The evolution of collaboration tools to facilitate internal collaboration

Seminar paper

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Abstract

The collaborative environment of the human being has changed since the digital age. In the past, the best communication was face-to-face communication. Today there are Internet-based possibilities that should not be missing in any business. And tomorrow, people will have to adapt themselves to a collaborative environment in which technology becomes an intelligent cooperation partner. Intelligent technology offers considerable opportunities for collaboration in companies. In this paper, I focus on the development of possibilities for internal collaboration and examine the effects that intelligent technologies can have on tomorrow's collaboration.

Keywords: Enterprise 2.0, Collaboration, E-Collaboration, Collaborative Business, Collaborative development, Internal communication.

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1 Introduction

Technology-based collaboration tools open up new possibilities for people to work together in different places and in different time zones. The importance of space and time is loosened up on us, and creative freedom is created in coping with the task (Riewald, 2013).
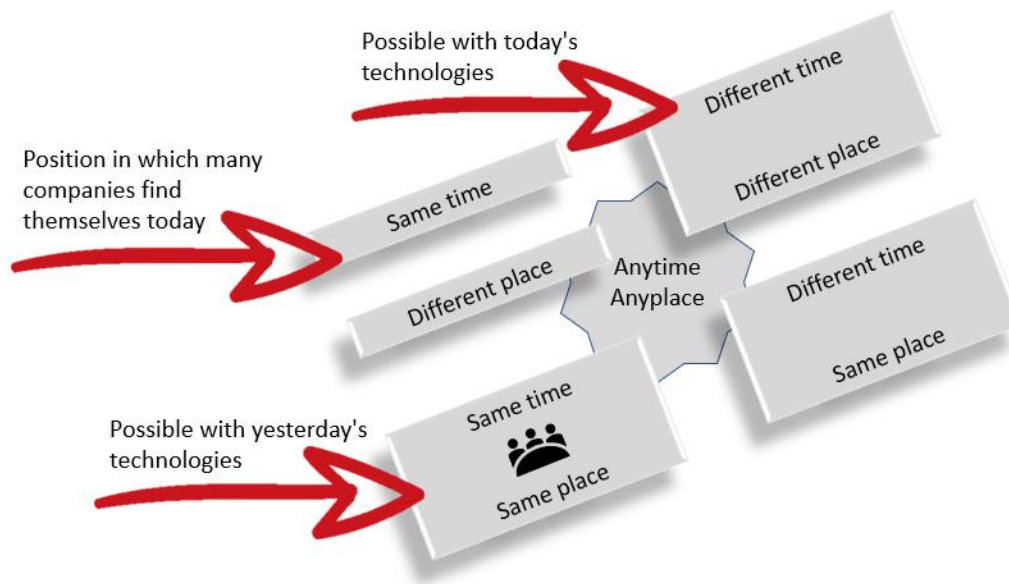

Figure 1 - Anytime Anyplace Matrix (Riewald, 2013).

Figure 1 shows the collaborative situation. In the past it was only possible to work together at the same time and in the same place. Today it is possible to work together in different places at different times. Many companies do not use this potential.

The previous cooperation in companies by means such as telephone, letter and fax are long obsolete. More and more employees receive a flood of E-Mails every day and feel overwhelmed by it. In order to find a way out of this flood, more and more people rely on the use of collaboration tools. The collaboration is not only facilitated, but also made open and transparent. This is also accompanied by a change in the corporate culture, which calls for competent managers (Bitkom, 2013).

The use of collaboration technologies in today's age is necessary to be an innovative, successful and assertive company in the marketplace (Bitkom, 2013).

But human behaviour should not be forgotten either. Generation Y, which is increasingly determining the image on the market and in companies, has a strong collaboration culture. Social contacts are very important to them and they are in constant communication and interaction with others (see Annex 1). They are used to receiving and processing information very quickly from an early age. They are therefore also called "digital natives"(Petry, 2012, S. 199).

Collaboration tools can not only improve collaboration within an organization, but also work across organizations. The main advantages of online tools are that they provide access to the content everywhere and at any time. Documents can be distributed online and there are fewer problems with different documents. Collaboration and rapid exchange within a group are greatly facilitated (Klocke, 2011).

In addition, work projects can be better planned, organized-, and reports can be more efficiently shared with each other. Collaboration tools support creative work and idea-finding processes (Peipe, 2019).

How the collaboration tools have evolved and what new opportunities for in-house collaboration are emerging will be explored in this paper.

1.1 Defining Collaboration tools, E-collaboration and Enterprise 2.0

"Collaboration is the action of working with one or more other people to produce or create something. The word has become synonymous with effective scholarship and collegiality. A Tool is a device or implement, especially one held in the hand, used to carry out a particular function" (Lomas et al., 2008).

There are many other terms that are used synonymously in this context. These include E-collaboration, Enterprise 2.0, social software, groupware and others. The most common term is Enterprise 2.0.

The term Enterprise 2.0 was coined in 2006 by Andrew McAfee. He derived the term Enterprise 2.0 from the term Web 2.0. Web 2.0 was spread by Tim O'Relly and generally stands for a new evolution stage of the Internet (McAfee, 2009, p.44). Enterprise 2.0 refers to the use of social media within a company to facilitate collaboration. The aim is to increase efficiency and effectiveness in teams. The goals of Enterprise 2.0 are to improve internal communication and collaboration, to store knowledge and to use collective intelligence by exchanging knowledge. Enterprise 2.0 and the use of social software offer the possibility of networking knowledge carriers and thus making implicit knowledge accessible (Petry and Schreckenbach, 2013).

The term Enterprise 2.0 does not only cover the use of social software, it also includes the change of the corporate culture to an autonomous self-management of teams, which is moderated rather than led by managers.

Social software is generally understood to be applications that support human interaction and use Internet-based applications for this purpose (Koch and Richter, 2009, p. 11). This includes not only an internal Facebook, but also software for project management, knowledge documentation, social intranet and many other things (Back, 2016). Coates (2005) defines social software as „Software that supports, extends, or derives added value from human social behaviour" (Koch and Richter, 2009, p. 11).

E-Collaboration is the shortcut for "electronic collaboration". The term stands for measures for computer-aided collaboration between teams that are separated in time or space. To be more precise, the term covers not only computer-aided software, but also electronic devices such as the telephone (Kock, 2005, p.2). The electronic tools used in this context are called e-technologies. Those technologies make it possible to digitize information and visualize service offerings (Kersten, 2003, p.147). In contrast to the term Enterprise 2.0, this term only covers the use of tools, but not an adaptation of the corporate culture.

Groupware is a "computer-based system" that supports a group of people in their tasks and provides an interface for a shared work environment. The main goal of groupware is to reduce user isolation and improve collaboration (Koch, 2019).

The term collaboration is thus the overall term above all other terms on this subject and stands only for collaboration. At first, the term "e-Collaboration" emerged with the spread of the computer in the corporate world. This stands for the use of electronic tools to facilitate collaboration in companies. In 2006 the term Enterprise 2.0 was coined, which does not only mean the use of electronic tools, but especially the use of social software to improve internal collaboration. In addition, this term also means that leadership must adapt to change, in order for improvements in collaboration to be successful.

2 Background

It is questionable whether or not all collaboration tools can be easily compared with each other. Especially in the period between 2000 and 2010 a lot of tools were developed, which were specialized for different purposes. Some were supposed to support internal communication, others were supposed to facilitate project management and supposed to enable the joint processing of documents. Nowadays, there are more and more so-called all-in-one tools that combine many functions. The advantage of such tools is that companies no longer need such an excessive number of tools. Users only have to learn how to use one tool and the costs are limited to that product. Coordinating teams across different tools means a loss of productivity (Samepage, 2018). Despite the obvious disadvantages, specialized tools are still very popular today, for the simple reason, that one tool for all has a wider variety of functions and that it therefor takes longer to master and handle safely (t3n, 2014).

In order to provide a better overview of the collaboration tools, this paper is divided into the sections Communication, Project Management, Document Sharing and Wikis. In order to show how internal collaboration in this area has changed over time and technological progress, the sections are broken down into the period between 2000 and 2010 and from 2010 onwards. In addition, the most important areas are given an outlook of what opportunities could still be created in the future.

3 Literature Review

For the literature review I searched in the databases Google Scholar, Ebsco and SpringerLink. I also searched the open net for books with titles that fit this topic.

In the databases I first searched for the words "Collaboration tools", "Communication technology in business" or "Tools for better collaboration" and quickly realized that the search was not promising. I googled the topic and looked for synonyms for the term collaboration tools for companies. The terms Enterprise 2.0, Enterprise collaboration, E-collaboration and Connected Enterprise emerged. Especially the term Enterprise 2.0 is common. Then I searched the databases for the terms Enterprise 2.0 and E-Collaboration. SpringerLink alone published 4041 results with the search term Enterprise 2.0. Following that I looked at the titles of the displayed results and filtered them. The year of publication was also a decisive criterion in my choice of suitable literature. Since I also write about technologies from the past in this paper, articles from the years before 2000, were just as interesting. I decided to include familiar tools from the past in this paper and searched the databases accordingly. In between I searched for other terms like "collaboration tools for business" or "Enterprise collaboration".

In order to support the results of my research, I searched the McKinsey website for studies.

Since I describe many tools with their functions in this paper, I also accessed the corresponding website to research about the tools and their functions.

The most important sources I could find with the search term "Enterprise 2.0" are shown in table 1.

Table 1 – Search term "Enterprise 2.0", "e-collaboration"				
Type	**Title**	**Author**	**Year**	**Key Content**
Journal	State-of-the-Art und Herausforderungen von Enterprise 2.0 in Unternehmen	Petry, T.	2012	Social media changes the way of communication
Journal	Enterprise2.0–Digitale Transformation durch soziale Technologien	Back, A.	2016	Description of the development to an Enterprise 2.0 company
Journal	KEIN ENTERPRISE 2.0 – Warum Social Media in Unternehmen nicht funktioniert	Ullrich, T. W.	2012	Reasons against Enterprise 2.0
Book	Enterprise 2.0 – New collaborative Tools for	McAffee, A.	2009	Definition of Enterprise 2.0 and reasons for it

Type	Title	Author	Year	Key Content
	your Organization´s toughest challenges			
Journal	Enterprise 2.0 Transformation	Petry, T. et al.,	2013	Description of how a company needs to change in order to be able to use social media within the company
Book	Enterprise 2.0 – Planung, Einführung und erfolgreicher Einsatz von Social Software in Unternehmen	Koch, M. / Richter, A.	2009	Description of how social software can be introduced in the company and what effects this would have
Guideline	Unternehmen 2.0: kollaborativ. Innovative. Erfolgreich.	Bitkom, several authors	2013	Guideline for the optimization of communication, information and knowledge storage in companies
Journal	What is e-collaboration	Kock, N.	2005	Definition of e-collaboration
Book	E-Collaboration	Kersten, W.	2003	Trends in product development and procurement
Journal	Functional Analysis of Enterprise 2.0 Tools: A Services Catalog	Büchner, T. et al.,	2011	Comparison of eight Tools

Table 1   Search term "Enterprise 2.0", "e-collaboration"

Since I have decided to divide this paper into different sections, I have searched for the part Project Management. But I could not identify many suitable results.

Table 2 – Search Term "project management tools", "future project management" etc.				
Type	**Title**	**Author**	**Year**	**Key Content**
Journal	Project Management Tools for Agile Teams	Mihalache, A.	2017	Comparison of different project management tools

Table 2   Search Term "project management tools", "future project management" etc.

It was easier to find suitable sources for the communication tools section. Table 3 shows a short overview of the most frequently used sources.

Table 3 – Search term "Enterprise 2.0 communication", "Tools for communication", Skype history"				
Type	**Title**	**Author**	**Year**	**Key Content**
Book	Wie Informations- und Kommunikationstechnologien die Arbeitswelt verändern	Riewald, A.	2013	Description of how technologies affect the business environment
Newspaper article	Beware Skype´s hype	Livingston, B.	2003	First reports of Skype
Journal	Is Skype the, an or no answer?	Bradner, S.	2003	First reports of Skype

Table 3   Search term "Enterprise 2.0 communication", "Tools for communication", Skype history"

To find out how collaboration will change in the future, I searched for terms like "AI collaboration". A larger number of studies could be found on this topic. The most important studies are listed in Table 4.

Table 4- Search term "artificial intelligence collaboration", "project management future", "Chatbots communication"				
Type	**Title**	**Author**	**Year**	**Key Content**
Journal	Machines as Teammates: A Collaboration Research Agenda	Seeber, I. et al.,	2018	The influence of AI on collaboration
Internet	The future of project management technology	Bailey, G.	2018	How new technologies will support PM in the future

Book	Journalistische Praxis: Chatbots	Kaiser, M. et al.,	2019	Automated communication in journalism and public relations, how chatbots can be used
Journal	CW Communication world magazine - 5 technology trends that are changing business communication	O´Brian, J.	2019	Description of how AI and other trends affect internal corporate communications

Table 4   Search term "artificial intelligence collaboration", "project management future", "Chatbots communication"

As you can see from tables 1 to 4, it is quite different how much literature you can find about the topics. There are considerably more studies about communication and on the question of whether companies should change to Enterprise 2.0 than about project management. One of the reasons for this could be that it is becoming increasingly difficult to distinguish between communication tools and project management tools.

4   Findings

Enterprise 2.0 is the common term for successful collaboration in the company. As already clarified, Enterprise 2.0 means to generate, organize and continuously improve the company knowledge of all employees. The employees should cooperate better with each other.

The ability to store data in the cloud has opened up entirely new possibilities for collaboration in companies. The tools that have been developed since the 2000s are mostly based on a cloud-based service that allows data to be stored (on the Internet) so that it can be accessed from another location.

Cloud-based enterprise collaboration services such as online document processing and online calendar creation, provide users with anytime, real-time access to shared status (Feldman et al., 2010, p.1).

To complete the timeline, here is a brief explanation of how collaboration began in companies and what tools were available to entrepreneurs before 2000.

4.1 Collaboration in the 90´s

Before the Internet was freely accessible to everyone, communication within and between companies took place by telephone, post, telegram or pneumatic Mail. It was during the 1990s that the Internet and E-Mail became accessible. Until the 2000s, E-Mail was established at most companies and was a commonly used part of corporate communications (Newsletter2Go, 2016).

Projects could only be worked on together if the employees were at the same time at the same place. A common tool which is still in use nowadays was the Whiteboard, which gave project participants the opportunity to record ideas and progress together.

Cross-company project work was difficult to implement because project participants had to meet in one place or be involved in conversations over the phone.
Since the computer was already a widely accepted tool in the 1990s, documents were also created and stored on it. However, joint and simultaneous processing of these documents was just as impossible as cross-company project management.

4.2 Communication

The path to successful cooperation and therefore a successful company begins with communication. A distinctive and functioning communication within a company makes it possible to discuss updates within teams, share tasks and give feedback (Mihalache, 2017, p.88). In order to simplify this, tools have been developed over the last 20 years with the help of a wide variety of software.

4.2.1 Communication until 2010

At the beginning of the 2000s, E-Mail had become a recognized tool for communication in addition to the telephone. But since telephoning was expensive and E-Mails were not always answered in real time, the two Scandinavians Janus Friis and Niklas Zennström founded Skype (Bradner, 2003).

Skype was released in 2003 and was at that time the first software that made high quality Internet telephony possible. People who downloaded Skype software could make free Internet calls with other Skype users anywhere in the world (Livingston, 2003). The software was downloaded about 3 million times within the first year of being available. But switching from the long-established phone to the Skype software was not easy for many people. There was criticism that there was no connection between a normal phone and Skype. Skype responded by promising that there would soon be normal phone numbers for Skype users to call with a normal phone (Bradner, 2003). Over time, new features have been developed for Skype, such as answering machines, call forwarding and the ability to start a multi-party video conference (tnw, 2013).

With Skype, real-time chatting has become an essential and indispensable part of interpersonal communication. Not only in the private sphere the possibility of chatting has been used, but also for customer service and internal customer communication (Kaiser et al., 2019, p. 2).

Other software was also developed to simplify communication. Various Messenger services went to the market and video telephony was also offered by other providers. However, since communication software benefits from the network effect and Skype had the most users, this tool remained the most used tool for better communication in the 2000s (tnw, 2013).

4.2.2 Communication today

In 2015, the first version of Skype for Business appeared. It was possible to hold an unlimited number of meetings, send chat messages during business meetings, work together on a whiteboard and much more (Microsoft, 2017). The latest developments are the Skype translator, which translates language into another in real time during a conversation, and Skype call recording (Skype, 2019).

The tool "Slack", which is very popular in the USA, has been one of the biggest competing tools of Skype since its creation in 2013. Slack can be used to set up any number of "channels" that work like chat rooms. You can also communicate directly with individuals and upload and comment on files anywhere. A reliable search function has also been developed in Slack, which allows discussions and files to be found quickly. Last but not least, several services can be linked to Slack, allowing you to see what is happening elsewhere. This works for example with Dropbox, Trello or Twitter (Tißler 2019).

Soon Skype will be replaced by the new Microsoft tool "Microsoft Teams". Microsoft Teams was released in 2017. The "App for Everything" is supposed to be the central contact point for virtual teams. It offers a chat, the possibility to schedule and conduct online meetings or to store files. Furthermore, the application can also be combined with many other Office tools. Most functions are already known from other apps, but with Microsoft Teams these functions, which are offered by many different apps, can be combined in one app (Microsoft,2019). This latest development from Microsoft shows that it is not so much a question of enabling new functions, but rather of offering an all-in-one tool that combines many functions. Microsoft Teams is not just a communication tool, but also a project management tool and a cloud service at the same time (Fritz, 2019).

With the emergence of Web 2.0, the Conversational Web, the classic sender-receiver model in which only people chat with other people belongs to the past. With the Conversational Web and the associated technology, communication between humans and machines is also possible (Kaiser et al., 2019, p. 2).

Many companies are already using virtual assistants to improve communication with their customers. The advantages of using virtual chatbots to communicate with customers are obvious. It is possible to communicate with many customers at the same time without taking up a lot of personnel. With the previous very complex conception of chatbots, these are not yet universal conversation partners, because they quickly reach their limits in terms of content (Kaiser et al., 2019, p. 2 f.).

4.2.3   Communication tomorrow

The previously very complex concept of chatbots will be made easier in the future through the use of machine learning. Artificial intelligence (AI) uses machine learning to improve the possibilities of interaction with customers. Chatbots therefore learn to understand the user, which makes them a profiling instrument of the future. Through the communication between chatbot and user the profiles of the users can be refined, and products or services can be better adapted to the customers. This reduces costs- and works more efficiently (O´Brian, 2019).

Artificial intelligence describes the ability of a machine to mimic intelligent human behaviour. AI can influence collaboration in many different ways (Seeber et al., 2018). For example, in the form of artificial personal assistants.

Artificial personal assistants will simplify communication in the future. At the end of 2018, the Deplux telephone assistant developed by Google was introduced and entered the test phase. Previously, the assistant could only make a restaurant booking by first asking the user a few questions and then calling the desired restaurant and reserving a table with a human voice (https://www.googlewatchblog.de/2018/11/google-duplex-der-assistent-2/). In the future, this technology will most probably be further developed and used in many other areas of communication. Within a company, an artificial assistant could arrange appointments with other employees, book rooms or invite them to company events. In the future, other tasks performed by a human assistant could also be performed by artificial assistants (O´Brian, 2019).

Virtual reality (VR) adds information to the physical world through audio, visual and/or sensory elements. VR can influence collaboration especially through IT communication and presentation capabilities. VR can influence collaboration in the form of virtual meeting and interaction surfaces that can replace both physical and current computer/mobile device-based interaction platforms (Seeber et al., 2018).

Cognitive technologies such as natural language processing, neural networks and deep learning will significantly change the way companies collaborate and make decisions (Seeber et al., 2018).

With the help of artificial intelligence and machine learning, many other opportunities will arise to develop tools for better communication in companies that hardly anyone can imagine today.

4.3 Project management

Apart from communication, working together and exchanging information about projects is also of great benefit to companies. Before the entry of the Internet into business, this was much more difficult than it is today. Before the 2000s it was common to meet in person and communicate face to face. To record ideas and numbers and to share them with others, the only option was the use of a whiteboard, the telephone, the post office or the E-Mail. The Internet and the associated software created completely new opportunities for companies.

4.3.1   Project management until 2010

When the Internet finally arrived in the offices, various possibilities were developed to simplify the work on projects with certain software. Jira was, and still is, one of the best-known project management tools of the digital age (Mihalache, 2017, p.87). Millions of people chose the tool, which was released in 2002, to plan projects and develop products. It is used to transform feedback into new features and higher customer satisfaction. With Jira, teams gain insight into long-term goals, work status and real-time release information. As teams adapt to market changes, Jira helps ensure that processes evolve at the same speed (Atlassian, 2019).

Tools like Jira made it possible for the first time to plan projects online and distribute tasks. For the first time, users were assured that the information they could see online were up to date.

4.3.2 Project management today

Project management tools that are currently available or have been developed since 2010 offer much more possibilities than the tools mentioned in the last section. It should be mentioned here that tools like Jira also keep up with the latest trends and constantly develop the software further.

Trello is one of the best-known project management tools of the digital age. The web-based project management software was developed in 2011 and since 2015 the service is also available in German. One of the best options Trello offers is the option of blogs and maps. They can be used to set up access for members, labels can be given, checklists can be created, the service can remind the user of deadlines and files can be attached. The service offers the possibility to connect the Trello card with Jira Issues. The tool can also be linked to other services (Trello, 2019).

A big competitor to Trello is Asana. This tool offers similar functions as Trello but also additional ones. For example, Asana offers the possibility to manage all projects in a timeline and thus make them clearer (Asana, 2019).

Awork is a very new tool which provides a digital assistant for projects, tasks and time recording for the user. Intelligent notifications keep users up to date. Via the app or via E-Mail, users receive notifications when a deadline is approaching or a colleague needs feedback. Lists can be managed, it is easy to switch to a Kanban overview to keep track of ongoing projects and tasks can be executed via drag & drop. This tool also has a language assistant with which e.g. tasks can be created on demand. Just like Microsoft Teams, Awork also works seamlessly with other apps (Awork, 2019).

The new project management tool from Microsoft, Microsoft Teams is not only a communication tool, but also a project management tool, as it offers the possibility to exchange information about projects and to access the information stored by other team members. However, there are also pure project management tools that can be linked to teams and thus make working on projects even more effective (Microsoft,2019).

With the mentioned tools it is nowadays possible to have a clear and easy to plan project management. Most tools offer a time overview, when which task has to be completed and which tasks are connected to it. The status of individual tasks can also be set in most tools. Thereby every project participant knows the current status of the project.

4.3.3 Project management tomorrow

In the area of project management, tools for improving collaboration can be developed in the future with the help of new technologies. Technologies include the Internet of Things (IoT), machine Learning, Artificial Intelligence and Robotics (Bailey, 2018).

The IoT generally refers to devices that are increasingly connected and controlled over the Internet. But physical resources such as devices and machines can also be integrated into a digital infrastructure in the future. With the help of appropriate tools, the devices and machines could be controlled from the office. This would lead to more dynamic and adaptable project management (Bailey, 2018).

In addition, the IoT has the potential to influence collaboration by collecting and sharing skills and information (Seeber et al., 2018).

Robots are physical, electromechanical machines that can automate, expand or support human activities. By being able to perform physical collaborative tasks and appear as agents of physical collaboration, they can support internal collaboration (Seeber et al., 2018).

AI and machine learning also have an impact on tomorrow's project management. In the future, there may be tools that use AI to independently analyse large amounts of data and create their own algorithms to support resource management. This makes it easier to collaborate within a company because data analysis would be less error-prone and there would be greater trust within teams (Bailey, 2018).

In many cases, tasks can be transferred to machines and these machines become more knowledgeable than people. AI will be able to help collect, understand and explain the impact of options. In the future, humans will have to be prepared to have intelligent robots as team colleagues who advise humans or even give instructions. The big advantage of intelligent robots is that they have an unlimited attention span and infallible memories. Even if a robot does not have the ability to develop unique and original ideas, robots are highly likely to become important human partners. Appendix number 2 presents a scenario in which artificial intelligence supports humans in their normal work (Seeber et al., 2018).

4.4 Blogs and wikis

Blogs and wikis are applications in which all users can write, edit and comment on articles quickly and easily. The content is not only compiled, but also continuously improved in a joint process. They are used for software documentation, manuals, sales lists, best-practice collections, project management, etc. The advantage in comparison to document creation in versions sent by E-Mail to participants is obvious. Among other things a higher transparency of the work status and an easier integration of new project members. In addition, wikis often work in real time, which means that several users can work on a document at the same time. Checking the quality of the contributions is the responsibility of all users (Back, 2016, p. 130).

Many other tools of this kind were developed, such as the "Confluence", published in 2004. Confluence was developed by Atlassian and offers many possibilities. This tool was also quickly used by many people. The tool provides an open and shared workspace to help users share ideas and information. Documents can be created and stored in one place, users can easily communicate across teams and projects can be delivered faster. A connection to the already introduced Jira software is also seamlessly possible with Confluence (Confluence, 2019). Confluence is not just a tool for blogs and wikis. It is also a project management tool.

4.5 Document sharing

The first document sharing tools were developed after 2000. Before that, files had to be sent by E-Mail or post. Napster was one of the first file sharing providers. Napster made it possible to exchange music files. Then tools like Google Docs or Dropbox were developed. They allow files to be imported, edited or shared. Files are automatically stored on servers and it is documented who has edited what and when. In addition, documents can be marked and archived for business purposes. Over time, these tools have been improved. In the meantime, simultaneous editing of documents is possible. When one user edits a document, another user at another location can see in real time what the other is editing. In addition, most of these tools have a chat feature that allows users to communicate with each other while editing.

5 Discussion

The constant further development of the state of technology and the associated new functions of the tools make this topic a difficult one for companies. How should a company decide with such a large selection? Are all-in-one tools better or are there different ones that are more specialized? What should be published in blogs and wikis and what not? All these are difficult questions that managers have to ask themselves before they can introduce new tools into the company (Back, 2016, p.127).

Which tools a company chooses depends entirely on the purpose of use. If there are several tools that offer the same functions, the choice is usually related to the user interface and the simplicity of use. There is no best tool that can be identified. But it makes sense to choose tools that can be combined. At first glance, it also makes sense to choose an all-in-one tool. However, it should be noted that an all-in-one tool is only worthwhile if the various functions are used by the company. If a company only needs one tool for internal communication, it makes more sense to introduce a simple communication tool.

At first it seems that the tools, some of which are still quite new, are very useful and practical to facilitate cooperation in companies. The transformation of a company into an Enterprise 2.0 company is advocated by many, but there are also some voices against it. T.W. Ullrich explained in his article "KEIN ENTERPRISE 2.0 – Warum Social Media in Unternehmen nicht funktioniert" what speaks against the introduction and use of social media in companies. His main message is that he says that only a small

part of a company's employees is willing to use the new software. The idea behind an Enterprise 2.0 organization is understandable, but if the people who are supposed to use the technologies are not ready yet, the "new" tools won't do the job very well (ULLRICH, 2012).
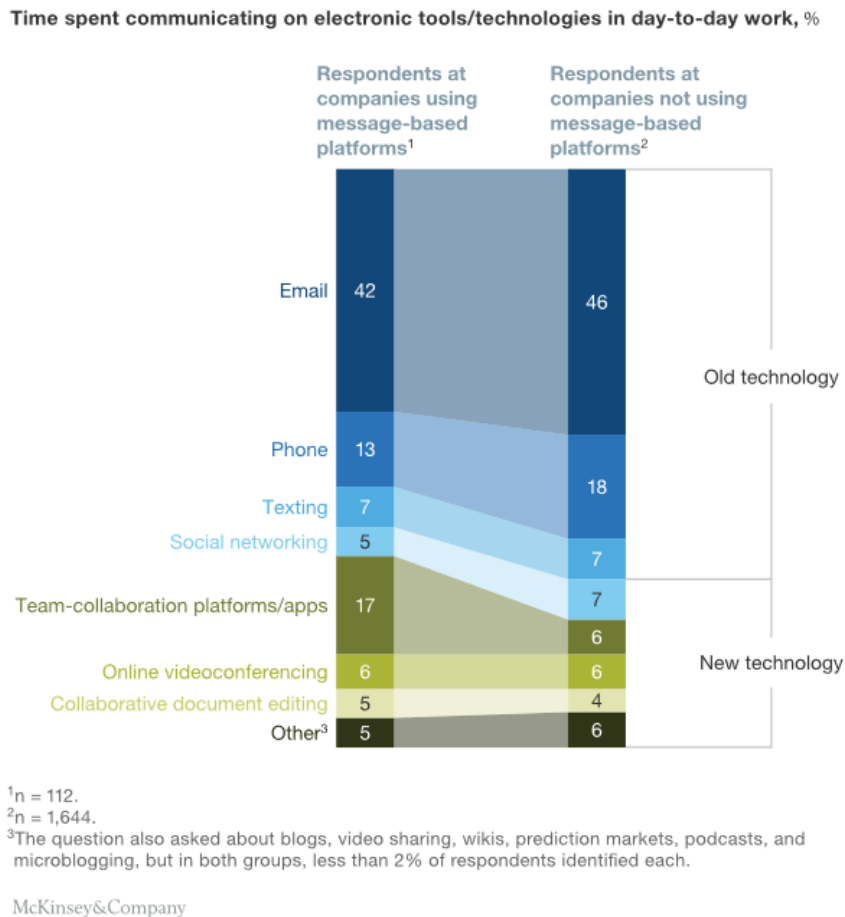
Time spent communicating on electronic tools/technologies in day-to-day work, %

	Respondents at companies using message-based platforms[1]	Respondents at companies not using message-based platforms[2]	
Email	42	46	Old technology
Phone	13	18	
Texting	7		
Social networking	5	7	
Team-collaboration platforms/apps	17	7	
		6	New technology
Online videoconferencing	6	6	
Collaborative document editing	5	4	
Other[3]	5	6	

[1] n = 112.
[2] n = 1,644.
[3] The question also asked about blogs, video sharing, wikis, prediction markets, podcasts, and microblogging, but in both groups, less than 2% of respondents identified each.

McKinsey&Company

Figure 2 - Use of new/old technologies (MCkinsey, 2017).

A study by McKinsey from 2017 shows how often old technologies are still used in comparison to the new ones. It becomes clear that the focus continues to be on old technologies such as e-mail and telephone.

When choosing the tools, you should make sure that they are understandable and easy to learn. This could eventually lead to a higher number of new technologies being used in the future. To conclude the journey of Enterprise 2.0 tools, the next step would be to focus on company management. The transition must start from the core of the business.

The current hype that artificial intelligence and machine learning will sooner or later lead to new tools for business practice is still uncertain. Especially with artificial assistants or chatbots, users must first have the necessary confidence. At the present time, people are not used to communicating with a machine (O´Brian, 2019).

In particular, the analysis of the effects of artificial intelligence on collaboration in companies provides material for many important research questions. It would be interesting to investigate to what extent people and technologies understand their roles and whether people can work effectively in such a collaborative environment. In addition, there are still many gaps in the investigation of information exchange between humans and machines and between intelligent technologies (Seeber et al., 2018).

6   Conclusion

The results show that the tools that make internal collaboration easier have evolved into social software over time. Nowadays, almost every tool offers the possibility to communicate with each other via a chat function. A distinction between communication tools and project management tools is therefore no longer possible. Many of the presented tools are useful for both project management and communication. The technologies make it possible to work on projects at different times and in different places.

More and more companies use social media and recognize the significant potential for business activities (Petry, 2012, p. 179).

In the future, the topic of internal company collaboration will receive another building block, namely artificial intelligence. It will make it possible to shorten communication paths and overcome many hurdles that still exist. But the tools are evolving faster than people's willingness to use them and trust the technology. This problem could be solved by a simplification of the tools in the handling.

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Appendices

Appendix 1: Generation Y vs. Generation X vs. Baby Boomer (T. Petry, 2012, S.199).
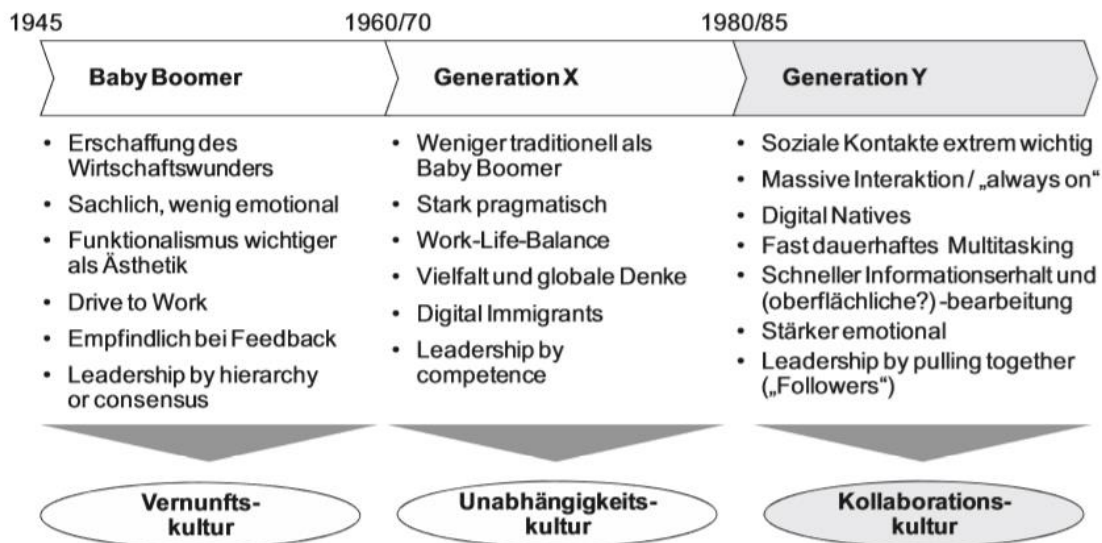
Appendix 2: Scenario in which artificial intelligence supports humans ((Seeber / Bittner and others, 2018).

Scenario 2: Crowd Testing

Luke sets up a new project for bug testing on the crowd-testing platform. Quickly, the first bug reports come in and are collected by an AI that forwards genuine and probably suitable reports to Luke. The AI constantly observes Luke's way of processing bug reports. Since its inception it has extended its original database of debugging algorithms and can solve programming errors in the bug reports independently and automatically. This time, most of the bug reports can be solved by the AI on the test system. The code changes are automatically put in the cue for the next update on the life system so that future crowd testers will no longer see the bugs. The AI forwards 5 genuine and suitable reports to Luke who then processes the first reports. He takes a long time to read it in detail. Luke likes that he does not have to deal with all the redundant bug reports that used to come in because testers sent reports over and over again or multiple testers worked on the same bug. After finishing up with the other bug reports, Luke checks the filtered bug reports because he knows that also his AI could make mistakes. Luke tells the AI to show all bug reports that have been filtered based on a probability score of below 0.95. Twenty reports show up and within 10 minutes he identifies two new important bug reports that had been wrongly categorized as redundant even though they had not been solved in the system. He is quite glad to have also checked the filtered list.