Collaborative Business - The effects of Wikis on collaboration practices in organizations

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Abstract

Wikis and other web 2.0 technologies are increasingly used in business. In this sense, the overall purpose of this research was to investigate the effects of wikis on collaboration and the impact of collaboration on organizational innovation. Four interviews have been conducted with IS managers as well as regular Wiki users in different organizations to show how can wikis affect collaboration and exploit innovation. The results showed that the Wiki is used as a shared platform for collaboration and the ability to participate in the process of knowledge creation in an iterative manner helped in generating more ideas which leads to more innovation. We concluded that the Wiki affects the nature and context of collaboration. The research showed that the use of the wiki for internal collaboration purposes helped organizations to benefit from collective intelligence through allowing everyone within a team or a project to contribute and share ideas and experiences. Also, it showed the use of wikis for external use might be associated with problems such as the reluctance of collaborators to participate in the group work and other problems related to data quality and organizations won't use it for more open use where information is opened for people outside the organization.

Keywords
Wikis, Collaboration, Collective Intelligence, Web 2.0, Enterprise 2.0, Peer Production, Organizations, Innovation, Creativity.

ACKNOLEDGMENTS

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1. Introduction

1.1 Overview

The growing developments of the web are enabling new forms and mechanisms of collaboration. Collaboration is becoming the basis of successful organizations that support sharing and co-production through leveraging dispersed resources and capabilities (Hansen & Nohria, 2004; Gloor & Cooper, 2007). Lotia (2004, p. 58) stated that "learning and knowledge creation are important benefits of collaboration." Also, she added that by "extending the social perspective of learning in organizations and groups, learning in collaborations can be understood as the emergence of common knowledge, behaviors, routines and procedures in the collaboration, legitimized through social interactions and experiences" (p.58). In this sense, collaboration and user contributions can add value and empower innovation using architecture of participation to build a commanding advantage because of the richness of shared data (O'reilly, 2005b; Tapscott & Williams, 2006).

The new Web or Web 2.0 provides a set of tools such as Wikis, Blogs, peer-to-peer downloading that enable new ways of collaboration, transaction, and participation (Dearstyne, 2007; Tapscott & Williams, 2006). These collaborative technologies allow people to establish self-organized and social communities where they can collaboratively and openly develop and produce goods and services that compete with the world's largest and best self-financed enterprises (Tapscott & Williams, 2006). Examples of such goods and services are: Linux, a computer operating system, which is the outcome of collaborating between thousands of volunteers that competes with other systems developed by dominated software enterprises. Also, Wikipedia, an online encyclopedia, is another form of mass collaboration where people collaborate and participate to create the largest web-based encyclopedia.

This new mode of innovation is called peer production or peering (Hansen & Nohria, 2004; Tapscott & Williams, 2006). Innovation within an organizational context is referred to the successful implementation of creative ideas (Gahan et al., 2007). The organizational creativity which is defined as "the creation of valuable, useful new product, service, idea, procedure, or process by individuals working together in a complex social system" (Woodman et al., 1993, p. 293 cited in Gahan et al., 2007, p. 44) is a requirement for innovation. The new web is becoming a place for collaborative construction of information and ideas and the focus is shifting from personal focus into a community focus (Lee & Lan, 2007; Mader, 2007). A wiki can be used as a tool for collaborative authoring that allows users not only to communicate and collaborate but also to participate and contribute (Peacock et al., 2007; De la torre, 2005). Nevertheless, Surowiecki (2005, Introduction) argued that "...under the right circumstances, groups are remarkably intelligent, and are often smarter than the smartest people in them." In this sense, organizations are required to establish the basis for successful collaboration at the workplace to benefit from the added value of the collection of judgments by many contributors (Surowiecki, 2005; Hideo & Shinichi, 2007).

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In addition, the underpinning motivation for this research is to explore more understandings about the Web 2.0 phenomenon through analyzing the effects of Wikis that are part of the Web 2.0 technologies on collaboration. Many researchers have examined and discussed several aspects of this emerging phenomenon such as mass collaboration, disruptive innovation, and open business models (e.g. (Tapscott & Williams, 2006; Chesbrough, 2007; Christensen et al., 2002; Chesbrough, 2003; Gloor & Cooper, 2007; Santos et al., 2004)). However there is a need for more research to study the dynamics and interactions between collaborators (Peacock et al., 2007) using the Web 2.0 technologies in order to increase the understanding of this phenomenon as well as to recognize both the upsides and downsides of using these technologies.

1.2 Problem Area and Research Questions

The use osf Web 2.0 technologies for corporate affairs is expanding (Grossman & McCarthy, 2007; Yukihiro, 2007; Shinichi & Heidi, 2007; De la Torre, 2005). Also, there is an increasing use of Wikis in different business environments (Peacock et al., 2007, Wood, 2005; Mader, 2007). However, there is skepticism about the business value of web 2.0 technologies which is a major barrier for its adoption in organizations (Center of Digital Strategies, 2007). For example, in the case of Wikis there are many critiques to the idea that people can collaboratively create information because of the possibility of low quality and inaccurate content (Peacock et al., 2007). Hence in this research we will try to investigate the use of the Wiki technology and highlight different aspects of using this technology for collaboration. Our research will answer the following questions:

- How can wikis affect collaboration?
- What is the impact of Wiki-based collaboration on organizational innovation?

1.3 Research Purpose

The overall aim of this research is to identify different factors that affect collaboration using Wikis and analyze their impact on group working. Also, we aim to investigate the role of wiki-based collaboration in affecting groups' innovation at the workplace.

1.4 Target Audience

The research will be of interest to different types of organizations e.g. companies, universities, governmental agencies. It provides a thorough analysis about the effects of wikis on collaboration practices and collective working. Also it reveals different aspects of wiki-based collaboration both in internal and external contexts.

1.5 Delimitations

Adopting new technologies such as wikis in the organization might be associated with several consequences that impact the organizational structures and architectures. However our research doesn't focus on such consequences but rather we focus on collaboration and collective working that can be affected using wikis. Also, we don't discuss the integration between wikis and other knowledge or content management systems used in the organization as well as how to transform current business knowledge in the new wiki environment. In addition, we don't discuss any technical issues such as installing and configuring the wiki, wiki management and maintenance.

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2. Wikis

2.1 The Use of Wikis in Organizations: Enterprise 2.0

In the information age, information becomes an indispensable building block for the success of information-based organizations, knowledge-based enterprises, and learning organizations. However, this success can only be achieved through their ability to manage information politics by allowing people to negotiate the use and definition of information (Davenport et al., 1992). Wikis that are part of the Web 2.0 technologies may help organizations to manage and share information in a collaborative fashion through connecting people together. In this sense, Tim O'Reilly (2005a) defined the new Web or Web 2.0 as follows: "the network as platform, spanning all connected devices; Web 2.0 applications are those that make the most of the intrinsic advantages of that platform: delivering software as a continually-updated service that gets better the more people use it, consuming and remixing data from multiple sources, including individual users, while providing their own data and services in a form that allows remixing by others, creating network effects through an "architecture of participation," and going beyond the page metaphor of Web 1.0 to deliver rich user experience."

The new Web allows people to collaboratively participate in content creation through blogging, mashups (consuming and remixing data), and tagging (Tapscott & Williams, 2006; O'reilly, 2005b; Grossman & McCarthy, 2007; De la Torr 2005). Also, software becomes a service (SaaS) in the sense that it is used by people as needed and it gets better with more active participants using it (O'reilly, 2005b; Grossman & McCarthy, 2007; De la Torr, 2005; Yukihiro, 2007). Moreover, organizations can benefit from the intelligence of groups or the wisdom of crowds as many researchers describe it by adopting new mechanisms of collaboration (Lee & Lan, 2007; Hideo & Shinchi, 2007; Tapscott & Williams, 2006). Table 1 concludes the characteristics of the enterprises and consumers using web 2.0 technologies:

Consumer Web 2.0	Enterprise Web 2.0
Architecture of Participation	Architecture of Partition
Social networking	On Demand computing/SaaS
Harnessing the collective intelligence	Enterprise social computing
HTML Mashup	Enterprise mashup
The Web As Platform	
Rich User Experience	

Table 1: Characteristics of consumer Web 2.0 & Enterprise Web 2.0 (Wei 2006, p. 4)

There is a growing accessibility for the tools required for collaboration and information sharing which create new models of collaboration (see section 3.3). These models represent new ways of production and innovation (Tapscott & Williams, 2006). However, many researchers have discussed the challenges and barriers of collaborative business (see section 2.5) and also pointed out to some threats of Web 2.0 technologies (e.g. (Mcafee, 2006; Aggarvel & Dupont, 2004; Center of Digital Strategies, 2007)).

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On the one hand, collaboration allows connected individuals to build self-organized communities and vibrant ecosystems that create value more efficiently than hierarchal businesses. In this sense, the Wiki workplace that is one of several models of mass collaboration can enable organizations to peer produce products and services and also to tie together the skills and intelligence of employees more efficiently (Tapscott & Williams, 2006). The Wiki workplace is discussed under section 3.4.

On the other hand, Tapscott & Williams (2006) have discussed a number of conditions for peer production that organizations need to satisfy in order to benefit from collaboration including the object of production should be information, tasks can be performed by many individuals in the sense that the task can be completed by the contributions of the many, and finally the combination of these contributions must be of low cost and good quality.

An organization that applies Web 2.0 techniques is called Enterprise 2.0 (Mcafee, 2006). E 2.0 is defined as a mechanism for promoting information sharing inside and outside an organization by adopting web 2.0 technologies such as Wikis (Yukihiro, 2007). Mcafee (2006, p. 23) used the acronym SLATES to refer to six components underlying E 2.0:

1. "*Search*: the ease of finding information through keyword search which makes the platform valuable.
2. *Links*: guides to important pieces of information. The best pages are the most frequently linked to.
3. *Authoring:* the ability to create constantly updating content over a platform that is shifted from being the creation of a few to being the constantly updated, interlinked work. In wikis, the content is iterative in the sense that the people undo and redo each other's work. While in blogs is cumulative that posts and comments of individuals are accumulated over time.
4. *Tags*: categorization of content by creating tags that are simple, one-word descriptions to facilitate searching and avoid rigid, pre-made categories.
5. *Extensions*: automation some of the work and pattern matching by using algorithms e.g. amazon.com recommendations.
6. *Signals*: the use of *RSS (Really Simple Syndication)* technology to notify users with any changes of the content by sending e-mails to them."

In this respect, the following list represents the core competencies of Enterprise 2.0 (O'reilly, 2005b, p. 19):

1. "Services, not packaged software, with cost-effective scalability.
2. Control over unique, hard-to-recreate data sources that get richer as more people use them.
3. Trusting users as co-developers.
4. Harnessing collective intelligence.
5. Leveraging the long tail through customer self service.
6. Software above the level of a single device.
7. Lightweight user interfaces, development models and business models."

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In addition, Wikis and other Web 2.0 technologies can help organizations to create a collaborative environment as described by Andrew Mcafee (2006, p. 2) "…can make a corporate intranet into a constantly changing structure built by distributed autonomous peers – a collaborative platform that reflects the way work really gets done." However, organizations need to deal with barriers of collaboration and to cultivate the basis for a collaborative business environment by handling human and cultural challenges in order to achieve successful use of collaboration. The figure1 describes the use of wikis in E 2.0 and its underlying social and technical infrastructure:
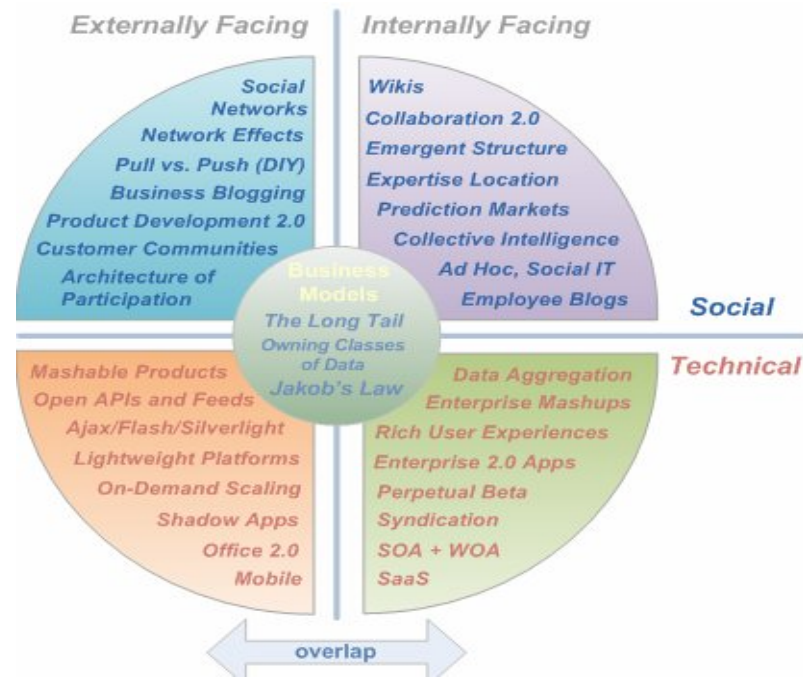
Figure 1: The use of Wikis in Enterprise 2.0 (Kemsley, 2008)

2.2 Wikis: Definition

The first wiki (WikiWikiweb) was created in 1995 by Ward Cunningham for the purpose of collaboratively document and edit software design patterns. The word Wiki means "Quick" in Hawaiian (Reinhart, 2005; Mader, 2007). A wiki is a simple website that enables users to create, edit, tag, and link content in a collaborative manner.

The basic idea behind the wiki concept is that anyone who can view the page can also contribute to knowledge construction through creating, editing, and remixing pages in few clicks (Reinhart, 2005; Buffa, 2006; Mader, 2007; Lee & Lan, 2007; De la Torr, 2005; Dearstyne, 2007). Although wikis are means for collaboration they are also a product of collaboration in the sense that what makes a wiki is the informal, unstructured collaboration between participants who create, edit, and share knowledge (Dearstyne, 2007; Mader, 2007; Reinhart, 2005).

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2.3 Characteristics of Wikis

One of the major characteristics of wikis is that there is no right or wrong way to use them because they are designed to support different patterns of group activities (Mader, 2007). The following list describes a number of characteristics:

1. ***Basic Structure***: wikis are flexible, adaptive, and come with a simple structure that is collaboratively developed over time by different participants (Wood, 2005; Mader, 2007). In the early stages, a wiki is flat and pages are blank to allow users create a collaborative organization that fits their needs (Mader, 2007).

2. ***Spaces and Pages:*** in Enterprise Wikis, the overall Wiki is called a site, and this site includes spaces consisting of different pages. Each space can be used for different topics, groups, products, projects, etc. that represents an individual wiki and can be accessed using a specific web address. It is easy to manage and grow Enterprise Wikis as you can create a new space whenever needed without the need to install new wikis. Then, whenever a new space is added users are informed via an RSS (Really Simple Syndication) feed. It is also easy to manage and control different spaces through connecting the wiki with the enterprise LDAP (Lightweight Directory Access Protocol) so each employee can use the old account to access spaces without the need to create a new one (Mader, 2007; Wood, 2005).

3. ***Editing Pages and Creating Content:*** wikis use a Wiki markup language for creating and editing content. The Wiki markup is a system of simple formatting prompts that is easy to use because it uses fewer characters and is very close to natural writing (Mader, 2007). The Wiki markup is called WikiML that is much easier than traditional HTML used for creating and publishing content (Buffa 2006; Wood, 2005).

4. ***Folksonomy:*** a categorization system developed over time by folks (Mcafee 2006). Wikis allow people to tag pages with keywords to describe their content. The collaborative process of tagging pages helps to organize information that best describes content rather than putting the content in predefined categories. Then users are able to use these tags or a combination of tags to find wiki pages (Mader, 20007).

5. ***Recent Changes***: wikis maintain a history of any changes that shows time, date, and author and enable users to track the progression of additions, editing, and deletions (Wood, 2005; Mader, 2007). Also, any changes made on the wiki content are maintained in a new version in the revision history. This helps to have an accurate picture of all changes in each page and also saves time to check pages as they are changed over time. Thus it helps all participants to keep track with others' contributions and motivate for more timely contributions (Reinhart, 2005; Mader, 2007; Wood, 2005).

6. ***User-generated Templates***: wikis allow people to collaboratively create templates and structures that best suit their content (Wood, 2005; Mader, 2007).

7. ***Extending Wikis:*** wikis balance between simplicity and customization by allowing users to develop plug-ins to perform specific tasks. There is no need for a software maker to extend wikis. The community collaborates to find existing plug-ins that meets their needs or find someone of them to build a specific feature (Wood, 2005; Mader, 2006).

2.3.1 Collaboration using e-mails and Wikis: e-mails have been recognized as a standard collaboration tool in organizations for a long time (Tapscott & Williams, 2006). Studies show that the e-mail is the mostly used tool in organizations among all other collaboration tools (Hideo & Shinichi, 2007; Mcafee, 2006; Mader, 2007). The following chart (see figure 2) shows a high percentage for using e-mails as a collaboration tool:
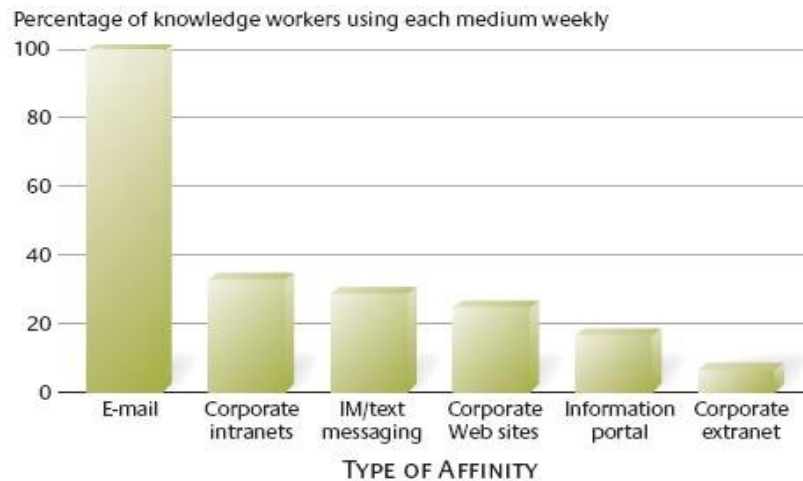
Figure 2: Dominance of e-mail as a collaboration medium (Mcafee, 2006, p. 4)

However, the process of collaboration using e-mails may end up with many separate files being distributed among many people. The risk when someone edits a file and another one makes another editing, and so on is the difficulty to look up for changes. Each time a new file is being sent you need to download the attached file and check for changes. There will be uncertainty which file contains the final version of a document. That is a problem with using e-mails which is time consuming and counterproductive because of the lack of accuracy and difficulty to follow up changes. Also, these problems can balloon with more people sending e-mails (Hideo & Shinichi, 2007; Mader, 2007; Wood, 2005). In contrast, instead of separate files, everyone is working on the same page and seeing the same text (see figure 3). With the help of RSS technology, any changes can be seen immediately and edits can be made at the correct time.
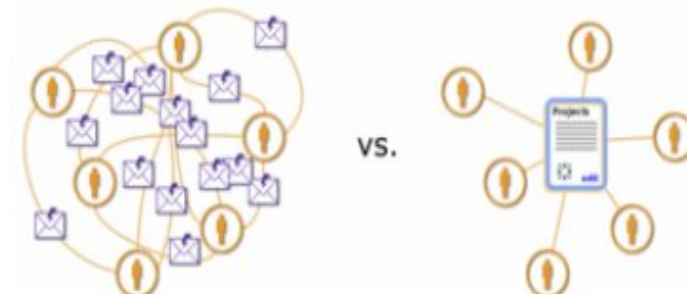
Figure 3: Collaboration using e-mails and Wikis (Buffa, 2006, p. 4)

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The ability to work on the same page reduces time, quick error correction, and collaborative editing results overlapping ideas and up-to-date documents (Mader, 2007; Wood, 2005; Dearstyne, 2007).

2.3.2 Wiki and an Intranet powered by Content Management Systems:
An Intranet is a knowledge management tool that serves as an internal network (a website) inside the organization that is accessible only to authorized employees (Buffa, 2006; Mader, 2007). It is used for archiving, sharing, and looking for information. However, the problem with these systems is in its ability to capture knowledge and make it accessible by all employees (Buffa, 2006). Moreover, these networks are guarded by few specialized person/s (administrator/s) who are responsible of updating knowledge and other people can't do changes when needed so they should wait until the website is updated. This results an out of date knowledge and slows down the usage of the intranet (Mader, 2006). Buffa (2006) stated that in order to succeed in capturing more knowledge and make it widely available throughout the organization there is a need for high participation, user involvement, and collaboration. He concluded that the centralized model of web publishing has to be rethought. Also, Mader (2007) supported this by arguing that intranets fail because people are not allowed to collaboratively edit knowledge and the needed critical mass of users for the success of the network cannot be reached.
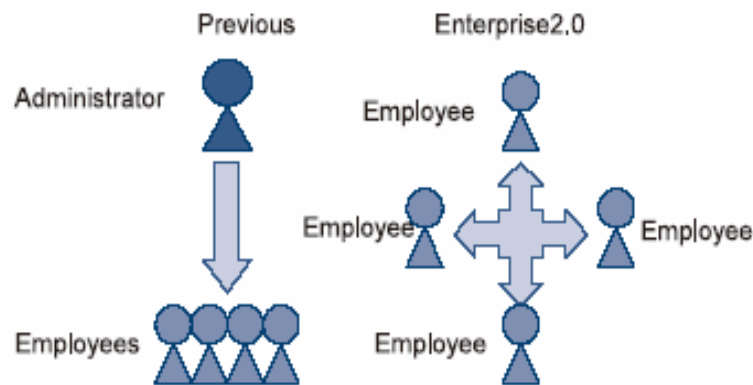
Figure 4: Differences from previous information sharing systems (Yukihiro, 2006, p. 2)

Diagram 4 shows the centralized model and the collaborative model in Enterprise 2.0 that can be supported using Wikis. This collaborative model allows each employee to participate in content creation and enables them to make the changes needed for their work without the need for centralized control by a specialized people.

2.4 Wikipedia Factor: Accuracy and openness in Enterprise 2.0

Besides the excitement of Web 2.0 and the revolution of social computing, organizations reflect their fears of using wikis for collaboration and information sharing. Their fears about accuracy, privacy, and security are major concerns when thinking of adopting wikis in the workplace (Mader, 2007; Mcafee, 2006; Grossman & McCarthy, 2007; Dearstyne, 2007).

The Wikipedia factor is behind these fears and misconceptions of the use of wikis in organizations (Mader, 2007; Mcafee, 2006). Wikipedia is a large online encyclopedia that

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represents the first exposure to the use of wiki (Gloor & Cooper, 2007; Mader, 2007; Lee & Lan, 2007). It was designed to be a place for collaborative construction of articles that are destined for peer review process (Mader, 2007; Lee & Lan, 2007; Wood, 2005). This place is open for everyone to create, edit, and remove content regardless of place and time. The sum of collaborative contributions from thousands of people makes it the largest encyclopedia on the internet. The open nature of Wikipedia and the idea that everyone can manipulate data makes organizations think that adopting wikis might be associated with all the pitfalls of Wikipedia and lead to insecure, inaccurate, and messy workplace which they cannot afford for their organizations (Mader, 2007).

Wikipedia is different from using wikis inside organizations because of two factors: primary use and community (Mader, 2007). According to a study (cited in Mader, 2007 & Mcafee, 2006) comparing between Nupedia, an online encyclopedia where only experts can contribute to knowledge construction, and Wikipedia conducted by *Nature* magazine, showed that both encyclopedias are of similar qualities. The study compared between 42 entries in the two and proved this conclusion (Mcafee, 2006; Mader, 2007). The accuracy of Wikipedia content results from the ability to self-check errors made by others because everyone can check these errors and fix them (Mader, 2007). Table 2 shows major differences between Wikipedia and Enterprise Wikis:

	Wikipedia	Enterprise wikis
Size of community	large numbers	limited to (parts of) the organization
Goal	general public encyclopaedia	persistence and exchange of experiences
Type of knowledge	rather mature knowledge (at least ad-hoc training)	immature knowledge (mostly distribution in communities and formalization, up to ad-hoc-training)
Maturing focus	artefact level (knowledge is considered to be sufficiently mature)	knowledge level (artefacts are considered to be facilitating the collaboration and exchange)
Motivation	idealism and identification with Wikipedia goals, quest for social esteem	work process needs, professional esteem, organizational goals

Table 2: Difference between Wikipedia and Enterprise Wikis (Braun & Schmidt, 2007, p. 7)

The community of Wikipedia is large and everyone can access content and make changes from all over the world. However, the community of an established organization is limited to its employees and their contributions on the wiki belong to their professional work in order to achieve common goals both on a project and organizational level (Mader, 2007). These employees might be working in the same office or distributed among different departments or branches but they collaboratively create content and share ideas to support their work. Any kind of vandalism of controversial entries, posting rude comments on others or editing entries to serve individual interests are unlikely to happen because of the fact that employees don't abuse tools that are important to their professional work (Mader, 2007). Moreover, teams collaborating for projects or planning meetings and events are authorized to access their spaces which are open to all employees

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within the team but not the others. There is a balance between the openness of wikis and its security in the sense that everyone can work closely but where necessary spaces are less open for others (Mader, 2007).

Although there is a difference between the application of wikis in organizations and Wikipedia, there are a number of challenges and barriers that may hinder interunit collaboration inside the organization (Hansen & Nohria, 2005). These challenges and barriers are discussed in the following section. Also, there are some difficulties in managing constantly-changing information that is accumulated on the wiki over time which can make it difficult to transform this information into knowledge (Bibikas et al., 2008).

2.5 Collaboration: Challenges and barriers

Our early discussion about Web 2.0 technologies and Wikis shows that these technologies can enable new forms of collaboration and collective working (Tapscott & Williams, 2006). However, when talking about collaboration it is important to realize the challenges and the barriers for successful collaboration. A major challenge for collaboration or collective action is that it cannot be easily achieved (Hansen & Nohria, 2006; Aggarvel & Dupont, 2004). Also, managers fear that their employees need incentives to use Web 2.0 technologies for collaboration (Dearstyne, 2007).

A number of reasons are behind this difficulty which may lead to the failure of the collaboration process among people as Aggarvel & Dupont (2007, p. 40) described them "Cooperation can be expected to fail due to actor's incentives to cheat, actor's sensitivity to distribution issues, or the lack of confidence in the actors behavior." Also, collaboration involves social and political interactions where members collaboratively evaluate and agree on common collective knowledge (Lotia, 2004). In such collaborative process there might be asymmetrical power among members of the groups which may influence the outcomes of collaboration (Lotia, 2004).

In that sense, achieving successful collaboration and collective action depends not on the technology but rather on the people collaborating together; technology is just a tool (Center for Digital Strategies, 2007). Hansen & Nohria (2005, p. 6) mentioned that "Although recent research on basic drivers of human action suggests that cooperation maybe a natural human tendency, collaboration at multinationals does not just happen on its own." Therefore, collaboration within an organizational context can be associated with several barriers depending on the human behavior. They have listed four main barriers to interunit collaboration as follows:

1. *Unwillingness to seek input and learn from others*: This is related to psychological motivations. Sometimes people don't see any value of others ideas and experience and they believe that these people have nothing to teach them and therefore they become unwilling to seek input from others. Also, they might work individually rather than with a group of people as they can gain personal rewards and pride. Furthermore, one kind of this problem is what is called in-group bias where members of a particular group are unlikely to ask their peers outside the group their opinions or collaborate with them. This is because they value

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members and undervalue non members. Such biased behavior results no interaction between different groups and therefore their different ideas will be restricted within single groups affecting the production of different view points.

2. ***Inability to seek and find expertise***: It happens when people are willing to ask for help but they can't find those who can help them. The lack of tools and connectors between people can be a major barrier to collaboration. Although there might be some networks and connectors but different issues such as security may hinder collaboration.

3. ***Unwillingness to help***: There might be cases when people are unwilling to help those who seek knowledge. Employees may not help others because of competitive motivation where everyone needs to be better than the other. Also, employees might not offer help when they have too much workload and therefore they don't have time for others and they just need to finish their work.

4. ***Inability to work together and transfer knowledge***: Professional relationships among employees are important to create a collaborative environment. Sometimes they are willing to help each other but there will be problems in transferring their knowledge to other. Employees need to understand each other in order to be able to transfer their knowledge for others otherwise it will be difficult both providers and seekers of knowledge to communicate knowledge.

The use of Wikis can be affected with these barriers and therefore affect the collaboration process. Also, when using these lightweight collaborative technologies there is a need for appropriate management to align their use to support group activities as well as balancing between spontaneity and structure which is a challenge to successful collaboration (Dearstyne, 2007; Hawryszkiewycz, 2007). In addition cultural barriers related to traditional norms governing the workplace such leadership and control are challenging to the success of a collaborative environment which requires managers to strike balance between hierarchal and horizontal integration (Hansen & Nohria, 2005; Tapscott & Williams, 2006).

2.6 Grassroots adoption: Starting a successful Wiki at the workplace.

Adopting wikis represent a new mechanism for collaboration and knowledge sharing. Therefore, the success of a wiki depends on building strong basis for active and sustainable participation by motivating people at the early stages of the adoption process to use the technology and show them that it easy to use and can be adapted to meet their needs (Mader, 2007; Dearstyne, 2007). In the long run, the best way to start using wikis in organizations is from the grassroots rather than mandated adoption that can slow down over time (Mader, 2007). In this sense, it is essential to involve different types of users when adopting new technologies such as wikis at the organization and to give much emphasis for social influences that might affect acceptance behaviors (Malhotra & Galletta, 1999).

There are five groups of people shown in the "Roger's Bell Curve" (*see figure 5*) who are different in their characteristics, needs, attitudes to new technologies (Meade & Rabelo, 2004). These groups are described from right to left starting with laggards who represent the group that is unlikely to accept new technologies and as we go through the figure to

the left side groups will be more likely to accept and use new technologies or innovative products. When introducing the wiki it is critical to develop user attitudes that are conducive to effective utilization and acceptance behaviors to ensure successful use of the technology (Malhotra & Galletta, 1999).
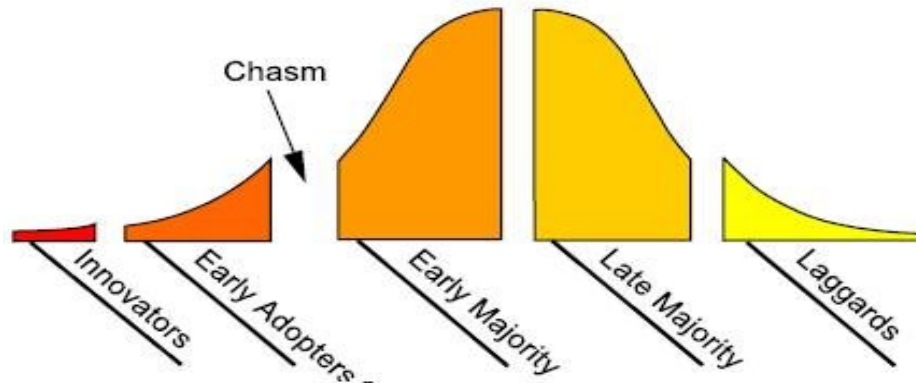
Figure 5: Technology Adoption Life Cycle "Bell Curve" (Meade & Rabelo, 2004, p. 2)

Mcafee (2006) argued that Enterprise 2.0 technologies are not easy to implement and rely heavily on decisions made by managers. He suggested that it essential to establish a *receptive culture* by cultivating new collaboration practices at the workplace, a *common platform* for emergent collaborative work, an *informal rollout* by giving employees time to adjust wikis to their work and don't rush to replace current tools by the wiki, and *managerial support*. Mader (2007) described the process of grassroots adoption (or informal rollout) which starts with a pilot where some groups are given access to the wiki to start their collaborative work and let them lead the wiki growth and feel the sense of control and ownership of their work which provides a good foundation of a successful wiki. The following two sections describe a pilot and a large-scale wiki adoption process.

2.6.1 Wiki Pilot

Mader (2007) proposed 11 steps for a successful pilot that help to start the wiki in a controlled environment, build examples that are relevant to the wiki use in the organization, and develop the administrative and support structure that forms a basis to run a wiki until it becomes a full production service:

1. ***Establish a Time Frame***: set a reasonable time frame for each selected group to get them familiar to use and adjust a wiki to meet their pilot goal. The time needed to complete a pilot depends on the size of the organization and general attitudes toward using new tools.
2. ***Make it Representative***: choose groups that are representative to different activities and projects in the organization. This will help to offer relevant examples later when including more groups.
3. ***Keep it Compact***: work with a manageable pilot size to be close to pilot users in each group so that you can communicate effectively with them and rapidly respond to any unexpected problems and provide guidance.
4. ***Choose Participants Carefully***: include multiple users as shown on the bell curve and avoid focusing on particular types of users such as innovators and early

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adopters because it affects the appeal of wikis to mainstream users as well as limit its scope for future use by other employees.

5. ***Seek or be Sought?***: call for participation. This depends on the culture of the organization. For example, in a tech savvy organization calling for participation will result a pool of applicants, but in an organization where employees are less attracted to use new technology it's helpful to choose those groups whom you know are receptive to trying new technology.

6. ***Wiki with a Purpose***: find the pain points where knowledge construction and collaboration are not efficient in your organization and let everyone use the wiki for the purpose of fixing these problems. In doing so, wikis would have a great impact of being part of the existing social structure of groups and projects that help them to be more productive and efficient.

7. ***Define House Rules***: develop a set of guidelines for content, conduct, and community that are concise, informative, and posted prominently. These guidelines can be extended for larger use later during a large-scale adoption.

8. ***Personal Spaces***: invite everyone to create a personal space to post their personal information such as blog and personal website URL, e-mail, telephone, IM, and biography. This will help create a comforting social network that would motivate everyone to collaborate and contribute to the growth of the wiki.

9. ***Never an Empty Page:*** Encourage creating templates so that other people will know what to write and contribute.

10. ***Make it Magnet:*** put some important content on the wiki and guide others to check the wiki when they need particular content by e-mailing them a link to the appropriate wiki page. This will let them get used to the wiki and check it to find their needs.

11. ***Be Firm and Think Logic***: Be sure that people are using wikis and they don't think of going back to use earlier tools. In case of any ramifications caused of using wikis, respond rapidly and show them the advantages of wikis in the long run over the other collaboration tools they used before.

2.6.2 Large-scale adoption

After conducting a successful pilot with representative groups the next step is to drive a large-scale adoption. A large-scale adoption is much more complex than a pilot because its purpose is to make a wiki used by everyone in the organization (Mader, 2007). It involves a large number of targeted employees and different patterns of collaborative group activities that requires planning.

The first step in starting a large-scale adoption is to *develop a wiki use policy*. It includes explanations for new users of how to use the wiki as well as how to deal with information on the wiki (Mader, 2007). A Wiki use policy starts with a positive opening to encourage others to use the wiki and emphasizes the role of the wiki in supporting common goals and collaborative work. Also, the wiki use policy advices everyone to be moderate and emphasizes that everyone can see the content and feel a sense of ownership rather than being controlled by others (Mader, 2007). Furthermore, the policy raises the awareness of people using wiki about information sensitivity and disclosure, so they know what information should be disclosed that is useful for achieving organizational goals. Most

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importantly, the policy advices users to be reasonable, constructive, and use sound judgment before any contributions (Mader, 2007).

Second, it is important to *work in phases* and set time for each phase (Mader, 2007). In each phase you work with a particular number of employees and the time needed to complete successive phases will be shorter as the wiki becomes more used in the organization. The pilot is the first and the longest phase. It includes installing the wiki e., testing, and technical integration with other tools e.g. LDAP and other enterprise services which will take 6 months. Also, the first phase during a large-scale adoption will take another 6 months. The second phase will take 3 – 4 months and so on. The overall process of starting a successful wiki in your organization is about 2 years (Mader, 2007).

Third, *explain why people should use the wiki* (Mader, 2007). When you call people to use the wiki explain for them that the wiki won't add complexity to their work, but rather it will simplify the process of collaboration, speed up communication, reduce redundancy, and keep their content secure (Mader, 2007). This can be achieved by showing the difference between using wikis for collaboration and other highly structured tools that contains walled-off information that is difficult to access, slows down communication, and results redundant information (Mader, 2007).

Fourth, *use pilot cases as examples* (Mader, 2007). The pilot phase gives good examples that can be useful during a large-scale adoption. These examples are useful to show new users experiences of their colleagues who start using the wiki and give them ideas of how to use the wiki for successful collaboration and knowledge sharing (Mader, 2007). It is useful to present some screen shots of other groups spaces on the wiki to show how they organize information, for what purposes they are using the wiki, and how it increases the efficiency of their work (Mader, 2007). Finally, Mader (2007) suggests applying *wiki patterns* which are different strategies and approaches that are useful to a successful wiki use, and also to *avoid anti-patterns* which are the things that you don't want to happen and might hinder wiki adoption. This research provides a number of recommended wiki patterns (see Appendix A) and anti-patterns (see Appendix B). Also, more adoption patterns and explanations are available at http//:www.wikipatterns.com/ that is a wiki-based website where people can contribute to create or edit patterns.

2.7 Wiki beyond Knowledge Management: KM 2.0

Traditional or conventional knowledge management systems are used to gather, share, and structure organizational knowledge into centralized data repositories to improve organizational performance (Lee & Lan, 2007; Jones, 2001; Reinhart, 2005; Mcafee, 2006, Grundstein & Sabroux, 2007). However, this understanding of knowledge management becomes less attractive for organizations in the new era of web 2.0 (Hideo & Shinichi, 2007; Reinhart, 2005). A major problem with traditional KM systems is their highly structured nature and top-down approach to knowledge management (Mader, 2007; Tapscott & Williams, 2006). These systems are based on systematic workflows, business rules, information push and people must adapt themselves to use them (Tapscott & Williams, 2006; Bibikas et al., 2008; Mader, 2007). In this sense, the primary role of employees is limited to maintain and control structured knowledge which has a negative effect on them because of the difficulty of using and adapting these systems to meet their

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needs (Hideo & Shinichi, 2007; Mader, 2007; Tapscott and Williams, 2006). In other words, employees are required to be knowledge readers rather than knowledge creators. There are two types of knowledge: explicit knowledge such as knowledge stored into a database and tacit knowledge (know-how) which is inside the human's brain such as collective knowledge (skills and routines) by a group of individuals (Grundstein & Sabroux, 2007; Jones, 2001; Reinhart, 2005). With traditional knowledge management systems tacit knowledge is difficult to capture because it deals with knowledge as an object where the role of its creators is limited to make it structured into data repositories (Reinhart, 2005; Grundstein & Sabroux, 2007; Mader, 2007; Hideo & Shinchi, 2007). Therefore, it is not useful to use these systems to capture tacit knowledge of people because it rigidifies the process of knowledge management and keeps a systematic workflow of knowledge creation and extraction (Grundstein & Sabroux, 2007; Mader, 2007; Jones, 2001).

The new technologies of Web 2.0 help to capture tacit knowledge, experiences and best practices of knowledge workers in the organization because of their flexibility to be adapted to the way these workers work (Mader, 2007; Mcafee, 2006). Most importantly, technologies like wikis don't impose hierarchal knowledge or systematic workflows e.g. databases which forces employees to only browse this knowledge without giving them the ability to adapt this knowledge to their needs (Dearstyne, 2007; Mader, 2007; Tapscott & Williams, 2006, Bibikas et al., 2008). De la Torre (2005) discussed that knowledge management benefit from wikis because they are easy to use, ability to capture knowledge in a shared, growing repository, better accessibility to knowledge, and architecture of participation. The new mechanism of managing knowledge is referred to KM 2.0 which describes the process of managing knowledge with the collective intelligence at the core (Hideo & Shinchi, 2007). As shown in figure 6, there are different sources of knowledge and the role of KM 2.0 is to utilize knowledge from these sources to establish the basis of collective intelligence rather than static accumulation of dynamic knowledge (Hideo & Shinchi, 2007; Reinhart, 2005).
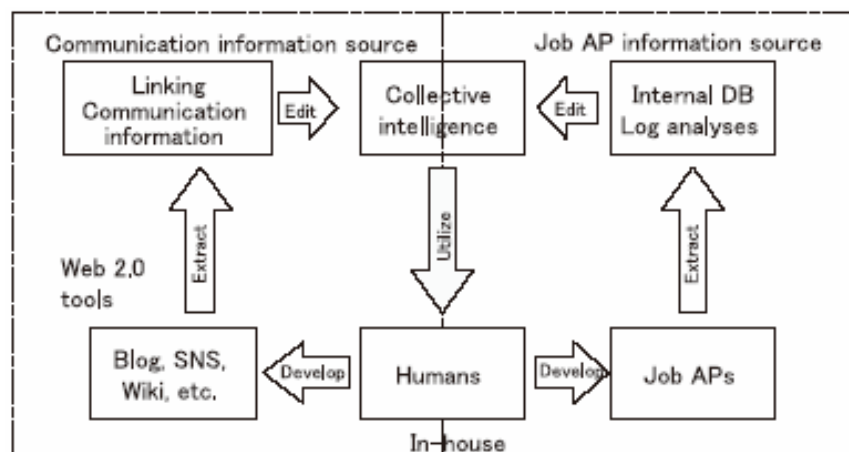
Figure 6: KM 2.0 model (Hideo & Shinchi, 2007, p. 3)

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There are four interlinked processes of collective intelligence as shown in figure 7 (Hideo & Shinchi, 2007). First, *disclosure* which means opening different sources of information for employees. Second, *linking* between disclosed knowledge and its sources. Third, *selection* which involves determining the value of knowledge. And finally, *evaluation* which entails assessing the values of selected knowledge.
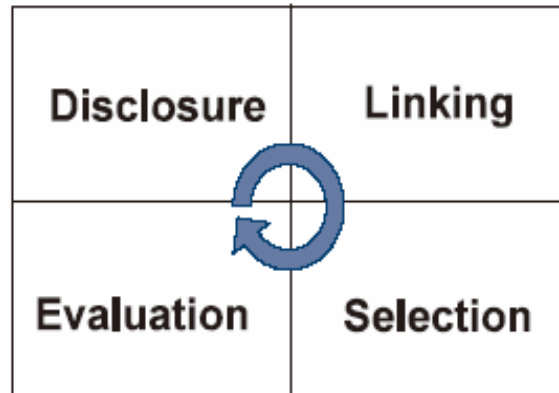
Figure 7: Steps of collective intelligence building (Hideo & Shinchi, 2007, p. 3)

The use of wikis allows employees to collaborate in creating, editing, refining, and managing knowledge with their peers (Mader, 2007; Mcafee, 2006). This can facilitate gathering decentralized and tacit knowledge of employees and therefore organizations can benefit for the accumulated sum of their ideas and experiences (De la Torre, 2005). In this sense, although the new mechanisms of Web 2.0 can help overcome problems of conventional knowledge management systems there is still a challenge for organization to effectively use this sum of ideas and experiences (Bibikas et al., 2008). Bibikas et al. (2008, p. 46) argued that "in the absence of a knowledge representation scheme to assist in the interpretation of the accumulated information, the evolution of content in a bottom-up fashion may hinder the effectiveness of managing this information and eventually prevent knowledge workers from transforming it into knowledge." As a result, there is a need to enhance the collaborative process of knowledge management by providing intelligent information processing capabilities using semantic technologies that help knowledge workers to use and benefit from this accumulated information for their every day tasks (Bibikas et al., 2008).

2.8 Reliability and Trustworthiness of collaborative Wiki content

The user-generated and collaborative content such as the content of Wikipedia, epinions.com, etc. has an increased influence over the web (Peacock et al., 2007; Adler et al., 2007). However, there are some risks related to managing content quality associated with the collaborative production of content (Tapscott & Williams, 2006). When discussing the reliability of the collaborative Wiki content researchers always try to investigate the quality and accuracy of Wikipedia which is the largest application of the wiki concept on the web (Peacock et al., 2007; Adler et al., 2007). Although the open nature of Wikipedia and the ability to collaboratively edit and change content are keys to its success, a number of challenges arose regarding the reliability of its articles that can be edited by everyone within the community (Peacock et al., 2007).

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The free editability of the wiki content can be sometimes disadvantageous in the sense that the reliability of collaborative content edited and changed by many people is difficult to assess (Peacock et al., 2007; Adler et al., 2007). More clearly, there is no guarantee about the quality and accuracy of content because of the absence of formal validation procedures e.g. formal peer review process. A formal peer review is the process of validating content by a group of experts that is a trusted model (Peacock et al., 2007). This is a strong argument against the quality of Wiki content in the Wikipedia environment because people contributing knowledge are not necessary experts but they can be amateurs or web savvy and their contributions are questioned (Adler et al., 2007). Also, even if the process of creating knowledge is iterative and content is continuously checked by they community, their contributions might be biased as they want to satisfy their self interests or sometimes inaccurate because of the lack of experience in the field (Peacock et al., 2007; Adler et al., 2007). As a result, many university teachers discourage their students to use Wikipedia as a scientific reference due to possibility of vandalism and the lack of quality (Tapscott & Williams, 2006; Peacock et al., 2007).

The open nature of the Wiki content made managers to be worried about their proprietary information that should be confidential within the company firewall. These worries come from the idea that there are many participants who have the accessibility to content and therefore confidential corporate information might be threatened (Dearstyne, 2007). In that sense, Dearstyne (2007, p. 28) identified a number of challenges caused by Web 2.0 technologies e.g. Wikis for records and information management including:

1. "Managing the creation, collection, storage, and dissemination of vast amounts of unstructured and constantly changing information.
2. Controlling access to particular levels and types of information.
3. Protecting the security and integrity of information.
4. Assessing the legal implications of vast amounts of information in scattered systems and databases.
5. Deciding how much information to make public.
6. Get the right information for the right people when they need it.
7. Putting information to work for the enterprise."

3. Wikinomics: The New Era of Mass Collaboration

3.1 Wikinomics: The rise of a new era of collaboration

Our previous discussion about the wiki and the rise of Enterprise 2.0 represents the impact of four forces that led to a new era of collaboration in business. The new Web or Web 2.0 technologies overlap with another three forces shown in figure 8 and led to the so called *collaboration economy* (Tapscott & Williams, 2006). The truth about organizations is that they exist to collaboratively achieve what individuals cannot achieve alone (Hansen & Nohria, 2004). In this sense, Hansen & Nohria (2004, p. 13) stated that "...in an era when advantages based on traditional economies of scale and scope are rapidly diminishing, the successful exploitation of collaboration possibilities may hold the key for multinationals seeking to gain or maintain leads over their rivals."
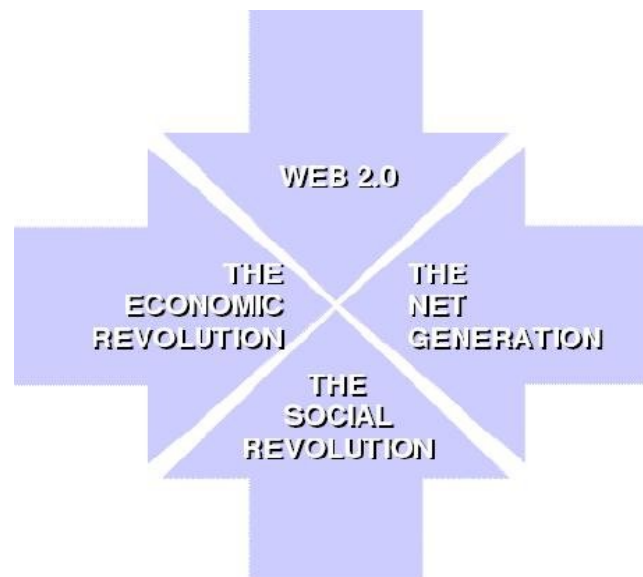
Figure 8: Four driving forces of change (Tapscott, 2007, p. 62)

The new generation of the web has affected the vertical structures and architectures of organizations and the way they orchestrate capabilities. Collaboration is a major aspect of the new Web in the sense that it provides people with the ability to communicate and share information together to co-produce with other peers (Tapscott & Williams, 2006; Gloor & Cooper, 2007).This process of production is called peering or peer production which involves groups of people collaborating together without hierarchal control. (Tapscott & Williams, 2006).

The web 2.0 movement is accompanied by a demographic change that is characterized by the Net Generation. The youth and teens that are increasingly using the internet to create their virtual spaces where they collaborate, play, engage, participate, and interact are called the Net Generation (Tapscott & Williams, 2006). This generation differs than any other generations because it has been growing up using the internet and interactive technologies that help them shape their identities and create their private lives on the web through social connectivity, diversity, and sharing. The new Web allows this generation

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to self-organize and establish social communities where they interact and engage producing entertainment services (Gloor & Cooper, 2007; Tapscott & Williams, 2006). This can be found in the increasing number of social communities on the web such as Facebook, Flickr, and Wikipedia that represents a social revolution empowered by the Web 2.0 technologies and demographic changes. The application of Web 2.0 technologies such as Wikis at the workplace would bring the norms of the social communities and enable employees to engage in the process of collaborative work (Hansen & Nohria, 2004; Tapscott & Williams, 2006).

In collaboration economy, organizations are practicing new models of mass collaboration which is a large-scale collaboration with large numbers of collaborators (Ghoshal & Gratton, 2002; Tapscott & Williams, 2006). Hierarchal organizations that follow a top-down approach to management are now changing into collaborative self-organizing business-webs (B-webs) where employees, partners, suppliers, customers, and even competitors collaborate to co-produce and co-innovate (Ghoshal & Gratton, 2002; Tapscott & Williams, 2006; Sawhney, 2002; Gloor & Cooper, 2007). B-webs represents new way of interorganizational collaboration that are working together to produce more wealth than working individually.

Figure 9 shows the changes in the economics of collaboration from the industrial age until the new era of mass collaboration:
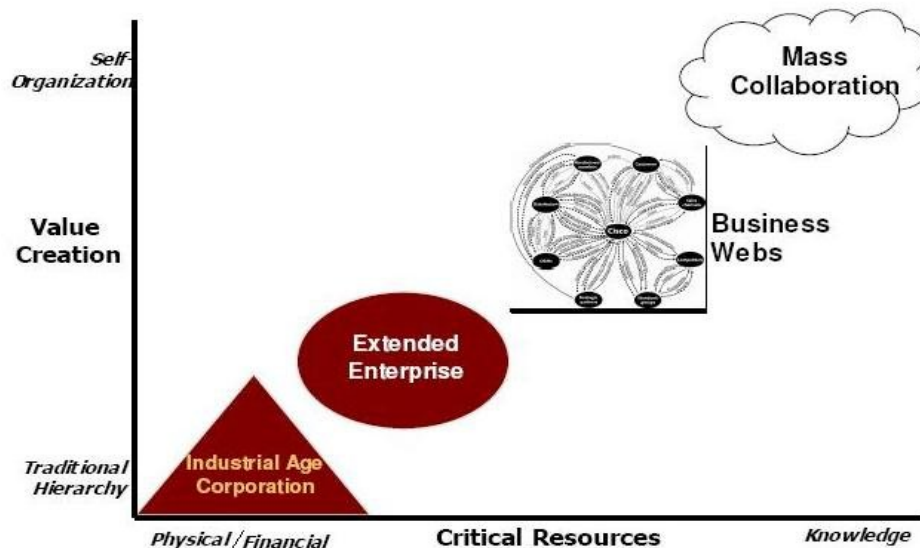
Figure 9: Economics of collaboration (Tapscott, 2007, p. 57)

3.2 Principles of Wikinomics

There are four principles of Wikinomics: Being open, Peering, Sharing, and Acting globally (Tapscott & Williams, 2006):

1. Being Open: Being open involves transparency, freedom, candor, engagement, expansiveness, flexibility, and access. Being open and transparent through disclosing pertinent information has become a growing force in the networked economy for many

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reasons. First, customers can realize the true value of products. Second, employees have more freedom and flexibility to express their ideas about organizational strategies. Finally, partnerships become more visible and stimulate each other to collaborate.

2. Peering: Hierarchal and vertical systems dominate organizations throughout history through dividing people into levels of control and order. However, a new form of horizontal systems is emerging through peer-to-peer communication (Ghoshal & Gratton, 2002). This new form is called peering where participants collaborate together in a peer production community. Employees collaborate horizontally with each other and motivated by the altruism to achieve common goals that are important for them and their organization rather than being controlled by upper management (Gloor & Cooper, 2007).

3. Sharing: Different organizations protect and control their intellectual property through copyrights, trademarks, and patents. Although protecting intellectual property is advantageous, but it is also associated with barriers to innovation. It restricts access to essential tools for knowledge sharing and collaboration and therefore impedes users' innovation and creativity. Surprisingly, sharing knowledge with others has become prevailing in the knowledge-based economy. Sharing is not only limited to share knowledge but includes sharing computing power, bandwidth, and content.

4. Acting Globally: Globalization is making the world more interdependence generating enormous economy. Many organizations are trying to cope with the expansion of the world market and compete globally. In order to succeed, organizations need to harness global capabilities including global talents, global collaborative platforms for employees, customers, and partners, and unified global processes. A truly global platform for collaboration on a large scale would help organizations harness these capabilities and to act truly global.

3.3 Models of Mass Collaboration

Unlike traditional understanding of collaboration which involves a limited number of people doing certain tasks, the growing number and increasing accessibility of tools that support collaboration on large scales are introducing new forms of mass collaboration (Tapscott & Williams, 2006). The following list describes six models of mass collaboration (Tapscott & Williams, 2006 cited in Grossman & McCarthy, 2007, p. 182):
1. "***Peer Pioneers***: the shift to peer-to-peer networks and the open-source movement.
2. *Ideagoras*: the ability to tap global pools of highly skilled talent for ideas, inventions, virtual collaboration.
3. *Prosumers*: dynamic world of customer innovation and the intentional 'hackability' of Web services.
4. *New Alexandrians*: the new science of sharing that will accelerate scientific discovery and that will ultimately help the world address its most difficult problems (e.g. environment, human health).
5. *Platforms for Participation*: how companies are moving from proprietary formats to platforms that are open and that encourage communities of partners to create value.
6. *Global Plant Floor*: manufacturing intensive industries are moving towards global ecosystems for design and development of goods."

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3.4 The Wiki Workplace

At this section, we give much emphasis for the final model of mass collaboration which is the Wiki workplace. The social and collaborative nature of the wiki that is, what makes a wiki the collaboration among employees, stimulates establishing collaborative human capital networks that cultivate collaboration and augment the thinking and communication of knowledge workers (Tapscott & Williams, 2006; Mader, 2007).

Organizations are decentralizing their decision making functions, communicating in a peer-to-peer fashion, and adopting new technologies that allow employees to collaborate more easily with each other (Tapscott & Williams, 2006; Hansen & Nohria, 2004). In this sense, a Wiki thrives on active participation by peers with trustful relationships and willingness to be transparent through sharing knowledge with others (Ghoshal & Gratton, 2002; Mader, 2007).

Currently, there are many companies producing social software and Wiki systems for Enterprise use. Many large enterprises are adopting wikis and other web 2.0 technologies for collaboration purposes such as Sony Ericsson, IBM, P&G, Sun, Google, IKEA, Goldcorp, Amazon, Boeing, BMW, etc (Gloor & Cooper, 2007; Tapscott & Williams, 2006; Mader, 2007). Socialtext, the first wiki company and a provider for Enterprise 2.0 solutions – http://www.socialtext.com, applies and provides Wiki systems for enterprise use (Wood, 2005). Most often, when something goes wrong at the workplace, many employees are naturally tending to self-organize and collaborate because they genuinely enjoy the challenge of coming up with solutions to exceptions in a spontaneous and collaborative fashion (Gloor & Cooper, 2007; Tapscott & Williams, 2006; Hansen & Nohria, 2004). However, organizations are unable to capture such decentralized and collaborative approach to problem solving because of the lack for tools that can be adapted to such moments of innovation. In this respect, Tapscott & Williams (2006, p. 256) explained the value of social software such as wikis by saying that: " Social software provides companies with a way to document and leverage those moments of innovation with relative ease, providing a living, breathing repository of easily accessible knowledge that grows along with the organizations. Companies can continually harness their local insights and adaptations to new problems by capturing and using those insights to drive organizational change and renewal."

The following list shows a number of possible uses of the Wiki technology for different collaboration purposes:

1. **Time Allocation**: This can be best described through Google's policy with their employees. Google encourages self-organization and collaboration through allowing their employees to dedicate 20% of their time to pursue own interests. As a result, employees are glad and most importantly it boosts their creativity and spur their innovative ideas. Google CEO Erich Schmidt (cited in Tapscott & Williams, 2006, p. 260) said that "Virtually all of the products ideas in Google come from the twenty percent of the time employees work on their own projects." An example of such innovation is Orkut, a social networking service, which was an idea for Orkut Buyukkoten who works for Google.

2. **Corporate Communications**: Wikis support blogging that can be used for a variety of tasks such as product development and releases, planning events, providing support, and informal updates (Mader, 2007). An example about the use of Wikis and blogging at the workplace is from Sun CEO Jonathan Schwartz (cited in Tapscott & Williams, 2006) who was one of the first executives to use blogging for corporate communications. Schwartz emphasizes that "Blogging was a more effective, more reasonable, and more transparent way of communicating with employees than sending an all-Sun-e-mail." He also said: "I wanted employees to understand why Sun executives were thinking the things we were, why we said the things that we did...we're going to drive unparalleled transparency into everything we do…transparence enables everything to go faster, invites accountability, and drives dialogue between Sun and the communities we serve."

3. **Knowledge Base or Support Site**: Wikis are very useful to establish a knowledge base for support issues. Employees can collaboratively create a FAQ and support questions on the wiki which are easily updated by them. As the wiki grows and cultivated with constantly updated information, support staff can answer quickly and also provide more accurate explanations for their customers (Sawhney, 2002; Mader, 2007).

4. **Intranet or Extranet**: As discussed before, intranets or extranets doesn't help people to contribute because there are specialized people responsible about administering these sites which often results out-of-date information. However, a wiki can be used as an intranet or extranet where different types of data can be developed collaboratively such as project documents, standard materials, meeting agendas, and other kinds of data. This will ensure everyone contributing and maintain updated data (Mader, 2007).

5. **Public Website**: A wiki can be used as a public website where people are collaboratively creating and editing content which results up-to-date information and a more comprehensive content provided by many peers (Mader, 2007).

6. **External Communication**: In the same way a wiki can be used internally, it is also used to collaboratively communicate outside the organization to meet the external needs of customers (Sawhney, 2002; Mader, 2007; Gloor & Cooper, 2007). People from outside the organization such as customers, suppliers, and business partners can participate in the wiki growth. These are given permissions to participate in the production process through allowing them to collaboratively comment, share ideas, provide feedback, and ask questions. A wiki can serve as a global collaborative platform for all participants inside and outside the organization to achieve common goals. This collaborative approach to work encourages all to actively participate and be more willing to open sources of knowledge and share ideas (Mader, 2007).

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4. Collective Intelligence

4.1 Intelligence of Crowds: We Are Smarter Than Me

Confronted with an ever-changing trend in technologies, cultures, economics, the arts and fields of knowledge, the need for a creative mind as a source of innovation that can handle new needs appear to be more important that ever (Paulus & Nijstad, 2003). Specialization and new sources of innovative ideas are now being sought in the shadow of group interactions because it is now evident that "under the right circumstances, groups are remarkably intelligent, and are often smarter than the smartest people in them." (Surowiecki, 2005, Introduction).

Relying on the crowd's intelligence is not a brand new concept. If we dig through the history, we'll find out that long before the innovation of the Internet the power of crowds has been used and influenced human's life in many ways .From honey bees to the brain-raisings of rural American they all have been based on the crowd's intelligence and cooperation. And still wisdom of crowds is influencing our lives in many aspects although sometimes we don't notice it. Stock prices, votes, juries and such are all examples of such collective working; but the ever-changing and ever-growing nature of the world is pushing the need for new ideas more and more (Libert & Spector, 2007; Surowiecki, 2005).

However one may argue that why we need to engage ourselves with group activities when we can do the same thing individually. The answer might lie in the nature of human being. Human's knowledge is limited and incomplete or in other words as economist Herbert Simon puts it Human being is boundedly rational (Simon, 1972). We usually know less than we like or think we know and we often have a limited foresight about what will happen in the future. In some situations particularly in case of confronting with complicated calculations we are unable to make accurate estimates and we usually choose the simplest possible choice over the best one. However, if we combine our imperfect and limited judgments with that of others in a right way, we are able to achieve an excellent collective intelligence (Surowiecki, 2005).

4.2 Information Sharing in Organizations

In traditional models of business, companies used to lock down their data and information for themselves and have a tight control over the products and services. Now they have came to the point that by giving out access to their information and knowledge to individuals and by relying on the collective intelligence of groups of informed people they can reduce their costs to an acceptable level and at the same time gain better products and services. This process is what Libert & Spector (2007) called in their book: "crowdsourcing".

"Crowdsourcing is a business model that turns over tasks traditionally performed by employees to the Internet multitude" (Libert & Spector, 2007, p. 3).

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Brabham (2008) puts crowdsourcing in another way by defining it as:

"Crowdsourcing is an online, distributed problem-solving and production model that has emerged in recent years. Notable examples of the model include Threadless, iStockphoto, InnoCentive, the Goldcorp Challenge, and user-generated advertising contests." (Brabham, 2008, Introduction)

Jeff Howe, writing in *Wired* magazine (June, 2006), defined crowdsourcing as: "the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call."

Example: out of many examples of crowdsourcing we choose to mention Canada's Cambrian House: Cambrian House applies a crowdsourcing model to identify and develop software and web-based businesses as it works with its community as partners by helping them turn the hottest ideas into business. Each time they run a contest and each of the members of the community (could be a student, a designer, an entrepreneur, a business advisor an investor or a game player) can submit his/her idea. The ideas will get feedback from the other members of the community and one idea will be chosen by member's vote. The winning idea with the help of the community will be turned to reality as it connects with the community for writing the codes, developing a business model, design a logo and so on in exchange for royalty points or Cambros. (Currency: one Cambro equals to 1$). In so doing , by using a simple voting model, Cambrian House attempts to find sticky software ideas that can be developed using a combination of internal and crowdsourced skills and effort.

As we see, "a business can live or die on the strength of what it offers." (Libert & Spector, 2007, p. 23). By directing and leading the power of crowds (can be their customers, employees, suppliers or investors) toward a common goal more business people can make and are making better decisions and bigger profits. From Google search engine, to Skype, or eBay's massive auctions, new business models have blossomed from online collaboration communities in marketing, products development, customer relations and even basic research and design.

Forrester Research that was performed in early 2007 reported that a survey of 119 chief intelligence officers found that fully 89 percent were using at least one of six technologies for collective intelligence including unlikely business tools as podcasts, wikis, blogs, and social networking (Libert & Spector, 2007, p. 5).

R&D companies ask people about their desired products and services and give them an opportunity to speak their mind. Customers on the other hand are more interested to buy what they have created and also there will be a guarantee that they will like it. This as business professor of Michigan University C. K. Prahaland puts it is "an economy of the people, by people and for people." (Libert & Spector, 2007; Surowiecki, 2005).

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"The days of kissing off employee's ideas with a couple of suggestion boxes are long past." (Libert & Spector, 2007, p. 29).Today, businesses can not afford to ignore invaluable ideas suggested by its customers and staffs.

Basically there are three different types of issues that organizations and groups usually face. There are coordination issues, cooperation issues and cognition issues (Surowiecki, 2005).

4.2.1 Coordination Issues

Coordination problems refer to the ability of the group in coordinating their behaviors with each other in a way that is convergent with the general benefit of group. For instance How do companies organize their operations? (Surowiecki, 2005).
Perhaps these types of problems are the most important yet challenging issues within a group. Considering that a successful group is made up of independent, decentralized individuals, it seems hard for group members to coordinate their activities and decisions with collectively beneficial goals.

Surprisingly, the results of experiments performed by many scientists show that group's behavior is very similar to flocking birds (Surowiecki, 2005). In many situations they act in an organized way without anyone telling them what to do. These experiments like the one that social scientist, Thomas C. Schelling (1958) ran with a group of his law students suggest that: In many situations people's expectations would converge in points that he calls them "focal points". These points are in other words a set of norms and conventions internalized by people that show how people find their way to "collectively beneficial results not only without centralization, but also without even talking to each other directly." (Surowiecki, 2005, p. 91).

Hence once people find themselves in a group, they organize their behaviors according to a set of conventions that arrange people with a spontaneous order and illustrate the group's wisdom and help them converge their decisions and behaviors with the whole group with a relative ease and absence of conflict. These conventions are like standing in a queue to pay to the cashier in supermarkets or the convention of first comes, first sits in buses that people have created themselves and there is not any externally established rule for it (Surowiecki, 2005).

4.2.2 Cooperation Issues

Cooperation problems are related to the ways that bring a number of distrusted and disconnected people with diverse backgrounds and interests to cooperate with each other for a common goal. Some may argue about the motivation for cooperation among people and ask why are people willing to cooperate with each other and outweigh the group's benefits over their own self-interests. The reason to this question lies in the definition of cooperation:

"Cooperation is the result of repeated interactions with the same people which its foundation is not just trust, but durability of the relationship." (Surowiecki, 2005, p. 117). Getting involved in this mutual interaction will benefit all participants like being a part of

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a game that does not have a winner and a loser; instead, everyone will gain something at the end. They rely on trust in their cooperation and believe in their partner's trustworthiness and their initial self-interests grow to a higher level of collective reliability and willingness to cooperation. Because having trust in others is the only way to ensure long-term success and benefits. Even though, it might be risky (Surowiecki, 2004).

4.2.3 Cognition Issues

"Cognition problems might have or not have a definite answer" (Surowiecki, 2005, Introduction part). For instance "where is the best place to build the company?" or "how many computers do we need for the IT department?"

When the group is confronted with the cognition problems particularly in case of judging or estimating an issue, the individual estimates of each person will be aggregated to other estimates and then will be averaged. The result of experiments conducted by American sociologists and psychologists particularly between 1920 and the mid-1950 shows that the group's collective estimate or judgment is most of the time more brilliant than the estimate of the smartest individual in the group (Surowiecki, 2005).

These experiments show that certain people consistently outperform the group but they are not the same people each time. Each person's guess is consisted of two components: information and error. When we average the estimates of individuals, the errors that each of them makes in coming up with an answer will cancel themselves out. So if we subtract the error form "information plus error" preposition, we are just left with information. In other words, the level of knowledge and information of individuals regarding the issue being discussed affects the ability of the group as a whole in coming up with the smart answers. It is important that the group members are chosen from relevant and well-informed people who can contribute to the issue properly. Otherwise the wisdom of crowds will not be meaningful. We can not compare the answer of a group of children about an architecture for instance to the answer of an engineer (Surowiecki, 2005, p. 10).

4.3 Conditions required for group intelligence

In spite of all the factors mentioned above, it is not always the case that a group makes smart decisions and even sometimes the result of a case being discussed in a group is even more disappointing. This is due to the fact that there are certain conditions that prepare the ground for the group's collective intelligence to evolve. Groups need rules to maintain order and coherence and if they miss or malfunction such conditions the result will not be desirable.
Conditions that are necessary for the crowd to be wise include (Surowiecki, 2005):

1. Diversity
2. Independence
3. Decentralization

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4.3.1 Diversity

"A group is diverse if it is consisted of members who differ from each other with respect to one or more features." (Paulus & Nijstad, 2003, p. 36; Surowiecki, 2005).

As individual judgments are not accurate and consistent enough, cognitive diversity is essential to good decision making as it can expand the possible solutions to a given problem. Diversity can promote creativity and innovative outcomes in groups (Austin, 1997; Bantel & Jackson, 1989; Mcleod et al., 1996; Paulus & Nijstad, 2003).
As diverse group of people possess diverse degree of insights, knowledge and judgments about an issue they can offer different alternatives.

Homogenous groups are usually good at what they are used to do. However, if they are confronted with a case out of their expertise area, they will have problems. Because they are so much alike, they think like each other and they make similar mistakes. The more similar people in a group are, the more similar their ideas are. But bringing new people to the group even if they are less experienced can make the group smarter because what new minds offer is not exactly the same and redundant as others offer and it is more likely that a creative or unlikely idea crosses someone's mind.

Unlike what many might think, chasing experts may not be the best solution for solving problems in a company or organization. The result of the survey of overconfidence by economist Terrance Odean found that experts like physicians, nurses, lawyers, engineers, entrepreneurs and investment bankers all believe that they know more than they really do. Another study by conducted by James Shanteau one of the US leading thinkers on the nature of expertise found that experts' judgments are neither consistent with the judgments of other experts in the same field nor internally consistent. This does not mean than amateurs can comment on issues better. Instead it shows that however skilled and well-informed an expert is, his ideas should be pooled with those of others to result in best outcomes (Surowiecki, 2005; Paulus & Nijstad, 2003).

Furthermore, another positive effect of diversity among members in a group is that it allows them express their ideas without being under the influence of other members. If everyone agrees on a wrong idea, the power of majority usually convinces even the only disagreeing idea (Surowiecki, 2005; Paulus & Nijstad, 2003).

However it should be noted that diversity of members in a group increases the risk of conflict between the members and should be managed in an efficient way (Surowiecki, 2005; Paulus & Nijstad, 2003).

4.3.2 Independence

Another determining factor in the group's overall intelligence is the degree of independence of individuals within the group. When every one can take decisions independently, the group will favor in two ways. First, the mistakes that each member makes will not be correlated to other ones. In other words, errors made by individuals won't affect the group's collective judgments. Because each individual's errors is

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restricted to his personal knowledge and so is independent from others and therefore can be realized better by others. Second, the possibility that new information be added is more rather than having the same data that everyone already knows (Surowiecki, 2005).

Many people are able to think and act independently regardless of decisions that others make. However, there are a number of situations that people closely observe and copy actions of others before making their decisions. The more individuals in a group are under the influence of their peers, the possibility that the group ends up collectively beneficial conclusions is less (Surowiecki, 2005).

4.3.3 Decentralization

In order to benefit from a group's collective decision making power, the group should be decentralized. Decentralization means that power and decision making is not concentrated to one person or one unit. Instead, independent, well-informed individuals make decisions based on their local knowledge. Like social networks that allow people to connect and coordinate with each other while there is no single person in charge of others (Surowiecki, 2005; Paulus & Nijstad, 2003).

Decentralization brings several values to the group's decision making:

1. It reveals tacit knowledge which is "the knowledge that can't be easily summarized or conveyed because it is specific to a particular experience", (Hayek, 1945, cited in Surowiecki, 2005, p. 71). It is crucial, yet hard to achieve.
2. On the one hand it encourages independence and specialization and on the other it still let people to coordinate their thoughts to solve the problems (Surowiecki, 2005).
3. It brings each individual closer to the issue. The closer a person is to a problem; the more likely she is to find a good solution for it (Surowiecki, 2005, p.71).

Google search engine (and generally the Net) which relies on the local knowledge of millions of websites to help it make smarter and quicker searches is a perfect example of a decentralized system. When a search term is entered to Google it actually asks all websites to introduce it the closest related website to the subject. Linux on the other hand which is a result of collaborative work of thousands of programmers is another example in this regard that no single person is in charge of it (Surowiecki, 2005).

However, decentralization should not be mixed up with disorganization. According to Surowiecki (2005, p. 74) "decentralized system can only produce genuinely intelligent results if there is a mean of aggregating of information of everyone in the system." This mean can be a person, a data base, the price of a product, the product itself and such. Without such a mean decentralization will not have positive effect on the organizational activities. If a group of independent individuals tend to solve a problem without assigning a mean that gathers all their judgments together, the result of their problem solving in the best situation will be the answer of the smartest person in the group however there is no guarantee that they even reach this point. With a mean of aggregation, they can produce collective solutions that are smarter the group.

4.4 Groups and innovation

Nowadays with the help of communication; the useful knowledge is widespread and innovation is no longer defined as just creation and pursuit of new ideas and traditional approaches to innovation which says: "master all skills and locate them under one roof" is no longer enough (MacCormack et al., 2007, p.4). Accordingly, there is a new trend in management of innovation in which "innovations are increasingly brought to the market by networks of firms, selected according to their comparative advantages, and operating in a coordinated manner" (MacCormack et al., 2007, p.4).

In this new trend, firms seek better performance in innovation through collaboration. They exploit innovative ideas through establishing mutually beneficial relationships by de-constructing innovation value chain and source-pieces from their partners that result in lower costs, better skills and access to more sources of knowledge. So collaboration is not just a nice idea to have anymore, it has turned to be a competitive necessity (MacCormack et al., 2007).

Furthermore, according to Rura-Polley & Baker (2002) there are different sources that refer to collaboration as an important factor for enhancing innovativeness in organizations as well as industries. For example: Dougherty and Hardy (1996, p. 1122) suggested that mature organizations that want to develop a capacity for sustained innovation must "provide collaborative structures and processes to solve problems creatively and connect innovations with existing businesses." Also, Smith et al. (1999) reported that open collaboration between different organizations represents a main driver for technological innovation in the late 20th century.

Wycoff and Snead (1999, p. 55) claimed that innovation itself was "a collaborative skill that involves actively scouting the future, generating new ideas, choosing the best ones, rapidly and effectively implementing them, and then learning the lessons from successes and failures to begin again."

Therefore providing a place where these diverse ideas, information and talent can be mixed and mingled can be a brilliant action for a jumpstart to innovation. These places can be in different forms. From collaboration rooms, innovation centers, creativity labs to Wikis (Wycoff & Snead, 1999).

Figure 10 illustrates how a communication platform can lead to increased collaboration and therefore result in idea generation and innovation. The outcome of this loop is usually in the form of development of products or services which later will be implemented and for that purpose it will require more and more collaboration which ends up to an accelerative collaboration/innovation loop, producing new ideas all the time.

Figure 10: High-level collaboration/innovation cycle, (Williams, 2006, p.2)

4.4.1 Benefits of collaboration on innovation
Cooperation and collective working affect the process of innovation in different ways:

1. ***Reducing the costs***: innovation is not just about giving out brilliant ideas. It also can be defined as producing cheap ideas. According to a research conducted by MacCormack et al. (2007) for Harvard Business School, reducing R&D costs was the number one priority for firms using collective sources like partnership to innovate. Firms in their sample reported between 10-30% reductions in cost, as compared to their performance prior to partnering. However, it also should be noted that preparing the ground for proper and efficient cooperation might sometimes be costly itself (MacCormack et al., 2007).
2. ***Enhancing capabilities***: each individual have certain abilities and bringing diverse skills, expertise and technical know-how together give the company and also each individual instant access to a repertoire of skills and abilities that they might not possess themselves. This implies to the same characteristic of diversity in groups mentioned earlier in section 4.3.1.
3. ***Providing contextual knowledge***: this knowledge contains the local ties and relationships that each person possess based on his/her position in the local context and therefore can act as a link that connects the whole group to valuable sources and in so doing contributes to their knowledge creation.

The following table illustrates these benefits according to the above categories:

Lower Costs	Superior Capabilities	Contextual Knowledge
Low cost labor	Rapid access to capacity	Market access
Low cost materials	Technical know-how	Supplier relationships
Low cost suppliers	Process expertise	Institutional ties
Low cost infrastructure	Domain knowledge	Government connections

Table 3: The Benefits from Collaboration (MacCormack et al., 2007, p. 5)

5. Research Methodology

In this chapter we present the methods and other supporting tools used for collecting and analyzing empirical evidence. Also, we describe our research approach. Moreover, we discuss the research quality as well as related ethical concerns. In addition, the overall aim of this chapter is to provide a thorough explanation about the process of collecting and analyzing data.

5.1 Research Approach

There are two approaches to research: qualitative and quantitative (Creswell, 2007). In our study, we employ a *qualitative study* as our research approach. This is because we study people in their real-life settings. Therefore there is a need for qualitative methods to obtain qualitative data (Creswell, 2007). Qualitative data comes in the form of written text and words and can be obtained using a variety of qualitative methods such as interviews (Miles & Huberman, 1994).

A major strength of adopting a qualitative approach in our research is that it helps us in collecting data from people in their real life settings and therefore we will be able to get deeper understandings about their experiences and their local contexts (Creswell, 1999; Miles & Huberman, 1994). Also, qualitative data helps to reveal detailed descriptions of people's lives which give more trust and confidence for data as well as emphasize the meanings of people for their contexts and experiences (Miles & Huberman, 1994).

5.2 Data Collection

Since in this research we rely on the experiences of different subjects about the wiki technology, the phenomenological tradition of research (phenomenology) has been used. Phenomenology is a qualitative research tradition which according to Kvale (1996, p. 53) is defined as "the attempt at a direct description of experience […] it studies the subjects' perspectives on their world; attempts to describe in detail the content and structure of the subjects' consciousness, to grasp the qualitative diversity of their experiences and to explicate their essential meanings". Depending on this approach, we began the data collection process by gathering people's experiences through conducting semi-structured interviews which is the main source of empirical evidence in this research.

5.3 Semi-structured interviews

The most important source of evidence for our research is the qualitative interview as it helps us to understand our subjects in their real-life settings (Yin, 2003; Kvale, 1996). It involves a personal interaction and a direct conversation between us and our participants at their workplaces which is a major source for obtaining qualitative data that captures their daily life experiences and can be used to support our research (Kvale, 1996). There are different types of interviews: structured interviews with predefined questions and the interview is limited to them, unstructured interviews without any planned questions or themes and both the interviewer and the interviewee are involved in an open discussion, and semi-structured interviews that come with predefined questions but it is not limited to

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them and it is open for a discussion to follow up some important meanings (Kvale, 1996). We decided to adopt the semi-structured interview to collect our data because it helps us to easily interact with our participants and to provide a flexible way of asking and answering the questions. Therefore, we have conducted four semi-structured interviews with IS managers, specialists, and also people who have been contributing to the wiki. We tried to choose people who have had the experience of using and implementing wikis with a balanced view about their use, so that they could provide us with both positive and negative practical issues, for this purpose we have interviewed:

First: IS managers who had ran the wiki and were managing it, they could give us ideas about their motivation of using wikis, the issues they were facing and it's effects on their work.

Second: People who didn't run the wiki but they contribute to it. They could provide us with information about their motivation of using it and how it affects their job and how they feel about using it.

We asked them about the use of wikis, collaboration practices and collective working, and the impact of collaboration on innovation. Each interview took approximately 40 minutes and was performed at the interviewee's workplace (i.e. their office). At the beginning of each interview, we explained our purpose from the interview, its consequences, and ethical concerns that are necessary for maintaining the interviewees' rights. The informants provided us with a thorough explanation of their experiences of using wikis and different aspects of their wikis such as why they use a wiki, how they use it, what are the purposes of using it, what are the challenges of using a wiki for collaboration, and how it can improve collaboration and thus facilitate innovation. An interview guide (see appendix) has been developed that contains the purpose, themes, and the questions of the interview to guide us throughout the interview session (Kvale, 1996). However, during our semi-structured interviews, we were open to start a free discussion about related topics regardless the predefined themes or questions contained in the interview guide. This open discussion helped us to explore more about the interviewees' experience with the wiki as well as provided us with new knowledge without being limited to predefined themes and questions. All interviews have been recorded using a digital audio recorder. Then, each interview has been transcribed into a written text for the purpose of later analysis and verification.

5.4 Data Analysis

The analysis of each interview started during the conversation with the interviewee. Although all interviews are recorded for later analysis, we have been analyzing and interpreting immediate descriptions, feelings, gestures, and explanations during our conversation with the interviewees. According to Kvale (1996) this process help us to establish an immediate analysis of some meanings that can be difficult to capture while listening to the recorder or reading the text after the interview session. The transcribed text of each interview has been structured and condensed to make it easier for us to clarify necessary parts that are strongly related to the main purpose and eliminate any redundant or unnecessary data. In this research we rely on the phenomenological

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approach to research. At this respect, Giorgi (1975) (cited in Kvale, 1996, p. 194) described five steps for the empirical phenomenological analysis as follows:

> 1. The whole interview is read through and reconstructed in a narration manner to produce a coherent story (Kvale, 1996).
> 2. The natural 'meaning units' expressed by subjects are determined.
> 3. The theme that dominates a natural meaning unit is stated as simply as possible.
> 4. The meanings are discussed in terms of the specific purpose of the study.
> 5. The essential themes of the entire interviews are linked together into a descriptive statement

Therefore, at the first step, the whole text of each interview was read to gain a general understanding of the interview. This helped us to get an overall impression of the interviewee and his/her feeling about the wiki. Then we went through details of interview and tried to take out the implicit notes and comments along with the explicit ones. In so doing, we were able to understand the reasons of actions although the interviewee might not have mentioned them clearly. We specified the meaning units in this stage. Further, we have examined the main themes and issues behind that unit. These themes were specified according to our research topic and purpose and could be collaboration, innovation, data quality, openness, transparency, etc. And then we have examined these themes according to their relation to the research questions. At the final stage of analysis we have discussed the relation between main themes that provided us with a descriptive explanation and discussion that could be a reasonable answer to our research questions.

	1	2	3
Question 1	What motivates you to use wiki in your company?	---	---
Answer 1	…It is cheap, easy to use and fast…		
Central Theme	Convenience, Time, speed		
Meaning Unit	She is satisfied with the use of wiki but at the same time does not consider it as the only alternative for collaboration practices in the organization where she works		
Research Question	How can wikis affect collaboration?		

Table 4: Illustration of how to analyze the meanings of the participants

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5.5 Research Quality

The quality of our qualitative research is determined by its trustworthiness (Lincoln & Guba, 1985). Seale (1999) stated that "trustworthiness of a research report lies at the heart of issues conventionally discussed as validity and reliability". The concept of trustworthiness has four elements: credibility, transferability, dependability, and conformability that are analogous to the concepts of internal validity, external validity, reliability, and objectivity. In order to ensure a good quality for our research we need to establish the qualities that are described in the following list:

1. *Internal Validity*: This concept describes the truth and confidence of our research results and findings (Lincoln & Guba, 1985; Norris, 1997). In order to ensure achieving internal validity, our research findings and results must reflect the perspectives and expressions of our subjects and avoid an egocentric point of view that only reflect our own ideas. Therefore we interpreted the meanings of the collected data from the participants' point of view that best reflects their experiences and explains the reality of their situations. In addition this also ensures the objectivity of our research (Seale, 1999).

2. *External Validity:* this concept is referred to the level of generalization of our research results and findings (Seale, 1999). Our empirical research is directed toward collecting data from different organizations where we collect data about different experiences and contexts of using wikis to ensure a higher level of generalization. We relied on providing much logical reasoning of each different context through deep understanding and analyzing of the particulars in each context rather than focusing on its typicality which ensures an adequate level of generalization for our research results and findings.

3. *Reliability*: it means that the use of the same methods should produce the same results (Lincoln & Guba, 1985). However, this is difficult to achieve because the process of collecting data is dynamic and is subjected to change.

5.6 Research Ethics

Since we are dealing with human subjects, and human subjects are always vulnerable to be exposed to different risks while doing scientific research, we have attempted to maintain an ethical quality for our research along with scientific quality during conducting different phases from literature reviews to doing interviews, analyzing data, and reporting the results and conclusions.

These risks as Sieber (2001, p. 330) puts it refer to "the possibility of some harm, loss or damage" and might be in the form of:

1. **Inconvenience:** people might feel a sense of wasting time or frustration about interviews and would prefer to spend their time on other things than being interviewed.

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2. **Physiological risk:** some people might fear from being criticized or might feel pressure about mentioning something that their boss wouldn't like them to say or even some people may feel uncomfortable or embarrassed about being observed or interviewed. These fears will lead to stress and can affect the results.

3. **Social risk:** the sense of being disapproved by peers in case of saying something that they don't like or fear of loosing job or trust in workplace or revealing company's secrets.

4. **Economic risk:** can be in the form of loss of employment, loss of opportunities or revenues.

5. **Legal risks:** with low possibility of occurrence refers to overstate ability or characteristics.

6. **Physical risk:** This is unlikely to happen with regard to the topic of this research.

Lack of autonomy of subjects, lack of informed consent, confidentiality or invasion of people's privacy or their intellectual property prepares the context of occurrence of these risks (Sieber, 2001, p. 330) Hence, in this research it has been tried to study, avoid or at least control such potential risks, protect people from harms, minimize damages and enhance the overall benefits of the study. Although there always have been arguments about how to reach ethical quality, we mainly focused on some common rules that are commonly accepted. Through applying these considerations in our research, we are able to assure ourselves and others about authenticity and reliability of our work and gain their trust which in turn enhances our research integrity.

5.6.1 Informed consent

Since we have interviewed people, took their time, energy, and personal information, we are responsible to assure that they firstly have comprehended the nature of our research and second, they agreed voluntarily to contribute to the research. For this purpose, before starting to do any interview or data collection, we explained to all of our participants the topic of our research, the themes we were aiming to include, the purpose that motivated us to do the study and more importantly we thoroughly mentioned the potential risks and harm of their contribution and the expected benefits that they might get out of this research.

5.6.2 Confidentiality

"Confidentiality refers to data and to agreements between the researcher and the subject concerning how the data will be managed and who will have access to it." (Sieber, 2001, p. 330). As researchers we are responsible for people who have trusted us by keeping their confidentiality. In other words, in this research it has been tried to avoid revealing participants' private data, not to enter their personal territory where they do not like anyone to know about a certain point without their permission, and preserve their privacy which is considered as a respect to them.

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5.6.3 Avoiding harm and doing good, (beneficence)

As a scientific research, it is expected that we assure that our study about investigating the effects of wikis on collaboration in organizations would not cause any harm (defined as "defeating of an interest") by Israel & Hay (2006) to anyone. This harm can be social or physical or in any other kind (Israel & Hay, 2006; Singer & Vinson, 2002).

Also by doing a research, our goal is to add something beneficial to the previously known knowledge or at least complement it in a valuable way. Our purpose of doing this research was to analyze the effects of Wikis on collaboration and their impact on organizational innovation and so was supposed to have good effects (maximizing benefits) on them. We have tried to keep the balance between harms and benefits of our research or even in a way that benefits outweigh harms. Although direct benefits of our research might not be clear for the participants at the time of conducting, it might reveal its role on the performance and creativity of the company in later phases.

5.6.4 Voluntary

It means to give the participants the freedom of choosing whether to participate or not or to the extent that they are willing to contribute and to assure that their contribution is not over coercion or under influence (Singer & Vinson, 2002). Obviously we could not make people talk about something or take their time while they were not willing. Voluntary nature of participation make participant's contribution more valuable both for them, as they are eagerly cooperating, and for the study as a whole because the results would be more fruitful if people themselves have chosen to participate. Besides, it will be considered as a respect to them if we do not push them to do something (Israel & Hay, 2006; Singer & Vinson, 2002).

5.6.5 Avoiding research misconducts

In this research we seriously avoided research misconducts such as falsification, fabrication, plagiarism, authorship, duplicate publication and conflict of interest that can put the value of our study in danger.

5.7 Reduction of Bias

Bias can be defined as the researchers' tendency to consciously or unconsciously produce or interpret data in the sense that supports his or her self interests and therefore lead to erroneous conclusions (Hammersley & Gomm, 1997). Being biased is a natural human tendency and there are many cognitive and motivational determinants behind such biased behavior (Ehrlinger et al., 2005).

Research is a human activity which might be subjected to errors and bias like any other human activities (Norris, 1997). Most often researches are subjected to be biased in the sense that their data is produced and interpreted to meet their own desires. Much worse they can't detect bias in themselves because when they introspect their data they are unlikely to confess any bias. They always avoid thinking that they are biased because of the fact that they don't think in a way that reveals the truth about their data that might be different from their own meanings and understandings (Ehrlinger et al., 2005). However when they assess and judge other people they usually charge them to be biased because

they think that they are better than them and their own beliefs are more appropriate. Moreover, people might charge others to be biased because their beliefs and ideas don't satisfy their own self interests. Briefly, it's a natural human desire to see bias in others but not in the self (Ehrlinger et al., 2005).

It is essential for us to recognize this natural desire which may lead us to erroneous conclusions that affects our research quality. Therefore we must be aware and committed to avoid or reduce bias as much as possible through being constructively self-critical of our ideas and meanings and to be willing to accept the things in the world as they are. Moreover, there is a need to question ourselves about our desires and preferences in relation to the main topic of our research in order to keep in mind that we are subjected to be biased. In addition it is also useful to ask our peers and participants to review and validate our research in order to evaluate our ideas which can help us figure out some biases and therefore avoid them.

6. Empirical Findings

In this chapter we provide a description and an analysis of each interview. The analysis of each interview involves determining the natural meanings of the interviewees as well as providing a little interpretation of these meanings. Hence the purpose of this chapter is to present and interpret the empirical findings from our interviews.

6.1 Interviews

In this section we provide a little description of each interview, an analysis, and a discussion of the main issues which have been addressed with the interviewees. The following sections describe four interviews that we have conducted with Lund University, and two other companies: Aescapia and Capgemini.

6.1.1 Interview One: Lund University/ Web publisher

6.1.1.1 Description

We met Ms. Katarina Csanta, a web editor at Lund University. Katarina works at the dean's office as a web editor responsible for editing, managing, and publishing content at the school's website. She is using [Wiki name] for editing and publishing web content and has been collaborating with other departments to manage their web pages. After we introduced ourselves to her and explained our purpose from doing this interview we started to talk about her experience in using the wiki. In the following section we provide an analysis to what she has been telling us about the use of the wiki.

6.1.1.2 Interview Analysis

The interview with Katarina has provided us with some insights about the characteristics of the wiki, potential uses of the wiki, and limitations of using a wiki. We first asked her about why they use a Wiki and for what purposes and she mentioned that there was a need to make major changes to the look and feel of Lund University website. They had limited time and in some departments there was no IT person who can take the responsibility of handling these changes. So they adopted the wiki because

"...the wiki was an easy tool that could help us to make these changes fast and easy..."

So basically they were looking for a system that could do the tasks easily and fast and also can be used in each department independently enabling them to make their own changes without needing a single person in charge. And the wiki helped them achieve their goals.

She mentioned a successful experience of using the wiki in one of the departments as the main reason that brought the idea of adopting the wiki to their minds.

In addition, she added that the wiki is currently used in many departments.

After that, we asked her if it is possible to use the wiki for further purposes, she replied:

"*A wiki could probably be used as a collaborative tool for example in an eLearning environment or as a complement to campus education, or in a research group for that matter...*"

In continue we started to talk about the wiki in comparison to other tools used for collaboration and she stated that:

"*...we didn't choose it (the wiki) because it was a wiki.*"

She continued:

"*...we use it because it's easy to use...it is easy to contribute, edit, insert links, and manage content. Also it is easy to learn how to use it, people didn't need any introduction to learn how to work with it...it was cost effective...the wiki is open source and free and was easy manageable without external consultation.*"

She provided us with some reasons that motivated them to use the wiki including the ease of use and learn, cost effective, and time saver. Therefore it helped them to perform their work easily, reduce time, and avoid the costs needed for training the employees or consulting other companies.

Further, she talked about how much easier it is to work with the wiki unlike other tools used for web publishing in different departments and she mentioned that it is easy to connect the wiki to the LDAP and to other databases such as SQL and this characteristic enables users to access the wiki using their original accounts. They don't need to create new accounts to use the wiki which would make them more likely to use the wiki and facilitate their work. Also, the wiki was easy to connect to other applications:

"*...it was easy to connect the wiki to our own applications, such as our news and event handling...*"

So the wiki wasn't only used for web publishing but also it was used to manage events and news that can be a good source for different departments where they can access and find new information.

In respond to our question about her experience in collaboration she explained that

"*It is decentralized where every department is responsible of making the changes for their web pages.*"

She referred to the use of wikis which allow for decentralization of work. Each department has the ability to access and edit their own web pages and the role of the central management was described by Katarina as follows:

"...we provide the server and the system...the wiki provided one platform and each department is responsible for their own data where they can make changes and edit their information."

The wiki helped different departments to manage their own content and make the changes and updates they need and the role of the central department was to provide the wiki and the server. Most importantly, the wiki provided one platform where different departments can do their changes and therefore benefit from collaborative publishing and editing of information by many departments.

When we asked her about her evaluation to the experience of using wikis for collaboration, she answered that it's not the wiki per se that helps to improve collaboration but any content management systems can do it. However, it helped decentralized departments to share a common platform. She knows the wiki as one of the knowledge management systems that can support organizations in collaboration.

Then we asked her if the wiki has helped in collaboration between different departments, she answered that she thinks collaboration had its roots in the fact that they had to change the look and feel of their website and of course it helped them in a difficult period when they had to make some changes fast.

When Katarina was asked if she suggests the use of wikis by other organizations and she confirmed that she believes it is a good platform however she continued that

"…but we wouldn't want everyone to be able to edit and change the content of our website such as the Wikipedia…"

This final answer reveals a major concern of using wikis for collaboration. She expressed her reluctance to allow everyone to edit and make changes such as what people do in Wikipedia. This is related to control and data accuracy. Allowing people to edit and change content will reduce the control of central management by decentralizing data creation and editing. Therefore some people fear to lose control over content and therefore lose their power at the workplace or they are reluctant to allow everyone edit and change content in order to avoid chaotic and messy workplace. Moreover, there are several concerns about data quality and accuracy in the wiki environment where everyone can edit and change content. The fears about data accuracy arise from the possibility that people might intentionally produce erroneous data or in some cases when they discuss controversial issues they start to edit and change each others contributions which results counterproductive collaboration and therefore affects data accuracy and quality.

Katarina suggested that a wiki can be used as follows:

"It can be used as separate website where users can contribute and provide feedback to each other. Even the university can have something like a blog or wiki for people to share their ideas."

6.1.2 Interview Two: Aescapia AB.

6.1.2.1 Description

In this in-depth interview, we met Mr. Jonas Ledendal, a cofounder and manager of Aescapia AB, which is a specialized company in game development. It is a small Swedish company located in the university town of Lund and has been founded in 2001. The company's business model is based on open source software development and it has been producing software applications for both entertainment and educational purposes. The company is using a DokiWiki as well as other wikis. Jonas is responsible about administrating the wikis and developing computer games. He is a game enthusiastic working in Aescapia with a group of dispersed game developers all over the world. He is also a content provider for small companies. He works with wikis in several organizations and therefore he provided us with multiple experiences from different contexts. In his early days, he had a limited role and didn't contribute much to the open source community. However he was only using their information for two years to achieve personal purposes. But after a while, especially after he understood the technology better, he started to contribute and to become more active in these communities by giving more feedback and contributions. We introduced ourselves and explain the purpose of our interview and then we talked to Jonas about his experience of using the wiki at his company and how he sees the technology as an enabler for collaborative innovation and collective working.

6.1.2.2 Interview Analysis

The interview has provided us with a practical picture about collaborative innovation that can be facilitated through collaboration using the wiki technology. Also, it has provided us with some concepts related to collaboration such as openness, transparency, sharing, trust, etc. We started the interview by asking him about the tools that he uses for collaboration at his company, and he pointed out that he mostly uses DokiWiki especially for internal documentation where every game designer has the ability to create, access, and edit wiki content.

Jonas sees a lot of potential in using the wiki technology:

"...it actually has enough power to run much larger project, so it could be useful for large projects as well...because it has most of the features that a wiki system needs...it doesn't need to be further optimized or things like that...it is powerful enough to search huge amount of data ..."

He continued talking about the use of wikis in small and large organizations and he also talked about the differences in using the wiki in these different contexts as follows:

"...it's not only targeted for small companies for the internal documentation needs...and of course security is good enough, probably not good enough for large multinational companies, they want to keep their information secure...internally it's ok..."
According to Jonas wikis can be used for both small and large organizations. However it cannot be used in all contexts because it has it's pitfalls about security in some contexts

especially in large organizations where they have huge amount of information. Although large organizations can use wikis for internal purposes, but they would not use them for external purposes where information is open for everyone to edit and change.

Jonas provided us with some of the reasons that made him use the wiki at his company as follows:

"...we mainly using it because it is easy to use and above all it is very easy to modify...you can learn the structure very easily, just few hours you can learn how to modify the program..."

So the main reason of using a wiki was because it is a very easy tool that helps them edit and change content in a convenient way. It is also flexible to use and users can easily understand how to build structures and to modify them. However people cannot use the wiki unless they spend some time trying to understand how it really works and most importantly to understand how to work with it properly. In this regard, Jonas mentioned that if someone spends enough time somehow small he/she can learn how to write plug-ins but if they don't have that sort of time to learn how to write plug-ins in the proper way they can just hack it and have it do whatever they want. He believes that it's just the threshold of learning how to modify it properly without breaking anything.

In respect to the actual purposes or the actual uses of a wiki at his company he stated that he is using the Wiki for its intended purposes which is the internal document needs of their project which is game development.

"...we're developing open source games...and we have group of people that are dispersed around the world so we don't have the opportunity to meet all the team in real life, so we communicate either using e-mail ...it just becomes unstructured when you want to share documents...that you're working collaboratively on documents, e-mail just doesn't work...we create our game design documents, so the game design team is posting changes on the game documents...everyone is providing his input into the database and its in one place..."

The wiki has provided the company with a collaboration platform where every game designer has the ability to access, create, edit and organize information. Everyone is working collaboratively with other people regardless of time and place. Although game designers are distributed around the world, the wiki is the place where they can all meet together, communicate, share, and collaboratively develop and contribute ideas for game development. The wiki helped the group to collaboratively create documents that contains information about how to develop a particular game. The design team members edit and change this information collaboratively and everyone contribute specialized knowledge that supports or compliments other components of the game. The total sum of this collective working among the design team is a collaborative strategic plan for developing the game. As Jonas described, using the e-mail for collaboration and exchanging ideas among the design time is not effective because it results unstructured

and scattered information. Also it is limited to simple communications that cannot be useful for the group to share information.

Jonas also expressed the importance of one of the major features of the wiki that is the versioning system which is used to compare edited data by the group:

"…it has a versioning system so you can compare things, like you can say: so the game designer has changed something, he has a lot of features, so what does he change. We can immediately see what he has changed…"

In a discussion about the need for people to understand the concept of the wiki and how it works as there are many fears and misconceptions about the quality of data Jonas mentioned about this major problem by explaining more about what he has been trying to do with his colleagues when introducing them to the wiki in order to deal with their fears about the idea of changing and editing data:

"…they don't understand the basic idea that nothing is never deleted; they don't understand that there is a versioning system…the IT knowledge do not yet have the maturity to that level so that they can understand how to use it in day-to-day work which is of course important…"

He explained the main reason behind the reluctance of people to use the wiki technology that is the lack of IT knowledge about this technology. So he suggested that there is a need to show people how this technology works:

"…I showed them how easy it was, how easy the wiki syntax is and immediately understood the power of that and they didn't have to use HTML and things like that which never works because people always forget some closing tag…"

Also he believes that the most powerful thing is for ordinary people that how easy they can create pages, he thinks the process is so logical and they can just create it by pressing a button and he sees it as the power of wiki.

"…it's just about simplicity. And I also sort of showed people the feature of the versioning system and I thought that was very neat feature…"

Jonas described some features of the wiki to motivate people to use the wiki by giving them examples and describing some of its features. In so doing, people can understand how to work with the wiki and can use it in the proper way. This is important when introducing the wiki technology at the organization especially when it is intended to be used by groups of people. However, the lack of knowledge or the improper knowledge about the wiki concept would create negative understandings that may result rejection of using the Wiki or inappropriate use of the technology.

Further, Jonas provided us with an example about the use of Wikipedia which shows that there are several misconceptions about the wiki concept and how it affects collaboration as follows:

"We have a large discussion going on of course if you can use Wikipedia...the main reason for not using it is that people think that it's too hard to verify information, it's hard, but it's not impossible and I think that the most common thing people have sort of misunderstood is that they haven't found the discussion part in Wikipedia... you can just go to the discussion page and you have the whole history what people find controversial and things like that and if you take into the context and read both the page and the discussion, you will of course take a better picture, I mean perhaps even its sort of higher quality than if you just get finished edited text because you get all the history and also you can also combine that with the revision history of the page... you have a lot of tools to actually verify..."

Jonas provided us with this example about Wikipedia which raises some of the fears about data quality and accuracy in the open wiki environment. The text is collaboratively produced by the community of Wikipedia and there might be some cases where the topics are controversial which may lead to erroneous data as it is edited and changed by opposing contributors. However, Jonas mentioned that there are some tools to check up data such as the discussion which includes a history for the changes of any topic that helps readers to evaluate content. He sees this as a good way to verify data which may result higher quality data. After all, Jonas told us that there is a problem with this open environment about sources of knowledge which is central to the reliability and quality of data:

"...still they need to cite sources; usually they don't do that because it's too much work... unless you cite sources properly you can't use it for scientific purposes ..."

Talking about the differences between Wikipedia and the use of the wiki technology in organizations, Jonas pointed out to a major difference between them. The community of Wikipedia is very large unlike the community of an organization. According to his experience, he believes that the size of the community should be manageable to control the collaboration process. Also, the community should share common goals to collaborate effectively. However,

"...people also have to learn other things I think, like for instance they have to understand the concept of collaborative innovation and why that is going to give better results than other models of innovation...it's very new..."

Jonas believes that collaborative innovation, that is people collaborating together to exchange ideas and experiences, is better than other models of innovation.

"...in time I think people will acquire more knowledge of these concepts and understanding things like the economics of collaborative innovation and why collaborative innovation is the only way to organize innovation today because that's the

major of everything from markets and organizations, collaborative innovation is the only way for them today..."

When Jonas was asked to talk about his company and how different groups are practicing collaborative innovation, he stated that the foundation of their work is based on openness.

"...no body owns certain aspects of the project, it is owned by the community and that's a form of openness and at least in experience it is very uncommon in more traditional especially in traditional hierarchal organizations, you own problems, this is my problem, stay away from it..."

As he described, different groups are working collaboratively in an open environment for their game development project. And he pointed out to the difference between this open environment and the traditional hierarchal organization. When they work in an open environment using the wiki, they all share the solution for a problem and when it is fixed, it is the sum of all efforts by the group. Therefore the project cannot be own by anyone as it is the outcome of a collaborative work. But in a traditional organization, an employee is given a problem and then it is his or her problem, he or she must fix it. An open environment that allows everyone to collaborate with the other is much better than the traditional way of working to increase the quality of work through collaborative innovation. As he stated, he was making efforts to foster this openness and trust at the workplace and also trying to foster the ideas that the community owns every problem and they solve it together because he believes that otherwise it won't work because it creates too much costs and too much communication.

With these efforts, employees can be more likely to collaborate together because of the fact that they work within an environment that depends on the philosophy of collective working, openness, and the feeling that everyone is part of the community and he or she should contribute to solve the problem. Otherwise the process of collaboration will be counterproductive because it results useless communications and more costs.

In his interview Jonas gave us a practical picture of their open and collaborative environment as follows:

"…I trusted people with this openness, very transparent way of working; everyone knows what everyone else is doing and you don't have to ask them because everything is getting recorded …all information is there, its open and anyone can comment on things, anyone can add stuff and anyone can change it. But people of course don't overwrite each others work, so that's just the way it works, it's just a fear that someone will go and do that, but they usually don't...openness is important, if everyone is very transparent, if everyone has the information or has easy access to information...then it's just works, its surprising..."

What he mentioned can be defined as characteristics of openness and transparency of the wiki. He expressed that in such environment there is a high possibility of trust since everyone knows what the other is doing. The wiki contains the content and anything that

is added, edited, or changed is already accessible by others and they know everything about it. The feeling that anyone can know what the others are doing is motivating people to just collaborate in a trustful and open environment without conflicting with each other.

Describing this open environment in a different way, he noted to responsibility and how an open environment would develop the sense of being responsible.

"…Some sort of chaos, but when everybody takes responsibility, I think that is also a key thing, you shouldn't take away responsibility from someone by saying you need my permission...when you take away responsibility, people start acting like children, and they don't take any responsibility but if you give them responsibility and say: Hey, this is your responsibility. This works, it is our responsibility that it works. People take that responsibility... mostly people work very well in such a context; it is the exception that people do not work that they have absolutely no ability to collaborate whatsoever in such a context...it happens and of course they just don't work in that kind of projects...."

Everyone is part of a larger community, and they all collaborate together because they feel responsible of the growth and development of this community. Most importantly, when people are given responsibility in such environment they will be motivated to work as their work will complement the others work and of course they can see better outcomes from their work that is added to the sum of the collective work by others.

He compares the wiki with other tools used for collaboration such as e-mail in a way that wiki is more suited for a kind of collaboration comparing to e-mails for example.

"... a wiki is a database with brilliant interface and brilliant simplicity, but the way databases are traditionally designed is based on the principle that things are locked down...".

Also, this locked information is difficult to manage and therefore cannot be easily used by groups of people.

"…...about extensive modifications databases cannot easily be used for a more open collaboration or collaborative innovation, they are not designed for this, but I think wikis are designed for that purpose and that's why they work so well. That's a simple answer."

Hence the wiki with its flexible and simple design is more convenient for collaboration and everyone can use it to collaboratively create knowledge that facilitates innovation.

We have been interested to know about problems with using wikis and working in an open environment where anyone can edit and change content. So we asked Jonas if he faces problems in his company and he noted

"...not in an internal context...But if we moved to Wikipedia or other similar projects where they use it in an external context with even more openness, open to the world not just openness within the community or the design team... there is a problem here…"

His answer clarifies the difference between two open environments. Working with wikis internally in the organization where changes and editing made by an internal community are known and there are no premonitions about the sources of information. He explained that this kind of openness is not associated with the problems of the other kind of openness such as in Wikipedia where information is open for a larger community that creates, edits, and changes information anonymously.

"...but I think anonymous editing...it's a big problem...but in a more internal context, I can trust that because I know who edit it, ...it's open within the community, if you're logged in you can edit anything, you can see anything, and you can read anything, but it's not open to the world. Anonymous editing...I don't think that works...there is not enough trust, so that information becomes worthless.

According to Jonas the anonymous way of editing and changing content makes the quality of information questioned because the sources of information are not known and therefore it affects its quality and accuracy.

"...We need to be able to verify who edited what... you can not have an anonymous editing unless its sort of just minor things like correcting spellings..."

However this process is not anonymous within an internal organizational context which makes the open use of information in the wiki environment more accurate and trustful.

Jonas described this difference in his company where they use a wiki for internal collaboration as follows:

"...it's far better within my company..."

But Jonas told us that they face some problems with some of their design team because of different technological backgrounds:

"We have lot of different persons, everything from professional programmers who understand this technology very well but might not like it for philosophical reasons...they might not like the way or the idea of openness perhaps, some do some don't..."

He also mentioned some problems in the design of wikis that might negatively affect the use of wikis in organizations:

"It's easy, but it's not easy enough. It has to be even simpler... it's basically HTML. It's a web graphical user interface and it is limited of course in functionality, you can't make useful use and user friendly interfaces with that technology, it's not a mature technology...So I think that's the big problem, it's going in that direction using java and things like that and then you have all the problems with java not being standardized [laugh] all the bugs and it works differently on every kind of browser..."

_____

Although wikis have several advantages but they also have some disadvantages regarding their design that is based on HTML and other web programming languages which already contain problems. According to Jonas the problems with these technologies can hinder more use of wikis in the future.

When Jonas was asked if he suggests the use of wikis to other organizations and why, he talked about the importance of adapting the use of wikis and collaborative working to meet the organizational strategy:

"Yea, I would recommend it for a lot of projects, but especially if your idea is collaborative innovation or something similar to that kinds of collaboration. You can't have the technology without also sort of implementing the organization around the technology; you have to have both, they go hand in hand. So if you're going to have a sort of a very traditional hierarchal organization, you don't need a wiki obviously..."

A major first step in using the wiki is that it will be used for collaboration. If the wiki is not used for such intended purposes it won't work properly or at least it won't give the expected outcomes of collaborative innovation. Also it is very important to make a successful use of wikis and to benefit from collaboration innovation, to adapt the technology to meet the organizational strategies in the sense that the collaboration process doesn't not conflict with current business processes as well as complement and support these processes.

And then he continued talking about when is it appropriate to use wikis:

"If you believe in openness, if you believe in that kind of collaboration then that's the tool you should use, if you don't believe in it for some reasons that might be right that something is better achieved in a more traditional hierarchal organization you should use other tools..."

He emphasized the importance of openness when using the wiki for collaboration. The wiki works well if the information is open for everyone to edit and change. But it's not useful to use the wiki in a traditional organization where the information is locked and difficult to access by everyone. Therefore information should be open for everyone to make a useful use of the wiki.

In our final discussion with Jonas, with more focus on innovation and how it is affected by collaboration using wikis, we wanted to know how collective working adds more value to work than individual working. At the beginning he thought that was a hard question to answer because it is not easy to get a grip on what the added value is. But then he pointed out that *"...It obviously does..."* and he described the process of innovation within the wiki environment as:

"...You're not getting more faster revolutionary ideas ... I don't think anyone knows how to sort of, facilitate that kind of innovation because...these ideas are just scarce in

nature...that's the nature of it...But I think that most innovation is actually cumulative, so it works very well for cumulative innovation..."

He pointed out to an important concept which is cumulative innovation. The wiki content is cumulative because there are many people collaborating together and continuously contributing to knowledge and ideas generation. In that sense, the knowledge is always under a continuous process of refinement and improvement by the community and therefore innovative and smart ideas are more likely to be developed. However it cannot be useful for revolutionary ideas that are not the outcomes of collaborative activities because these ideas are just the result of the moment and don't come in a cumulative and collaborative sense.

Furthermore, Jonas told us about this process of cumulative innovation and how it can be facilitated by using the wiki:

"...what it does is that I think lowers the cost of getting sort of...the knowledge, all of this expert knowledge together...something as simple as just lowering the cost to near zero, , it's very powerful..."

The wiki environment lowers the cost for collaboration to be zero among groups of people and therefore facilitates the accumulation of their knowledge. The ability to easily collaborate with other people and easily contribute to the process of knowledge creation and management allow everyone to participate in the innovation process by contributing different experiences and ideas. The continuous accumulation of these ideas will result cumulative innovation that everyone in the community is part of it.

However he talked about the lack of knowledge about this new process of producing innovation and he discussed people's attitude toward this zero-cost collaboration:

"...that's something we're not understanding in economics. Of course again, the reflex here is to say: well, if it is zero-cost, if it's free, then it has to be low quality [laugh] because that's what standard economics theory...or at least how we have the misconceptions of it."

He reflected on the traditional thinking which may hinder the use of wiki. The wiki concept involves no costs for collaboration and knowledge creation and this contradicts with the traditional norms. More clearly, when it's free then it's of low quality and the wiki from this perspective is useless.

In that sense, he continued:

"...there is an enormous power in the near-zero cost...we're not understanding that yet, but I think the key is very simple... Somebody who already has that knowledge now has a very easy way of providing everyone else with it. So instead of someone acquiring that knowledge in a very expensive way, everyone can be someone around the world that

already knows the answer to that, and that way you get a very rapid innovation that should work well in cumulative innovation...”

Jonas was asked about innovation at his company and he mentioned that in his company they believe in:

“...being innovative in a cumulative sense ... wiki I think just makes the process more rapid, and that is of course connected to with the lowering of cost...in the same amount of time you can have more iterations and that's of course important...that's the nature of cumulative innovation like you need a lot iterations and you get more innovations in the same amount of time so that's why it works... certainly in software, that kind of innovation works very well in an open wiki context and the important thing in this is that you can get as many iterations as possible in a small amount of time...”

So the two factors mentioned by him, acceleration of the innovation process as well as reducing the cost of innovation, are major impacts of using the wiki for collaboration. The accumulation of knowledge on the wiki is iterative in the sense that knowledge is continuously processed by a constant-increasing number of collaborators which results in rapid innovation. Moreover, it easy to create, edit, and change content on the wiki which lowers the cost for knowledge accumulation.

For more clarification about accumulation of knowledge and cumulative innovation he believes that exchange of ideas is a key to innovation which is absolutely done in collaborative systems. They reduce the cost for exchanging ideas makes it easier to access a person who actually knows the answer to their questions. So they have lowered the cost and they get the answers faster and exchange ideas faster and this has to do with openness. It is a dynamic process performed by active participation in knowledge creation from everyone within the community that accelerates the process of coming up with innovative ideas.

Therefore Jonas has by now pointed out that in his idea the wiki contributes to innovation by being easy, open, fast, and low-cost tool for exchange of ideas.

He compared this open process of sharing ideas with the process in a closed environment:

“...If you exchange ideas in a more closed environment you don't get the same effect ...the exchange of ideas is important that's what I call transparency...”

In a more closed environment where knowledge is not open for everyone, the exchange of knowledge and ideas is rather low compared with an open environment such as a wiki. Probably, this is because knowledge is locked down and highly structured and it is difficult for people access this knowledge because they need permission to do that and also its structured nature make it difficult to be adapted into the needs of people.

Jonas provided an example of the ability to create knowledge in a learning process:

"...the science works a lot on the dialogue...a traditional way of looking at learning or teaching that you say someone has the knowledge and it has to be transformed into someone and has to receive the knowledge...but a more modern way in looking at it, is that all learning includes the creation of knowledge, you're creating knowledge as you learn although it might not be the absolute novel way which is required for example for patenting technical solutions...but the way of looking at it is that learning is the creation of knowledge...so in that sense wiki just facilitates that."

Jonas described that the developments of the technology and the facilitation of creating and exchanging knowledge have affected the learning process. A wiki can be an example of such technology because while you use knowledge, you are also creating knowledge and sharing it with others rather than just send and receive knowledge among the group. Then the creation of knowledge has now become a part of learning through an easy way of dialogue and conversation between individuals.

To sum up his ideas about wikis, collaboration, and cumulative innovation he repeats that in his idea it is clearly that openness is important and he also believes in the importance of cumulative part

"......innovation builds on other knowledge so you obviously need some input for innovation, so I think innovation of course is you are contributing something...you need inputs and the inputs of innovation is knowledge,...so I think that opening this up will increase transparency, lowers the cost of exchanging ideas and access of knowledge, the creation of knowledge, etc, if you integrate all of that in sort of just one tool, one way of organizing innovation you clearly get more innovation, you get more rapid innovation..."

He described the Wiki as a tool that allows for easy creation and access for knowledge. Groups of people are collaborating together, sharing knowledge and experiences within an environment that facilitates collective creation of knowledge with a cheap price. It enables everyone to be transparent through giving knowledge to others and collaboratively adapt this knowledge to meet the goals of the community. As a result, they can build a constantly-changing knowledge base that is associated with cumulative innovation which in turn facilitates achieving more innovation.

6.1.3 Interview Three: Lund University/Course administrator

6.1.3.1 Description

Sophie Albrechtson is a course administrator at the department of business law in Lund University; she is not involved with the management and running of the wikis. Instead she contributes to it daily as her job requires her to change and update the information on course web pages every day. This information includes information about course schedules, manuals, curriculum and literature list and generally all information that students need to know about.

6.1.3.2 Interview Analysis

After the common initial stages of asking her permission to record, and explaining the purpose and subject and talking about her rights, we asked her about other tools that they use for collaboration:

"...we mostly use e-mails, telephone conversations and maybe sometimes we have a web formula that we use ..."

What types of wiki do you use?

"...I don't really know, I just use it..."

As a contributor and user of the wiki and not a creator, it was quite normal that she didn't know about the technical details of the system. She can achieve her purpose by using the wiki and she doesn't really "need" to know about its details.

As a respond to our question asking bout the reason of choosing the wiki she motioned that it was chosen by their web developer which shows that Sophie did not have a pre-judgment about wiki systems before engaging to use it and every information she provided for us was purely her experience of using the system without any bias towards accepting it. The web editor had experienced the system before and realized it as a suitable platform to be used in this department because as Sophie puts it in so many different ways during the interview:

"...it is easy to manage ..."

She emphasized her satisfaction of the use of the wiki comparing to the other systems that were used before and are even currently used in other departments as:

"...I really like it; it is much, much much better than the other systems that they use at the other departments of Lund University called OOES which is so much more complicated to use. This is very easy to log in and work..."

She mentioned that the Wiki is convenient because it does not need extra program to use it; the user just needs to log in and use the page she is in. She added that it is very easy to understand and to learn. The user can do the formatting on the wiki itself or she can use HTML if she likes.

When we asked her how they use it for collaboration, she first responded that she didn't think that they use it for such a purpose at all because that is done through e-mails and maybe face to face interactions, they have all separate log ins and the wiki is mainly for information updating purposes. However as the discussion continued she pointed out:

"...we administratives help each other out through the wiki ... sometimes we have something in common and we discuss how to present it on the webpage, but every one is responsible for her information..."

This quote in the other word represents the idea of "decentralization" in group working through wikis and illustrates how in spite of having the same goals and purposes, the group of administratives cooperate with each other and at the same time they work in a decentralized manner, each being responsible for their actions. The outcome of this decentralized cooperation is a respond to the whole group's purpose.

As we continued she pointed out to interesting notes about: how does the wiki help them to overcome the problems with collaboration?

"...if you log in to the wiki page the information on page is always the same for you and all your other colleagues, I think that is very good because there is nothing specific for "you", what you see is what you get so you can all agree before publishing the information ..."

This is a good point since it demonstrates the characteristic of transparency of the wikis and that everybody has the same representation and access to the information so that they can agree on what they see.

We asked her about the problems regarding the use of wikis but she mentioned that:

"...No, at this time I can't think of any..."

So we asked her if she suggests it to be used by others and she responded:

"...Of course, I would very much like them to use it, especially in the other departments, they have often systems that is so much more difficult. it takes time to log in to it, sometimes that people have problems with a page and they have to log out and in the system often gets locked for some time because they didn't log out properly, that doesn't ever happen with wiki. You can do editing and it shows immediately, it saves the changes also immediately and it is so much easier (she emphasized) very much to attach documents, pdf's...I really like it"

According to what Sophie experienced through using the system, wikis respond more real-time that the other systems previously used in the department, they are more flexible with the attachments and provide good editing functionality for users. This along with the user friendliness and being easy to learn adds more value to the characteristics of the wikis mentioned by one of its practical daily users.

What differences do you think the use of wiki brought to your work?

"...It's much much more different. For example if you have new information and want to reach it to students fast, wiki can really does it fast. It doesn't need any special program; you just need your web-reader. Besides, I can do it on my computer on the other department or even at home..."

What Sophie mentioned shows the compatibility and flexibility of wikis and that it can be used almost everywhere regardless of the location of the user. Also what Sophie said corresponds to Katarina's interview and her idea about how wikis can make the changes fast and immediate.

Regarding the potential of using wikis for collaboration practices Sophie commented that there is indeed the potential of using it for instance if they have problems with e-mails it could be used as an alternative communication system. Maybe it could be used as an intranet.

In fact, if we examine what Sophie was describing about the nature of their work among her and other administrative, there was a type of collaboration happening, although she didn't notice it at the beginning. But when we described it according to the definition of collaborative activities, she agreed that what they are doing is indeed of that nature. She was convinced that: When they want to edit the information to their website and for example there are erroneous information which need to be corrected, her colleagues have the accessibility to the wiki and the information and could do the editing themselves and this is a form of cooperation.

Sophie also added that:

"…That is a very good point. Now that I look at it with this view, it is true; we are collaborating with each other over the wikis. Since we all have different skills, if I see for example that there is a misspelling on the page, I can go and correct it myself, without telling the author that you have made a mistake, go and fix it, which sometimes make some people pretty pissed off when you comment on their mistakes, the more correct the information is, the better the PR…"

This obviously is *cooperation* for providing the accurate and uniform information on a webpage between different web administratives. Even the further we move on; she clarified other types of collaborative practices that they have been doing through the wiki.

You collaborate with each other by seeing this information, you see any mistakes and you correct it. Do you think this kind of collaboration help you to offer a good quality of job?

"…Yes, I think so. That's also good and important thing that I can go and see how other people have done it and how I am going to do it. Is it good the way I did it? So I can go and check on others. Oh, so that's how she did it. Good idea, let's try it…"

She also continued when she was asked to give more practical examples:

"…especially with courses administration we have a lot of information about courses, how you present the schedule and etc .so I sometimes think…ok…how can I present this information in the clearest form that one can get it? So I think that is good that we have pretty much the same ways of presenting. That is also why I check out other's pages to make sure that they are similar to each other …"

As she mentioned, using the system give them the ability to suggest ideas to each other and at the mean time the wiki can help them make information compatible with each other and keep them uniform. Because all of the editors see the same thing on the screen, this is the way that it helps a group of diverse people to overcome their *coordination* issues as discussed in the section 4.2.1 and to create convergent solutions that support the whole group's purpose which in this case is the Lund university website.

When we asked her if she thinks the use of wiki in such a cooperative form help them improve innovative ideas she responded:

"…yeah, that's a good way to put it, since I use wiki a lot I usually tip off my colleagues, saying maybe you could do that and so we tip each other a lot by the wiki. …"

The point that she just mentioned is considered as another practical feature that the wiki offers to its users. In the department that Sophie works, users of the wiki who are specialized members of a team use the wiki to suggest ideas to each other and in so doing increase the quality of their work. This way the wiki provides the platform for increased competence along with the cooperation that lead to producing creative ideas. We already discussed in chapter 4 that innovative ideas rise up in the shadow of discussions and group interactions, the more people discuss and the more they give each other comments, the more they are likely to come up with creative ideas (Paulus & Nijstad, 2003).

How do you react or appreciate using wikis? Do you suggest it to others?

"…I would definitely say it could be used much more at the department. It mostly is used by administrative at the moment and I would say teachers could be more involved with it. They can just log in and the rest is easy. It can show the changes immediately and it's so instant …maybe in the form of intranet it can be used…also it would be good if we could have a personal page both for students and teachers and staffs. Students can see what courses they are registered, and the link to the course page and they can apply for the exams there. I think it makes every thing much easier for everyone. Also teachers, they can see if there are other teachers that are doing the same things. They can discuss to do something in common and put it there for students .They main page is for everyone but there could be a specific course that they have the password to it…"

Sophie's ideas about the further use of the wiki in the department suggests that there are still a lot of fields that could benefit from using such a system without having to spend much money for it and without having complicated training courses for the people who are going to use it. Also if we get back to what Sophie mentioned, it can be realized that all three factors previously discussed in section 4.3 about the conditions that help a group act smarter are included in what she and other administrative are doing in this department. According to Sophie they are a group of specialized people, each having separate responsibilities and skills which represents the diversity in their group, they are independent as each of them is responsible for her part of information and they are decentralized as there is no single person to have the responsibility of others.

6.1.4 Interview Four: Capgemini

6.1.4.1 Description

We met Mr. Daniel Terborn from Capgemini - Sweden. Capgemini is a global company that provides IT consulting, technology, outsourcing and local professional services. It has more than 34 branches all over the world. Moreover, Capgemini provides consulting services for collaborative business. The company has central global Wiki used for internal information sharing by more than 80,000 people. Daniel works for Capgemini as a part time team manager for 20 people, developers and integrators and also a part time consultant where he works as a systems architect and technical manager. He also works with Wikis and other Web 2.0 technologies.

6.1.4.2 Interview Analysis

The idea of using the wiki as a global collaboration platform between different branches shows that Capgemini feels a need to connect to its other partners around the globe, to have a common platform to put their knowledge and talent which according to Daniel make them unique and the wiki has been serving them almost effectively to achieve this goal.

As Daniel mentioned Capgemini has separated the use of wiki into two categories.
1. Project Level
2. Global Level

The project level wiki which is also open to customers is specific to each project and lives along the duration of the project at hand. On this wiki which is called "Trac" they mainly cooperate, discuss and communicate with the people who are involved in the project.

"…When we want to communicate with the team, when we want to give instructions how a specific thing works or we have perhaps some notes that we want to share, we use a wiki…"

They have several communicative and collaborative tools such as share points, project rooms, virtual meeting place and conferences and Wikis. This shows that the wiki is not solely used as a communicative platform; instead it is used as a supportive collaboration medium.

Daniel also cited that the small wiki has been recently used that implies the fact that it is still new, although he seems quite satisfied with the way it worked:

"…but generally for my new modern projects I use a small wiki for example, I use "trac". It's very small nice one that merges with our development environment."

As a technical project manager he is responsible for the choice of collaborative platform being used for the project and he mentioned that he chose wiki because:

"…On the project level it's all about making the project more efficient, getting quick access to the information and makes it easy to share…"

But prior acquiring the wiki it was hard to put the related documents on the source environment and

"…you had to repeat it once and over and over again to all team members…"

So basically the easiness of publishing and sharing the documents over the wiki lead them to use it on the project level.

However, the global wiki is completely different and it has been created for a different purpose. This wiki is only open to different branches of Capgemini around the world and not to the customers. Everyone who is a part of the company can contribute to it including Daniel who knows himself as just a contributor to the wiki. He clarified that:

"… Basically all kind of information that we have we can share on that. Everything that we want to be structured, or be used later on we should document in our knowledge management system or in our wiki… On the global level we have our big structured knowledge network…If you have an area that you work with for example Microsoft, then you can contribute to the Microsoft section of the wiki."

They have different networks around the world like Software Engineering, Microsoft, Java, Oracle, test and so on which each of them can be used on a local level too.

"…So we generate a lot of information that we want to share, package and redistribute to a global level for example. So we use a wiki to enhance the usability…"

Therefore the global wiki is an open platform for international colleagues and partners of Capgemini to put their knowledge on it and discuss various alternatives and solutions and in so doing enhance the efficiency of the systems. For example:

"…We have an Agile focus for example this year for Software engineering network. And all the discussion is that we keep it on the wiki and in our forums so that everyone can go in and generate to be able to get a good usability…"

But he also mentioned that this wiki "could" contain all kind of information, however it is still failing to do this purpose completely since it has been around for two years but still has some ways to go. This wiki in another word is not yet as completely common to be used by all colleagues and needs time to be more popular.

The important note here though is what Daniel mentioned about openness of the global wiki. Since the global wiki contains the knowledge base of the company, they do not like to share this information with others on a global level as it keeps them being competitive and unique.

"...A global wiki is just for internal purposes. Capgemini is a knowledge driven company...The wiki is central to give us an extra edge, so that we can be better in competing. It's all about knowledge..."

This is the same reason that keeps many of the users of the wiki from sharing their knowledge on an open platform which also seems totally natural.

The other important comment in Daniel's interview is that still people don't feel comfortable about putting their knowledge on a global platform to be seen and commented by others. He cited that:

"... It still is not easy enough and most people are a bit afraid of sharing information on a global level. It's much easier for them to write on a wiki on a project level. They feel like a big part of the solution. On the global level very few really want to. They think : oh, my information is not good enough for the global level..."

This lack of confidence is perhaps related to the sociological reasons that should be examined particularly when using a new technology like wiki.

However, according to what Daniel has experienced there are solutions that make a technology easier to be accepted by people and by making them feel more comfortable with it:

"...It's a challenge to get people to realize that they are not scarier in Germany, England, France or elsewhere...."

One of the ways he suggests according to his own experience is that:

"...we have to properly structure the wiki in different ways to make it easier as well. We structured it on a local level and we started working there and it feels that it's not so fearsome and difficult..."

Regarding the problems or expectations that he was asked to mention about the wiki system that they are currently using he stated that the wiki is currently used as an informal way of communication and collaboration and they can not used it for formal documentation. So comparing to the other collaborative tools like share point that has the functionality of version management and document generation, it might be a lack of systems particularly on the project wiki that doesn't provide them with proper documentation ability so that they become able to print and deliver what has been published in the wiki to the customers as well. This is one of the weak points of the systems at the moment although he clarifies that for the purpose that it is being used right now, it is working perfect.

In respond to the question that how the wiki helped them overcome the existing problems of other collaborative tools Daniel stated that before the platform that was to be used was knowledge management 2.0.

"...But I'm not really sure, I didn't use it much before.... It was cumbersome. It was hard to find. Basically there was too much work to get started and too much to learn how to use it. For that reason we didn't use it..."

But when they got closer to the collaborative environment that the wiki provided, they got the feeling that how easier it was. Although he said it still is not easy enough and it still have ways to make it easier.

We asked Daniel about the reaction of people when they see incorrect information on the Wiki, he replied:

"Well, we can discuss these. Basically it's really good...we haven't had any bad reactions to the wiki in terms of bad information or so. It a natural trust to share information that continues to develop, so should we see anything as wrong we wouldn't complain we just discuss it and fix it."

His answer reveals the ability by everyone to discuss content with each other in order to ensure accurate information on the wiki. He pointed out to an important factor that is trust which helps him and his project team to share information and discuss content together in order to ensure accuracy on the wiki. Also, he mentioned that this trust grows as everyone is collaborating with the other and this helps them to continuously check up content and enhance its quality.

After that we asked if he would suggest the use of wikis for other companies and he said:

"Definitely, I tried to make it a standard platform for all our projects...I would definitely recommend it for everyone because it's a good way of sharing information."

Daniel described that the wiki is a good tool for information sharing and for that reason he recommends the use of wiki by others. He also mentioned that he is trying to make the wiki a standard platform for information sharing among all project teams at his company.

Then we asked him about the differences that the wiki has made for collaboration at the company and he answers as follows:

"It reduced some of the work required to share information... when the information stays and is available afterwards so it's just basically lowered the complexity and the work involved with sharing information...Also it enhanced collaboration a bit in terms of making it easier for people to comment what you wrote... so it's basically has made big issues."

According to Daniel, the wiki facilitates information sharing among project teams through making the information available for everyone in one place and therefore it is easy to share this information with each other. He also expressed that the wiki has enhanced collaboration through allowing team members to provide feedback for each other's contributions.

In that sense, we asked him how different project teams are collaborating together and providing feedback to each other, he said:

"*That's a general challenge...to make them put extra effort to work with the internal information and put back what you actually work with...but we do have a lot of engaged people that really want participate and do create information in the wiki...*"

Daniel explained that they face a challenge in getting everyone share his or her information with other members. The challenge of getting people share knowledge with others may affect the collaboration process. However, there are many members who like to participate in collaborative content creation and share knowledge with each other because they engage working with other people.

Later we wanted to know his evaluation to the role of the wiki and its effects on collaboration between people. His answer was as follows:

"*We haven't really measured it in any scientific way. But it's quite apparent I think for most people that it is actually a good tool, it does help. Finally, we have an easy tool to work with compared to the old knowledge management systems...we all feel that it is the way to go and the whole organization really now turns to the Web 2.0 techniques and we have our platform up and running and we're enhancing them right now...*"

Although they didn't measure the effects of the wikis on collaboration but everyone working within the company feels good about the technology. It is easy to use and share information among teams. Most importantly, Daniel expressed a general satisfaction by him and his company in the sense that their organization is adopting Web 2.0 techniques that are based on collaboration and participation. He mentioned that they have their wiki-based collaboration platform used for collaboration and information sharing and also they are enhancing the technology to be more widely used in the company.

We continued our discussion about the role of the wiki in facilitating collaboration and we asked him about the extent of facilitation that a wiki has made to their collaboration and then he replied:

"*…it's hard to define. But there is like a sociological difference…You need to make it feel easy to share information, when you know that it's just two clicks to share then you will share information…So I think that the wiki is enough and that's what needed to get people share information...in projects it's working quite fine. Still a bit more to go in a global context. You need to be able to really package what you have done, you can't just take what you done and put it into a global, you need to rework it and make reusable, package it...*"

In the sense that a wiki has improved collaboration, Daniel explained that it makes a person feels good about the easiness of sharing information with others and therefore everyone will be more likely to share his or her knowledge. In an internal context where information is communicated among the project teams, the wiki works well. However, in

a more global use of the wiki where for example a wiki could be open for customers and partners, Daniel expressed that the wiki content should be managed appropriately in order to make it useful for all collaborators.

Afterwards, we asked him about the role of groups in collaborating using the wiki and his answer was as follows:

"...everyone shares and we all trust each other so we don't really if we talked about peer review and that kinds of staff, we don't have any set of rules or policies or anything for our internal wikis, it's just people commenting and changing information."

We wanted to know more about the global use of the wiki at this company and what does it mean to use a wiki for global information sharing. He said:

"...that's global information that is just for our use."

He continued:

"Capgemni is a global company with 80,000 employees all around the globe so we have one central wiki that everyone can share it... all of Europe but you also have India, US, Australia, wherever..."

He described the use of a central wiki in a global organizational context where information sharing occurs between thousands of employees working in different parts of the world. These employees share information that is used for internal purposes.

Then we asked him if the wiki can be open for customers to share information with them and he replied:

"I don't think so."

As a result, we asked him if this is about the privacy of their information. In this sense, Daniel expressed the philosophy of his company as follows:

"It's a big part of Capgemini... Capgemini is a one of the largest companies in the world in IT consultancy. Instead of buying a local consultant they know they can pay more to get us because we are much more professional...We're famous for that kind of information. It's vital for us... its valuable information, we don't give it out for free; we paid a lot of money for it so we will not give it away...It's our knowledge base and it worth a lot we won't give it out to our competitors. Its part of our competitive edge..."

It seems that the company's pride and reputation are important motivations not to open the wiki and to share information with customers or partners. They believe that in order for customers to get their knowledge, they should pay for it. Also, this knowledge constitutes their competitive advantage and professional reputation and therefore should be secured because opening up the sources of their knowledge would be threatened by their competitors and loose which may cause loss in reputation and pride.

We shifted to talk about the role of collaboration and information sharing using wikis in affecting the innovation of the company. Daniel said:

"Innovation is one of the focus areas for us...innovation is all about creating some good information, share it and let other people continue working on it. It's a process it's not just one idea it's a long work. When we e do something great in one project, if I don't share it we wont be able to use that information to become innovative and to really show how innovative we are. Information sharing is the most important part of innovation."

He also continued talking about innovation as follows:

"...let's say the Agile work that we have done. Agile is very popular right now and many customers talk about...we are really more used to work within groups...we work on for example Agile methods we discuss it on the wiki, we're kind of process it and combine it with other approaches and document it in our wiki where we discuss our Agile platform. In that way we can really find really good work methods that Capgemini can reuse. We're working in a way where we could combine our all skills, in that way w can be more innovative."

Daniel gave us an example how they work in groups for agile development. He described the collaboration process using the wiki to share ideas about the development process which enables them to find new methods for work. This new method involves discussing, processing, and combining the ideas of all project members together to provide more innovative outcomes.

We then started a little discussion about the phenomena of Web 2.0 which has been questioned by people and he provided us with the following:

"I talk a lot about Web 2.0 and wikis are very new still for most...You need to see the value of a wiki...even internally within companies there is a lot of people do things and wikis fit them perfectly and you don't need to develop these special systems. Wikis really are great generic way of handling a lot of information."

Finally we asked him about the reaction of people when introducing the wiki for collaborative work and information sharing. He said:

"...in a project level it is always fun. Some team members for example haven't used to use wikis before. And when they send me e-mails I tell them put it on the Wiki and each time they have information they put it on the wiki."

7. Discussion

In this chapter we provide the answer for our research questions by discussing the main issues and themes that have been acquired from analyzing the empirical findings.

7.1 The Wiki as a Shared Platform for Collaboration

In this research, we have found that Wikis can affect collaboration in relation to the nature and the context of collaboration. The Wiki concept which is based on the idea that everyone can be involved in the collaborative process of creating and editing content (Reinhart, 2005; Buffa, 2006; Mader, 2007; Lee & Lan, 2007; De la Torr, 2005; Dearstyne, 2007) is behind this effect. In this sense, our research showed that all participants use the Wiki as a shared platform for collaboration. Collaborators can use this platform to contribute their ideas as well as editing and making changes for others contributions. Their contributions are presented over the Wiki and other participants can access this information and provide feedback for the others immediately.

The traditional collaboration is based on a group of people working together at the same time and place such as collaborating in a meeting room, R&D department, conference room, etc (Gloor & Cooper, 2007;Tapscott & Williams, 2006; Wycoff & Snead, 1999). This kind of collaboration is limited to a certain number of people due to time and place constraints and also it is associated with coordination, cognition, and cooperation problems (Surowiecki, 2005). Our research showed that the Wiki can allow everyone to collaborate together regardless of time and place and it facilitates collaboration among the groups by altering these problems thus affecting the nature of collaboration.

From a **cognition** perspective, our participants expressed that the Wiki allowed everyone within the organization to feel more involved in achieving certain tasks of projects. They can easily contribute their ideas and discuss it with others who can alter their contributions to avoid any errors and most importantly they can see the effects of their contributions when it is used to be part of the total sum of the work. The feeling that everyone is part of the collaborative process helps the group to share the responsibility of finding solutions to problems and also to feel engaged with working within the group. Also, it helps to improve trust among the groups especially when every contribution or change is transparent for everyone and can be discussed by the group. Furthermore, group working is affected by the social and political interactivity between collaborators (Lotia, 2004). In this sense, the nature of the Wiki affects the behavior of employees through balancing the power between collaborators so everyone can contribute and everyone can edit and make changes for others contributions. More clearly, the ability to add and edit information over the Wiki gives everyone a sense of control over their contributions and therefore there is no central control over content because it is owned by the group. Therefore, this collaborative process using the Wiki can help the group in making better estimations for problems through the collective outcome that consists of many contributions by the group members.

From a **coordination** perspective, a major challenge for collaboration is to get the contributions of many people to meet the needs of the group and generate collective benefit (Surowiecki, 2005). For instance, this might be a big problem in using e-mails for collaboration since the outcome of the group is distributed among several members (Hideo & Shinichi, 2007; Mader, 2007; Wood, 2005) and it is difficult to coordinate collective working for getting a collaborative outcome. Our research showed that this problem can be fixed using the Wiki in the sense that the contributions from many members within the group are gathered over the Wiki and can be reflected as an outcome of collective working. Moreover, we have found that the ability to check up changes and evaluate each others contributions (Reinhart, 2005; Wood, 2005) can help in improving coordination. The collective outcome can be used by any member of the group and get benefit from the contributions of the many.

Finally, the easy-to-use nature and the flexibility of the Wiki facilitate collective interactions among the members of the groups (Wood, 2005; Mader, 2007). At this respect, our participants agreed that the Wiki is an easy tool to be used for sharing information by many people. **Cooperation** problems are related to the mechanisms that enable people to interact together in order to achieve collective outcomes (Surowiecki, 2005). Our research showed that the Wiki can be a dynamic collaboration channel where people can easily access and share information with others and at the same time manage and manipulate others information. In this sense, the process of cooperation can be viewed as a network of information and each contributor acts as a node that is connected to other nodes through the Wiki. The Wiki affects cooperation in providing a link between all members which make them closer to each other and participate in a process of organized sharing of mutual knowledge. Therefore, participants can benefit from cooperation through learning from each other and exchanging their own information together (Lotia, 2004).

7.2 The Use of Wikis for Internal and External Collaboration

There are two different contexts of using Wikis for collaboration: **Internal and External**. Our research showed that the use of the Wiki for collaboration expands the context of group working. In this sense, we have found that the Wiki allows for more people to be involved in the collaboration process because everyone has the ability to easily share information with others as well as to access others information. Within an internal organizational context the Wiki can be used for both **local and global** collaboration. Local wiki-based collaboration is conducted within a limited organizational context for collaborative content management purposes and also for collaborative development of projects. The number of people involved in this kind of collaboration is limited to those who are involved in the group work or a particular project. For a global context it provides a global platform for employees to cooperate together from many different places but within an organizational context which means no other collaborators such as customers or partners are involved in the group work. This kind of collaboration is different than the traditional collaboration using other tools; the nature of group working using the Wiki allows large numbers of people to collaborate in a new way where they can engage cooperating with others and have better ways to coordinate their interactions together. In other words, the effect of Wiki on expanding the

context of local collaboration into a global collaboration within the organizational boundaries had its roots in the ability for everyone to easily share and access information on a large scale. Therefore, it allows for more integration of diverse knowledge and experiences (Hansen & Nohria, 2004; Gloor & Cooper, 2007).

In an external context, Wikis can expand the process of collaboration by allowing masses of people to cooperate inside and outside the organization (Tapscott & Williams, 2006; Gloor & Cooper, 2007; Chesbrough, 2007). Previous researches have discussed the external use of Wikis for large-scale collaboration and described different contexts and models of collaboration where organizations collaborate with external customers and partners (cf. chapter three). However, our research showed that organizations are not likely to use the Wiki for more open use and mass collaboration. We have found that organizations are reluctant to open their sources of knowledge to large numbers of people which may threaten their pride, competitiveness, and reputation. The external use of Wikis for large-scale collaboration is associated with many risks and problems related to cognition, coordination, and cooperation issues. A major cognitive problem is that with more people collaborating using the Wiki, the more information will be gathered and therefore the amount of contribution by any member doesn't count as much as in an internal context. More clearly, the huge amount of information created by large number of people affect the impact of contribution on an individual level and therefore it is difficult to see the effect of their contributions in the total sum which may in turn discourage them to cooperate and share their information with others. This can be applied for both global use of Wikis within the organization or even for the open collaboration e.g. Ideagoras and other models of mass collaboration (cf. section 3.3). In the case of organizations they may need to offer incentives in order to affect the reaction of their employees and encourage them to cooperate with others (Dearstyne, 2007) which can be costly. Furthermore, the security and quality of information was a major concern expressed by our participants in both internal and external contexts. We will discuss these issues in the following section.

Other cooperation and coordination problems are related to the size of the community and also to the sum of accumulated information by many people. We have found that with a large number of people involved in a group it will be difficult to manage their interactions so as to be able to adapt their collective working to meet the needs of the organization. A more global use of the Wiki would produce large amount of interactions that requires control and tracking to ensure that these interactions are productive and can be integrated to achieve a collective outcome.

7.3 Collaborative Content in the Wiki Environment

Another aspect of the Wiki-based collaboration is related to the reliability of collaborative content. The content over the Wiki can be accessed by everyone and also it can be changed and edited by the group. The reliability of this content depends on the context of collaboration whether it is internal or external. In this sense, the Wikipedia example has been prevalent in our discussion with the participants about the reliability of Wiki content (Peacock et al., 2007; Adler et al., 2007).

In an internal context, our research showed that the quality and accuracy of collaborative content is quite high in the sense that this content is managed by a certain size of collaborators who are known to each other. More clearly, the content is open for everyone to edit and change and this process is transparent in the sense that the contributor is known for the community and also the changes can be tracked and checked by other identified members which ensures the reliability of content. Moreover, the cognitive factor that we discussed before shows that the behavior of the employees and their feeling about being part of doing certain collaborative tasks would prevent them to input any erroneous data or to intentionally modify data to be wrong. With this feeling our participants expressed that the content is constantly refined and enhanced by the members of the group which results higher quality content.

However, our research showed that the collaborative content created in an external context of collaboration where information is open for masses of people e.g. Wikipedia (cf. section 2.4) is not reliable because the contributors are not known and the sources of information cannot be tracked thus affecting the quality and accuracy of data. Also, the cognitive motivations that we have discussed before about participating in a more open or large-scale collaboration may affect the quality of contributions because people don't feel like involved in the collaboration process and therefore they might feel irresponsible about the errors made by others. Moreover, our participants expressed that opening up the sources of information for people threatens the security of their information which is a valuable source for them. This openness might put their confidential and proprietary information under risk because everyone has the accessibility to content and can edit and change this information. In addition, a major challenge that has been expressed by our participants is how to use this accumulated information to meet the needs of the organization both within an internal and external context. The content is constantly created and changed by the members which results huge amount of data that is difficult to be adapted for the needs or even to select which data is more useful to meet their needs (Bibikas et. al, 2008).

7.4 Collective Intelligence

What makes an organization to be innovative is its ability to come up with new ideas and new solutions to problems, to make better decisions, and to have the right and at the same time cheap and quick answers to its questions. In this regard, three conditions previously discussed at section 4.3 can help the group act smarter to produce more innovation. Accordingly, the empirical findings of this study were examined based on these factors to see whether or not cooperation over the wiki can help groups achieve this purpose.

7.4.1 Diversity

Diversity in the wiki-based collaboration has its roots in allowing anyone to participate in the collective working. Our participants expressed that different people can use the Wiki to share their own ideas and experiences. This condition is related to the cognitive factor discussed before in the sense that different contributors feel responsible to share problems with other members in the group in order to use the combination of their contributions for better judgments of the problems and therefore produce innovative solutions. Another

aspect of diversity which is also discussed before is related to the symmetrical power among many contributors which allows everyone to contribute his or her own ideas and knowledge without being controlled or influenced by any central control. As a result, this equal weight in the collaboration process allows everyone to freely express diverse insights and judgments which have different impact on the total sum of contributions. Furthermore, the Wiki expands the context of group working by allowing larger number of contributors to be part of the collective outcomes both on internal and external levels as we discussed before. This is also gives more opportunities for diverse contributions from many different people.

7.4.2 Independence

An important aspect in using Wikis for collaboration is that the influence by collaborators on each other is less in the sense that everyone is independent to decide what information to input on the Wiki. This independent action can be manifested through the less effect of the individual error on the group outcome (cf. section 4.3.2). At this respect, the Wiki allows for immediate presentation of any contributions which can be seen by everyone within the group and therefore it lowers the possibility that any erroneous contributions by any member to affect the collective outcome. Our research showed that the process of collaboration in the Wiki puts the collective outcome under a continuous refinement by the group members which results more smart contributions that consists of free-of-error ideas which in turn can be applied for producing innovation. This can work well within an internal context of collaboration because of the transparency and the shared motivations to produce a better collective outcome from independent actions. However, these independent actions might be chaotic in a more external use of the Wiki for collaboration where large numbers of people are involved in group working. As we discussed before the huge amount of data which produced by a large number of people is difficult to be adapted for the needs of the group. Also, it is difficult to ensure the reliability of this data because the independent action of large numbers of people might be associated with intentional errors and other kinds of threats on data. Hence the external collaborative process can have a negative impact on innovation through the lack of creative ideas that comes from a productive collaboration.

7.4.3 Decentralization

Another major aspect in the nature of the Wiki-based collaboration is that it allows for decentralization among the groups. Decentralization in the collective work prevents a central control to decide the final collective outcome (cf. section 4.3.3). We have found that the collective outcome of cooperation between members cannot be achieved by central decisions of some people but rather everyone within the community has the power to input information and edit others information which make the collective outcome a result of decentralized decisions of group members. Most importantly, the Wiki provides a shared platform for continuous aggregation of these decentralized decisions in a form of information and ideas that can be shared and discussed with other contributors. As a result, the continuous process of aggregating knowledge helps for emerging ideas to come up that reveals the skills and experiences of collaborators and therefore there are more opportunities to achieve innovation through the production of creative and useful

ideas. In addition, this kind of decentralization is related to diversity and independence as we discussed before.

7.5 Collaborative Innovation

Our participants expressed that the nature of collaboration using the Wiki provides an iterative process for exchanging ideas and experiences in the sense that their knowledge is continuously combined together resulting a cumulated innovation. The feedback-giving ability by everyone especially within an internal context can be viewed as a productive building of creative knowledge that is useful for producing innovation (cf. Figure 10). More clearly, collaboration using Wikis allows for effective exchanging of ideas through enabling everyone to easily access each others ideas and also to provide comments and feedback that can either compliment these ideas or enhance them. Moreover, the iterative process also affects the accumulated ideas not only in gathering them in one place but also in the ability of many members to collaboratively refine them through fixing errors, repetitive information The refinement process can be empowered using the Wiki which has an important impact innovation because different ideas by many members need to be evaluated and checked by the community in order to ensure the consistency of knowledge. Succinctly, the nature of the wiki-based collaboration reduces the complexity of creating, accessing, combining, and refining knowledge by many contributors which support the production of creative ideas and therefore increase the innovation.

8. Conclusions and Further Research

In this chapter we summarize the main conclusions from our research which give an answer to our research questions. Also, we present some suggestions for further research in this field.

8.1 Conclusions

Two questions have been asked at the beginning of this research in an attempt to investigate the effects of using Wikis at the workplace on collaboration and also the impact of this collaboration on the innovation of an organization. In order to answer the first question which was: How can Wikis affect collaboration? We have discussed the collaboration process using Wikis in terms of three issues that face group working: cognitive, coordination, and cooperation issues. Using Wikis for collaboration can affect the nature of collaboration through altering these three issues on both internal and external levels. The wiki-based collaboration alters the cognition factor through enabling group members to use their collaborative assessment of problems to find the right solutions. The coordination issues have been altered in the sense that collaborators have the ability to gather and combine their contributions in one place and can be used by each member in the group. Also, the Wiki provides a link between all collaborators which facilitates their interactions and also their contributions can be mutually communicated by everyone. Moreover, the alteration of wiki-based collaboration for these issues in an internal context differs from an external context due to differences in the size of the group and the amount of collaborative content which have a major impact on the behavior of collaborators. Furthermore, the collaborative content created internally is reliable because of high transparency between collaborators but in an external content this content cannot be reliable due to lower transparency. In addition, the reliability of the collaborative content is affected by cognitive issues due to large amount of data especially in an external use of Wikis for collaboration.

In order to answer the second sub question which is: What is the impact of wiki-based collaboration on organizational innovation? We have discussed three conditions required for achieving collective intelligence which are: diversity, independence, and decentralization. The nature of the wiki-based collaboration is more diverse through allowing different people to be involved in the group work and balancing the control over contributions which helps to gather diverse knowledge and combine them together. Also, people using wikis for collaboration can have more independence because the influence by any member on other members is low because each and everyone can decide what kind of input should be contributed. The final condition that can be achieved through collaboration using Wikis is the decentralized action by group members. In this sense, the collective outcome is produced through decentralized contributions by many people in the absence of central contributions. Hence the application of these three conditions required for collective intelligence in the collaboration process using the Wiki can impact organizational innovation through the introduction of creative ideas, knowledge, and experiences that result from the collective outcome of the diverse, independent, and decentralized activities.

8.2 Further Research

This use of Wikis and the ideas of openness, transparency, and collaborative innovation at the workplace are still new approaches and their advantages and disadvantages are not yet fully understood and recognized. We have pointed out to different situations where Wikis can result productive collaboration or not. Therefore there is a need for further research to study these situations more deeply in order to increase the understanding and stand on the most controversial issues related to data quality and accuracy as well as other side effects of openness. Moreover, the Wiki is only used for informal collaboration and communication we believe that there is a need to do more research to investigate the use of this technology for more formal collaboration.

Data quality and accuracy has been one of the most important issues in an open collaboration environment. This is because of more openness in the wiki environment where everyone can edit and change information and as a result people might feel uncomfortable with this idea and they won't trust data. Therefore, it is essential to study the conditions that are decisive to either success or failure such projects in any environment such as business, education, etc.

In addition, it is important to study social effects and consequences on people because collaboration is a group activity where people interact, discuss, and brainstorm different ideas and experiences. Therefore it becomes useful to investigate these effects on collaboration and how it can facilitate or hinder this process. Furthermore, it might be the case that people are not likely to collaborate together for sociological or economical reasons that affect the process of collaboration. At this respect, studying these sociological and economical aspects is necessary to understand real motivations for collaboration.

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Interview Guide

Interviewee Name:	Interviewer 1:
Organization:	Interviewer 2:
Department:	Date:
Position:	Time:

Step 1: Introduce ourselves to the interviewer.

Step 2: Explain the purpose of the interview. What is the interview about and why we're doing it.

Step 3: Explain the rights of the interviewer in relation to his/her confidentiality, anonymity, and consequences of the interview.

Step 4: Ask the interviewer if he/she has any questions or need any explanations before starting to record the interview.

Step 5: Start Recording and ask questions according to the themes below.

Note 1: The interview is open to a free discussion about related topics with the interviewer without being restricted to our predefined questions in the sense that supports our main purpose of the interview.

Note 2: The interviewers may write down any comments related to silences, facial and body expressions during the course of the interview.

Theme 1: **The use of Wikis**

1. What are the kinds of tools that you use for collaboration practices at your organization?

2. What type of wiki are you using?

3. What is your role in using the Wiki?

4. Why do you use a Wiki in your organization and for what purposes?

5. How do you use the Wiki for collaboration at the workplace?

6. How does the wiki help your organization to overcome the problems of current tools used for collaboration?

7. Comparing to other tools used for collaboration, what are the advantages of using a wiki at the workplace?

8. What problems did you face or what are the potentially problematic issues regarding using wikis?

9. Do you suggest the use of Wikis to others? Why?

10. What differences do you feel the use of wikis made to the work that you do?

Theme 2: **Harnessing the power of collaboration and collective working**

11. How do you evaluate the role of your Wiki in harnessing the power of collaboration and stimulating collective working?

12. To what extent does your Wiki improve collaboration practices and collective working?

13. How do you evaluate the work of groups in using the Wiki?

14. Does it affect the innovation of your organization? How?

15. How do people react to or appreciate using wikis? How interested they are about using it?

Finally, stop recording and ask the interviewer if he/she wants to share any ideas about the interview and if he/she has any comments or questions that can be answered by the interviewers. (Debriefing)

THANK YOU FOR YOUR PARTICIPATION.

APPENDIX A

The following list contains a number of recommended Wiki patterns that represent successful practices for driving a Large-scale adoption in organizations:

Pattern	Description
WikiChampions	An enthusiastic person/s that encourages people to use the Wiki, show them the benefits of using the Wiki, fix problems, and monitor the growth of the Wiki. A Wiki champion uses his/her relationships with colleagues to promote for the usage of the Wiki. See: http://www.wikipatterns.com/display/wikipatterns/Champion
Invitation	Inviting people to use the Wiki. It is important to give some time for encouraging mainstream users to use the Wiki. Also, a Champion or a knowledgeable Wiki user would help them at the early stages of adoption. See: http://www.wikipatterns.com/display/wikipatterns/Invitation
StartingPoint	A site that includes guidelines of how to use the Wiki and other information about how to create an account and set up the Wiki to help people familiarize themselves of using the Wiki. See:http://www.wikipatterns.com/display/wikipatterns/StartingPoint
Personal Spaces	Creating a personal space help people to practice editing and posting information on the Wiki. Also, it is a useful way for people to socialize and get to know each other especially when they are located at distance. See http://www.wikipatterns.com/display/wikipatterns/PersonalSpaces
Welcoming	Welcome first-time contributor by posting a comment on their contributions. This helps to increase the feeling of being part of the community and acknowledge their contributions. See: http://www.wikipatterns.com/display/wikipatterns/Welcoming
BarnRaising	A planned event in which a group meet at a physical space at the same time to start building their virtual spaces. This helps for a critical mass of people to be active users and also allow for taking decisions about the content and its organization. See: http://www.wikipatterns.com/display/wikipatterns/BarnRaising
SingleProblem	Showing others how you can fix pain points at your work by finding a particular task and explain how the wiki can solve or improve it. See:http://www.wikipatterns.com/display/wikipatterns/SingleProblem
Seed it with content	Wikis are unique because of a gradual process of creating content by many contributors. This helps to ensure up-to-date content and avoid errors. See: http://www.wikipatterns.com/display/wikipatterns/Seed+it+with+content
Intentional Error	Make an intentional error to motivate others to fix it and get them used to use and edit Wiki content. See: http://www.wikipatterns.com/display/wikipatterns/Intentional+Error
New Employee Wiki	Introducing new employees to Wiki by creating special spaces for them that contains orientation materials, a checklist of things to do, and form to fill out, etc. See: http://www.wikipatterns.com/display/wikipatterns/New+Starter

APPENDIX B

The following list contains a number of anti-patterns which are the practices that hinder wiki adoption and should be avoided:

Pattern	Description
Do-it-all	A person might be too enthusiastic and wants to do everything. He or she might be asked by others to do things on the wiki, so he or she would do it instead. But this may lead them to dominate the wiki without active participation from the others. Therefore it is necessary not to do this and encourage others to use the wiki by helping them and letting them get used to it. See: http://www.wikipatterns.com/display/wikipatterns/Do+it+all
OverOrganizer	An OverOrganizer is the person who always rearranges others' contributions to make a particular structure by renaming the spaces, moving pages, rearranging content, etc. This would make other feel confused and unable to find their contributions. Most importantly they might give away using the wiki as they don't see their contributions. A solution to this problem is to leave comments about desirable structures and organizations so that everyone would participate. See: http://www.wikipatterns.com/display/wikipatterns/OverOrganizer
WikiTroll	Posting negative comments that leads to negative responses which hinders productive collaboration. This problem rarely happens in organizations because of a single community and shared goals. When it happens, the only way is to require users to register and those who act negatively would be deterred. Also, registration gives identity for people so they can be identified and traced. See: http://www.wikipatterns.com/display/wikipatterns/WikiTroll
Empty Pages	When creating a page, avoid leaving it empty because this distract people as they don't know what to add and what is the purpose of this page. Therefore, it is important to add some structure and information to help people recognize the purpose of the page. Moreover, you can leave a comment asking the page creator has created it and also ask others about their ideas of the usage of a page. See: http://www.wikipatterns.com/display/wikipatterns/EmptyPages
Too much Structure	Try to avoid creating too much structure because this would hinder gradual creation of content and structure in the long run. In case there is too much structure suggest removing empty pages and managing unnecessary structure. See: http://www.wikipatterns.com/display/wikipatterns/Too+much+structure
Manager Lockdown	This happens when the manager decides to control the wiki after its success. The problem in this case is in going to traditional thinking of managing knowledge with the manager imposes restrictions and structures over content and also hinders an active collaboration process. This is a complex problem but can be reduced by showing the manager that doing this can doom the use of the wiki. See: http://www.wikipatterns.com/display/wikipatterns/Manager+Lockdown
All-wiki-all-the-time	Don't be pushy when inviting people to use the wiki. But rather be balanced and don't rush people to use the wiki and leave older tools. See: http://www.wikipatterns.com/display/wikipatterns/All+wiki+all+the+time