KM approaches in differently sized NPOs (adopted from Hume & Hume, 2007)

	Small NPOs	Medium NPOs	Large NPOs
<i>Specific attributes influencing knowledge</i>	Localized operation; Close proximity of knowledge-workers	Decentralized operation; Regionally and/or nationally organized; Growing information management needs	Scale economics; Geographically dispersed nationally and internationally
<i>Knowledge definition</i>	Largely unstructured knowledge Knowledge filed on PC hard drives	Explicit and structured KM and mainly focused on operational functions to support day-to-day activities	Strategically and operationally mature Structured capturing of both explicit and tacit knowledge

	Small NPOs	Medium NPOs	Large NPOs
<i>KM implementation</i>	Opportunistic	Incremental with strong KM development opportunities	Due to geographic dispersion KM is implemented incrementally (different countries / areas learn from each other)
<i>Culture</i>	Direct communication between peers on need to know basis	Common language / culture	Cultural and language differences
<i>KM collection and diffusion approaches</i>	Socialization and internationalization strategies are the most effective; Externalization is not effective due to day-to-day operational needs.	Socialization and internalization strategies are most effective; Focus could move to increased externalization	Externalization are most feasible, however culture issues (e.g. language) have to be overcome; Socialization strategies are logistically and costly difficult to co-ordinate
<i>Technologies</i>	Limited technology infrastructure (Email; PC hard drives; static Web pages)	Email; Intranets	Email technology to bridge geographic boundaries Collaborative knowledge workspaces tend to managed on regional basis

Whereas knowledge in small NPOs tends to be informal and does not require structural KM approaches, knowledge in medium and especially in large NPOs is more complex and dispersed in different branches. In contrast to medium NPOs, large NPOs not only possess regional branches but encompass a number of countries. According to Hume and Hume medium size NPOs have the best KM effectiveness increase potential among these organization types since they are neither as tightly structured as most large NPOs nor do they have the completely unstructured KM approach as small NPOs generally have.

In general, most NPOs' IT practices turn out to be underdeveloped (Hackler & Saxton, 2007). According to Hackler and Saxton the two main reasons for these deficiencies are that first, leaders do not see the strategic role of IT and that second, NPOs often do not possess the necessary organizational competencies for leveraging IT. Another reason that I can think of is the limitation of funds, i.e. many NPOs have tight financial constraints since their main source of funds are donations and governmental development funds. To react to these deficiencies Hackler and Saxton (2007) propose that outside assistance and expertise is needed. However, they point out NPOs should have partners that engage themselves on the long term rather than just do one time contribution, such as donating PCs. In addition, they point out that staff has to be trained in using IT and management has to be educated about the strategic significance of IT.

Hackler & Saxton (2007) see a great potential for NPOs in leveraging Web 2.0 technology for external communications as well as knowledge sharing within the organization. As an example, Waters, Burnett, Lamm, and Lucas (2009) examined how NPOs use Facebook, a major social networking site, to develop valuable relationships with their stakeholders. They concluded that although NPOs put some effort on leveraging the potential of social networking sites they have not yet been able to reach the full potential of it.

Both case organizations are at different stages of adopting Web 2.0 technologies to enhance their KM practices. Due to their different size and scope (national vs. international) they also differ considerably in regard to their KM needs as indicated by Hume & Hume (2008).

Case 1 – AIESEC Germany

AIIESEC has over 45,000 members globally, whereof more than 2,500 are from 47 local chapters (LC) in Germany. The organization aims at developing tomorrow's socially responsible leaders by running an integrated leadership development program and coordinating internships at its partner companies around the world.

Although not explicitly formulated, AIIESEC's general KM strategy is to codify critical knowledge to make it accessible to members. The strategy corresponds to a codification strategy (Hansen, Nohria and Tierney 1999). This strategy is necessary due to the high personnel turnover of the organization (AIIESEC changes its complete management team every year).

In general, people in AIIESEC get elected or nominated for a term of one year. Before the term of a person starts, he runs through a handover process with his predecessor. To facilitate local knowledge transfer the national support teams provide guidelines for their respective areas that can be used by the current board member to share knowledge with his successor. In addition to these handover sessions, in which mainly specific knowledge regarding the LC is transferred, there are trainings and sharing session amongst a group of people from on functional area that take place on the regional level. Due to limited time and financial resources not all of these regional meetings can take place. Therefore, AIIESEC is investigating the possibilities of virtual education practices such as online collaboration tools, video conferencing tools and telephone conferences.

KM practices

As not all organizations focus on the same aspects of KM, I use Binney's (2001) KM spectrum as a checklist in order to map which aspects of KM are used by AIIESEC. The key practices of AIIESEC's M are shown in Figure 5.

	Transactional	Analytical	Asset Management	Process	Developmental	Innovation and Creation
KM Practices	<ul style="list-style-type: none"> ▪ Help Desk Applications ▪ Customer service application 	<ul style="list-style-type: none"> ▪ Customer Relationship Management (CRM) ▪ Business Intelligence 	<ul style="list-style-type: none"> ▪ Document Management ▪ Knowledge Repositories ▪ Content Management 	<ul style="list-style-type: none"> ▪ Best practises ▪ Quality Management ▪ Process Automation 	<ul style="list-style-type: none"> ▪ Skills Development ▪ Staff Competencies ▪ Learning ▪ Training 	<ul style="list-style-type: none"> ▪ Communities ▪ Collaboration ▪ Discussion Forums ▪ Networking ▪ Virtual Teams ▪ Multi-disciplined Teams

Figure 5: KM spectrum with AIIESEC's key KM practices

Transactional KM. KM at AIIESEC encompasses a number of transactional KM applications. For handling requests and dealing with problems regarding information systems a help desk module is integrated into AIIESEC's web-platform MyAIIESEC. In addition, MyAIIESEC contains a module that facilitates the internship matching process, i.e. to match an intern candidate with a suitable internship. This application is similar to a customer service application as referred to by Binney (2001).

Analytical KM. AIIESEC's business Intelligence attempts are still very limited (e.g. analyzing the traffic on AIIESEC's website). However, the organization has recognized the importance of having an accurate overview of the organization. They are therefore investigating in which way business intelligence could be extended by mining e.g. data from the customer relationship management (CRM) system. The current CRM system is integrated into the organization's Lotus Notes platform. However, at the moment it is investigating how CRM can be integrated into the current platform based on Google Apps.

Asset Management. In regard to document management, MyAIIESEC contains a module for storing and sharing documents. It's integrated with the wiki module that is used for storing codified knowledge. AIIESEC's knowledge repository for storing codified knowledge is realized through wiki pages that are

integrated as a module in MyAIESEC. As all types of documents and files can be linked in this wiki system it can also be considered a content management system.

Process-oriented KM. In AIESEC best case practices are shared between local chapters on conferences and through the wiki system. In addition, AIESEC carries out quality management by having dedicated boards that are in charge of insuring quality for the internship exchange program, which is one of its core products. Several processes are automated in such a way that there are tailor made applications for executing processes in the Lotus Notes.

Developmental KM. Skill developmental takes mainly place through trainings for members on the local and the national level. At the moment AIESEC investigates the opportunities that virtual education would offer. Staff competencies are ensured by offering regular conferences where especially executive board members come together to exchange their knowledge and experiences. Training is a crucial activity in AIESEC. There's a dedicated department that is in charge of coordinating and ensuring the training of trainers, i.e. by offering a train-the-trainers seminar. According to a respondent wiki pages in the wiki module of MyAIESEC are used for learning as they contain the key concepts and manuals for roles in AIESEC.

Innovation and creation. AIESEC involves many sub-communities, e.g. the community of trainers or in a way each chapter or project team can be considered a community. Within these communities people often come together to create new knowledge in forms of concepts and procedures.

On different levels in the organization collaboration practices look quite differently; on the local level people usually meet each other for collaboration and the national level, where most teams are virtual teams, collaboration is mostly performed in a virtual way. In this case people only meet a number of times during their terms to coordinate things and do team building activities. In addition, people use social networking sites, such as Facebook, to keep in contact with each other.

Networking takes place during a number of conferences, in specific networking sessions that take place throughout the year and that are mandatory to attend for executive board members. In such a way, people build up a relatively large networking within the organization that might be helpful in difficult situations. On the national and international level most teams operate as virtual teams, i.e. they don't work from the same location but collaborate with each other by using technologies for coordination and information exchange. Many teams in AIESEC are multi-disciplined in such a way that they are formed of people from different functional areas. That

Web 2.0 applications

In 2007, AIESEC decided to focus its strategy on fostering an organizational culture, where all members actively contribute to achieving the organization's goals. For KM this would mean that members on all levels actively contribute knowledge assets for instance by sharing knowledge. As the KM infrastructure, mainly based on Lotus Domino, was not designed to facilitate a knowledge sharing from bottom-up, the national executive board at that time formulated an explicit information management strategy that encompassed the migration from the Lotus Domino system to the global web-platform MyAIESEC. The platform contains a module for creating wiki pages. In this way all members of the organization are enabled to create wiki pages and edit those created by others. As MyAIESEC is a global platform it had the additional advantage of making the knowledge of the German branch of AIESEC available to other branches as well. The migration to the new platform was also used as an opportunity to get rid of redundant information that had occurred by local executive boards copying documents from the national knowledge base to their local knowledge repository.

The migration process consisted of analyzing the existing documents, creating a national portal page and copying the actual knowledge assets from the old knowledge base into wiki pages. A screenshot of the portal page is shown in Figure 6.

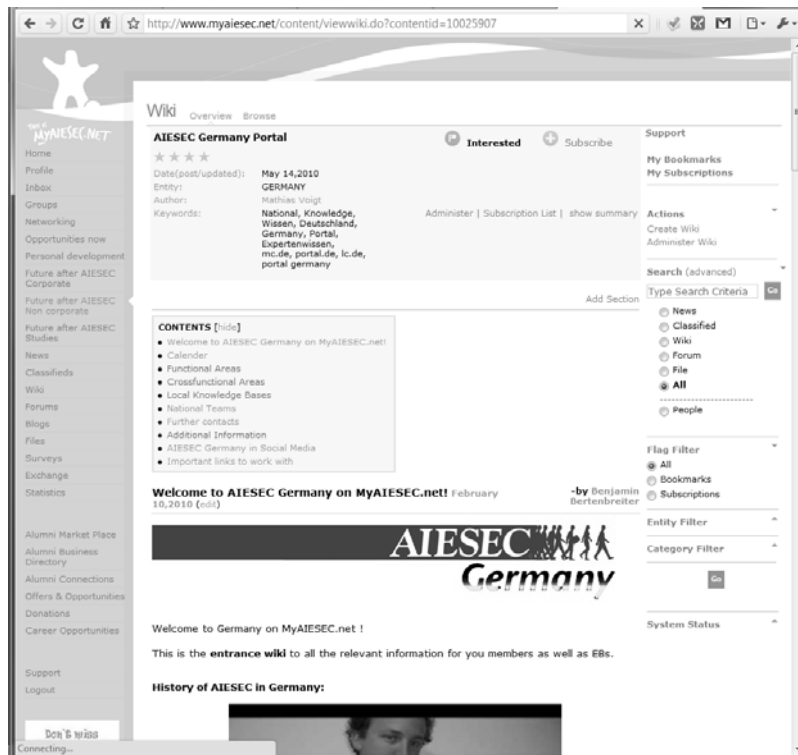


Figure 6: Web portal page of AIESEC Germany

On the national level there are more than 400 wiki pages covering all functional areas. These wiki pages contain content that was formerly stored in the Lotus Notes based knowledge base (manuals, process documentation, forms and other documents).

Since then the organization has adopted a number of Web 2.0 applications to improve collaboration and knowledge sharing between its members. The upper part of Figure 7 provides an overview of different KM aspects in AIESEC Germany and the bottom part shows Web 2.0 applications used for supporting these aspects.

	Transactional	Analytical	Asset Management	Process	Developmental	Innovation and Creation
KM Practices	<ul style="list-style-type: none"> Help Desk Applications Customer service application 	<ul style="list-style-type: none"> Customer Relationship Management (CRM) Business Intelligence 	<ul style="list-style-type: none"> Document Management Knowledge Repositories Content Management 	<ul style="list-style-type: none"> Best practises Quality Management Process Automation 	<ul style="list-style-type: none"> Skills Development Staff Competencies Learning Training 	<ul style="list-style-type: none"> Communities Collaboration Discussion Forums Networking Virtual Teams Multi-disciplined Teams
Web 2.0 Applications		<ul style="list-style-type: none"> Google Forms Google Analytics 	<ul style="list-style-type: none"> Web Portal (MyAIESEC) Youtube Flickr Wikis (MyAIESEC) 	<ul style="list-style-type: none"> Brandkore 	<ul style="list-style-type: none"> Google Presentation Slide Share WizIQ Teamviewer Netviewer Meetgreen 	<ul style="list-style-type: none"> Google Spreadsheets Google Docs Google Calendar Mindmeister Blogspot Twitter Wikis (MyAIESEC)

Figure 7: KM and Web 2.0 applications used for KM by AIESEC Germany

AIIESEC's global web platform MyAIIESEC contains a wiki module in which every user can create wiki pages. Information on MyAIIESEC is searchable through an advanced search function based on tags and elaborated filters. Wikis are used for storing information such as manuals, contain process documentations and are used for collaborative idea generation (e.g. virtual brainstorming sessions). Even though wikis should enable everybody to contribute content or enrich other people's contributions, only a limited number of members have actually been doing it and most of them are nationally active. Since there were some severe problems with the usability of the platform when it was introduced, an interviewee supposed that the problem might be related to that.

AIIESEC recently started using Google Apps, a bundle of collaborative web-applications. Its word processing module and its spreadsheets module are mainly used for documentation (e.g. minutes) and idea generation (e.g. brainstorming). The presentation module is used for virtual trainings and a module that allows form creation is used for creating surveys amongst members. In addition, for improving interaction and information exchange between the members a webmail application and a built-in instant messaging client that is identical with Google's consumer product Gmail is used. According to an interviewee the acceptance of Google Apps was significantly facilitated by its intuitive interface and the fact that users already knew the applications from personal use.

In order to streamline their marketing material creation, which needs to be customized for each chapter, AIIESEC uses Brandkore, a web-based marketing automation tool. Consequently, members no longer need to be familiar with using complicated graphic suites. In this way the tool includes process knowledge.

In order to facilitate the development and learning of its members AIIESEC uses a number of e-learning applications such as the platform WizIQ and Teamviewer in combination with web-controlled telephone conferencing tools such as Meetgreen. The organization is currently evaluating the use of web-based video conferencing tools such as Netviewer that allow multiple users to see and interact with each other.

Although some communication channels such as Facebook and Twitter are intended for communication with external stakeholders, members have started using them for internal communications and collaboration amongst each other as well.

Case 2 – MARKET TEAM

MT, solely operating in Germany, aims at providing students insights into the business world by organizing events like workshops, trainings and symposia with companies. The organization has around 1000 members in 23 chapters (Market Team, 2010).

KM focuses on supporting day to day operations of the organization, which mainly consist of running various projects on both the local and the national level. Most KM practices are focused on codification of knowledge by creating handbooks for the organization's key functions and documenting experiences with projects. Although there is no formally expressed KM strategy the generic strategy corresponds to a codification strategy (Hansen et al. 1999).

Most KM initiatives take place on the local level. There is little knowledge sharing between different chapters. At the time of examination the organization ran an initiative for improving knowledge sharing between local chapters to build on synergy effect, i.e. re-use knowledge in different parts of the organization.

People taking a role in a local or the national board generally have a term of one year. The fact that not all terms start at the same time ensures some retention of knowledge. On the national level this is formalized as the national board and the national advisory board have semi-overlapping terms, i.e. they start staggered by six months.

Knowledge management practices

As not all organizations focus on the same aspects of KM, Binney's (2001) KM spectrum is used as a checklist in order to map which KM practices are carried out by MT. The outcome of the analysis is shown in Figure 8.

	Transactional	Analytical	Asset Management	Process	Developmental	Innovation and Creation
KM Practices	<ul style="list-style-type: none"> ▪ Help Desk Applications 		<ul style="list-style-type: none"> ▪ Document Management ▪ Knowledge Repositories ▪ Content Management 	<ul style="list-style-type: none"> ▪ Best practises ▪ Quality Management 	<ul style="list-style-type: none"> ▪ Skills Development ▪ Learning ▪ Training 	<ul style="list-style-type: none"> ▪ Communities ▪ Collaboration ▪ Discussion Forums ▪ Networking ▪ Virtual Teams

Figure 8: KM spectrum with MARKET TEAMS's key KM practices

Transactional KM. For handling requests and dealing with problems regarding information systems a help desk module is integrated into MT's intranet platform.

Asset management. Document management practices throughout the organization look quite differently. Some approaches are: storing documents on a web-accessible hard drive, using Dropbox as online storage and sharing service and storing documents on a wiki platform. There are also various approaches to knowledge repositories. Some chapters just capture knowledge on projects in an Excel spreadsheet that they store at a central place. Others use wiki platforms for capturing codified knowledge. Recently, the national executive board decided to introduce a wiki platform that should be used as content management system by all chapters in order to bundle knowledge at one place.

Process-oriented KM. In MT best case practices are shared informally between local chapters on conferences and formally through the national intranet platform where project documentations can be shared between chapters. In order to ensure quality of documentation and communication towards external partners each local chapter has a responsible for quality and KM. On the national level, there are an executive board member and a national agent responsible for quality and KM who is in charge of publishing and updating quality assurance concepts.

Developmental KM. Skill development and most training sessions take place on the local level where the local executive board conducts trainings with its members. In addition, people may attend training sessions on national conferences. For learning explicit content the national level provides guidelines and handbooks to various aspects of the organization (e.g. for each functional area). Some chapters provide wiki platforms where people can find different kinds of codified knowledge.

Innovation and creation. The most distinct communities that I found in MT are the local chapters. Within in these communities there are different sub-communities such as project teams and the executive board. Collaboration practices on local and national level are quite different. On the local level, people may come together in physical meetings very often, e.g. for working on a project. As people on the national

level are spread all around the country, those teams (e.g. the national executive board) are virtual teams. Collaboration usually takes place virtually, by leveraging tools such as telephone conferencing, instant messaging and emailing. Networking informally takes place during a number of national conferences that can be attended by all members. These events help people building up a networking between different chapters.

Web 2.0 applications

MT uses a web-based intranet portal that contains a number of modules that allow members to access organization wide information. It contains a forum for announcements, a customer relationship management module, a directory of all members, a database containing some general facts about each past project and a data pool and a helpdesk module. Since the current platform that has been developed for more than 10 years and is mainly designed for unilateral communication from national to local level, the organization is currently evaluating how it can be replaced by a more interactive platform leveraging Web 2.0 applications such as wikis and social networking.

There is already a number of Web 2.0 applications used for KM on different levels of the organization as local chapters operate quite independently from the national level. Figure 9 provides an overview of the different KM practices in MT and the bottom part shows Web 2.0 applications used for supporting these aspects.

	Transactional	Analytical	Asset Management	Process	Developmental	Innovation and Creation
KM Practices	<ul style="list-style-type: none"> ▪ Help Desk Applications 		<ul style="list-style-type: none"> ▪ Document Management ▪ Knowledge Repositories ▪ Content Management 	<ul style="list-style-type: none"> ▪ Best practises ▪ Quality Management 	<ul style="list-style-type: none"> ▪ Skills Development ▪ Learning ▪ Training 	<ul style="list-style-type: none"> ▪ Communities ▪ Collaboration ▪ Discussion Forums ▪ Networking ▪ Virtual Teams
Web 2.0 Applications			<ul style="list-style-type: none"> ▪ MediaWiki ▪ Dropbox 		<ul style="list-style-type: none"> ▪ MediaWiki 	<ul style="list-style-type: none"> ▪ MediaWiki ▪ Dropbox ▪ Facebook ▪ StudiVZ

Figure 9: KM and Web 2.0 applications used for KM by MARKET TEAM

Some chapters use wiki platforms based on MediaWiki for facilitating project management. In general, information and experience reports from previous projects and manuals how to run a project are retrieved from the national web-platform and the local platform is used mainly for facilitating communication and collaboration between the members of project teams. In addition, they may guide project teams through the process of running a project.

Besides physical meetings, communication mainly takes place through emails but also through StudiVZ, a large German social networking platform and Facebook. These channels are therefore the main means of exchanging ideas and contributing to innovation.

Skill development and training solely takes place in physical meetings and apart from providing manuals and explicit information on the national web platform, no specific web technology is used for this aspect of KM.

Following the general trend, members have started using free Web 2.0 tools for collaborating and sharing files with each other. Dropbox is mainly used for sharing and storing documents online. Google Docs and Spreadsheets and Mindmeister, an online mind map tool, are used for collaboration and idea generation. These tools were not specifically introduced by the organization, but just appeared to be useful and very often already known by members from personal use.

Theory Building

We used the findings from the two case studies to construct a framework of Web 2.0 applications that can be used for different KM practices. As it follows the structure of Binney's (2001) KM Spectrum we refer to it as "KM 2.0 Spectrum". Furthermore, the case studies enabled us to identify a number of potential impacts of adopting Web 2.0 applications for KM that are summarized in the KM 2.0 Impact Model.

In order to ensure the correctness, completeness and consistency, we presented and discussed the Web 2.0 Layer Model that was introduced earlier, the KM 2.0 Spectrum and a list of impacts of Web 2.0 on KM with three experts both from academia and practice. Two of the experts are consultants in the field of social media and Web 2.0 in different companies and one of them is an associate professor and researches the impact of social media on knowledge work in multinational companies. The protocol for conducting the validation was based on the guidelines by Audenhove (2007).

The interviews revealed some suggestions for correcting some smaller inconsistencies and presenting the results. The suggestions are already incorporated into the respective models presented in this text. Both consultants generally agreed with the impacts that we identified and confirmed that Web 2.0 applications can be used in the way presented in the KM 2.0 spectrum. We found out that a key impediment of using social networking in companies is the potential of knowledge leak to the external environment. According to one of the experts this is especially critical for organizations handling sensitive customer data.

KM 2.0 Spectrum

Based on the findings from the case studies, we created a mapping between each type of Web 2.0 application and the KM practices it can be used for. This mapping is shown in Table 5.

Table 5: Mapping of Web 2.0 applications with KM practices

Web 2.0 Application	KM Practice	KM Spectrum Element	Source
<i>Wikis</i>	Content management	Asset management	AIESEC, MT
	Knowledge repository		AIESEC, MT
	Document management		MT
	Learning	Developmental	AIESEC, MT
	Collaboration	Innovation and creation	AIESEC, MT
<i>Media sharing</i>	Knowledge repositories	Asset management	AIESEC, MT
	Document management		AIESEC, MT
	Virtual teams	Innovation and creation	MT
	Communities		AIESEC, MT
<i>Social networking</i>	Communities	Innovation and creation	AIESEC, MT
	Networking		AIESEC
	Knowledge repository	Asset management	AIESEC, MT
<i>Shared workspaces</i>	Collaboration	Innovation and creation	AIESEC
	Virtual teams		AIESEC
	Training	Developmental	AIESEC
<i>Blogging</i>	Communities	Innovation and creation	AIESEC

Table 5 shows that *wikis* can be used for a number of different aspects of KM. They may be used as asset management tools as means of storing knowledge and containing codified knowledge. As they contain

codified knowledge they may also be used as a tool for learning or more specifically as a reference in the learning process of individuals as the AIESEC case suggests. Wikis also play a role as a tool for innovation and creation as they allow individuals to collaborate with each other. In both cases wikis have been used by people to come up with their own resources that facilitated their work practices (in the AIESEC case a portal page for different chapters and in the MT wikis have been used for a simple inventory management). As wikis can be used so flexibly in organizations they appear to be the “Swiss army knife” of Web 2.0 applications; being used for purposes that are not covered by other applications.

Media sharing applications including video sharing services such as Youtube or Google Video but also online storage and sharing tools such as Dropbox play two important roles in the context for KM. First, they can be used for simply storing documents and media files and making them easily accessible by a large number of people. Second, they facilitate innovation and creation as people can collaborate online without boundaries and create new content.

A third type of application that spans the asset management and the innovation and creation elements of the KM Spectrum is *social networking*. Some examples are Facebook and Twitter. From an asset management perspective a micro-blogging functionality, i.e. the possibility to post small messages that are shown to one’s peers, can be leveraged as a kind of knowledge repository as people can use to locate specific knowledge assets by simply asking their peers. This can be a valuable complement to existing knowledge repositories as a key challenge has always been to find relevant knowledge assets easily. Social networking also plays a role for innovation and creation as it allows people to communicate with each other across departmental or even organizational boundaries. People may increase their awareness of activities in other organizational units and therefore improve networking and collaboration with people they would otherwise not have been in touch with.

Shared workspace applications such as Google Docs and Mindmanager play a role for both “developmental KM” and “innovation and creation”. They may be used for virtual education purposes, such as online training sessions as demonstrated in the AIESEC case. In this way training sessions are not limited to physical meetings but can easily be conducted remotely as participants can complement voice interaction, which has been possible for a long time through telephone or voice-over-IP, by visual interaction using blackboards, mind mapping and online presentations. Shared workspaces also facilitate innovation and creation as people can collaborate with each other online although they might be at different places and work on documents at different times. These applications allow virtual teams collaborate with each other in new ways as the AIESEC case suggests.

As *blogging* allows people to easily publish experiences and opinions they may foster innovation and creation as they may represent a new generation of discussion forum. Discussion does not take place in threads as in traditional online forums but people may discuss with each other by commenting on blog entries and referring to other’s blog entries in their own blog.

The mapping that is shown in Table 5 is used for extending Binney’s (2001) KM spectrum to come up with the KM 2.0 Spectrum. This framework shows which applications can be used for different elements of the KM spectrum and the practices it encompasses. It is shown in Figure 10.

	Transactional	Analytical	Asset Management	Process	Developmental	Innovation and Creation
KM practises			<ul style="list-style-type: none"> ▪ Document Management ▪ Knowledge Repositories ▪ Content Management 		<ul style="list-style-type: none"> ▪ Learning ▪ Training 	<ul style="list-style-type: none"> ▪ Communities ▪ Collaboration ▪ Networking ▪ Virtual Teams ▪ Discussion Forums
Web 2.0 applications			<ul style="list-style-type: none"> ▪ Wikis ▪ Media sharing ▪ Social networking 		<ul style="list-style-type: none"> ▪ Wikis ▪ Shared workspace 	<ul style="list-style-type: none"> ▪ Wikis ▪ Media sharing ▪ Social networking ▪ Shared workspaces ▪ Blogging

Figure 10: KM 2.0 Spectrum

As we can see in Figure 10, there are no Web 2.0 applications associated with the spectrum elements “transactional KM”, “analytical KM” and “process-oriented KM”. Although one might think that these aspects of KM are excluded from being impacted by the developments of Web 2.0, the AIESEC case demonstrates that KM practices associated to these spectrum elements may benefit from technological enhancement (described by the technology-oriented Web 2.0 principles) of the applications that are used to support them. In addition, analytical KM may benefit from new sources of data. Interaction data from Web 2.0 applications can be mined to create knowledge from it as demonstrated by Hideo and Shinichi (2007).

Impact Model of KM 2.0

We consolidated the findings from the two case studies and created a list of possible impacts from using Web 2.0 applications for KM. By having a look at each of the impacts and the Web 2.0 application that is related to the impact, we identified the socially-oriented Web 2.0 principles that reflect best the characteristics of the respective application that have most likely triggered the impact. In this way it is possible to discuss the impact of Web 2.0 on KM practices on a higher level, i.e. independently from the application level. The impact table together with the associated socially-oriented Web 2.0 principles is shown in Table 6.

Table 6: Impact table of Web 2.0 applications on different KM practices

#	Impact	KM practice	Web 2.0 applications	Principles
1	Increased efficiency of document and media sharing	Document management	Media sharing	1
2	Increased quality of codified knowledge	Knowledge repositories, Document management	Wikis, Media sharing	2, 3
3a	More efficient creation of codified knowledge	Communities	Wikis	1
3b	More efficient sharing of codified knowledge	Communities, Networking	Social Networking	1,5
4	Increased knowledge leakage	Communities		
6	More transparency within the organization		Social networking, Blogging	3
5	More efficient communication		Social networking	1
7	More communication across organizational units			

#	Impact	KM practice	Web 2.0 applications	Principles
8	More efficient collaboration	Collaboration, Virtual Teams	Shared workspaces, Media sharing	1
9	More efficient coordination	Virtual Teams	Shared workspaces, Media sharing, Social networking	1
10	Emergence of user-generated structures	Collaboration	Wikis, Shared workspaces	3

The first impact is mainly triggered by the “unbounded collaboration” characteristic of media sharing applications as applications such as Dropbox simplify sharing of documents.

The second impact benefits from the fact that people may use wikis and media sharing applications to contribute the content they consider relevant (user-generated content). Quality is ensured as a whole collective of people may contribute their knowledge and improve content (collective intelligence). As wikis allow people to work together in creating codified knowledge independently asynchronously and from different places (unbounded collaboration) the efficiency of knowledge creation (impact 3a) may be increased. The same holds for social networking sites such as Twitter or Facebook (impact 3b) where people can post and react to micro-contributions independently from each other. Social networking in addition relies on the long tail as people may post micro-messages that they would otherwise not have expressed or just in an informal way (like during a coffee break) where their contribution would not have been captured. On the other hand unbounded collaboration and reaching the long tail in social networks may also lead to an increase leakage of knowledge (impact 4) as people can easily share organization internal knowledge with external peers.

As people may generate and share the content they wish (user-generated content) social networking applications and blogs may lead to an increase of transparency within an organization (impact 6). The unbounded collaboration characteristic of social networking applications such as Facebook may trigger an increase in communication efficiency (impact 5) as people communicate with each other without boundaries. Sending messages, sharing files and instant messaging is all possible in one single application. This may also lead to an increase of communication across departmental boundaries (impact 7).

Shared workspaces like Google Docs and media sharing applications such as Dropbox allows people to collaborate without boundaries and may lead to an increase in collaboration (impact 8). This is also the reason why these applications and social networking sites may increase coordination efficiency (impact 9), especially in virtual teams.

As users can create their own content they may use applications such as wikis and shared workspaces for creating their own structures (impact 10) such as tracking sheets (as mentioned in the AIESEC case), simple resource planning (as seen in the MT case).

The findings suggest that the principle “network effects” does not play a major role for the impacts that Web 2.0 application have on KM practices of the two organizations. However, as the Web 2.0 Layer Model suggests network effects are important for most Web 2.0 applications (especially wikis, social networking and blogging) to work properly. Only if there is a critically mass of people using the applications they may be successful. It should be therefore seen as a key enabler to those applications. The impacts in Table 6 can be associated with the different steps of the KM cycle (Figure 1). The associations are shown in Table 7.

Table 7: Impacts of Web 2.0 on different steps of the KM cycle

#	Impact	Principles	KM cycle step
1	Increased efficiency of document and media sharing	1	Knowledge sharing and dissemination
2	Increased quality of codified knowledge	2, 3	Knowledge capture and creation
3a	More efficient creation of codified knowledge	1	
3b	More efficient sharing of codified knowledge	1,5	Knowledge sharing and dissemination
4	Increased knowledge leakage		
6	More transparency within the organization	3	Knowledge capture and creation
5	More efficient communication	1	Knowledge capture and creation
7	More communication across organizational units		Knowledge sharing and dissemination
8	More efficient collaboration	1	Knowledge capture and creation
9	More efficient coordination	1	
10	Emergence of user-generated structures	3	

As impact 1 deals with the sharing of documents and media, we associate it with the “knowledge sharing” step. Impact 2 is associated with “knowledge capture and creation” as it deals with the quality of codified knowledge. Impact 3a concerns the creation and is therefore associated with the “knowledge capture and creation” step. As impact 3b deals with sharing of knowledge, we associate it with “knowledge sharing and dissemination”. As a side-effect of impact 3b, impact 4 is also associated with “knowledge sharing and dissemination”. As more transparency (impact 6) in an organization may lead to the discovery of new knowledge sources that would otherwise not have been discovered by people, it is associated with “Knowledge capture and creation”. As a more efficient communication (impact 5) and more communication across organization units (impact 7) may increase both knowledge creation and sharing, we associate it with “knowledge capture and creation” and “knowledge sharing and dissemination”. More efficient collaboration (impact 8) and coordination (impact 9) may lead to the emergence of user-generated structures (impact 10) and eventually may improve “knowledge capture and creation”. Based on Table 7 an impact model is created in which the socially-oriented Web 2.0 principles are related with their impact to the different stages and processes of the KM cycle. The impact model is shown in Figure 11.

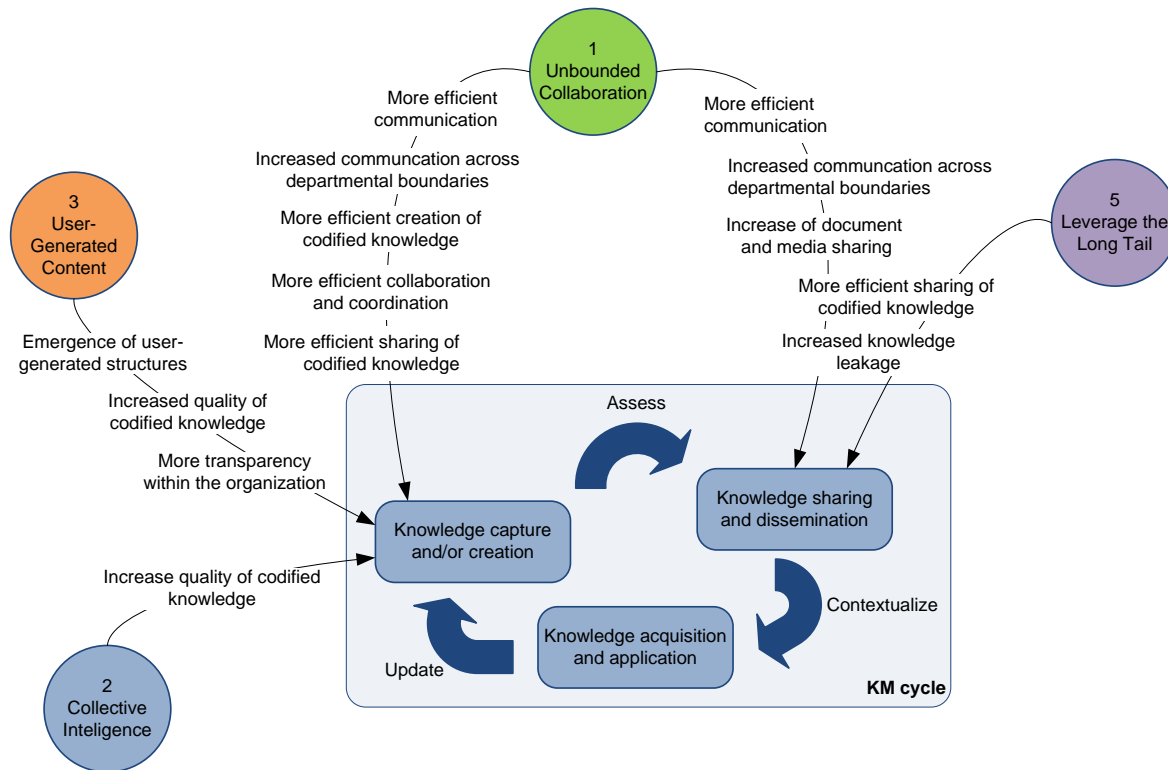


Figure 11: KM 2.0 Impact Model

By looking at Figure 11 one might assume that Web 2.0 solely has an impact on “knowledge capture and creation” and “knowledge sharing and dissemination”. Apparently, those KM cycle steps are mostly impacted by Web 2.0 applications. However, we think that especially “knowledge acquisition” should be impacted by Web 2.0 application as it is related to learning which can be facilitated by Web 2.0 applications as the AIESEC case showed. But, since AIESEC’s virtual education practices have only recently started, it was not yet possible to determine the impact of Web 2.0 application on them. Some research in this area was conducted by Kane and Fichman (2009) who demonstrate how wikis can be used for teaching and Andersen (2007) who examines Web 2.0’s implication for education. We expect that especially the principle “unbounded collaboration” has an impact on “knowledge acquisition and application”. For instance, the availability of powerful tools for long-distance learning may enable organizations to reduce costs by conducting training sessions online instead of having to meet.

Situational factors

As pointed out by DeSanctis and Poole (1994), the expected effects of using an advanced information technology in an organization may only show under ideal circumstances. There is a number of influencing factors that can be related to the technology itself, characteristics of the group of people it is used by and characteristics of the organization or the task it is used for.

Based on the findings from the case studies (mainly from the AIESEC case as we had only limited exposure to MT) and a review of literature, I identified a number of situational factors that influence which effect the use of Web 2.0 applications has on KM practices. In accordance with AST, we group these findings into the following four categories:

- The *characteristics of the respective knowledge management function* that are deduced from the “Structure from tasks” aspect of AST;

- The *characteristics of the used Web 2.0 applications* that are deduced from the “structure of advanced information technology” aspect of AST;
- *The characteristics of the organization* that are deduced from the “structure from organizational environment” aspect of AST; and
- *The characteristics the people* using the applications that are deduced from the “group’s internal systems” aspect of AST.

In the following the situational factors that we identified are explained and discussed in the light of related literature.

Knowledge management factors

KM strategy. Hansen et al. (1999) suggest that the generic KM strategy, personalization of codification, determines the selection of KM technology. Both case organizations follow a codification strategy. This is reflected by the fact that they put emphasis on storing codified knowledge in repositories. What concerns Web 2.0 applications they mainly use wikis for this purpose. Although the case organizations also use tools like social networking and instant messaging to connect people with each other, as suggested by a personalization strategy, we would expect to see a stronger emphasis on Web 2.0 applications such as social-networking in companies that mainly follow a personalization strategy.

KM history. The past KM strategy and approach may have an influence on the appropriation of Web 2.0 applications. In the case of AIESEC the transition from the traditional Lotus Notes based knowledge base to wikis seems to be difficult since people kept the spirit of the traditional KM where content was solely provided from the top level of the organization. This is supported by findings of Paroutis and Al Saleh who state that “‘the old/established way of doing things’ appeared to be one of the main barriers to knowledge sharing and collaboration using Web 2.0 technologies” (Paroutis & Al Saleh, 2009).

Web 2.0 applications factors

Intuitiveness. As the quick appropriation of the intuitively usable Google Apps shows in the AIESEC case, the intuitiveness of an application can have major impact on the appropriation of it. A similar observation could be made in the MT case where Dropbox has been appropriated seamlessly thanks to its high degree of intuitiveness. The role of perceived intuitiveness for the acceptance of a technology is described by Davis (1989) in his Technology Acceptance Model.

One platform. In the case of AIESEC people criticize that not all applications are combined in one single platform. The vast number of Web 2.0 applications makes it a challenge to connect all applications in one platform. An organization should aim at making all applications available on one platform that is accessible from various types of devices. One advantage of Web 2.0 applications is that they can be relatively easily connected with each other as is reflected by the Web 2.0 principle “Open platform” (Knol et al., 2008). Making all Web 2.0 applications available on one platform may have a positive impact of to the perceived usefulness of the applications as described by the Technology Acceptance Model (Davis, 1989) and therefore lead to a higher degree of acceptance.

Reliability. In the case of AIESEC the organizations web-platform was released as a collection of services and has been continuously extended and adapted to the organization’s needs. Although early releases of services are encouraged in the Web 2.0 world, organizations also need to ensure that the quality of the released service is not too low to scare people off. The AIESEC case demonstrates that a too early release can also lead to acceptance problems as AIESEC’s web-platform was not very reliable in the beginning. This finding can be related to DeLone and McLean's (1992) IS Success Model that says that “system quality” (together with “information quality”) influences how satisfied users of an IS are. According to the model this eventually determines the IS impact on the organization.

Novelty. Levy (2009) argues that the novelty of Web 2.0 applications may have a positive impact on their appropriation as people expect them to bring about a new approach to KM and may be more open to use them. In the case of AIESEC that could be observed as Google Apps were appropriated almost with spirit of optimism since many people had struggled a lot with the previous groupware system based on Lotus Domino.

Organizational factors

Financial constraints. The AIESEC case shows that constraints like financial limitations may have an impact on the selection of specific Web 2.0 applications. These constraints may limit the organization to use only specific applications.

Management style. The management style (e.g. top-down rather than bottom-up) of an organization may have an impact on the appropriation of Web 2.0 applications. The AIESEC case shows that a persisting top-down mentality may negatively influence the appropriation of applications that are based on user-generated content such as wikis.

Individual factors

Previous experience. The AIESEC case suggests that those applications that people are already familiar with are more quickly appropriated. Organizations should therefore consider using standard applications that are familiar to many people. DeSanctis and Poole's (1994) point out that previous knowledge and experience with a structure (in this case a Web 2.0 application) may impact its appropriation.

Personal motives. As Wasko and Faraj (2005) show that personal motives such as an increase of (professional) reputation have an influence on people's participation in Web 2.0 applications that rely on user-generated content (e.g. wikis). This should be taken into account by organizations that would like to adopt these applications, e.g. by creating suitable incentives for participation.

FUTURE RESEARCH DIRECTIONS

There are three types of validity considerations that have to be made in an exploratory case study research: construct validity, external validity and reliability (Yin, 2008, p. 40).

Construct validity. In order to ensure construct validity, we used multiple sources of evidence in the case studies, constructed a chain of evidence and presented the case study reports to the key informants of the two organizations. Therefore the two case studies encompassed interviews with numerous people in different roles in both organizations (7 people in the AIESEC case and 4 people in MT case) and a review of the organizations web-sites and internal documents. A chain of evidence is ensured by presenting the intermediate steps that led to the ultimate analysis.

External validity. First of all, it has to be noted that the nature of this research does not allow drawing any general conclusions from the examined topic. Instead, the findings provide an idea of how Web 2.0 applications can impact organizational KM practices. As we conducted both of the case studies in student-run NPOs some of the findings may not apply to other types of organizations such as companies. One difference that we can think of and that is also mentioned by Baltatzis et al. (2008) is that companies tend to have more protective policies in place that may be impediments for adopting Web 2.0 applications.

Reliability. In order to ensure that the research could be repeated and would lead to the same results we developed protocols for executing the case study research and the validation. In addition, we created a case study database that contains all documents related to the case studies.

Limitations

As noted in the previous section one of the main limitations of the research is that the findings cannot be generalized because only two case studies were conducted. However, the findings, especially the impacts of Web 2.0 applications on KM practices can be used to design further more quantitative research, e.g. by using it to design a survey that could be used to determine how Web 2.0 applications impact KM practices of a large number of various organizations.

Another limitation is that the case organizations were very similar in regard to the KM practices they encompass. Here are some additional ways of using Web 2.0 application for KM that we came across during the expert validation and the study of related literature:

- Mining data from Web 2.0 applications such as social-networking as explained by Hideo and Shinichi (2007) could be used as an additional source of knowledge by organizations. One of the practitioners who we interviewed explained me that this kind of data could be used to conduct network analysis (R. Helms & Buijsrogge, 2005). In this way formal and informal communities within the respective organization could be identified. This would allow managers to respond for instance by further stimulating these communities or create incentives for creating new ones.
- By harnessing Web 2.0 applications such as blogs and social-networking people within an organization could benefit from knowledge of external stakeholders such as partners or customers as indicated by Hustad and Teigland (2008) and Bughin, Chui and Johnson (2008).
- Using Web 2.0 applications such as wikis and learning platforms (containing functions such as video, instant messaging, wikis etc.) for teaching and virtual education. Some research in this direction was conducted by Kane and Fichman (2009) and Andersen (2007).

Further Research

The findings in this research are based on two case studies. In order to increase external validity of study, the research should be extended by replicating the case study in different types of organizations. For this it would be interesting to have a look at other types of non-profit and for-profit organizations. As both of the case organization had quite similar KM practices, it should be looked at organizations that cover different aspects of the KM spectrum.

These case studies should also encompass an in-depth analysis of situational factors that influence the impact of Web 2.0 application on KM. The outcomes would help organizations understand which levers they have to move in order to benefit from Web 2.0.

Eventually, the findings from the case study research should be used to conduct some quantitative research in order to derive some general conclusion about the impact of Web 2.0 on KM. The identified impacts could be used to design a survey to be sent to people in charge of KM in a larger number of organizations.

Discuss future and emerging trends. Provide insight about the future of the book's theme from the perspective of the chapter focus. Viability of a paradigm, model, implementation issues of proposed programs, etc., may be included in this section. If appropriate, suggest future research opportunities within the domain of the topic.

CONCLUSION

The research question, as proposed in the introduction, states:

How can organizations use Web 2.0 applications for managing knowledge and which impact can they have on KM?

From this question we derived a number of sub-research questions that are used to summarize the key findings of this research in the following.

What is Knowledge Management?

In order to define the concept of knowledge management we adopted the following definition:

Knowledge Management is the effective learning process associated with exploring, exploitation and sharing of human knowledge that use the appropriate technology and cultural environments to enhance an organization's intellectual capital and performance. (Jashapara 2004)

This definition suggests that KM uses but is not limited to technology; KM is also about fostering the right culture. The ultimate goal is to contribute to an organization's overall performance. In order to illustrate the major steps and processes of KM, I introduced Dalkir's (2005) integrated KM cycle that is based on a review of different KM cycles.

What is Web 2.0?

The concept of Web 2.0 emerged in the early 2000s and it turned out to be particularly difficult to define as it started as a loose collection of ideas. In order to come up with a definition that reflects those aspects that are commonly referred to as Web 2.0, we based it on the five socially-oriented and the four technology-oriented Web 2.0 principles that proposed by Knol et al. (2008) after reviewing relevant literature. Our definition of the notion is:

Web 2.0 is the reorientation of the Web that promotes unbounded interaction, collaboration and participation of people. It is characterized by the emergence of a large amount of content generated by a collective of Internet users. It harnesses networking effects and leverages the long tail.

Based on the Web 2.0 principles and review of common Web 2.0 applications, we constructed the Web 2.0 Layer Model. The model shows how these applications are related to the socially-oriented Web 2.0 principles. Later in the research we used these insights for discussing the impact of the Web 2.0 principles on the key steps and processes of the KM cycle.

How can Web 2.0 applications be categorized in accordance to their role in KM?

Binney (2001) proposes a framework that brings together various theories, tools and techniques discussed in KM literature and calls it the KM Spectrum. The spectrum contains the elements *transactional KM*, *analytical KM*, *asset management*, *process-oriented KM*, *developmental KM* and *innovation and creation*. As the KM Spectrum reflects a comprehensive overview of different KM practices I decided to use it as the underlying theory for categorizing Web 2.0 applications according to their role in KM.

How can the impact of Web 2.0 applications on KM be described?

DeSanctis and Poole's (1994) Adaptive Structuration Theory, a further development of Orlikowski's (1992) Structuration Theory, describes how advanced information technology impacts organizations. Based on this theory, DeSanctis and Poole propose a model that can be used for examining the impact of technology on organizations. As it considers the mutual influence of technology and social processes, I decided to adapt it for studying the impact of Web 2.0 applications on different KM practices.

In accordance with DeSanctis and Poole I identified a number of potential impacts of Web 2.0 applications. For each KM practice supported by a Web 2.0 application I determined if there was an increase of efficiency, an increase of quality and/or an increase of commitment of people towards the KM practice. In addition, I determined as proposed by Adaptive Structuration Theory if and which new structures emerged from using Web 2.0 applications for the respective KM practices.

As the structure of the case study protocol is derived from DeSanctis and Poole's model, I could determine a number of situational factors that may influence how Web 2.0 applications are appropriated in different organizations.

Which Web 2.0 applications can organizations use for KM?

I examined which Web 2.0 applications are used by the two organizations and related these applications with the different practices encompassed in the KM Spectrum. By using the Web 2.0 Layer Model, I was able to derive a number of generic Web 2.0 applications and associate them with the different elements of the KM Spectrum. The primary Web 2.0 applications turned out to be wikis, social networking, media sharing and shared workspaces.

The findings suggest that Web 2.0 applications are especially used for practices associated with the KM spectrum elements "asset management" and "innovation and creation". One of the organizations recently also introduced Web 2.0 applications as a mean for virtual education. Although there seems to be no influence on practices from the other elements of spectrum, I found that also these may benefit from Web 2.0 by enhancing related technology by adopting the technology-oriented Web 2.0 principles such as using lightweight models and providing an intuitive user-interface. In addition, analytical KM may benefit by mining data gained from interaction through Web 2.0 applications such as social networking as proposed in literature (Hideo & Shinichi, 2007).

Which impact can Web 2.0 applications have on organizational KM practices?

I talked to key personnel of the two case organizations to determine which impact the use of Web 2.0 applications had on different KM practices in terms of an increase of efficiency, quality and/or commitment. In addition, I tried to find out if new social structures had emerged from using these applications. I could identify ten impacts from the interviews. In order to validate them I discussed these impacts with two practitioners. Subsequently, I analyzed which socially-oriented Web 2.0 principles had contributed most to each of the impacts and which key steps of the KM cycle are affected by each impact.

Based on these findings I created the KM 2.0 Impact Model that is depicted in Figure 11.

The model suggests that the principles "unbounded collaboration" and "user-generated content" have the strongest impact on KM. The KM cycle steps most affected by Web 2.0 applications appear to be "knowledge capture and/or creation" and "knowledge sharing and dissemination". However, one of the case organizations is also investigating how Web 2.0 applications can be used for facilitating virtual education which can be related to the third KM cycle step "knowledge acquisition and application". In addition to the impact analysis, I identified a number of situation factors that may influence the way how Web 2.0 applications impact organizational KM practices. The factors were determined from the cases studies and relevant literature. Inspired by Adaptive Structuration Theory, these factors can be grouped as characteristics of the respective KM function, characteristics of the Web 2.0 application, characteristics of the respective organization and characteristics of the people using the applications.

General Conclusion

The findings from the research suggest that Web 2.0 applications may have a positive impact on KM as they may increase efficiency, quality and commitment of certain KM aspects but, coming back to the

question that I raised in the introduction, do they actually usher in a new era of KM, a “Knowledge Management 2.0”?

Pointing to the limitation that I made early when I introduced KM, I do not believe that just introducing technology brings about a change to an organization. This limitation also applies to introducing Web 2.0 applications in an organization as became apparent in both case organizations where interviewees pointed out that participation rate in wiki systems that were introduced by management tended to be very low. From the perspective of the Technology Acceptance Model (Davis, 1989) this problem may occur because people either do not perceive those wiki systems as useful or they perceive them as too difficult to use. On the other hand, when people took the initiative and started using the application “Dropbox” in one of the case organizations, it quickly spread out and eventually led to increased efficiency of collaboration. Apparently, this application did not suffer from low usefulness and/or ease-to-use.

So what can we learn from this? The difference between these two situations indicates that the actual users of a technology are better in determining if they consider it useful and easy-to-use than anyone who implements technology in behalf of management. Taking on this idea, I believe that if Web 2.0 applications are used in this way, they have the potential of having a significant impact on organizational practices. This is an extension of the “user-generated content” idea towards “user-initiated application selection”.

Interestingly, one of my validation-experts told me that Yammer, an intra-organizational micro-blogging platform, is being adopted by more and more organizations. Yammer is based on the idea that if they like it, employees just start using it within their organization (they need to proof their association to the organization by providing their corporate email address). If management of their organization likes it, they have the possibility of upgrading the network to a corporate account and would gain access to the posted content and customize the application according their needs.

In this light, I see KM’s role in fostering these user-initiated developments by providing the necessary means and incentives. KM 2.0 is not about enforcing new programs and tools from top-down. KM 2.0 is about listening to the people and encouraging bottom-up adoption of applications and encouraging user-participation.

Contributions

The main deliverables of this research are the Web 2.0 Layer Model, the KM 2.0 Spectrum and the KM 2.0 Impact Model.

From a scientific point of view, the Web 2.0 Layer Model contributes to the general understanding of how Web 2.0 applications are related to the principle ideas of Web 2.0. The KM 2.0 Impact Model proposes a number of impacts that adopting Web 2.0 applications may have for an organization’s KM practices. It demonstrates that mostly the KM steps “knowledge capture and/or creation” and “knowledge sharing and dissemination” are impacted. Among the five socially-oriented Web 2.0 principles “user-generated content” and “unbounded collaboration” appeared to exert the biggest impact on KM.

My research provides practitioners with insights how Web 2.0 applications can be used for KM. The KM 2.0 Spectrum associates different Web 2.0 applications to different KM practices and discusses how they can be used to support them. It demonstrates that mostly practices associated with the KM spectrum elements “asset management” and “innovation and creation” but also “developmental KM” may make use of Web 2.0 applications. However, also practices and tools associated to other spectrum elements may benefit from Web 2.0. They may be enhanced by adopting technologies stemming from the Web 2.0 (as

expressed by the technology-oriented Web 2.0 principles) or in the case of “analytical KM” exploit new sources of data created from applications such as social networking.

Practitioners should also keep in mind that adopting KM 2.0 is not only about replacing and complementing existing KM applications but also about adopting a “bottom-up mindset”, encouraging and fostering contributions from people on all levels.

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KEY TERMS & DEFINITIONS

Web 2.0 is the reorientation of the Web that promotes unbounded interaction, collaboration and participation of people. It is characterized by the emergence of a large amount of content generated by a collective of Internet users. It harnesses networking effects and leverages the long tail.

Knowledge management is the effective learning process associated with exploring, exploitation and sharing of human knowledge that use the appropriate technology and cultural environments to enhance an organization's intellectual capital and performance. (Jashapara 2004)

The Socially-Oriented Web 2.0 Principles:

User-generated content is one of the principal characteristics of Web 2.0. It breaks with the traditional way of publishing where spreading content was limited to professionals. In a Web 2.0 world, instead, users are enabled to create content and share it with each other. Consequently, large amounts of content are generated and available on the Internet.

Network effects apply to services that get better the more users use them. Since the Web 2.0 is characterized by user-generated content, it greatly benefits from network effects. O'Reilly (2005) notes that successful Web 2.0 companies heavily depend on their ability to harness networking effects from user contributions. He also argues that real Web 2.0 companies and their services do not rely on advertising. Instead, their popularity stems from viral marketing - that is one user recommends the products to another and so forth.

Collective intelligence describes the presumption that a large collective (of users) can develop more than a small number of experts (Knol et al., 2008). O'Reilly (2007) notes that one key enabler of the Web has been the use of hyperlinks that indicate which documents are interlinked with each other. By analyzing hyperlinks a considerable amount of intelligence can be created. O'Reilly indicates that in the Web 2.0 era hyperlinks have been complemented by additional mechanisms that analyze the behavior of users. One prominent example is an automatic suggestion system as that of Amazon.com. From a content perspective Web 2.0 benefits from applications such as wikis and blogs that enable users to post and

interact with each other. One of the most prominent examples of a wiki system is certainly Wikipedia, a large encyclopedia that allows everyone to edit it.

Unbounded collaboration indicates that users in the Web 2.0 world can collaborate with each other without boundaries in terms of time and location (Knol et al., 2008). In addition, Knol et al. note, users have an active role in the development of Web 2.0 applications by providing feedback or even delivering the content that would have traditionally been delivered by experts. One prominent example of such as collaboration would be social-tagging approaches (also referred to as folksonomies) that let users assign tags to content resulting in a categorization that strongly reflects the users' needs.

Leverage the long tail is a concept that allows for reaching out to the huge number of users and customers that represent a niche market. Thanks to approaches such as customer self-service and automatic data management in the Web 2.0 era, it becomes possible to leverage these markets. O'Reilly (2007) notes that successful Web 2.0 companies base a great deal of their businesses on the long tail of customers. This indicates a major change in understanding of e-business models.