Table of Contents

List of Figures

List of Tables

Appendix

Abbreviation List

AVE ..... Average variance explained
CMC..... Computer-Mediated Communication
CMCIM..... Computer-Mediated Communication Interactivity Model
HTMT..... Heterotrait-monotrait ratio
IM ..... Instant messenger/instant messaging
IRT ..... Information Richness Theory
MST ..... Media Synchronicity Theory
PLS ..... Partial Least Square
PLS-SEM..... Partial Least Square Structural Equation Modelling
TMS ..... Transactive Memory System
VIF..... Variance Inflation Factor
VT ..... Virtual Team(s)

1 Introduction

This chapter gives a short introduction into the topic of communication and communication tools in teams, describes the research problem and the purpose of this thesis.

For a long time the research of virtual teams, i.e. teams that are dispersed over space and time, revolved around the question how information systems can be used to enable and facilitate an efficient team work and one of the underlying questions is how to facilitate the communication (Hertel, Geister, & Konradt, 2005; Piccoli, Powell, & Ives, 2004). While originally a main feature of virtual teams was their dependency on communication tools, in recent years the discussion has shifted. Communication in companies has become more and more computer-mediated and consequently an emerging topic is the degree of virtuality or virtualness of a company. The boundaries between virtual teams and teams in a computer-mediated company become indistinct. People in the same building work together as a team most of the time without meeting each other (Dixon & Panteli, 2010; Foster, Abbey, Callow, Zu, & Wilbon, 2015; Gilson, Maynard, Young, Vartiainen, & Hakonen, 2015; Hosseini, Zuo, Chileshe, & Baroudi, 2015; Schweitzer & Duxbury, 2010).

Theories of communication are a vast field and communication could be seen as a mostly subjective process in which people individually have to gain an understanding of the utterances they make and they receive (Maitlis & Christianson, 2014; Weick, 1995). In the context of computer-mediated communication (CMC) the discussion has revolved for a long period of time around the question whether inherent objective characteristics of communication tools would be predictors for their performance (Daft & Lengel, 1983; Daft, Lengel, & Trevino, 1987). This was due to the technical limitations of the tools to convey not all the (social) cues a face-to-face communication would convey (Sproull & Kiesler, 1986). As research has shown proponents of the idea of a relationship between objectively measureable characteristics of a communication tool and its performance were often disproved and the importance of the social influence on communication performance was emphasized (Dennis & Kinney, 1998; Janet Fulk, 1993; Walther, 1992; Yates & Orlikowski, 1992). Further research has pointed out that communication should be seen as an interaction of several communication tools for different purposes and they should be considered based on their ability to be accessible simultaneously for all participants of the conversation (Dennis, Fuller, & Valacich, 2008; Yoo & Alavi, 2001).

Taking a look at the used communication tools on the market, what becomes striking is that since the 1990s there was now real new type of communication introduced after video communication (e.g. comparing tools in Sitkin, Sutcliffe and Barrios-Choplin (1992) and Dennis, Fuller, & Valacich (2008)). Without a doubt, the advent of the internet and continuous incremental

improvements of the existing solutions have increased the accessibility and efficiency, but they are still limited due to the physical and conceptual boundaries of their technology.

A logical combination of communication tools is to pair a text-based communication cool with an audio- or video-based tool. For text-based communication a major differentiator between tools is the ability to communicate synchronously or asynchronously (DeLuca & Valacich, 2006). While emails have been and are still the most commonly used tools for the latter, instant messengers (IM) and chats have become popular representatives of the former (Cutrell, Czerwinski, & Horvitz, 2000; Sproull & Kiesler, 1986). Although they have never reached the same dissemination in organisations as emails, they have still been established as common used tools for communication. Originally, these tools were often spread in separate applications that companies have developed or bought. Now, they tend to be integrated and labelled as enterprise social media or social networking tools trying to replicate the popularity of social media in private life (Leonardi, Huysman, & Steinfield, 2013; Oostervink, Agterberg, & Huysman, 2016; C. Ou Xiaojuan, Ling Sia, & Kit Hui, 2013; Rauniar, Rawski, Yang, & Johnson, 2014).

One of this tools and the subject of this research is IM. As it was mentioned, IM is not a completely new tool, but available since more than twenty years (Nardi, Whittaker, & Bradner, 2000). Accordingly, there is already a body of research on this topic. A common subject in research of IM is to investigate the effects of interruptions (e.g. Basoglu, Fuller, & Sweeney, 2009; Cutrell et al., 2000; Garrett & Danziger, 2008; Mansi & Levy, 2013) caused by IM on performance and the general effectiveness of IM as communication tools (Chan, Ly, & Meulemans, 2012; Dorwal et al., 2016; Ou, Davison, Zhong, & Liang, 2010). Another aspect of text-based communication is the use of non-verbal communication in the form of emotion icons that are used to convey either emotions or to emphasize statements (Dresner & Herring, 2010; Luor, Wu, Lu, & Tao, 2010; Skovholt, Grønning, & Kankaanranta, 2014). A thriving force of the dissemination of IM has been the popularity of smart phones and with them the ability to carry an IM application anywhere, anytime. This push into the private lives of people could also be seen as an antecedent for an increased willingness to a more intensive use in a business context.

1.1 Research problem

A quick scan of pre-existing literature on instant messaging on Google Scholar has shown that while there is a decent body of research on instant messaging there are several shortcomings and accordingly, the following research problems were identified.

1. A large part of research has focused on analysing the effects of IM use on students in universities and schools which was not related to a working place context (Fox, Rosen, & Crawford, 2009; Lancaster, Yen, Huang, & Hung, 2007).

2. There is quite often a focus on adoption models, neglecting actual usage (Li, Chau, & Lou, 2005; Rauniar et al., 2014; Song & Wang, 2011).
3. Research on the performance of IM and the impact of interruptions was mainly conducted in the first decade of the 21st century with varying results (Basoglu et al., 2009; Cutrell et al., 2000; Czerwinski, Cutrell, & Horvitz, 2000a; Czerwinski et al., 2000a; Garrett & Danziger, 2008; Hudson, Christensen, Kellogg, & Erickson, 2002). Considering the growth and adoption of IM applications in daily life former results might be outdated as they were mainly focused on case studies and observations.
4. The research on IM use in the last five to six years was mainly driven by Asian researchers focussing especially on China (Ou & Davison, 2011; Ou et al., 2010; Wang, Zhao, Qiu, & Zhu, 2014; Ou et al., 2013; Yoon, Jeong, & Rolland, 2015; Yoon & Kim, 2013). These studies rely often on local concepts like swift guanxi (Ou, Pavlou, & Davison, 2014). Bearing in mind the cultural differences of Asian countries as compared to the Western hemisphere it is reasonable to re-evaluate their results in other countries.
5. Following Vodanovich, Sundaram and Myers (2010) the generation of the so called digital natives has entered the labour market and they bring their previous experiences with social media tools into companies suggesting a higher tendency to make use of them.

Accordingly, only very few recent studies have examined the use of IM in a working context in Europe and further investigation can help to compare past foreign results with the current development (De Vos, Hofte, & De Poot, 2004; Fetter, Seifert, & Gross, 2010; Handel & Herbsleb, 2002). Moreover, there is a possibility to draw on exiting measures to obtain better results.

1.2 Purpose

Based on the increasing number of users of IM on smartphones, as well as their integration in enterprise social media platforms there is a need to investigate whether the mostly private usage of smartphones has already translated to usage in the work place. Due to the availability of these tools it is possible to rely on different means of communication. The purpose of this study is thus to assess the impact that the usage of IM as a communication tool can have on teamwork and especially on the performance of teams. In addition to that, being a communication tool, its effectiveness as such should be assessed by taking a look at its influence on knowledge sharing which is the core aim of a communication tool in business setting.
These relationships should be examined and potential underlying factors, relationships and their subsequent interdependencies worked out.
Specifically, this research should focus on workers in Germany as a large European country to contrast research conducted in Asia.

Therefore, the following Research Questions are assessed:

RQ 1: How does use of IM affect teamwork performance in Germany?
RQ 2: How does use of IM affect knowledge sharing among teams in Germany?

1.3 Delimitations

This thesis will focus on German members of teams. The reason for this delimitation is to minimize cultural biases. German is a language that is almost only spoken in Germany, Austria and Switzerland, three countries that have a rather similar origin and cultural background. In order to avoid a distortion of the intended results, participants of this thesis will be questioned in German. This serves as a clear control criteria. It is also helpful to reach out to people as the topic of communication in teams and performance is a rather sensitive topic where it seems favourable for participants to answer in their native tongue as compared to English where there might be a risk to not fully comprehend the questions.

This study aims to gain a broad overview of the perceptions of workers throughout all kind of organisations. Thus, it does not specify a specific setting as a requirement to participate in this study. Participants are asked to refer to their latest teamwork experience. On one hand this increases the size of the population, on the other hand it decreases the possibilities to control for every variable. Especially the field of social factors such as the social network is not included in this study. While this could be an important effect, it is also a variable that is built over a long period of time and difficult to capture. It is therefore not feasible in the realm of this thesis as the focus is on communication related to communication tools and these more specific factors shall be examined.

While there are some representative studies that indicate a large spread of IM throughout Germany, there is not enough reliable information to generate a useful projection of the population size. Accordingly, this thesis cannot rely on probabilistic means to assemble the sample, but uses non-probabilistic means. As a consequence the results of this thesis cannot be generalized to the entire population as such. However, a sufficiently large sample could still provide useful insights into latent variables and relationships that serve as the foundation for further examination. It could thereby serve an explorative purpose.

While there is a body of literature on the influence of IM on the performance of students in school and university, this thesis does not encompass this group but focuses explicitly on people in a work related context. This allows to avoid age and pressure related biases that might affect the attitude and perception of students.

1.4 Definitions

In order to enhance the understanding of this thesis several concepts and terms are defined in this section. They are revisited throughout this thesis.

Communication: Communication is the creation of a message that contains information and the subsequent exchange of this message between at least two persons and is usually a circular process (Holden & O'Toole, 2004).

Computer-mediated communication: CMC describes a communication process that is facilitated via a communication tool running on a computer/phone/tablet or a dedicated device. The transmission can consist of video, audio or text based content as well as a combination of those. It can occur either synchronously in real time or asynchronously, whereby it can be seen as a continuum with forms in-between that allow almost real time communication. (Dennis et al., 2008).

Instant messaging: IM refers to a text based communication tool that is usually called instant messenger, but sometimes also labelled chat or direct messaging. It is typically seen as a form of communication that occurs almost in real time. The communication history is displayed in a sequential flow format that allows the participants to track the communication process over a long period of time in one single window without the necessity to check a history of distinct messages. This creates the impression of a more direct communication. IM can be a stand-alone application or is integrated as a function in other applications or environments. Modern versions also allow to transmit audio or video messages as well as pictures and documents (Cameron & Webster, 2005).

Knowledge sharing: Knowledge sharing encompasses the sharing of tacit and explicit information and knowledge. It can either entail the sharing of task related knowledge, but also relate to providing access to human and non-human sources of knowledge (Nonaka, 1994).

Team: A team is a group of people that works in the realm of a project towards a dedicated goal (Cohen & Bailey, 1997).

Teamwork performance: It relates to the extent to which a team can reach its desired outcomes and to the extent to which the collaboration within the team has improved and not inhibited the work of the team as a whole (Fuller, Hardin, & Davison, 2007).

2 Theoretical Background

This section aims to provide an overview of the various aspects of (virtual) teams, CMC theories, and communication that are the foundation for this thesis. Drawing on different facets of the contemplation of these areas the difficulty in capturing the value of CMC should become clear. Based on these different perspectives the specific case of IM can be examined in the later part.

2.1 Teams, Virtual Teams and Virtuality in teams

In general, virtual teams (VT) are a form of teams. The difference between a team and a group is proposed to be seen in its level of interdependency and integration that exist in a team and not in a normal group (Gibson & Cohen, 2003; Powell, Piccoli, & Ives, 2004). Cohen and Bailey (1997) have provided a respective definition of a team that incorporates these thoughts:
A team is a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems (for example, business unit or the corporation), and who manage their relationships across organizational boundaries (p.241). That being said teams can be seen as a specific form of groups that are mostly referred to as small cluster of people at work (Powell et al., 2004). However, the two terms are still quite often used interchangeably, therefore this thesis will focus on using the term team, but refer to it as groups if presented literature describes it as such (Cohen & Bailey, 1997; Mortensen, Caya, & Pinsonneault, 2009).

Schweitzer and Duxbury (2010) have analysed the additional premises that make a team a virtual team. According to their analysis six major premises have been discussed in the research of virtual teams; asynchronicity, temporality, boundary spanning, cultural diversity and being enabled by communication technology. A further elaboration on these criteria has shown that most of these premises are not mutually exclusive to virtual teams but can also be found in normal teams to a certain extent. Therefore, the authors contend that only geographic dispersion, a condition where the team members do not work at the same place and asynchronicity, a condition where the team members to not work all at the same time, are criteria that justify for a team to be a virtual team (Gibson & Cohen, 2003; Powell et al., 2004; Schweitzer & Duxbury, 2010). It is argued that the use of communication technology is a property of all teams and in the case of virtual teams it is a result of the unavailability of regular face-to-face meetings, but not an essential premise (Fiol &

O'Connor, 2005; Foster et al., 2015; Gibson & Cohen, 2003; Jarvenpaa & Leidner, 1999). Schweitzer and Duxbury (2010) contend that geographic dispersion and asynchronicity are standalone criteria that characterise a virtual team, thus not both of them have to be in place. Consequently, their definition of a virtual team reads as follows:

A VT is first and foremost a team, which means that it is made up of individuals working together interdependently with mutual accountability for a common goal. In addition, in order to be considered virtual, a team must have members who do not work in either the same place and/or at the same time, and therefore cannot collaborate face-to-face all of the time. As such, VT members must rely on communication technology to get their work done. As with proximate teams, VTs would likely have varying lifespans and degrees of diversity with respect to organizational/national boundaries, culture, nationality, expertise, profession, etc. (Schweitzer & Duxbury, 2010, p. 274).

Virtual teams allow an organisation to configure teams that consists of the best possible talents. The computer-mediated communication allows to bridge individuals situated at different locations. Therefore, the quality of the decisions that a team makes is expected to be enhanced. As organisations are more often cooperating on a temporary basis with external actors, virtual teams enable them to avoid unnecessary high costs for travelling and coordination, which became especially common in the context of the globalization (Martins, Gilson, & Maynard, 2004; Townsend, DeMarie, & Hendrickson, 1998). Moreover, employers can make use of it to attract and retain employees as they can offer them more flexible working conditions by allowing them to work from home (Cascio, 2000).

Another use of virtual teams is in the field of software development where teams or/and sub-teams are working spread over the globe to allow a continuous work on a project for 24 hours. This approach is also called a "Follow the Sun" approach (Carmel, Espinosa, & Dubinsky, 2010; Colazo & Fang, 2010). The intent is often to minimize the time to market, reduce the costs and draw on the best available experts to ensure a high quality. Research in this field has shown that this approach is very much dependent on good functioning coordination mechanisms, especially with more complex tasks (Carmel et al., 2010; Cummings, Espinosa, & Pickering, 2009; Jalote & Jain, 2006; Setamanit, Wakeland, & Raffo, 2007; Sooraj & Mohapatra, 2008; Taweel & Brereton, 2006; Wiredu, 2011). However, it should be considered that the size of software development teams can often reach numbers of fifty and more members and they are mostly split up in local teams (Cummings et al., 2009; Espinosa, Slaughter, Kraut & Herbsleb, 2007).

As computer-mediated communication tools are becoming pervasive in modern companies the concept of virtualness or virtuality has evolved from the concept of virtual teams. The distinction between a virtual team and a computer-mediated team is becoming more and more blurry (Dixon & Panteli, 2010; Foster et al., 2015; Ganesh & Gupta, 2010; Gilson et al., 2015; Ortiz de Guinea, Webster, & Staples, 2012; Rapp, Ahearne, Mathieu, & Rapp, 2010). Therefore, it is proposed that

the categorization in virtual teams is outdated, but virtualness should be seen as a characteristic of teams. Following Ganesh and Gupta (2010) virtualness can be characterised on the basis of two dimensions; dispersion related factors and technology-related factors. The former relate to physical dispersion between members, temporal difference between members, social and cultural diversity and task and work process diversity. The latter refers to the level of technology used for communication and the level of media richness of the communication tools.

In Kirkman and Mathieu's (2005) concept team virtuality comprises of three dimensions; the extent to which a team depends on the use of computer-mediated communication tools, the tools' information value, and synchronicity. Consequently, virtuality could be seen as a continuum with these three dimensions. Teams that use no communication tools are seen as one extreme and teams that interact exclusively through communication tools are the opposite extreme of this continuum. Information value, i.e. degree that a combination of communication tools furthers team effectiveness by enabling communication and data transmission, is seen as less virtual the richer this information value is. Accordingly, a higher level of synchronicity, i.e. the extent of synchronous communication, leads to a lower level of virtuality (Kirkman & Mathieu, 2005; Mesmer-Magnus, DeChurch, Jimenez-Rodriguez, Wildman, & Shuffler, 2011).

In his Time, Interaction and Performance theory, McGrath (1991) describes that work groups are continuously involved in three functions; the production function (i.e. contribute to the organisation), the member-support function (i.e. contribute to the group members) and the group-wellbeing function (i.e. contribute to the group as a whole). The last two functions are related to developing relationships (Jarvenpaa & Leidner, 1999). Moreover, groups activities are falling under four different modes; inception (Mode I), problem solving (Mode II), conflict resolution (Mode III) and execution (Mode IV). It is proposed that teams that have established a relationship among each other and are used to their communication tools do not need to invest a lot of time in Mode II and Mode III and can therefore focus more on Mode I and Mode IV which means to focus on the performance of the team (Hollingshead, McGrath, & O'Connor, 1993; J. E. McGrath, 1991).

In the context of computer-mediated communication it is argued that a higher level of virtuality has a negative impact on the task-related collaborative behaviour. It is explained that due to the lack of direct contact the team members' perceptions of trust will be lower and accordingly the willingness to participate is diminished (Foster et al., 2015; Peñarroja, Orengo, Zornoza, & Hernández, 2013). While many studies imply direct and indirect negative effects of virtuality on team processes and team outcomes, it is also emphasized that these findings are strongly dependent on contextual factors. Despite the fact that measures for virtuality differ between studies it is indicated that especially teams that have worked together for a longer period of time are way less vulnerable towards the negative effects (Ortiz de Guinea et al., 2012).

Overall, it becomes clear that the influx of communication tools in companies has resulted a shift in the ways teams can work. The work of a virtual team and a local team converge more and more. Tools primarily used for virtual teams are now used in a local context.

2.2 CMC Theories

Theories of communication originates from different disciplines. From the start of computer-mediated communication in the 1980s discussions have revolved around the question whether there are clear characteristics of communication tools that allow to determine the optimal choice for specific tasks.

2.2.1 Information Richness Theory (IRT) and media richness

Daft and Lengel (1986) were analysing the reasons of organisations to process information. As an underlying assumption for their theory they assumed that information processing is influenced by uncertainty and equivocality. While the former describes a lack of information and requires accordingly the provision of information, the latter requires to reach a consensus about a common interpretation (Dennis & Valacich, 1999). Depending on the nature of a task in regards of these to contingencies, information requirements are defined in order to mitigate them. The subsequent consequence is to adjust the organisational structure accordingly. In order to do so two dimensions have to be considered, the amount of information and richness of information(Daft & Lengel, 1986). Language does not only comprehend the spoken word, but exists in multiple shapes and can be ambiguous in its meaning (Daft & Wiginton, 1979). The authors define information richness as *the ability of information to change understanding within a time interval. Communication transactions that can overcome different frames of reference or clarify ambiguous issues to change understanding in a timely manner are considered rich. Communications that require a long time to enable understanding or that cannot overcome different perspectives are lower in richness* [also described as *lean*] *. In a sense, richness pertains to the learning capacity of a communication* (Daft & Lengel, 1986, p. 560). Media richness is therefore the extent to which a medium can transmit information richness.

This is based on the concept of a social presence, which is defined as *the extent to which one feels the presence of a person with whom one is interacting* (Burke & Chidambaram, 1999, p. 559). Lowry, Roberts, Romano, Cheney and Hightower (2006) provide a more extensive definition for the context of computer-mediated communication as they describe social presence *as the degree to which a communication medium allows group members to perceive (sense) the actual presence of the communication participants and the consequent appreciation of an interpersonal relationship, despite the fact that they are located in different places, that they may operate at different times, and that all communication is through digital channels* (p. 633).

According to Short, Williams and Christie (1976) media differ in the range they can impart a social presence. The underlying assumption is that a human social system is too complex for a machine facilitated system to be captured. Especially the ambiguity in a social context can only be processed by humans in an appropriate manner (Daft & Lengel, 1986, p. 569). This presence imparts social cues that are necessary to develop interpersonal relationships. Thus, social presence theory expects a fit between the medium's ability to convey social presence and the task in order to perform the task effectively (Pazos, Chung, & Micari, 2013; Short et al., 1976).

As rich information cannot be processed by all communication media to the same extent, the authors have developed a hierarchy of media richness (Daft & Lengel, 1983; Daft et al., 1987). It considers the differences between the media in regard of (1) feedback, (2) multiple cues, (3) language variety and (4) personal focus. The hierarchy in decreasing order reads as follows (1) face-to-face, (2) telephone, (3) addressed documents (e.g. letters, memos, notes (4) unaddressed documents (e.g. flier, bulletin, standard report) (Daft et al., 1987, p. 358). The major advantage of face-to-face is the possibility to receive immediate feedback and clarify ambiguity through conveying the social presence. This can be done due to its physical presence, be it in the form of facial expressions, body language or the tone of the voice who provide a respective cue to convey the meaning of the information (p. 357).

The capability of a medium to transfer a multitude of cues and the maximal amount of time it takes to receive a feedback is also called its bandwidth, having a high bandwidth when the medium can transfer a larger amount of cues, such as in a face-to-face meeting compared to a low bandwidth medium such as emails (Burke & Chidambaram, 1999).

A medium with a high bandwidth is therefore considered to further a better performance compared to a low bandwidth medium in a situation of high equivocality while low bandwidth media are better suited to resolve situations of uncertainty that require the provision of information and facts (Yoo & Alavi, 2001). Daft et al. (1987) describe this with the interdependency between oversimplification and overcomplication, the former meaning the loss of the social cues and the latter referring to unnecessary distraction based on too many social cues. Following Rice (1992) an effective communication tries to find an equilibrium between those two poles. Referring to the task upon which a media choice is made, Rice defines its characteristics by the level of analysability or structure, implying that for analysable or structured task leaner media are more suitable, while for unanalysable and more complex tasks richer media are preferably.

Thus, overall IRT states that depending on the information processing requirements the right choice of media based on its inherent characteristics can help to enhance the processing of information in the most effective manner (Dennis et al., 2008).

As the original theoretical foundation of IRT was largely based on a pre-CMC era the advent of more sophisticated computer mediated communication media lead to further extensions and refinements of IRT, trying to answer the question whether the objective measures of IRT are applicable to these. In subsequent studies emails as media was included and in the hierarchy of media richness and ranked it between telephone and addressed documents (Kydd & Ferry, 1991; Trevino, Lengel, & Daft, 1987; Trevino, Daft, & Lengel, 1990; Zmud, Lind, & Young, 1990). As Walther (1996) points out a lot of the discussion around IRT encompasses the question to what extent CMC are capable of transmitting social presence (Sproull & Kiesler, 1986).

Recognized as one of the most influential theories, empirical studies have provided mixed results providing support as well as contradictions, especially predictions of media choice were not proven (Dennis, Valacich, Speier, & Morris, 1998; Lee, 1994; Yates & Orlikowski, 1992). Dennis et al. (1998) argue that studies of IRT often oversee that new media capabilities especially in regard of video conferencing might work in settings that IRT didn't expect and emphasize that the immediacy of feedback combined with the possibility to engage simultaneously in a conversation with several people allows a more effective use of the medium than comparable analogue media. A reason for this could be that IRT's empirical testing has focused too much on simple communication task and not encompassed more complex scenarios (Dennis & Kinney, 1998).

2.2.2 Social Influence perspective

While IRT focuses on the characteristic of media and explains its reasoning based on objectively inherently measurable aspects, the social influence perspective considers the same aspects to be subjective and influenced by the social context. It is argued that even if there were objective measureable properties of the media it would still require the participants to act solely rational and objective (Fulk, Steinfield, Schmitz, & Power, 1987). Accordingly, the authors talk about the perceptions of media characteristics and task requirements that consider objective properties, but are also shaped by the perception of the social environment as well as by own past experiences. Consequently, the attitudes toward the media and actual use behaviour are shaped over time by these perceptions and the experience through individual usage. Empirical studies have found that especially co-workers' and supervisors' use had a strong social influence on the usage behaviour (Rice & Aydin, 1991; Schmitz & Fulk, 1991). It has repeatedly been shown that the information richness of a medium is still a relevant influencing factor for the perception (Fulk, 1993; Markus, 1994; Walther, 1995). Walther (1994) criticises this perspective for being too narrow, only explaining the selection process of the media ignoring the actual use of the media. Using the email as an object of research Lee (1994) explains that the richness of the information is not determined by the medium's properties, but to a certain extent depending on the organizational context of the individual. Lee describes it as *an emergent property of the interaction of the e-mail medium with its organizational context, where the interaction involves distanciation, autonomization, social*

construction, appropriation, and enactment (p.156). Accordingly, there is not one appropriate mean of communication, but the necessity to adjust to different circumstances.

Another sign of social influence shaping communication can be found in Yates and Orlikowski's (1992) concept of genres of organisational communication. It is defined as *a typified communicative action invoked in response to a recurrent situation* (Yates & Orlikowski, 1992, p. 301). Following structuration theory they argue that genres are based on specific rules and these rules shape the behaviour of the users, but the behaviours of the users also shape these rules. Thus, over time the rules will change (Giddens, 1984; Yates & Orlikowski, 1992). A graphical illustration of this process can be seen in Figure 2-1. Orlikowski and Yates (1994) analysed the communication of a team of computer language developers, that were spread over the United States and worked on a two year project. They communicated via e-mails and around 2,000 of those were reviewed. In addition to that secondary information was gathered through semi-structured interviews with nine participants. The evaluation showed that several genres of communication have emerged during the project work (memo, dialogue, proposal, ballot).

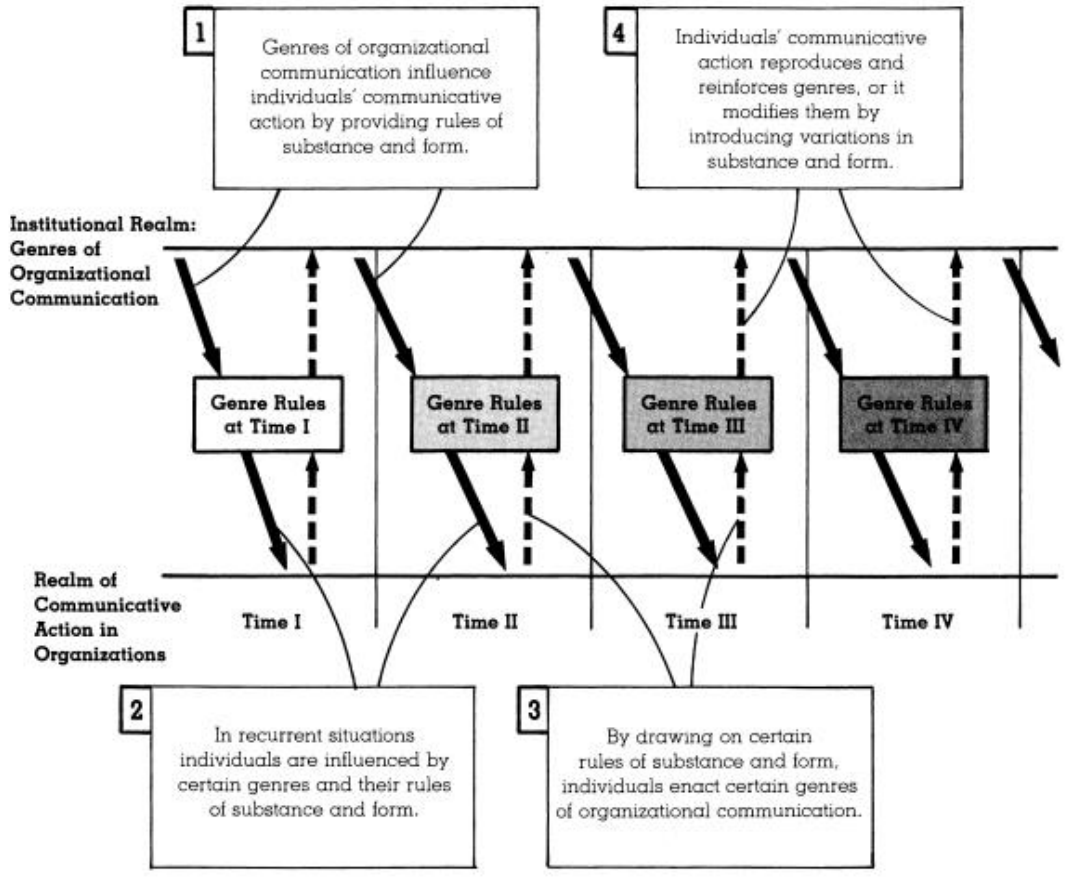

Figure 2-1: Process of genre evolution by Yates and Orlikowski (1992)

Overall, it is argued that the organization as a whole and groups within it develop their own genre repertoire that is not only shaping the way they communicate, but also the media they intend to use for a respective genre.

Burke and Chidambaram (1999) examined the use of media channels in a longitudinal study with 33 groups, encompassing face-to-face, distributed synchronous and distributed asynchronous communication, simulating different time zones. Their results provide proof that the perception of social presence is higher for a high bandwidth medium, e.g. face-to-face compared to a distributed group. While the perception of the communication effectiveness was similarly favouring face-to-face in the beginning, during the course of the study the perceptions reached an equal level. However, regarding the performance of the groups the authors found that distributed groups were outperforming face-to-face groups when processing tasks related to ambiguous situations. They explain this result with Walther's (1996) concept of hyper-communication which assumes that the reduced amount of cues in low bandwidth media leads to a stronger focus on resolving the required task as less, mostly irrelevant information has to be processed. This means that there are more mental capacities available to engage in the communication itself. Contrary, the large amount of cues in high bandwidth media can lead to more distraction, as the increased social presence of the other persons also draws to the attention on each other, furthering in some circumstances positive or negative feelings and thus reducing the awareness of the task. Considering asynchronous distributed groups, the study didn't reveal significant differences compared to the synchronous distributed group suggesting that these groups have a strong focus on the task, too. Moreover, the authors stress that a facilitating aspect for distributed groups was the fact that the groups are solely dependent on their communication system that also recorded the information ensuring that all members had access to the same information. Thus, it is assumed that the importance of an immediate feedback channel for distributed groups is more related to the task than inherently crucial for a successful performance. Siegel, Dubrovsky, Kiesler and McGuire (1986) propose that considering the awareness of the slower speed of typing and writing compared to speaking the group members will already focus on pointing out there opinion immediately avoiding unnecessary delays.

Yoo and Alavi (2001) extend the two perspectives and added the aspect of group history to their research. They examined how group cohesion as well as well media condition influence the perception of social presence, task participation and group consensus in a laboratory experiment. Their findings show that for new newly established groups the possibility of video mediated communication increases the perception of social presence, but it also leads to less focus on task participation. Moreover, for established groups it was shown that group cohesion has a positive influence on social presence and task participation. This encompasses also that for those groups group cohesion has a stronger influence on social presence and task participation than the media condition. In addition to that, the results indicate that a high degree of social presence does not facilitate group consensus and a high degree of task participation is only positively affecting group consensus in the context of established groups. Considering interdependencies between group

cohesion and media condition a potential substitutional effect was not found but both factors have rather a complementary effect on each other.
Based on their results the authors suggest that besides social loafing a rich media such as video that has a lot of social cues can have a negative influence on task participation as it provides increased incentives for socialization.

Watson-Manheim and Bélanger (2007) look at the use of media for communication from the perspective of the communication media repertoires, which they define *as the collection of communication channels and identifiable routines of use for specific communication purposes within a defined community* (p. 268). They argue in their framework that the use of communication media is determined by structuring conditions that can be either institutional or situational, the perceived consequences of use and the communication media repertoire. The authors stress that it is important to not only focus on one channel of communication and compare it to face-to-face meetings but to acknowledge that the availability of a multitude of communication media will lead to the usage of all of them. In that regard it is important to consider the situational factors, e.g. urgency is seen as factor where emails are not the appropriate means of communication.

2.2.3 Media Synchronicity Theory (MST)

MST was originally presented as conference papers 1998 and 1999 and published in a refined version in 2008 (Dennis et al., 2008; Dennis & Kinney, 1998; Dennis & Valacich, 1999). This theory aims to analyse communication performance. The authors defined media synchronicity as *the extent to which a communication environment encourages individuals to work together on the same activity, with the same information, at the same time; i.e., to have a shared focus* (Dennis et al., 1998, p. 1). It is argued that a flaw of former theories was to focus on fit of media characteristics for a respective task as a whole as this is a too abstract perspective. Based on this premise the authors propose to take the communication processes required to resolve the task as a reference to select the appropriate media capabilities (Dennis, Fuller, & Valacich, 2008). Two communication processes are identified as integral part of every task; conveyance and convergence.

Conveyance refers to the supply of new information and the subsequent processing and situational classification of the participants. This processing can encompass large amounts of a variety of information and thus demand an appropriate amount of time.

Convergence refers to agreeing upon a shared meaning of the information and to ensure awareness of this shared meaning which is also in line with social constructionist perspective (Dennis & Valacich, 1999; Miranda & Saunders, 2003; Weick, 1985; Weick, Sutcliffe, & Obstfeld,

2005). However, it is also assumed that this process of constructing a shared meaning will not always happen or be successful and a result of the process to agree on a meaning can also contain the possibility that the participants agree to disagree (Dennis et al., 2008; Lind & Zmud, 1991; Sitkin et al., 1992).

The conveyance process serves to create an individual understanding of the information based on the respective perceptions and experiences whereas the convergence is triggered by the participants of the communication process as a whole (Dennis et al., 2008).
In terms of IRT, to resolve equivocality convergence is necessary, while resolving uncertainty requires conveyance (Dennis & Kinney, 1998). However, it is emphasized that in both situations convergence and conveyance are required, because information is necessary to reach a conclusion and in order to progress together convergence is necessary (Dennis & Valacich, 1999). An underlying premise of MST is that synchronicity has a strong positive effect on convergence while it does not affect conveyance. The latter can be explained as a synchronous supply of information has shown to be not related with a synchronous processing of it (Dennis et al., 2008; Miranda & Saunders, 2003). Accordingly, Dennis et al. (2008) propose that a focus on conveyance is best suited with media with a high synchronicity while conveyance can be furthered with media with low synchronicity.

In a next step the authors define the media capabilities which describe the extent to which the properties of the media allow to transmit and process information and shape the media synchronicity. Based upon the technical model of communication, five capabilities were derived (Shannon, 1948). For the transmission of information parallelism, transmission velocity and symbol sets have been defined as capabilities. For the processing of information, rehearsability and reprocessability are the relevant capabilities. Transmission velocity represents the delivery speed of a message, parallelism refers to the number of transmissions at the same time and symbol sets encompass the range of possible ways a medium can capture the provided information and its cues. Rehearsability describes the ability of a medium to adjust the message before it is sent and reprocessability describes whether and how long a message can be accessed after the original receiving.

Considering that media tend to have strengths either for convergence or conveyance a combination of several media may be the best solution for respective tasks (Dennis & Valacich, 1999). In order to improve communication performance there is a need to find a match of the communication processes and media synchronicity, but there are also appropriation factors that have to be considered. They refer to the context of the communication.
One overarching characteristic of a task is the question whether it can be fulfilled mostly through complementary or collaborative actions (Shaw, 1961). Accordingly, a different extent of interaction and coordination is necessary. The variable that determines the appropriation to the communication context is its familiarity and familiarity is shaped by training, past experiences

and social norms. In a situation of low familiarity, a large share of convergence processes and thus high media synchronicity is necessary. Over time and reaching a higher level of familiarity, convergence processes are expected to become less relevant and so making high media synchronicity less important and therefore the richness of a medium may lose its importance (Dennis et al., 2008). A graphical illustration of MST can be found in Figure 2-2.

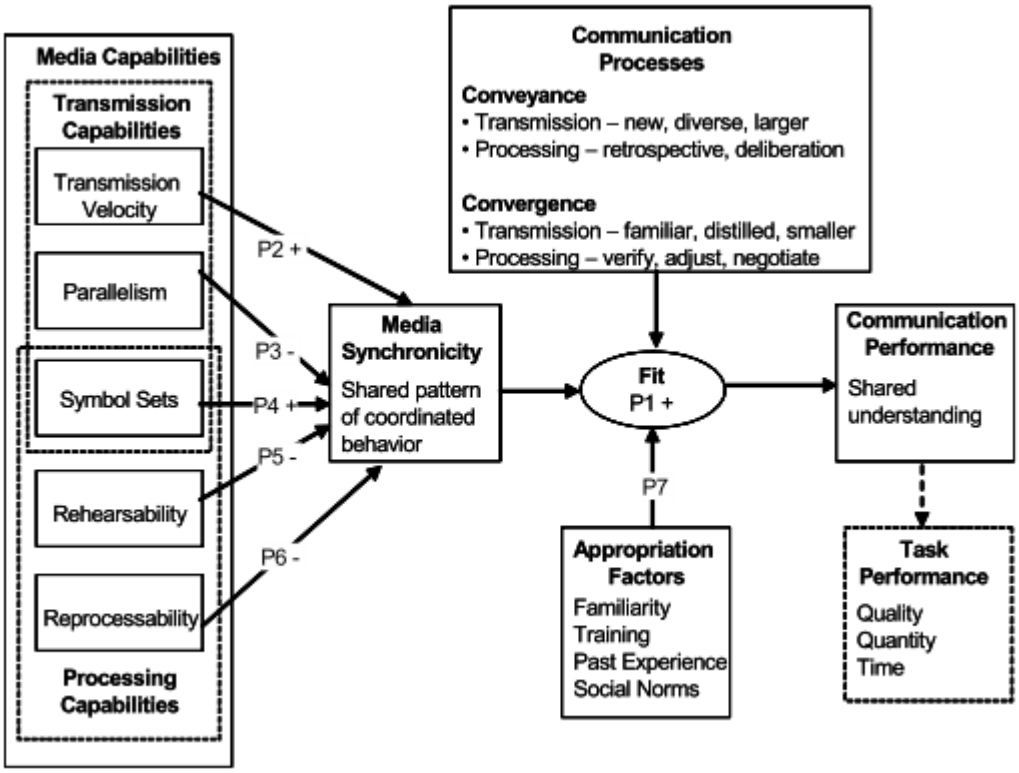

Figure 2-2: Media Synchronicity Theory by Dennis et al. (2008)

Lam (2016) tested MST in a field study and evaluated whether previous training of the propositions of MST would improve the communication of a group. He found that groups who received training communicated more often and reached higher levels of media fit, quality of discussions, communication richness and communication openness than groups without training.

2.2.4 Computer-mediated communication interactivity model

Lowry, Romano, Jenkins and Guthrie (2009) propose the computer-mediated communication interactivity model (CMCIM) in which they contend that interactivity positively influences communication quality, which leads to process satisfaction of work groups. They argue that process satisfaction is an important determinant of the performance of workgroups and their adoption of a collaborative group system. Their premise is that computer-mediated

communication tools allow more communication interactivity than face-to-face technology could provide. In their model, interactivity is described from the perspective of perceived interactivity as it can be used to explain to what extent the capabilities of a technology influence the perception of interactivity. The authors identified communication efficacy and direction of communication as the underlying foundation of perceived interactivity. Communication efficacy describes the user's perception of control of the communication and the extent to which a recipient can understand and reply to a message. The concept of direction of communication refers to the extent to which a communication tool allows two-way communication (Song & Zinkhan, 2008). Based on these two concepts, three sub-constructs of interactivity were derived (Liu, 2003). Those are 1) two-way communication as interactivity encompasses the involvement of at least two persons and a way for them to respond to each other, 2) control which explains the impact of the user on the communication process including the possibility to hide the own identity and interrupt it and 3) synchronicity which is here the extent to which communication is happening simultaneously (Paul Benjamin Lowry, Romano, et al., 2009).

For the effect of interactivity on communication quality, Lowry et al. (2009) draw on the underlying assumption that communication is always an action between at least two parties which means that one party has to make sense of the other's communication symbols (i.e. any form of communication). The authors argue that computer-mediated communication interactivity can be seen as a communication symbol in an interaction and positively affect communication quality. Communication quality is defined as a composition of communication openness, discussion efficiency and discussion effectiveness. It is predicted that communication efficacy is positively influencing communication openness, as the perceived control over the communication tool makes them more secure to engage in a discussion and subsequently discussion efficiency and discussion effectiveness will be increased. Direction of communication of a computer mediated-communication tool is also expected to facilitate communication as it conveys the impression that a communication flow between the parties can be established and maintained. Accordingly, these properties of interactivity are reinforcing each other to increase the communication quality. In order to reach this effect of interactivity it is important that the involved parties perceive the co-presence of each other, which means that the communication tool is running, i.e. it is accessible for them.

The resulting proposition of the CMCIM is that communication quality is positively related to process satisfaction. Process satisfaction refers to the extent to which group members are satisfied with the means to reach an outcome (Lowry et al., 2009; Reinig, 2003). The underlying theory is expectations disconfirmation theory. It assumes that people compare their expectations of an experience after engaging in it with the one they had before and feel satisfaction depending on whether their expectations were negatively or positively disconfirmed (Paul Benjamin Lowry, Romano, et al., 2009; McKinney, Yoon, & Zahedi, 2002). Consequently, their satisfaction influences future behaviour.

Regarding communication quality, there are expectations of the three dimensions, communication openness, discussion efficiency and discussion effectiveness and consequently, the extent to which these expectations are positively disconfirmed influences process satisfaction. Lowry et al. (2009) argue that computer-mediated communication interactivity will be compared with interpersonal communication, but depending on the communication tool used the expectations will be on a different level. Thus, it is proposed that increased communication quality leads to increased process satisfaction.

The authors also propose that status effects will act as negative moderators between communication quality and process satisfaction. Status effects refer to differences of individuals within a group that are perceived by the members during the interaction. They can be seen in the form of group members feeling afraid of presenting ideas to avoid criticism, group members who restrain from criticizing to avoid retribution or a group member being in a dominant position within the group. Accordingly, status effects diminish the participation of group members in a group.

The final proposition of the CMCIM is that social presence positively affects status effects. This predicts that communication tools that convey a higher level of social presence convey also more social cues. Those are necessary to perceive status effects and consequently status effects will be increased in this case.

A graphical illustration of the CMCIM and its propositions can be seen in Figure 2-3.

In an empirical study of their model in the extreme context of large groups with a very lean communication tool the authors' results indicate support for the model. Given the support in an extreme condition the authors further argue that their model is also likely to sustain in context of less lean communication tools (Lowry et al., 2009).

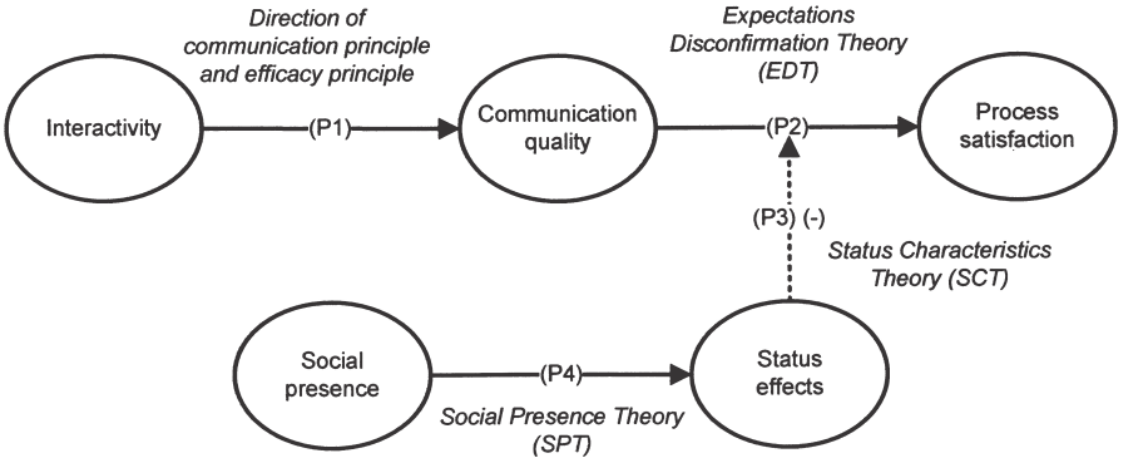

Figure 2-3: CMCIM by Lowry et al. (2009)

So, there are several perspectives that describe the impact on the efficacy of CMC tools such as IM.

2.3 Communication

This section provides a definition of communication in an organisational context. It is followed by a section about the concept of sensemaking, the process that allows an individual and a team to gain a similar meaning of data and information. This is the foundation for communication to happen effectively. Communication quality is then introduced as a means to capture the effectiveness of communication. As this study aims to assess the influence of the communication tool instant messenger on knowledge sharing the relationship between communication an knowledge sharing is also elaborated.

2.3.1 Definition

Communication is at its core the creation of a message that contains information and the subsequent exchange of this message between at least two persons and is usually a circular process. In the organisational context four purposes for the exchange of information have been proposed: task messages, related to job efficiency, maintenance messages that incorporate regulatory means, human messages that affect the social interaction and innovative messages that provide cues for the organization to evolve (Goldhaber, 1990; Holden & O'Toole, 2004).
Communication is especially seen as the important foundation for knowledge transfer (Schwartz, 2007).

2.3.2 Sensemaking

An important antecedent and part of communication is the process of sensemaking, the development of an understanding of events and issues in their environment that are unclear (Maitlis & Christianson, 2014). A lot of the discussion of sensemaking in organisations is based on the work of Weick (1995) who describes it as follows: *[S]ensemaking unfolds as a sequence in which people concerned with identity in the social context of other actors engage ongoing circumstances from which they extract cues and make plausible sense retrospectively, while enacting more or less order into those ongoing circumstances* (Weick et al., 2005, p. 409). Maitlis and Christianson (2014) analysed the research on sensemaking and identified four features that are common among sensemaking concepts. Sensemaking is seen as a dynamic, continuous process, that is triggered by the avenue of cues that are contrary to the own expectations, it is embedded in the social context and it encompasses to take action in order to start the sensemaking process.

Klein, Moon and Hoffman (2006) introduced the data/frame theory as a metaphor to describe the process of sensemaking based on the idea that it always starts with some kind of a framework. The model can be seen in a simplified version in Figure 2-4

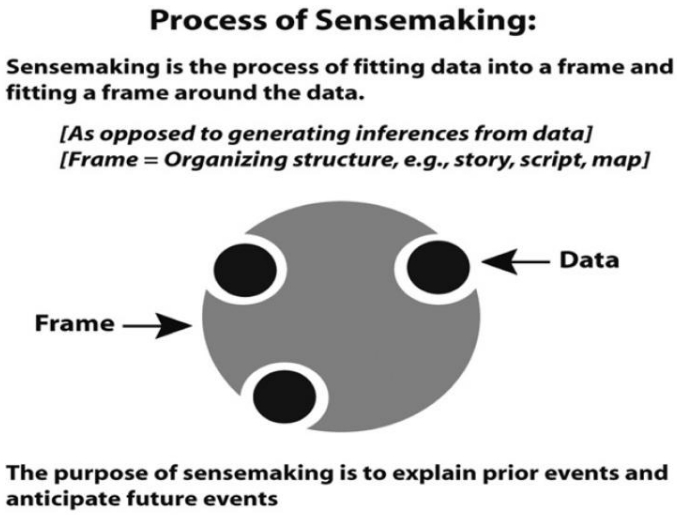

Figure 2-4: Simple data/frame diagram by Klein, Wiggins, & Dominguez (2010)

Klein et al. (2010) propose five sensemaking strategies, which are identifying a frame, questioning a frame, reframing: comparing frames, reframing: creating a new frame and elaborating a frame. A graphical illustration can be seen in Figure 2-5.

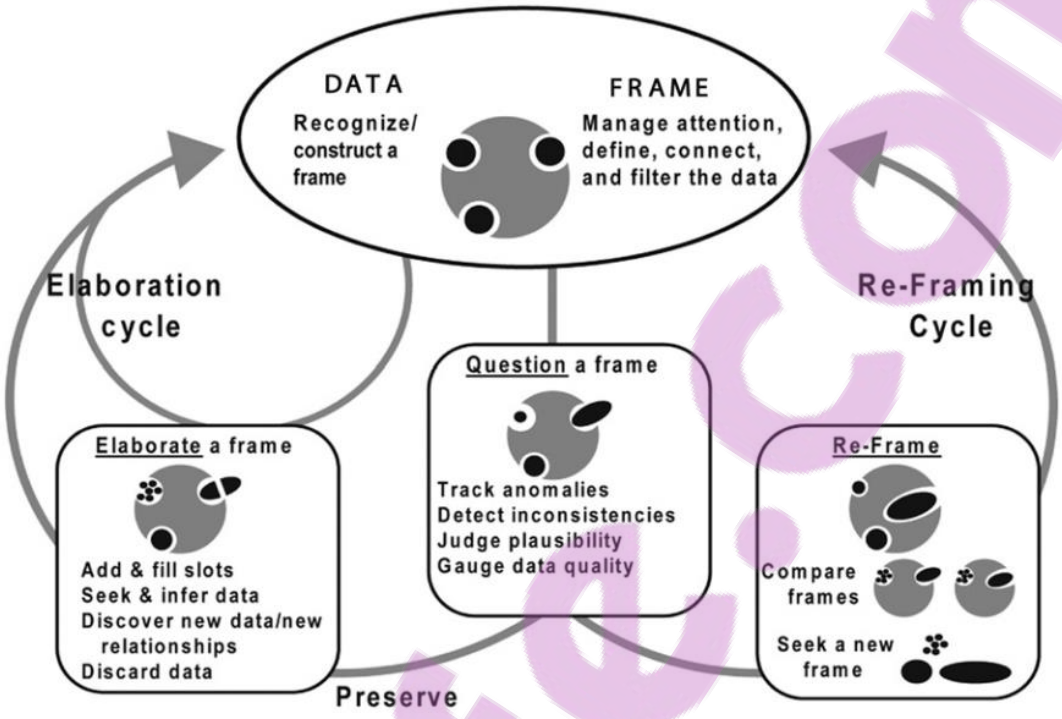

Figure 2-5: Expanded data/frame diagram by Klein et al. (2010)

On a team level sensemaking, these strategies also apply and it usually starts with an individual upon which input the team interacts. It is argued that teams additionally have to react upon emergent requirements that are dependent on the structure, data and coordination of the team. This increased complexity makes it a more fragile process than the individual sensemaking (Maitlis & Christianson, 2014). When a person engages in a conversation this can lead to a sensegiving process as the person tries to influence the sensemaking process of another person more or less actively (Gioia & Chittipeddi, 1991).

2.3.3 Communication Quality

While the previous section was mainly focused on the discussion on how the use of different communication tools can influence communication performance this section takes a look at communication quality and the factors that influence communication quality. Mohr and Sohi (1995) developed a model that shows how different factors influence the communication flow and accordingly the perception of communication quality. They argue that a high level of perceived communication quality will lead to a high level of satisfaction with the communication. As mentioned previously, an effective communication is dependent on a high quality of content and

form (Aubert, Hooper, & Schnepel, 2013; Holden & O'Toole, 2004). Accordingly, the factors that influence the communication quality are content factors and form factors. Aubert et al. (2013) have advanced and extended the factors of Mohr and Sohi (1995). In summary ten factors have emerged to be used for the analysis of communication quality (Hosseini et al., 2015). These are accuracy, completeness, reliability/credibility, purpose adequacy as content factors and timeliness, openness, audience adequacy, bidirectionality, frequency and balance of formality and informality (Aubert et al., 2013; Hosseini et al., 2015; Mohr & Sohi, 1995).

2.3.4 Communication as providers of knowledge

Knowledge itself could be categorised into explicit knowledge that can be codified and is therefore easy to share also with asynchronous communication tools and tacit knowledge which is knowledge that is mostly based on experience. To share this knowledge is more difficult as it is hard to codify and the sharing could be seen as an interactive process where the availability of synchronous communication is necessary (Nonaka, 1994).

Sharing of knowledge and information in a team is seen as an integral part of increasing the individual team members' effectiveness and subsequently the team's effectiveness. The possibility to access the knowledge of different team members is seen as the foundation of establishing teams and therefore a continuous exchange of information and knowledge is necessary to be effective (Aiken, Gu, & Wang, 2013; Choi, Lee, & Yoo, 2010; Henttonen & Blomqvist, 2005; Pangil & Moi Chan, 2014). The underlying theoretical framework is the idea of the group as a transactive memory system (TMS). The transactive memory system assumes that a team consists of different experts in a specific area and these experts have knowledge in this area and are responsible to maintain it. So it emphasizes the diversity of the knowledge of group members (Wegner, 1987). Next to this differentiated knowledge there is also the shared knowledge that is mostly referring to knowing who knows the differentiated knowledge in the group (Lewis & Herndon, 2011). Beside these two different types of knowledge that represent the TMS structure of a group there are also related TMS processes. They refer to encoding, storing and retrieving of knowledge among the members which are based on communication (Hollingshead, 1998; Kanawattanachai & Yoo, 2007; Wegner, 1987). The individual decides to encode information and within a group conversation the information gets a label and the knowledge about this label is shared among the group members and so the label gets stored within the group. The retrieval process encompasses how based on these labels the traces to the origin of the information are found (Wegner, 1987). These processes are also prone for disruptions (Lewis, Belliveau, Herndon, & Keller, 2007). So group members are supposed to know about the expertise of each other (Lewis & Herndon, 2011). As the cognitive load of the individual decreases the group as a whole has the capability to access more and better knowledge (Brandon & Hollingshead, 2004). Moreover, as TMS processes and structures are interdependent on each other repeated interactions will allow more effective use of

it and it facilitates the possibility to integrate the existing knowledge within the group to create new knowledge (Lewis & Herndon, 2011; Wegner, 1987).

Cummings (2004) emphasizes the importance of knowledge sharing in work groups as an important determinant of performance. His model shows that knowledge sharing could be seen in two categories, intragroup and external. While both benefit the group's performance he argues that especially structural diversity of a team positively affects external knowledge sharing's effect on performance.

3 Literature Review and research model

This chapter starts with a short excursion in the market of IM in Germany to provide an overview of the current situation. It is followed by a literature review for instant messenger and emoticons. First, the properties and usage of these two items is depicted, than further focal points are worked out. This is followed by the construction of the research model including the development of the necessary hypotheses as outlined by Hair, Hult, Ringle and Sarstedt (2016).

A full table of the literature review can be found in Appendix A.

3.1 Excursion: The market of Instant Messengers in Germany

In an annual representative study of online usage behaviour in Germany from October 2015 the German public TV stations ARD and ZDF captured the usage of Social Media applications including Instant Messengers. According to their numbers 43% of the population older than 14 uses IM services on a daily basis and at least 59% occasionally. Referring to age groups, people between the age of 14 and 29 years have a share of 72% of daily IM usage and the age group of 30 to 49 years has a share of 48% while among people older than 50 IM use has a share of 18%. Moreover, their numbers indicate that the overall amount of people using social media applications is stagnating while in this group of people there is a strong shift towards IM applications and from an application perspective WhatsApp has become the most dominant social media platform with a 57% share of regular usage (Tippelt & Kupferschmitt, 2015).
The statistic service Statista reports slightly lower numbers and indicates that 48% of the Germans are using IM services at least on a weekly basis in 2015 (Statista, 2016).

As with all statistical data these numbers should not be overrated and are just estimations, but they still indicate that approximately half of the population, especially under the age of fifty is using IM services. Moreover, IM seems to be established in society and cannot be seen as a small niche anymore.

A study on the usage of so called enterprise 2.0 tools in companies in Germany that help to connect employees in companies to further collaboration by Wiesbaden Business School and FeelGood@Work from October 2015 shows that the improvement of internal communication and communication is for 87% of the companies a major goal of the use of such tools. In addition, a better sharing of knowledge is intended for 56% of the companies. The study also indicates that companies are unsure whether the use of respective tools could reduce productivity if they are not

used efficiently. Between 2010 and 2015 a large increase in active interest of companies in enterprise 2.0 tools was recognized from 28% to 81% (Petry, 2015).

These data indicate that communication tools like IM are becoming more and more relevant in companies as the communication in companies is increasingly gaining importance among the agendas of senior management. Not only is there a trend of individual usage of IM applications but there is also the push of companies drawing on social media tools. Accordingly, a future growth of IM usage in companies can be expected.

3.2 Literature Review: Instant Messenger

3.2.1 Properties and usage

Instant messengers have become pervasive in the current working environment be it in the form of a desktop application or in smartphones. They have proven to be a useful means of communication with low communication costs. Originally based on chat systems instant messengers have adopted many features of the former. Thus, they support the possibility to have group discussions and to transmit pictures as well as files of all types and the recent versions integrate even a call and video call functionality. Another feature is that they usually signal the sender whether the recipient has received the message and whether he is available (Cameron & Webster, 2005). Nardi, Whittaker and Bradner (2000) describe this as *outeraction* meaning the ability of an individual to decide when to start or to reply to an often informal conversation which is also described as a social negotiation function to establish communication. Besides the authors also identified several communication functions of IM and categorized them as follows. IM serve for quick questions and clarification of current work related task, for coordination and scheduling, to coordinate impromptu social meetings and to keep in touch with friends and family (see also Quan-Haase, Cothrel, & Wellman, 2005; Vartiainen & Jahkola, 2013).

IM can be described as a peer to peer communication tool dealing with private data. Usually it is not bound to a server, but connects the participants in a conversation directly. It is therefore, mostly self-organized which makes it cost efficient and independent of existing infrastructure which makes them less prone for issues related to server failures (Tigelaar, Hiemstra, & Trieschnigg, 2012).

Koo, Wati and Jung (2011) analysed in a business context how a task and social factors influence the usage of IM and other communication tools and its subsequent effect on task performance. They therefore used task characteristics which were composed by task analysability, task urgency and task complexity (Zigurs & Buckland, 1998). The results indicate that IM is suitable for all task characteristics (Koo et al., 2011). Furthermore, especially the ability to communicate

synchronously with colleagues had a positive influence in executing urgent tasks. However, it was also argued that the usage of IM might decrease with urgent tasks and be substituted with face to face communication, because the ability to communicate critical ideas and concepts effectively via IM is questioned. Nonetheless IM is suggested to be a valuable tool in combination with email when the latter is used to convey information and the former to converge it.

Ou, Davison, Zhong and Liang (2010) showed how the use of instant messengers as a supplement of emails by professionals in China can help to enhance the social network and therefore improve the communication flow and consequently, the performance of teams. In accordance with MST, the combination of different tools is seen as the key element for an efficient communication performance.

Isaacs, Kamm, Schiano, Walendowski and Whittaker (2002) identify two styles of IM use in workplace communication. Frequent IM users were shown to tend to engage longer in conversations, but act with a faster pace and shorter turns spreading conversations over the day, while infrequent users tend to engage in shorter conversations. The results further hint that IM is mainly used for discussions which is why the authors suggest that the addition of other communication tools like video or audio may not be too relevant. These findings are in line with a follow up study by Isaacs, Walendowski, Whittaker, Schiano and Kamm (2002) who identified two categories and related patterns of IM use. One category is to use IM for collaboration and multiple purposes, which leads to a large amount of short messages within very little time. The other category is the use of IM for coordination, which is focused on one purpose only and engage in rather slow conversations.

According to a case study by Cameron and Webster (2005) instant messengers are dependent on a critical mass in an organisation to be successful and they are seen as a more informal way of communication which allows the participants to circumvent formal phone conversations. Moreover, instant messengers were used in a polychronic way allowing to either support the communication with another communication tool or to allow to communicate with several people at the same time. A special usage scenario of instant messengers is when the recipient cannot be reached in person or on phone because he is for example in a meeting, then the instant messenger allows to forward a message directly without intruding. As Nardi et al. (2000) point out that IM provide the concept of *plausible deniability* (p. 84). This means that despite the availability signal of the application the sender cannot know whether the recipient is indeed close to the application. Thus, users feel comfortable in ignoring incoming messages without assuming to offend the sender. Garrett and Danziger (2008) emphasize that from a sender's perspective IM can be seen as a decent form of checking availability. It is argued that it is also a more careful and less distracting mean to start a conversation compared to a phone call or an office visit as the sender is aware that he cannot expect an immediate response.

Gupta, Li and Sharda (2013) point out that especially the availability signal of IM could have a negative effect on an individual's task performance because it seems to urge people to reply to

messages and therefore interrupting the current task. An enforcing factor is the hierarchical role of the sender, which often urges the recipient to reply if it is from a superior. It is highlighted that an increase in reception of messages leads to perceived increased task complexity, which negatively influences the mental work load. It is stressed that sensible adjustments in the work flow can mitigate the problems and while there might be negative effects on individual task performance it does not necessarily imply negative effects on the overall work outcomes.

Fetter, Seifert and Gross, (2010) analyse the use of the availability signal function. Their experience sample shows that in general the status of availability in the IM was in less than half of the cases true. Moreover, it was shown that users tend to not change their status at all, unless there is a special occasion often combined with a negative experience. Quite often, there is also a lack of awareness about this functionality. Therefore, it is suggested that the use of what they describe as selective availability should be stronger promoted as it can help to manage interruptions better.

Shaw, Scheufele and Catalano (2007) present the concept of presence awareness communication as a basis for their analysis of IM. They define it as *any form of mediated communication in which users are directly aware of the online presence status of their communication partners, both before and during the communication* (Shaw et al., 2007, p. 378). Their results indicate that an IM has a positive impact on presence awareness. Overall, it mostly served as a complementary communication tool compared to email and phone, but it prevailed that the use of IM increased and was often used as means to initially contact persons. The authors emphasize the idea of IM as back-channel communication, i.e. to provide the ability to retrieve additional information or verification from other sources. In addition to that, the knowledge of the availability of a communication partner is also seen as useful for planning conversations when several people are supposed to be approached.

In a team context, IM is seen as an important means to facilitate a sense of copresence also for distributed team members as it provides an ongoing communication flow (Darics, 2014). This leads to a continuous switch between synchronous and asynchronous communication. The results highlight that signalling of availability of the IM be it automatically generated or self-disclosed is treated different individually and unavailability does not mean that a message is not sent. It seems to be accepted that a message is received as the IM records all of them. Quite often politeness strategies are used to emphasize the awareness of potential unavailability and to avoid appearing too blunt. Especially in conversations with less frequent communication partners, polite behaviour was expected to positively affect response times (Isaacs et al., 2002). However, the perception of response time seems to be a matter of personal expectations, which can often lead to uncommon conversations who are not following common norms of communication. Nonetheless urgency and hierarchical conditions are seen as further explanations for differing delays but require further research (Darics, 2014).

Once IM are used intensively this could also lead to a perceived obligation to reply to messages as soon as possible (Ahad & Lim, 2014).

In a comparison of the task effectiveness with emails in distributed teams Hung, Huang, Yen and Chang (2007) found that IM showed better outcomes. Especially in tasks related to idea generations and to reduce equivocality in messages IM were superior. The use of emoticons further enhanced the results. Besides, solving a task over IM was not seen as difficult as compared to emails.

According to Lancaster, Yen, Huang and Hung (2007) IM is seen as superior compared to emails regarding its ease of use, its ability for building relationships and the ability to convey emotions. Although these functional benefits were recognized, IM was primarily preferred for personal and social communication while emails were preferred for work related communication.

3.2.2 Interruptions

A common topic of IM research is the effect of the frequency of interruptions on the task performance. Following O'Conaill and Frohlich (1995) an interruption can be defined as *a synchronous interaction which was not initiated by the subject, was unscheduled and resulted in the recipient discontinuing their current activity* (p. 262).

Rennecker and Godwin (2003) propose that an unstructured use of IM has negative effects on the overall productivity due to increased communicative workload, polychromic communication and more interruptions which would lead to a cognitive overload (see also Cummings, 2004; Cutrell, Czerwinski, & Horvitz, 2000; Czerwinski, Cutrell, & Horvitz, 2000a, 2000b). Conversely, Garrett and Danziger (2008) indicate in their study that IM can have the opposed effect, it will further more frequent communication and at the same time reduce interruptions as they can be used to manage interruptions and to handle last-minute delays in communication. This will happen because workers tend to adopt IM in their workflow and adjust it accordingly to mitigate or avoid negative impacts. Ou and Davison (2011) present similar findings. While IM use is seen as a strong influence on the frequency of work interruptions, it does not seem to affect the outcomes as IM use positively influences communication quality and mutual trust. IM does not seem to lead to a significant increase of interruptions as compared to any other cause. Furthermore, the author found a significant effect of IM use on interactivity, which in turn is seen as an influence factor for communication quality and performance. Mark, Gonzalez and Harris (2005) argue that interruptions should not be seen based on singular tasks but on the impact of their content on the overall work flow. Their results suggest that interruptions are occurring in roughly 11 minutes intervals. Hudson, Christensen, Kellogg and Erickson (2002) emphasize that the tool should not be tailored to stop or to queue interruptions as their benefits often arise due to their delivery at a certain time. Indeed, it requires the contribution of the user to adjust a software to best serve the individual purpose. The acceptance of interruptions is seen as socially constructed and thus there should be a possibility to integrate this context in the tool and allow to prioritize interruptions.

The usage of instant messengers was seen as a way to interrupt communication that could have negative effects on the concentration on a working task (Cameron & Webster, 2005). However, there was no clear opinion whether they can be seen as more interruptive than any other communication tool. The results also point out that instant messengers are an additional means of communication, not just replacing emails or phones but the only tool to reach out to certain people. Basoglu, Fuller and Sweeney (2009) found that there is a positive effect of cognitive load and performance when it comes to task accuracy. However, the frequency of interruptions will negatively affect cognitive load and consequently task accuracy.

In a case study of knowledge workers, Mansi and Levy (2013) found that task completion time is a factor affected by IM interruptions. Their results indicate that for simple tasks related to interdependencies between different factors IM interruptions can have a positive effect on the task completion time while for respectively complex tasks they can have a negative effect. They further elaborate that there will be a point in such a complex task where the individual will start to ignore the interruptions if their frequency increases in order to finish the task. Therefore, the potentially ever increasing negative effects of interruptions will be stopped by the employees themselves. For a normal workflow IM use is seen as rather uncritical although it might increase the task completion time, but this mostly only to the extent that the time of IM use is added.

Lebbon and Sigurjónsson (2016) obtained similar results in an experimental study and emphasize that heavy users of IM tend to type fast which is seen as an indication that they are aware of the priorities in their job. It is also stressed that potential prohibitions or monitoring of IM are causing more harm than they are benefitting due to reduced trust and commitment. Overall, the authors point out that for experienced users of IM negative impacts on the performance were not recognized.

Fante, Jacobi and Sexton (2013) analysed whether the use of IM and its consequential interruption negatively affects reading comprehension. Their results indicate that the comprehension itself does not differ between people that use IM and those that do not, regardless of the difficulty of the text. However, it was shown that the users of IM took longer to complete the reading comprehension. This decreased efficiency is in line with similar research that analysed multitasking involving IM (Bowman, Levine, Waite, & Gendron, 2010; Fox, Rosen, & Crawford, 2009). In a study of the impact of IM use on the academic performance of college students, a majority reports that IM negatively affects the ability of students to complete schoolwork (Junco & Cotten, 2011).

Licoppe (2010) argues that the perception of interruptions through IM and other tools as a cause for bad performance has changed towards a more open and positive attitude. The handling of interruptions is seen as a means to contextualize with the surroundings and to optimize the own work flow in a continuously changing environment. De Vos, Hofte and De Poot (2004) stress that the increase of reachability due to the use of IM is often pointed out after the adoption of it for companies.

According to González and Mark (2004) people tend to get interrupted by others as often as they interrupt others. In general, the working day in a computer-mediated office is characterised by discontinuities and fragmentation. In most cases the use of one application before switching to another is only few minutes and in the longest scenario application use reached a duration of roughly twelve minutes.

3.2.3 Polychronicity and multitasking

In an experiment to examine the impact of IM on perceived task complexity and process satisfaction, Li, Gupta, Luo and Warkentin (2011) found that polychronicity acts as a moderator for the effect of interruption frequency of IM. Polychronicity is the tendency of an individual to be involved in more than one task simultaneously, also known as multitasking, and it is considered to be a rather stable trait (Conte & Gintoft, 2005). It was shown that persons that are monochronic are more susceptible for interruptions than polychronic persons. They are less satisfied with the multitasking process as they perceive an increased time pressure and increased task complexity. They would dedicate more time for information processing of the interruption than for their current task, while a polychromic person tries to find a balance between both. Moreover, the position power of the message sender was seen as another factor that especially affects monochronic people. According to Sykes (2011) multitasking has three major drawbacks for computer users: It is less efficient because the continuous switching between different applications consumes mental resources and time. It is more complicated because it requires awareness and management of the parallel tasks. It can be self-directed because a user tends to make a decision to perform a second task even if he does not have to.

Wang et al. (2012) highlight a related issue that people engaging in multitasking on IM tend to believe that they perform better as compared to multitasking with a voice chat in fulfilling a visual task. A possible explanation is that the perceived control over the reaction upon IM might distort the impression of the own performance. Moreover, there seems to be a tendency that purely visual tasks are considered to be handled easily and therefore often used in the context of multitasking (Bowman et al., 2010).

Cameron and Webster (2013) argue that multicommunication, i.e. participate in several conversations simultaneously, has become a common practice in the current working environment (Reinsch, Turner, & Tinsley, 2008). It is described as a more complex form of multitasking and therefore its effects on process losses such as errors and confusion are examined. When looking at multicommunication initiated from oneself it seems to cause less personal process losses as compared to when it is initiated by someone else. However, this consequently means that the communication partner would have drawbacks. Thus, it is a reinforcing circle and a trade-off is necessary. This should be considered in choosing communication tools that allow to communicate with several persons simultaneously. It could mean to combine synchronous and asynchronous communication tools but also to manage availability better in delaying or avoiding

to get engaged in multicommunication in specific situations that require a high level of concentration. Bearing this in mind the advantages of increased availability can still be exploited (Cameron & Webster, 2013).

Pazos et al. (2013) looked at IM as a task-support tool in technology organisations. They use the distinction of tasks by McGrath (1984) in collaboration tasks or conflict tasks. According to their results IM is more often used for the former than for the latter. They argue that IM is not sufficient for conflict resolving as it does not provide enough social cues as proposed by the social presence theory. In general IM served mostly as part of multitasking and supported work tasks and task-in progress.

3.2.4 Benefits

A study by Zaman, Anandarajan and Dai (2010) indicates that the use of IM can lead to a flow experience which can indirectly affect the perceived expected creativity.

Deng, Lu, Wei and Zhang (2010) stressed that mobile IM allow the user to engage ubiquitously in conversations providing the opportunity to interact at a convenient time and place without being dependent on for example a specific computer. This convenience would also positively affect their perception of the IM's usefulness (Yoon, Jeong & Rolland, 2015).

In order to retain users of an IM it is not only important to provide a high level of utilitarian factors but it is also important that the application reaches a high level of perceived enjoyment (Lou, Chau, & Li, 2005; Song & Wang, 2011; Wei Wang, Hsieh, & Song, 2012; Wang, Ngai, & Wei, 2012). Wang et al. (2012) tested the impact of personality traits on the continued use of IM. Their results indicate that conscientiousness and extraversion positively influence perceived enjoyment which would lead to a continued use.

As Cui (2016) points out, mobile IM can also send voice messages which can be useful in case of more complex situations that are easier to explain verbally than to type. He argues that this repertoire of communication capabilities leads to more frequent interactions, which will reduce the formality that is often implied by mediated communication and the possibility to communicate without geographic or temporal restrictions facilitates the maintenance of relationships.

Dorwal et al. (2016) tested the use of the mobile IM Whatsapp in a laboratory of a hospital. Their results show that in this scenario the possibility to share pictures of results to gain advise, was seen as a primary advantage as compared to emails to which the access is often restricted to specific networks and the operability is more complicated. Moreover, the possibility to share information among a group of people was seen as beneficial as it allows to communicate instructions or changes on short notice which can be very important in a medical environment. While drawbacks in the form of increased message flow and interruptions were seen, the authors

contend that the advantages seem to outweigh them. Accordingly, IM is seen as a significant factor to facilitate the communication flow in a hospital.

Huang and Yen (2003) indicate that IM use can lead to an increased volume of information exchange as compared to emails and therefore benefit the usefulness for the workplace.

In an analysis of the communication patterns of financial traders, Saavedra, Hagerty and Uzzi (2011) found that instant messaging was used to collect a large amount of information, making use of diverse individual sources and converging this information in the group which helped to engage in a more collective, synchronous behaviour.

Simon (2006) compared IM, video conferencing and face-to-face communication in an experiment. His findings indicate that there were no significant differences regarding the outcomes between those three. Contrary to his expectations, using IM communication did not require the participants to take more time to finish it. He points out that a certain amount of familiarity with the communication tool could be seen as a reason for this equality, suggesting that communication patterns via IM are adjusted to further a smoother flow of communication.

In a study of the use of IM in a Korean company Cho, Trier and Kim (2005) found that it has helped to maintain relationships within and outside of the organisation. In addition, the perception of these relationships improved compared to before. The authors indicate the importance of the job profile of a user. Persons that mainly aim to collect information tend to use IM as an amplifier of their social connections, while persons that provide services to support other people tend to use IM to increase their productivity by conveying context to their co-workers.

A longitudinal examination of the communication of six global workgroups indicates that especially in text-based group conversations the major focus is on work-related discussions, managing and planning of meetings and project and negotiating availability (Handel & Herbsleb, 2002). Similar results were obtained by Isaacs et al. (2002) and Quan-Haase et al. (2005) who further argue that IM can also be used as a tool to seal themselves off from superiors. They also point out that the availability signal can be seen as an important means for task and social related communication. The availability signal is further seen as a facilitator of mutual closeness among each other. This provides an integral advantage for teams as it enables to draw on the knowledge of the team spontaneously when necessary. In order to improve this feature Begole, Tang, Smith and Yankelovich (2002) argue that it is necessary to differentiate more between being reachable for communication and being available for it, the latter referring to the mental capability to engage in a conversation while potentially being busy with another task.

Ou, Ling Sia and Kit Hui (2013) use instant messenger, emails and knowledge sharing forum as objects of their research and argue that those can be seen as communication tools as well as social networking tools. Drawing on the conceptualization of Media Synchronicity Theory as a theory of communication performance (Dennis et al., 2008) and social network theory (Rogers, 1986) they found empirical confirmation that all three communication tools can have a positive impact on

the communication process as well as on interactivity and on relationship networks, and consequently on work performance. They provide an empirical proof for MST and adds social network as an additional element of theoretical explanation to it.

3.3 Literature Review: Emoticons

Emoticons have emerged during the literature review on IM as a common means to convey social cues in text based communication and were therefore added to the literature review as a rather unexplored factor in the research and a potential property of the research model (Dennis et al., 2008).

3.3.1 Definition and properties

Dresner and Herring (2010) theorize about the use of emoticons (emotion icons, i.e. symbols for facial expressions) in computer-mediated communication. They identified three functions that they can fulfil: *(a) emotion, mapped directly onto facial expression (e.g., happy or sad); (b) nonemotional meaning, mapped conventionally onto facial expression (e.g., a wink as indicating joking intent; an anxious smile); and (c) illocutionary force indicators that do not map conventionally onto facial expression (e.g., a smile as downgrading a complaint to a simple assertion)* (Dresner & Herring, 2010, p. 263). The authors propose that it is not clear to what extent these functions are in balance or whether one function is more dominant.

According to Amaghlobeli (2012) there are three different types of emoticons that are used in computer-mediated communication: Typographic emoticons are combinations of symbols on the keyboard, often including punctuation marks. Graphic emoticons are pictures that are also sometimes animated. Quite often the applications automatically convert typographic emoticons in graphic ones. The last form are verbal emoticons which describes the simple writing of the current emotion (e.g. 'Happy Smiley').

Ganster, Eimler and Krämer (2012) compared graphical emoticons and typographic emoticons. Their results indicate that both convey the same message interpretation, but graphical emoticons have a stronger impact on the mood and the perception of the writer's commitment than typographic.

After the analysis of more than 1,600 company emails, Skovholt, Grønning and Kankaanranta (2014) built upon the functions proposed by Dresner and Herring (2010) and confirm that emoticons have gained more functions after originally being used as a mark for jokes and signals of positive attitude. On the one hand, emoticons can be used to hedge a request to appear less demanding, on the other hand, emoticons can be used to stress a statement and express commitment and gratitude. That is why they can help to reduce the social distance between the communication participants.

Luor, Wu, Lu and Tao (2010) analysed the emoticon usage in a financial company in Taiwan to focus on task-oriented communication. Their analysis of the log files of 6,000 instant messages identified three categories for them, task-oriented simple communication for example for the organising meetings, task-oriented complex communication for example to discuss or coordinate task and social-oriented communication. Based on the results it is suggested that positive emoticons should always be used in discussion and communication tasks as they have shown to have an emotion enhancing effect. This is seen as especially useful in situations where the communication might have a negative touch. Furthermore, any emoticons related to flaming (i.e. hostile verbal behaviour) should not be used as they tend to trigger negative emotions (Luor et al., 2010; Thompsen & Foulger, 1996). In order to avoid a weariness of emoticons, neutral ones should not be used in normal situations. Lo (2008) could show that emoticons attached to messages allow recipients to perceive the right emotion, attitude and attention.

The results of an experiment that measured the brain activities when confronted with emoticons by Yuasa, Saito and Mukawa (2006) found that a person can detect the emotions of a counterpart based on computer-mediated communication. In a follow up study they confirmed these findings and describe emoticons as a *means of verbal and nonverbal communications characterized by a simple form of emotional enhancement* (Yuasa, Saito, & Mukawa, 2011, p. 22).

It was moreover shown that the brain can perceive emoticons as faces, but only if they stick to a natural shape and configuration of faces. Once the configuration is inversed, they are not perceived as faces by the brain anymore. This is in contrast to inversed faces where the brain seems to able to identify faces either through by recognizing the individual elements of a face (Churches, Nicholls, Thiessen, Kohler, & Keage, 2014).

3.3.2 Effects

In an early analysis of emoticon in emails, Walther and D'Addario (2001) analysed whether the smile, wink and frown emoticons would have an impact on the message interpretation. In their results the impact was mostly rather low or not consistent. Thus, it might serve as a complementary function but nothing more. They emphasize that the written message itself is still the most important influence factor and propose that this is mostl likely due to the larger effort necessary to write a text than to type an emoticon or to speak. Therefore, in a verbal conversation facial expression would have a higher importance as they are more prevailing. They further state that emoticons might not serve as a means of social communication, but are a signal for the writer to check and adjust their message whether it fits the own emotions and intentions and therefore are more an indirect form of social communication (see also Luor, Wu, Lu, & Tao, 2010). In that regard, they would serve similar to gestures in verbal conversations that should help to convey the meaning of the utterance. This notwithstanding an overuse of emoticons is also seen as an alternative explanation of the results. In a discussion whether emoticons can be seen as truly nonverbal cues, Krohn (2004) argues that the difference between a nonverbal cue in a facial

conversation and the use of emoticons in a text-based conversation is that the use of the former is seen as unintentional, while the latter is used intentionally, thus their effectiveness is seen as lower (see also Derks, Bos, & von Grumbkow, 2007b; Provine, Spencer, & Mandell, 2007). Overall, he describes the effectiveness of emoticons as a factor depending on the age of the people.

Derks, Bos and von Grumbkow (2007a) found that an emoticon in emails can have an amplifying effect on the intensity of a message. In line with the results of Walther and D'Addario (2001) contradicting emoticons do not have the impact to influence the understanding of a message. In another study Derks, Bos and von Grumbkow, (2007b) examined the use of emoticons in chats. Their findings show that emoticons tend to be more often used in social-emotional than in task-oriented contexts as the social norms of the society ask to not show emotions at work. Negative emoticons are more often used in text-based messages than emotions would be shown in a verbal conversation, but in a negative task oriented context emoticons would be used less often than in any other situation. Accordingly, the social context is seen as an important influence in the use of emoticons in computer-mediated communication as much as it influences facial communication. In a study of the effects of the use of emoticons in instant messengers, Huang, Yen and Zhang (2008) found that emoticons can positively affect enjoyment which than affects personal interaction and consequently increases the information richness. As these factors have a positive impact on productivity, the authors suggest that communication with emoticons will positively facilitate a cooperative environment.

Park and Sundar (2015) show that emoticons create a higher affective understanding and they indicate that a communication tool with synchronicity, such as instant messengers, increase the feeling of social presence for the communication participants.

Wang, Zhao, Qiu, and Zhu (2014) have taken a look at the use of emoticons as feedback mechanism in the communication of a virtual team. They suggest that emoticons can be powerful means in computer-mediated communication. However, their impact is dependent on the accompanied text and the context of the situation. Especially the provision of negative feedback through emoticons is seen as a sensitive topic that should be treated with care to avoid a negative effect.

A comparison of the usage of emoticons in weblogs between Americans and Japanese indicated that the cultural context can play a role in the use of it. In a high context culture like Japan emoticons were more often used to transfer information smoothly compared to a low context culture like the US. Therefore, the author argues that the impact emoticons have as an amplifier of communication is larger in a high context cultures than in low context ones. While these results are an indicator for similar behaviour in communication processes it is stressed that this research is based on the passive use in weblogs and not in a discourse (Kavanagh, 2010).

Regarding different styles of typographic emoticons that are used, Park, Barash, Fink and Cha (2013) compared the data of 1.1 billion Twitter tweets from Western and Eastern countries. They identified two styles. Western countries tend to use horizontal emoticons, which are based on the

mouth shape and Eastern countries tend to use vertical emoticons which are based on the eye shape. Similar results were obtained in a follow-up study were horizontal emoticons were assigned to be more common in individualistic cultures and vertical emoticons in collectivistic cultures (Park, Baek, & Cha, 2014). This is also in line with a study by Yuki, Maddux and Masuda (2007) who compared the interpretation of emoticons by Japanese and US participants in an experiment. They emphasize that cultures like Japan that tend to supress emotions focus more on the eyes of a person while cultures like the US that are more open towards emotional expression focus on the mouth which is the more obvious part of the face that shows emotions. Besides it should be considered that the analysis of Twitter data can only be seen as an indicator for the use of emoticons in younger generations of these countries as older people are less likely to use and accept it (Park et al., 2014).

Kwon, Kim and Kim (2013) show that emotional expressions such as emoticons have a positive effect on the receivers' emotional intensity and consequent acceptance of the message. In a negative context emoticons were shown to be way less accepted as compared to positive or neutral contexts. The authors also evaluate the characteristics of the recipients and argue that persons who are characterised by a higher level of authoritarianism or formalisation would be more reluctant and prefer formally written content.

Based on the results of a longitudinal research panel, Menchik and Tian (2008) emphasize that emoticons fulfil a prescriptive purpose and not so much an emotional function. They are used to adjust and clarify a message in order to avoid misinterpretations. Therefore, emotional reactions should not be expected.

Derks, Fischer and Bos (2008) suggest that due to the reduced spontaneity and the increased control over text-based computer-mediated communication, emotional expressions in the form of emoticons or differently are more regulated, expecting less emotional outbursts. They emphasize that emotions are represented in computer-mediated communication to a similar extent as they are in face-to-face communication. Overall, the authors conclude that emotions in computer-mediated conversations are rather similar to face-to-face conversations. It is further elaborated that the lack of visibility not only for the communication partner, but especially for potential observers of a face-to-face conversation increases the willingness to express emotions online. Therefore, computer-based communication is seen as better suited towards expressing negative emotions.

A long term quasi-experimental study of 21 students indicates that there seems to be a tendency that women use emoticons in SMS more often than men. However, considering the small sample size and the space limitations of SMS, these results have to be seen with a grain of salt (Tossell et al., 2012).

3.4 Research model

The research model depicts the structural model of the PLS-SEM approach. It specifies the constructs and relationship between the constructs, presented in the form of Hypotheses. Furthermore it is the basis the basis for defining the measurement model upon which an efficient means to collect data in the form of a survey can be designed.

The hypotheses in this framework draw on existing theories of computer-mediated communication, specifically the CMCIM (Lowry et al., 2009) and MST (Dennis et al., 2008). While the former points out the positive impact of interactivity on communication quality the latter emphasizes that communication tools should enable to work in synchronicity coordinated when they work together. Taking this into account and drawing on the research identified in the literature review I also include the effect of work interruptions as a mediating factor in this framework. In addition to that, a potential moderating effect was identified in the literature review, which is the use of non-verbal cues in the form of emoticons. Previous studies have already indicated that IM use could have a direct and indirect positive effect on teamwork performance and this thesis aims to test these results in a Western setting (Dorwal et al., 2016; Koo et al., 2011; Mansi & Levy, 2013; Pazos et al., 2013; Quan-Haase et al., 2005). A cornerstone of the examination and the foundation of the proposed research model is the work of Ou and Davison (2011), Ou et al. (2010); Ou et al. (2013).

Table 3-1 provides an overview of the used research constructs.

Table 3-1: Research Constructs, extended and adapted from Ou & Davison (2011); Ou et al. (2010)

Construct	Description	Source
IM use at work	Use of IM as a communication tool at the work place that serves to ask and reply to questions as well as the sharing of files in combination with participation in socialization related to the work	Cho et al., (2005); Quan-Haase et al. (2005)
Use of emoticons	Use of emotion icons when using IM at work	Huang et al. (2008)
Interruption	Perception of disturbance from unscheduled IM interaction, or the discontinuity of current work activity because of IM interaction which is not initiated by the focal employee.	Garrett and Danziger (2008); O'Conaill and Frohlich (1995); Ou and Davison (2011)
Interactivity	Perception of the IM's ability to grant active control to the user, exchange messages and to provide synchronicity.	Paul Benjamin Lowry et al. (2009); Teo, Oh, Liu and Wei (2003)
Communication quality	Perception of communication quality based on its timeliness, adequacy, accuracy, completeness, interactivity and effectiveness.	Mohr and Sohi (1995); Ou and Davison (2011)
Knowledge Sharing	Perception of the extent of one's engagement in sharing of tacit and explicit knowledge.	Bock, Zmud, Kim and Lee, (2005)
Teamwork performance	Perception of outcome satisfaction, group outcome satisfaction, outcome quality	Fuller, Hardin, and Davison, (2007)

3.4.1 IM use at work

As shown in the literature review, a major point of discussion of the effect of IM use at work is its ability to provide easy access as they often do not require repeated logins or using specific functionalities to start. It is argued whether this synchronous communication increases the occurrence of work interruptions (Nardi et al., 2000; Quan-Haase et al., 2005; Sykes, 2011). As Cameron and Webster (2005) explain IM are often used as an additional communication tool in combination with another allowing to communicate with several people at the same time. Therefore, the switching between the tools leads to an increased level of interruptions. In addition, IM are often using the notifications of new incoming messages which lead to an additional distraction and disruption of the workers (Ou & Davison, 2011). This is occurring even more often because people tend to believe that text-based communication is easy to handle in multitasking and accordingly the preferred tool to add (Wang et al., 2012). Another treat of IM is that it is often used in a more informal way reducing the barriers that phone communication or personal meetings demand, which further increases the likelihood of interruptions especially in urgent situations (Koo et al., 2011; Nardi et al., 2000). Moreover, the increasing dissemination of smartphones has led to a spread of mobile IM or mobile applications of desktop IM. This provides a further source that is using different means of notifying incoming messages and result in an increase of potential interruptions.

Hypothesis 1: The use of IM at work increases work interruptions.

Following the CMCIM interactivity is typically characterised by control, synchronicity and two-way communication (Lowry et al., 2009). Control describes the extent to which it is possible to intervene in a communication process, to control and adjust the information flow as well as the possibility to leave the application (Liu, 2003). Two-way communication encompasses a conversation between at least two persons that can exchange messages with each other which describes the functionality of an IM (Koo et al., 2011). MST attributes IM of all text-based communication tools the highest level of synchronicity (Dennis et al., 2008). Several studies have shown that IM is fulfilling these properties and therefore positively affecting perceived interactivity (Lebbon & Sigurjónsson, 2016; Li et al., 2005; Nardi et al., 2000; Ou & Davison, 2011; Ou Xiaojuan et al., 2013; Rennecker & Godwin, 2003; Teo et al., 2003; Yoon et al., 2015).

Hypothesis 2: The use of IM at work positively affects interactivity.

Drawing on the conceptualization of Aubert et al. (2013) communication quality is characterised by content and form attributes. The focus of this study lies on IM as a communication tool, therefore the form attributes shall be considered. Timeliness refers to the extent to which

information can be transferred on time (Kahn, Strong, & Wang, 2002). As IM is exchanging messages instantly, its delivery is as soon as possible. Openness refers to the possibility to disclose information also of a more personal nature (Aubert et al., 2013). In general, IM allow private conversations of individuals and teams which can only be seen by the participants, as they are based on a peer-to-peer infrastructure (Tigelaar et al., 2012). Thus, they provide a safe environment for conversations. Balance of formality and informality refers to the extent to which communication can be structured (Mohr & Sohi, 1995). IM can be seen as a communication tool that more serves the informal communication (Cameron & Webster, 2005). It is often used for more spontaneous conversations (Quan-Haase et al., 2005). As IM tends to act as a complement to other communication tools that require a more formal procedure it can be seen as a good fit that enhances communication (Shaw et al., 2007). These reduced hurdles of formality and the easy use of IM also have also a positive effect on the frequency of the conversation which is another determinant of information quality (Garrett & Danziger, 2008). The final attribute of communication quality is bidirectionality which is two-way communication and as described before IM as a tool is designed to support it (Koo et al., 2011).

Hypothesis 3: The use of IM at work enhances communication quality.

3.4.2 Effect of Emoticons

While emoticons are not bound to a specific application, IM has emerged as a platform that not only supports to convert typographic emoticons in graphic emoticons, but have also integrated a selection of emoticons in its interface, facilitating and incentivising its use.
Emoticons were often seen as a mirror of the emotions of a human face and neuroscience has shown that the brain associates them respectively to some extent (Churches et al., 2014; Yuasa et al., 2006, 2011). However, the difference between emoticons and emotions is that the former occur intentionally, which means that they are used to serve a purpose (Krohn, 2004). It was shown that the use of emoticons that reflects the intention of a message emphasizes the significance of it (Walther & D'Addario, 2001). Emoticons can help to clarify a message and to avoid misunderstandings (Menchik & Tian, 2008). Using positive emoticons can also enhance the atmosphere in a conversation (Luor et al., 2010) and as they trigger the enjoyment they encourage further engagement in the conversation (Huang et al., 2008). Moreover, they can serve as a hedge to diminish barriers of formality and hierarchy in conversations (Skovholt et al., 2014).

As the proper use of emoticons can reduce ambiguity, it is likely that interruptions that would have occurred without the use of emoticons can be reduced. In the same way, communication quality can be strengthened as messages appear to be more complete and reliable. It was also shown that particularly the use of negative emoticons as a feedback mechanism is a sensitive topic that can affect communication negatively if not used in a proper manner (Wang et al., 2014).

While the use of emoticons that contradict the utterance of the text are not strong enough to convert the understanding of the meaning, they are still likely to increase the ambiguity of recipient which can result in further interruptions to clarify the message (Derks et al., 2007a; Walther & D'Addario, 2001). In addition, this would also negatively influence the reliability of the communication

Hypothesis 4: Use of emoticons moderates the relationship between use of IM and communication quality such that the emoticons that confirm the utterance increase communication quality.

Hypothesis 5: Use of emoticons moderates the relationship between use of IM and communication quality such that emoticons that confirm the utterance decrease interruptions.

3.4.3 Effect of Interactivity

Following the CMCIM, interactivity is positively related to communication quality. Specifically, it is outlined that interactivity enhances communication openness, as well as the possibility to discuss efficiently and effectively. This relates to the timeliness of communication quality. Thus, it allows to discuss without a delay and it also relates to content attributes of communication quality as it enables the transfer of more complete and accurate information as the two-way communication allows the team members to refine and extend their communication (Lowry, Romano, et al., 2009). In the context of IM, this means to easily enable the conversation between two or multiple team members synchronously which enhances the willingness of team members to engage in the conversation (Deng et al., 2010; Koo et al., 2011). This willingness to contribute to a discussion is further stressed due to the team members perceived control over the communication tool, which allows them to decide what to post and when to post. As being a tool that is less bound to formal communication rules it can also lead to a quicker response (Cameron & Webster, 2005). Accordingly, the capabilities of IM's interactivity can be seen as means to enhance communication quality (Ou & Davison, 2011; Ou et al., 2013).

Hypothesis 6: Interactivity enhances communication quality.

To the same extent that the factors of interactivity affect communication quality, as they further to participate in a conversation, it also increases the amount of interruptions (Ou & Davison, 2011). IM based conversations tend to be rather unstructured and often occur as a communication that is conducted while working on another primary task (Li et al., 2011). Consequently, they lead to interruptions of the work on this primary task (Dorwal et al., 2016). Talking from a team perspective it has been shown that users that communicate more often tend to engage in conversations that are based on many short messages which further increases the amount of interruptions (Isaacs, et al., 2002).

Hypothesis 7: Interactivity increases interruptions.

Knowledge sharing in computer-mediated teams was often related to the problem of slow and asynchronous communication channels and difficulties to engage in more complex conversations (Cramton, 2001; Daim et al., 2012). The ability of IM to enable synchronous communication with varying constellations of team members facilitates to adjust the knowledge sharing process in either a more complex or more broad way depending on the context. It allows to access the knowledge that is required when it is required, circumventing the formal or technical barriers associated with other communication tools, at least to the extent that the likelihood of a timely mutual engagement in knowledge sharing is higher, even if it just means to negotiate availability for such an interaction (Dorwal et al., 2016; Nardi et al., 2000; Quan-Haase et al., 2005).

Hypothesis 8: Interactivity enhances knowledge sharing.

3.4.4 Effect of Communication Quality

An enhanced communication quality is related with satisfaction of the communication which increases the likelihood to engage in further in further communication (Mohr & Sohi, 1995). It also should be emphasized that communication quality alone is not a factor that directly leads to better teamwork performance and the perception of it is purely subjective (Aubert et al., 2013; Chang, Hung, & Hsieh, 2014; Ou & Davison, 2011). Communication quality is especially necessary for successful knowledge sharing as this exchange process should be accurate, timely, adequate, credible, frequent and reliable (Chen, Li, Clark, & Dietrich, 2013; Johlke & Dunhan, 2001; Kanawattanachai & Yoo, 2007; Kuk, 2006; J. Mohr & Spekman, 1994; Sarker et al., 2003). Conclusively, the attributes of communication quality are the antecedents of knowledge sharing. It is important to consider that knowledge can be distinguished between explicit and tacit knowledge (Nonaka, 1994). As explicit knowledge can be codified and therefore transferred, it is useful to use it for text-based communication. However, when it comes to tacit knowledge the sharing occurs in an interaction between sender and recipient. Therefore, it is necessary that the communication is conducted in a timely manner but also contains sufficient accuracy and completeness. Thus, the attributes of a good communication quality can benefit the knowledge sharing process.

Hypothesis 9: Communication quality enhances knowledge sharing.

3.4.5 Effect of Interruptions

It should be mentioned that in recent years, research on interruptions' impact on teamwork performance has led to mixed results and it is suggested that this effect is further tested (Garrett & Danziger, 2008; Gupta et al., 2013; Lebbon & Sigurjónsson, 2016; Li et al., 2011; Ou & Davison,

2011). Considering that previous research on the use of IM in the second half of the first decade of the 21st century has indicated heavy usage by students and negative consequences, it is also of interest to see whether this behaviour has translated in their later work life (Bowman et al., 2010; Fox et al., 2009; Lancaster et al., 2007).

Interruptions are seen as frequently occurring during the work process and often leading to discontinuing previous activities (O'Conaill & Frohlich, 1995). IM is a tool that delivers its message instantly regardless of knowing about the current working situation of the recipient and therefore it contains a highly disruptive potential. The property of IM to send mostly short, but therefore frequent messages, leads to an increased volume of interruptions. These increased disruptions are negatively affecting the individual performance and will consequently negatively affect teamwork performance as the individual contributions decrease (Rennecker & Godwin, 2003). It is considered that frequent interruptions increase the cognitive workload of the recipient which occupies mental capacities that are not available for primary tasks (Basoglu et al., 2009; Gupta et al., 2013). Mark et al. (2005) indicates that interruption occur as often as roughly around every 11 minutes. Tasks that are characterized by a higher complexity were shown to be negatively affected by interruptions (Gupta et al., 2013; Mansi & Levy, 2013). It is further argued that people tend to overestimate their capabilities to handle IM interruptions, which leads them to respond to more interruptions that would be beneficial.

Hypothesis 10: Interruptions negatively affect teamwork performance.

Interruptions usually occur to either ask questions or to provide information. It has been shown that in many cases people are contacted via IM to draw on their knowledge and in this process share it consequently (Dorwal et al., 2016; Quan-Haase et al., 2005). In any case an interruption caused by IM aims to start or continue a conversation in which knowledge is exchanged either task related or of a more social background. So directly or indirectly it contributes to the knowledge sharing in the team, either because new knowledge is obtained that can later be shared in the team or because knowledge is shared within the team.

Hypothesis 11: Interruptions positively affect knowledge sharing.

3.4.6 Effect of Knowledge Sharing

Knowledge sharing has been positively related to teamwork performance. Considering teams from the perspective of a TMS with diverse expert knowledge, they draw on knowledge sharing as a key process to work effective. At least two elements can be ascribed to knowledge sharing, improved coordination and decision making (Srivastava, Bartol, & Locke, 2006). Knowledge sharing further improves knowledge application and thus also improves teamwork performance

(Choi et al., 2010). Drawing on the TMS, effective knowledge sharing is related with better awareness of the knowledge existing within the team allowing a better evaluation of the team and leading to more effective decision making (Stasser & Titus, 1985). As teams continue to exchange knowledge and are building their knowledge, they are also able to coordinate and increase the speed of the access to the knowledge within their team better. They develop a shared understanding of knowledge at least on a superficial level which facilitates the further utilization of it, as the effort to make sense of knowledge within a team decreases (Maitlis & Christianson, 2014; Marks, Mathieu, & Zaccaro, 2001; Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000). Especially in tasks related to equivocality it is necessary to draw on knowledge sharing to resolve this ambiguity (Daft et al., 1987). According to MST, performance is related to the conveyance and convergence of information and knowledge as the basis of each communication process related to a task (Dennis et al., 2008). Considering the ability of IM to communicate synchronously, to transfer files and to be used in combination with another tool, it offers the potential to share knowledge effectively.

Hypothesis 12: Knowledge sharing positively affects teamwork performance.

A graphical summary of the proposed research model can be found in Figure 3-1.

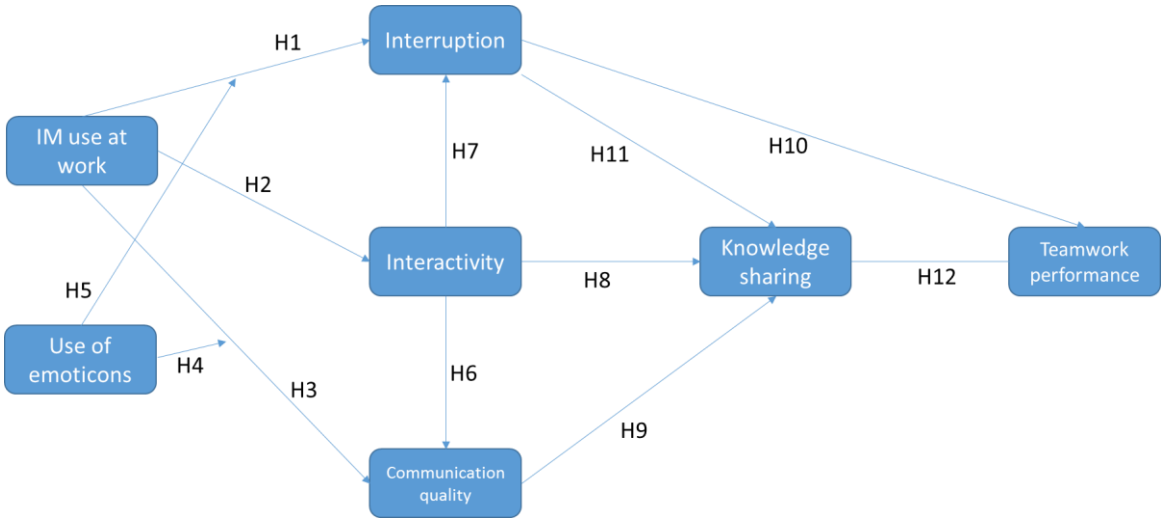

Figure 3-1: proposed Research model

4 Methodology

This section describes the process of the literature review and outlines the methodological approach of this thesis. It is followed by the process of the data collection. The first step is to define the measurement model, which depicts the items that predict the constructs of the structural model/research model that has been outlined in the previous section. The respective variables are elaborated and their properties defined. The second step is explaining the survey, measurement scales, validity, sampling and distribution.

4.1 Literature review

To retrieve relevant articles and book chapters the systematic search approach by Webster and Watson (2002) was used. *A systematic search should ensure that you accumulate relatively complete census of relevant literature* (Webster & Watson, 2002, p. xvi) This approach consists of three search stages: keyword, backward and forward. The literature review was conducted to gain an overview of research between 2010 and 2016 and to use it as a starting point to find relevant theories used in the past. It started with an analysis of the archives of the journals *Communications of the ACM, European Journal of Information Systems, Information Systems Journal, Information Systems Research, Information Technology & People, Journal of Information Technology, Journal of Strategic Information Systems, Journal of the Association for Information Systems, MIS Quarterly, Scandinavian Journal of Information Systems and Organization Science*, as highly regarded magazines in the field of information systems. After an journals initial scan *Management Science, Communication Research* and the *Journal of Computer-Mediated Communication* were examined. Afterwards a universal search was conducted. The following databases and search engines were used: *Primo, Google Scholar, Ebsco, ABI/INFORM, Emerald, ACM digital library, ScienceDirect, SAGE journals online, SpringerLink*. The used search terms were: *communication in virtual teams*, *virtual/distributed/dispersed team/group, computer-mediated communication, communication, team*. These terms were used to generate a broader overview over the topic and theories of computer-mediated communication. Chapter 2 presents the derived relevant concepts and describes the broader frame of communication theory/computer-mediated communication theory.

In a second step the review was narrowed and focused specifically on the terms *instant messenger*, *instant messaging*, *IM* as the communication tools of interest for this research. After

an initial scan, the time window was extended to between 2000 to 2016 as the body of research for the younger history was not too extensive. Moreover, emoticons as a common means of non verbal communication cues in IM software have frequently appeared in the results and were taken into consideration for further examination.

Therefore, the search terms: *emoticon, smiley, emotion, emotion icon* were searched, using the same sources. Literature related mostly to the adoption of instant messengers was omitted as well as literature that was concerned with the way how educational institutions should handle the messaging behaviour of students. Shortlisting of the articles was done after checking the abstract and key words, respectively the conclusions or further parts of the articles if necessary.

Overall, 58 articles about the topic of IM and 25 articles about emoticons were shortlisted and used for a further review and further usage.

4.2 Methodological approach

This thesis follows a quantitative approach. After an initial scan of the literature, it became obvious that many theories and concepts in this area, especially when they focus on a topic such as performance or quality use relationships between constructs and are therefore cut out to be evaluated on a statistical basis (Dennis et al., 2008; Lowry et al., 2009).

Following Creswell (2013) quantitative research is a*n approach for testing objective theories by examining the relationship among variables* (p. 4). It tends to follow a postpositivistic approach.

Postpositivism emerging from positivism assumes that there is a deterministic relationship between causes and outcomes. The research claims to be objective and thus has to find variables that reflect this reality. In doing so a postpositivist also has to put his concepts into variables which is a sign of reductionism. These ideas of relationships and the variables are necessary in order to test theories that are assumed to determine the way the world works. Accordingly, the research process is seen as iterative where theories are supposed to be supported or rejected which leads to a removal or adjustment of the theory and a repetition of the process. In the need of finding objective measures to test the theory, it is important to ensure the absence of bias. It is important to bear in mind that the intention of positivists is to test the theories and its related hypothesis for failure. The underlying assumption is that reality is putative and therefore can only be approximated by increasing the probability of an explaining theory. This in turn is done by proving the failure of any other possible explanation using mostly quantitative means (Crotty, 1998; Mertens, 2014).

It can be distinguished between an experimental and non-experimental design. For this thesis a non-experimental design was chosen. Experiments tend to be very resource extensive and they require to follow rather restrictive rules to be executed properly.

As the of aim of this study is to examine the impact of IM use on teamwork performance, an experiment would suggest to include a sufficiently large group of people, an appropriate long period of time and a lot of resources, this option was discarded as being not feasible in the realm of this thesis.

The most common non-experimental design is survey research which aims to capture opinions, attitudes and developments within a population. Therefore, a sample of the population is taken aiming to generalize the results for the entire population (Biemer & Lyberg, 2003; Kaplan, 2004).

A survey provides the means to test a model. As such, it serves mostly to follow a deductive approach. It aims to answer descriptive and explorative questions (Saunders, Lewis, & Thornhill, 2015). Given the constraints of this thesis, a survey is a resource saving means that can be managed efficiently.

As pointed out before, this realm of research is driven by relationships between variables. In order to analyse the configuration of multiple variables, multivariate analysis is a method to process respective relationships (Hair, 2014).

For the conduction of this thesis a PLS-SEM (partial least square structural equation modelling) approach was chosen. PLS is a useful means to analyse data as it can be used with a small sample size and allows not only to test for models but also leaves the leeway for explorative findings (Hair, 2014). PLS can be seen as a causal modelling approach with the goal to maximize the explained variance of the dependent latent construct. PLS falls under the category of structural equation models (SEM). A different approach of SEM is covariance-based SEM (Hair, Ringle, & Sarstedt, 2011). It aims to minimize the differences between a developed theoretical covariance matrix and the estimated covariance matrix.

Hair, Hult, Ringle and Sarstedt (2014) have provided an overview of the procedures necessary to for applying PLS-SEM (p. 25):

1. *Specifying the Structural Model*
2. *Specifying the Measurement Models*
3. *Data Collection and Examination*
4. *PLS Path Model Estimation*
5. *Assessing PLS-SEM Results of the Reflective Measurement Model*
6. *Assessing PLS-SEM Results of the Formative Measurement Model*
7. *Assessing PLS-SEM Results of the Structural Model*
8. *Interpretation of Results and Drawing Conclusions*

Following this process, the first step in a SEM approach is to construct a path model. The path model describes how variables/constructs are related to each other, based on hypotheses developed from the literature. A path model consists of two models, the structural model and the measurement model. The structural model which is also referred to as the inner model in PLS-

SEM, shows the sequence and the interdependencies between the latent constructs which are determined with hypotheses. The measurement model shows the relations between the latent constructs and the indicators that determine them.

A structural model is read from the left to the right and the independent variables on the left side that are not dependent on any other variable in the match are called the exogenous latent variables, while the dependent variables on the right are called the endogenous latent variables. Variables that act as independent and dependent variables in the middle of the model are also referred to as endogenous latent variables. A graphical illustration of the structural model can be found in the proposed research model in Figure 3-1.

The measurement model, also referred to as the outer model in PLS-SEM, which determines the relationship between a construct and its indicators can contain two measurement models; reflective measurement models and formative measurement models. The former assumes causality between a construct and its measures. These indicators are supposed to be correlated among each other and therefore the construct as a whole is not dependent on one individual measure which can be exchanged or removed. The collection of reflective measures is referred to as a scale. The latter model assumes that the construct is caused by the indicators. A formative measurement model is also referred to as a formative index. Indicators cannot be exchanged as the construct as a whole is dependent on each formative indicator, otherwise it would get a different nature and meaning (Diamantopoulos & Winklhofer, 2001).
PLS has the tendency to overestimate the measurement model and underestimate the structural model. In order to minimize this bias it is suggested to use more indicators or/and increase the amount of observations (Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012).

Based on theories of media synchronicity, computer-mediated communication interactivity and communication quality in conjunction with research models and theories obtained by the literature review, several variables should be identified, hypothesis developed and composed in a research model that can be tested.

This thesis follows the process as outlined by Hair, Hult, Ringle and Sarstedt, (2014) who have released a comprehensive guide on the application of PLS-SEM.

A survey will be constructed based on the research model derived from the literature.

4.3 Measurement Model

The measures in this study are mostly inherited from existing measures that were used in the literature in the context of IM use, particularly by Ou and Davison (2011), Ou et al. (2010) and Ou et al. (2014).

The following variables were defined:

IM use at work as the independent variable is a reflective exogenous latent variable and can be described as the use of IM as a communication tool at the work place that serves to ask and reply to questions as well as the sharing of files in combination with participation in socialization related to the work (Cho et al., 2005; Quan-Haase et al., 2005). The items that measure IM use at work were adapted by Ou et al. (2010) based on measures used by Kankanhalli, Tan and Wei (2005). The items are designed to capture the frequency of the usage of IM at work and the frequency of file sharing, engaging in work-related socialization, asking and answering questions.

Use of Emoticon as the moderator is also a exogenous latent variable and a first-order construct, partly based on items introduced by Lancaster et al. (2007) to evaluate the frequency of using emoticons and the perception of whether they can convey additional meaning. This is extended by adding items that ask for the potential impact of the use of emoticons on irritation of the recipient. It is a formative construct with the items being non interchangeable and being a combination of the items rather than a construct (Jarvis, MacKenzie, & Podsakoff, 2003; MacKenzie, Podsakoff, & Jarvis, 2005).

Interruption is an endogenous latent variable and a formative first-order construct which refers to the frequency of interruptions (Garrett & Danziger, 2008) and to the extent to which they are disturbing and affecting concentration which is suggested to confirm scale robustness (Ou & Davison, 2011).

Interactivity is an endogenous latent variable and a formative first-order construct which is defined based on the CMCIM as a composition of allowing interactive communication, providing control for the user and providing the possibility to reply quickly (Lowry, Roberts, Dean, & Marakas, 2009).

Communication quality is an endogenous latent variable and is based on the items used by Mohr and Sohi (1995) which encompasses the beliefs of timeliness, adequacy, accuracy, completeness, interactivity and effectiveness and the perception of the availability of a person. It is a reflective first-order construct (Ou & Davison, 2011).

Teamwork performance as the dependent variable refers to the individual's perception of group outcomes. It is a reflective second-order construct and a composition of the perceptions of team

satisfaction, team outcome satisfaction and outcome quality and it is based on items developed by Fuller, Hardin and Davison (2007).

The perception of knowledge sharing is an endogenous latent variable and a reflective second-order construct. The first-order components are the sharing of explicit knowledge which is determined by four indicators and tacit knowledge sharing which is determined by three indicators that were adapted by Ou et al. (2010) based on Bock et al. (2005). It is a reflective construct as sharing of explicit and implicit knowledge.

As control variables and drawing on Ou and Davison (2011), use of email, video conferencing, intranet and organizational support with a seven-point likert scale measuring the frequency were chosen. In addition to that gender, age and education level are captured as well as the industry type, position in the company and company size are asked. IN addition, the IM behaviour of the participants is requested by capturing their amount of IM contacts, the share of work-related contacts, the amount of IM tools used, the devices on which IM are used, work preceding experiences and private IM usage.

4.4 Survey and data collection

As this survey adopts mostly pre-existing and pretested items, it follows primarily a predetermined structure. It consists of three parts, the first part asking for demographic information of the participants, the second part asking for information about their general use of communication tools at work and the third and largest part covers the SEM-model as outlined before. Screening questions were included to being able to weed out unusable results (Creswell, 2013).

Before each part, the participants were given a short introduction about the scope of this part. Before the first part, the participants were informed about the scope of the study as whole, the usage of their data and provided with an estimation about the time it took to complete the survey, which was estimated to be 10 minutes. Given the time frame beforehand, participants know what to expect and there is a lower likelihood of cancelling the survey (Saunders et al., 2015).
In addition to that, the participants were informed that their privacy is respected and complying with the laws. Therefore, untraceable links were provided.
Most importantly, the participants are provided with the frame, based on which they should conduct the survey: *Please answer this is survey in the context of the current or most recent team project* (Ou & Davison, 2011, p. 65).

After the design of the survey, it was translated into German. While the German audience usually has a decent comprehension of English, it is not commonly used in every day's life so the provision of a long, English survey might deter potential participants and make it harder to reach a sufficient sample size. Therefore, it was considered as reasonable to translate the survey into

German. The retrieved results were then translated back into English. The use of German also allowed to select the participants naturally as it is a language mostly spoken only in Austria, Germany and Switzerland. Consequently, the sample origin could be controlled.

4.4.1 Measurement scales

All items were measured using a seven-point Likert scale. An exception were the items for communication quality. They were measured using a five-point Likert scale. This was due to the design of the items, which had a non-standardized lower range of potential answers based on its meaning and to avoid changing the scale within this construct. Tests of these items indicated a lower comprehension of the differentiation within a broader range. A seven-point Likert enables a broader range of and therefore a more precise answer. While it has also been shown that larger scales can provide even more precise results it has to be considered that this increased complexity also increases the efforts of the recipients, making it less likely that they will finish the survey (Saris, 2014). Moreover, in many situations it is more difficult to name the response scales with meaningful terms in larger scales, accordingly five-point and seven-point scales are seen as an appropriate means of providing the ability to make nuanced choices (Stopher, 2012). In a comparison of different scale sizes, Revilla, Saris, and Krosnick (2014) found that for scales with more than five points it is necessary to label each response choice and not only the two ends of the continuum of choices in order to reach a high quality. They in general argue that five-point scales are already appropriate and higher scales unnecessary. Conversely, Finstad (2010) explains that five-point scales also increase the likelihood of interpolations in the answers which makes them less accurate than seven-point scales. While there is an ongoing discussion which scale is better to use, Krosnick and Presser (2010) propose and Revilla et al. (2014) confirm in their analysis that overall the differences in the quality of the results between both ways are often quite low. Therefore, for this thesis a seven-point scale was used, specifically because the research from which the constructs were taken also used seven-point scales and significantly different results were not expected.

4.4.2 Validity

All constructs, except use of emoticon were used and validated by Ou and Davison (2011) and Ou et al. (2010) who drew on existing variables, tested adjusted constructs in expert rounds and reported reliability of the constructs. Use of emoticons consists partially of pretested indicators. A test run was conducted to evaluate potential problems related to the understanding of the questions. Three persons evaluated the survey in English. After the translation to German the survey was handed to another five persons capable of English and German that were given both

versions to ensure the quality of the translation. After that, minor adjustments of verbiage was conducted.

4.4.3 Sampling

This sample is a non-probabilistic sample. It relies on a volunteer sampling and it uses a snowball sampling approach. This was done because there is no accessible data about the population of IM users in Germany. Accordingly, the target population cannot be identified and probabilistic approaches cannot be used. Subsequently, this also means that it will not be possible to generalize the findings to a larger population and the findings might contain biases. Saunders et al. (2015) outline this procedure in four steps:

1 *Make contact with one or two cases in the population.*

2 *Ask these cases to identify further cases.*

3 *Ask these new cases to identify further new cases (and so on).*

4 *Stop when either no new cases are given or the sample is as large as is manageable.* (p. 303)

4.4.4 Distribution

The survey was distributed through the online platform qualtrics.eu. Compared to other services Qualtrics has servers in Europe, which is in line with data protection regulations and was provided by the university. It supports multiple languages and multiple forms to ask questions. A significant difference compared to other survey platforms was not viable. It was therefore chosen to carry out the survey. Links to the survey were sent directly to potential participants via email or direct messages and they were asked to identify further potential participants. The data was collected during a time window of 8 weeks between May and June 2016. This rather long time frame was used due to the time intensive snow balling approach that requires respective lead times (Creswell, 2013).

A full depiction of the survey can be found in Appendix B.

5 Results and analysis

The results of the data collection are presented and an analysis of the presented values is provided. The results of this thesis are divided in the descriptive statistics and the statistics of the PLS-model, namely the data of the measurement model and the structural model.

5.1 Descriptive statistics

Overall, 176 completed surveys were retrieved. After checking the answers of the screening questions four entities were removed leaving 172 valid entities. The participants were in an age range between 20 and 58 with a mean of 28.84. More representative is here the median of 26 as the vast majority of the participants is 30 years or below. Considering the gender there was an imbalance between male and females with a respective ratio of 65.1 % to 34.9%. From an educational perspective, 76.8% held a university degree and 88.4% were working in a non-management position. The participants worked by a large margin either in organizations with at least 1000 employees or less than 51. They were from an industry perspective rooted in the IT industry with a share of 34.9% followed by others and manufacturing with 16.3% and 11.6% respectively. Regarding their IM contacts 23.3% stated to have between 100 and 200 contacts while the remaining options are in a range of 11.6% and 18.6%. Out of these, 58.1% of the participants indicated that work related contacts have a share of 20% or below, 11.6% argue for a share of 80 % and above. The most commonly used communication tools are emails with a mean of 5.53 followed by the telephone with a mean of 3.95. The extent of organizational encouragement and provision of IM tools resulted in a mean of 4.67 with a strong standard deviation of 2. On average, two different IM tools were used. A detailed overview of the descriptive statistics can be found in Appendix C.

5.2 PLS-Path model

The analysis of the PLS-Path model was conducted with SmartPLS 3 a software tailored specifically for conducting PLS analysis (Ringle, Wende, & Becker, 2015). As suggested by Hair, Hult, Ringle and Sarstedt (2016) the data was first analysed without the moderator.

5.2.1 Assessment of the reflective measurement model

An evaluation of the results started with the assessment of the measurement model. For the reflective measurement model, this encompassed internal consistency and individual indicator

reliability for composite reliability as well as convergent validity. In addition to that discriminant validity was determined (Hair, Hult, Ringle, & Sarstedt, 2016).

Internal consistency reliability can be estimated using Cronbach's alpha and the composite reliability measure. While the former assumes that all indicators have the same reliability, the latter considers each indicator's reliability. Subsequently Cronbach's alpha tends to underestimate internal consistency reliability and composite reliability tends to overestimate it. Therefore, they can both be seen as the bipolar ends of an equilibrium of reasonable results. Both values are interpreted similarly on a scale between 0 and 1, considering a range between 0.6 and 0.9 as good results. The results in this study despite teamwork performance yielded between 0.796 and 0.884 indicating a high level of reliability. The constructs for teamwork performance were above 0.9, but below 0.95 indicating that there is a slight tendency for some indicators measuring the same phenomenon which is not totally uncommon for the dependent variable.

Convergent validity describes how measures of the same construct correlate positively with each other. It is assessed using the indicator's outer loadings and the average variance extracted (AVE) (Chin, 1998; Fornell & Larcker, 1981). Outer loadings of the items are deemed to have a value of 0.708 or higher to have a high relevance and values between 0.40 and 0.708 should be assessed by their necessity for internal consistency and content validity and eventually be removed (Hair et al., 2011). AVE shows the extent to which a construct determines the variance of its indicators with a common threshold of 0.50.

All Outer Loadings were above 0.40 and every construct had indicators with values below 0.708. This indicates a weak to medium effect. Therefore, the respective indicators had been checked and considering its content validity, two indicators were removed from the path model. The first was file sharing from use of IM as it did not reflect a major contribution for communication as compared to the other indicators of this construct and its deletion from the model helped to increase the composite reliability above the threshold. The second was the removal of the assessment of interactivity from communication quality with similar effects. As interactivity is also a construct of its own, it was considered to be expendable from a content perspective (Hair et al., 2016). A full list of the Outer loadings can be found in Appendix D.

The values of AVE were above 0.50 for knowledge sharing and IM use at work indicating a medium predictive power and reached 0.458 for communication quality suggesting that less than 50% of the variance of the indicators was explained by the construct. This is a discrepancy compared to existing studies and might require future investigation (Mohr & Sohi, 1995; Ou & Davison, 2011). The results of construct reliability and validity are listed in Table 5-1.

Table 5-1: Construct Reliability and Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Communication quality	0,796	0,754	0,833	0,458
IM use at work	0,810	0,842	0,865	0,525
Knowledge Sharing	0,842	0,866	0,884	0,530
Teamwork Performance	0,927	0,941	0,942	0,651

Discriminant validity indicates whether constructs are different from other constructs and therefore unique. This is done measuring the heterotrait-monotrait ratio (HTMT). HTMT was introduced as an approach to overcome these shortcomings (Henseler, Ringle, & Sarstedt, 2015). It takes the within-trait correlations and the between-trait correlations and sets their ratio. HTMT aims to estimate the correlation of constructs if they were perfectly measured suggesting values of 0.85 and above as a threshold to indicate a lack of discriminant validity. In order to gain a distribution of the HTMT statistic a bootstrap confidence interval is created. Applying bootstrapping means to take a huge amount of random subsamples to estimate the model. It can be assumed that the real HTMT population value will be included in this interval with a respective confidence and a value 1 is indicating a lack of discriminant validity. Being randomly drawn each run of bootstrapping can lead to slightly different results after each run, but they do not tend to differ significantly, given a sufficient number of runs. All estimations were run based on a significance level of 5% for 5000 bootstrapping runs (Hair et al., 2016). The results of the HTMT can be seen in Figure 5-1. The settings of the bootstrapping procedure used in this thesis are described in Table 5-2.

Table 5-2: Bootstrapping Settings

Complexity	Complete Bootstrapping
Confidence interval method	Bias-Corrected and Accelerated (BCa) Bootstrap
Parallel processing	Yes
Samples	5000
Sign changes	No Sign Changes
Significance level	0.05
Test type	Two Tailed

All three values of the HTMT results were well below the threshold of 0.85 and the bootstrapping confidence interval did not include a value 1 indicating that discriminant validity was given. Thus, both results suggest the provision of discriminant validity. The results of the confidence interval can be found in Table 5-3.

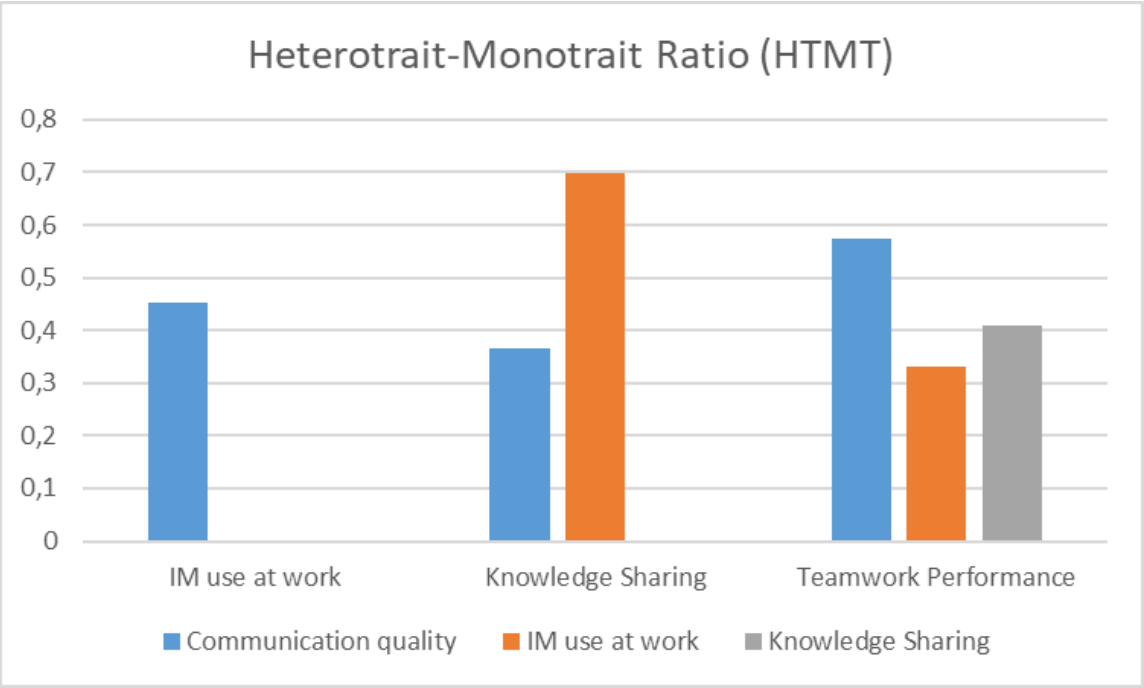

Figure 5-1: Heterotrait-Monotrait Ratio (HTMT)

Table 5-3: Confidence Intervals Bias Corrected

	Original Sample (O)	Sample Mean (M)	Bias	2.5%	97.5%
IM use at work -> Communication quality	0,452	0,474	0,021	0,357	0,541
Knowledge Sharing -> Communication quality	0,365	0,391	0,027	0,254	0,446
Knowledge Sharing -> IM use at work	0,697	0,694	-0,002	0,612	0,764
Teamwork Performance -> Communication quality	0,574	0,572	-0,002	0,402	0,715
Teamwork Performance -> IM use at work	0,331	0,357	0,026	0,250	0,389
Teamwork Performance -> Knowledge Sharing	0,408	0,415	0,007	0,287	0,552

5.2.2 Assessment of the formative measurement model

Formative measurement models are assessed evaluating collinearity issues and the significance and relevance of the indicators. Collinearity issues examine the extent to which indicators have a high collinearity, which is a high level of correlation between two indicators. It can lead to an increase of the standard error and negatively affect the results of the model estimation. To measure this, the variance inflation factor (VIF) with a threshold value of 5 and higher as an indicator for collinearity problems is used.

All VIF values of this study were below this threshold hinting at a lack of collinearity issues (see Table 5-4).

With the help of the outer weights, an indicator's relative contribution for a construct can be measured. Bootstrapping is used to find out whether the outer weights are significantly different from zero and subsequently the bootstrap confidence interval is created.

Results show that the P-Values of the formative indicators INT1, INT2, WI2 and WI3 were above the threshold of 0.05 rendering them not significant at a 5% level for their outer weights, with the remaining indicators reaching a significance level of 5% (see Table 5-5).

The confidence interval indicated a lack of significance for the indicators WI 1 and WI3 as they yielded values including 1 in their interval. Drawing on the literature and previous usage of these indicators they have shown to be relevant for the characterisation of the variables. They were therefore retained, despite not having significant outer weights (see Table 5-6).

Table 5-4: Outer VIF Values

	VIF
INT1	1,805
INT2	2,086
INT3	1,293
WI1	1,764
WI2	1,525
WI3	2,038

Table 5-5: Outer Weights: Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
INT1 -> Interactivity	0,244	0,205	0,158	1,539	0,124
INT2 -> Interactivity	0,294	0,232	0,177	1,660	0,097
INT3 -> Interactivity	-1,118	-1,022	0,337	3,320	0,001
WI1 -> Interruption	1,048	0,948	0,362	2,896	0,004
WI2 -> Interruption	-0,506	-0,419	0,268	1,884	0,060
WI3 -> Interruption	0,157	0,018	0,494	0,318	0,751

Table 5-6: Outer Weights: Confidence Intervals Bias Corrected

	Original Sample (O)	Sample Mean (M)	Bias	2.5%	97.5%
CQ1 <- Communication quality	0,410	0,390	-0,021	0,243	0,676
CQ2 <- Communication quality	0,078	0,078	0,001	-0,232	0,205
CQ3 <- Communication quality	0,332	0,315	-0,017	0,195	0,647
CQ4 <- Communication quality	0,231	0,223	-0,008	0,082	0,309
CQ5 <- Communication quality	0,031	0,041	0,010	-0,173	0,141
CQ7 <- Communication quality	0,338	0,326	-0,013	0,253	0,469
GS1 <- Teamwork Performance	0,092	0,114	0,021	0,011	0,244
GS2 <- Teamwork Performance	0,127	0,155	0,028	0,048	0,223
GS3 <- Teamwork Performance	0,141	0,149	0,009	0,096	0,281
IMUW1 <- IM use at work	0,162	0,167	0,005	0,063	0,266
IMUW2 <- IM use at work	0,271	0,270	-0,001	0,238	0,317
IMUW3 <- IM use at work	0,285	0,274	-0,010	0,225	0,351
IMUW4 <- IM use at work	0,250	0,254	0,004	0,185	0,338
IMUW5 <- IM use at work	0,180	0,189	0,009	0,094	0,263
IMUW7 <- IM use at work	0,208	0,199	-0,009	0,114	0,275
INT1 -> Interactivity	0,244	0,205	-0,038	-0,099	0,509
INT2 -> Interactivity	0,294	0,232	-0,061	-0,038	0,616
INT3 -> Interactivity	-1,118	-1,022	0,096	-1,260	-1,057
KS1 <- Knowledge Sharing	0,135	0,127	-0,008	0,049	0,213
KS2 <- Knowledge Sharing	0,236	0,231	-0,005	0,193	0,303
KS3 <- Knowledge Sharing	0,192	0,194	0,002	0,135	0,242
KS4 <- Knowledge Sharing	0,151	0,151	-0,001	0,106	0,194
KS5 <- Knowledge Sharing	0,233	0,230	-0,002	0,197	0,283
KS6 <- Knowledge Sharing	0,218	0,219	0,001	0,169	0,267
KS7 <- Knowledge Sharing	0,193	0,200	0,007	0,148	0,236
OQ1 <- Teamwork Performance	0,141	0,115	-0,026	0,055	0,186
OQ2 <- Teamwork Performance	0,121	0,119	-0,002	-0,004	0,145
OQ3 <- Teamwork Performance	0,144	0,138	-0,006	0,110	0,182
OS1 <- Teamwork Performance	0,130	0,128	-0,001	-0,093	0,155
OS2 <- Teamwork Performance	0,164	0,146	-0,018	0,123	0,256
OS3 <- Teamwork Performance	0,175	0,166	-0,009	0,145	0,263
WI1 -> Interruption	1,048	0,948	-0,100	0,632	1,342
WI2 -> Interruption	-0,506	-0,419	0,087	-0,891	0,027
WI3 -> Interruption	0,157	0,018	-0,139	-0,946	1,159

5.2.3 Assessment of the structural model

After the evaluation of the measurement model the structural model can be analysed based on the following criteria as outlined by Hair et al. (2016, p. 191):

1. Assess for collinearity issues
2. Assess the significance and relevance of the structural model relationships
3. Asses the level of R^2
4. Assess the f^2 effect size
5. Assess the predictive relevance of Q^2

These steps are used to comprehend the model's predictive capabilities as there is no goodness-of-fit criteria applicable for PLS-SEM (Sarstedt, Ringle, Henseler, & Hair, 2014).

Collinearity is treated the same way as with formative measures, using the VIF value. All values were below the threshold of 5. Thus, it can be assumed that collinearity among the predicting constructs was not a relevant issue for the structural model (see Figure 5-2).

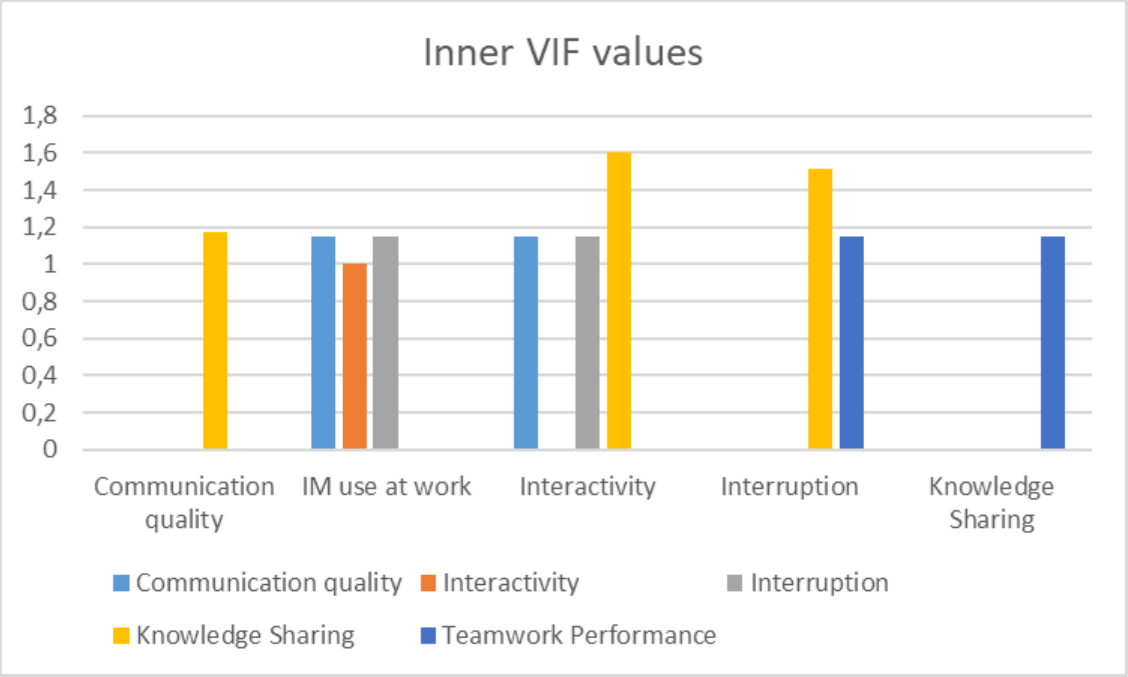

Figure 5-2: Inner VIF values

Path coefficients measure the significance of the relationships between constructs and tend to fall in a range of -1 to +1 with respective strong negative/positive relationships at both ends. T values, P values and a bootstrap confidence interval as means to test the significance are gathered via bootstrapping. Furthermore, the relative importance of the relationships has to be examined and direct and indirect effects of a construct can be seen in the total effect.

The R^2 value describes the predictive power of the model with a range from 0 to 1. (To overcome a potential bias toward complex models the adjusted coefficient of determination R^2adj is a useful tool). The resulting values for R^2 and R^2adj range between 0.122 and 0.439 suggesting a rather weak predictive power (see Table 5-7).

Table 5-7: R Square

	R Square	R Square Adjusted
Communication quality	0,206	0,196
Interactivity	0,128	0,122
Interruption	0,342	0,334
Knowledge Sharing	0,439	0,429
Teamwork Performance	0,201	0,192

When the effect of an exogenous construct on endogenous constructs is under consideration f^2 effect size is chosen. Values that hint at a small, medium or large effect are usually 0.02, 0.15 or 0.35 (Cohen, 1988). According to the results, interactivity did not have an effect on communication quality and interruptions do not affect knowledge sharing. The remaining effects are medium for IM>CQ, INT>WI, INT>KS and KS>TP and small for IM>INT, IM>WI, CQ>KS and WI>TP (see Table 5-8).

Table 5-8: f Square

	Communication quality	Interactivity	Interruption	Knowledge Sharing	Teamwork Performance
Communication quality				0,082	
IM use at work	**0,176**	0,146	0,102		
Interactivity	**0,014**		**0,239**	**0,278**	
Interruption				**0,019**	0,117
Knowledge Sharing					**0,217**

Looking at the total effects it is viable that IM use at work has a strong total effect on communication quality and interruption and a negative effect on interactivity (see Table 5-9).

Table 5-9: Total effects

	Communication quality	Interactivity	Interruption	Knowledge Sharing	Teamwork Performance
Communication quality				0,232	0,104
IM use at work	0,441	-0,357	0,430	0,335	0,009
Interactivity	-0,113		-0,425	-0,580	-0,120
Interruption				0,127	-0,271
Knowledge Sharing					0,447

The path coefficients of the relationships in the structural model following a bootstrapping procedure indicated that most relationships were significant at a 5% level, except INT>CQ,

WI>KS and WI>TP. These results indicate that interruptions at work do not seem to influence the performance of a team or affect the sharing of knowledge (see Table 5-10).

Table 5-10: Path Coefficients

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Communication quality -> Knowledge Sharing	0,232	0,222	0,079	2,948	0,003
IM use at work -> Communication quality	0,400	0,397	0,117	3,432	0,001
IM use at work -> Interactivity	-0,357	-0,355	0,140	2,553	0,011
IM use at work -> Interruption	0,278	0,269	0,133	2,093	0,036
Interactivity -> Communication quality	-0,113	-0,120	0,124	0,912	0,362
Interactivity -> Interruption	-0,425	-0,376	0,166	2,566	0,010
Interactivity -> Knowledge Sharing	-0,500	-0,468	0,172	2,907	0,004
Interruption -> Knowledge Sharing	0,127	0,136	0,133	0,954	0,340
Interruption -> Teamwork Performance	-0,328	-0,219	0,261	1,258	0,208
Knowledge Sharing -> Teamwork Performance	0,447	0,418	0,095	4,695	0,005

Besides the predictive accuracy, predictive relevance has to be assessed with Q^2 values (Geisser, 1974; Stone, 1974). They state that a model has a relevance for a specific dependent construct if the values are above 0, meaning the extent to which a path model can predict originally observed values. To get Q^2 values, the procedure blindfolding is applied. It *omits a part of the data for a particular block of indicators during parameter estimation and the attempts to estimate the omitted part using the estimated parameters. This procedure is repeated until every data point has been omitted and estimated* (Chin, 1998, p. 317). Analysing the differences between the predictions and the original values leads to a prediction error, which is the foundation of the Q^2 values. As a result, a generalized cross-validation measure is generated (Hair et al., 2016). Blindfolding is conducted using an omission distance value D of 7 as it is not an integer fraction of the sample size. Values of 0.02, 0.15, and 0.35 indicate that an exogenous construct has a small, medium, or large predictive relevance.

All Q^2 values were above 0 providing the path model with a predictive relevance with communication quality, interactivity interruption and teamwork performance having a small predictive relevance and knowledge sharing having a medium predictive relevance (see Figure 5-3).

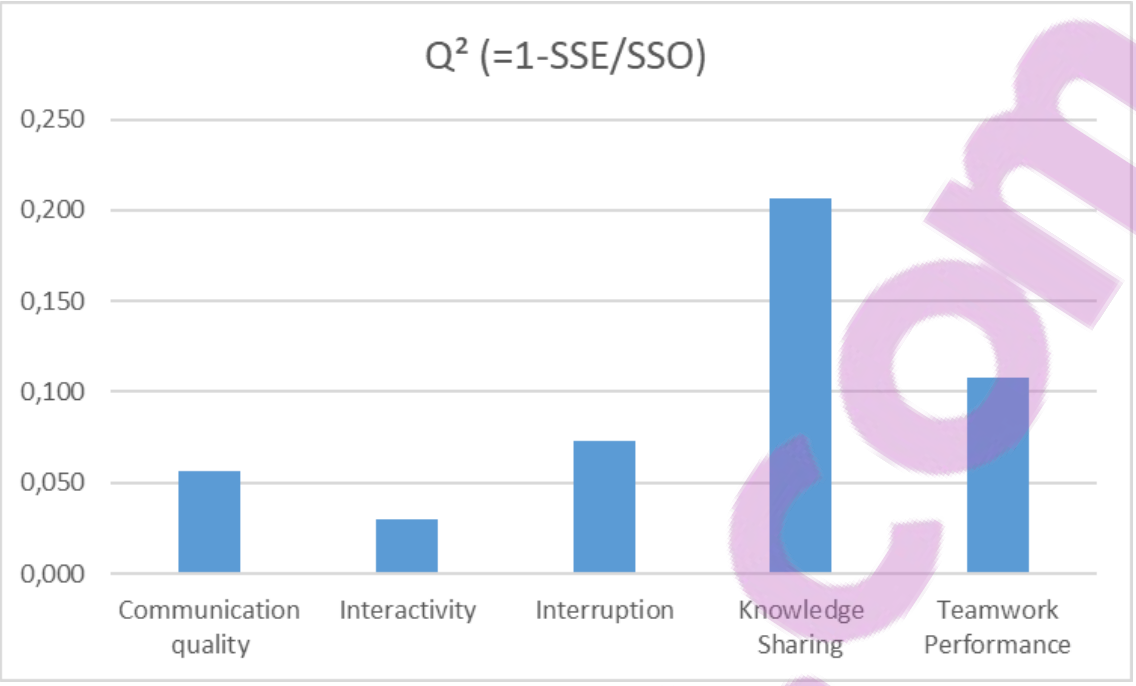

Figure 5-3: Q² values

5.2.4 Analysis of Mediators and Moderators

There are five types of mediation and nonmediation: direct-only nonmediation, no-effect nonmediation, complementary mediation, competitive mediation and indirect-only mediation (Nitzl, Roldan, & Cepeda, 2016; Zhao, Lynch, & Chen, 2010).

Multiple mediation analysis is used to analyse structural models for mediation effects. The first step is to assess the significance of the indirect effects of the constructs following bootstrapping. According to the derived P-values all indirect effects between constructs were not significant at a 5% level, except CQ>TP, IMU>WI, IMU>KS that showed significant indirect effects. Therefore, there was no empirical support for a mediated relationship for the non-significant effects (Table 5-11).

Table 5-11:Indirect effects

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Communication quality -> Teamwork Performance	0,104	0,096	0,045	2,318	0,020
IM use at work -> Communication quality	0,040	0,052	0,038	1,069	0,285
IM use at work -> Interruption	0,152	0,142	0,076	2,003	0,045
IM use at work -> Knowledge Sharing	0,335	0,355	0,055	6,084	0,005
IM use at work -> Teamwork Performance	0,009	0,053	0,093	0,099	0,921
Interactivity -> Knowledge Sharing	-0,080	-0,076	0,055	1,462	0,144
Interactivity -> Teamwork Performance	-0,120	-0,139	0,107	1,123	0,262
Interruption -> Teamwork Performance	0,057	0,055	0,056	1,016	0,310

Taking the direct effects into account that state the relationship IMU>WI as significant a complementary partial mediation through INT is given as both effects are positive (Hair et al., 2016, p. 233).

5.2.5 Moderation

To run a moderator analysis, data should be standardized. A two-stage approach is used to compute a moderation analysis when the moderator is a formative construct. The first stage is to estimate a main effects model that does not include the interaction term to get the values of the latent variable. In the second stage the values of the moderator and the latent variable are multiplied to obtain an interaction term (Chin, Marcolin, & Newsted, 2003; Henseler & Chin, 2010). An assessment of the VIF values indicates a lack of collinearity issues for the moderator variable EMO as the values are well below the threshold of 5.

An analysis of the P-values of the outer weights showed that all indicators in this study were not significant (see Fig. 5-12). In addition, an analysis of the outer loadings showed no significance for the indicators as well. While individual indicators that lack significance could have been eliminated from the data, this did not seem to be desirable, when no indicator had reached a level of significance (Hair et al., 2016). Therefore, use of emoticons as a variable was discarded from the model.

Table 5-12: Outer Weights

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
EMO1 -> Use of Emoticons	0,368	0,554	0,575	0,640	0,522
EMO2 -> Use of Emoticons	0,809	0,183	0,616	1,313	0,189
EMO3 -> Use of Emoticons	0,054	-0,359	0,613	0,088	0,930
EMO4 -> Use of Emoticons	-0,559	0,027	0,550	1,016	0,310
EMO5 -> Use of Emoticons	-0,694	-0,119	0,479	1,449	0,147
EMO6 -> Use of Emoticons	0,036	-0,096	0,262	0,135	0,892

5.2.6 Path Model revisited

A graphical representation of the remaining path model with the respective path coefficients can be seen in Figure 5-3.

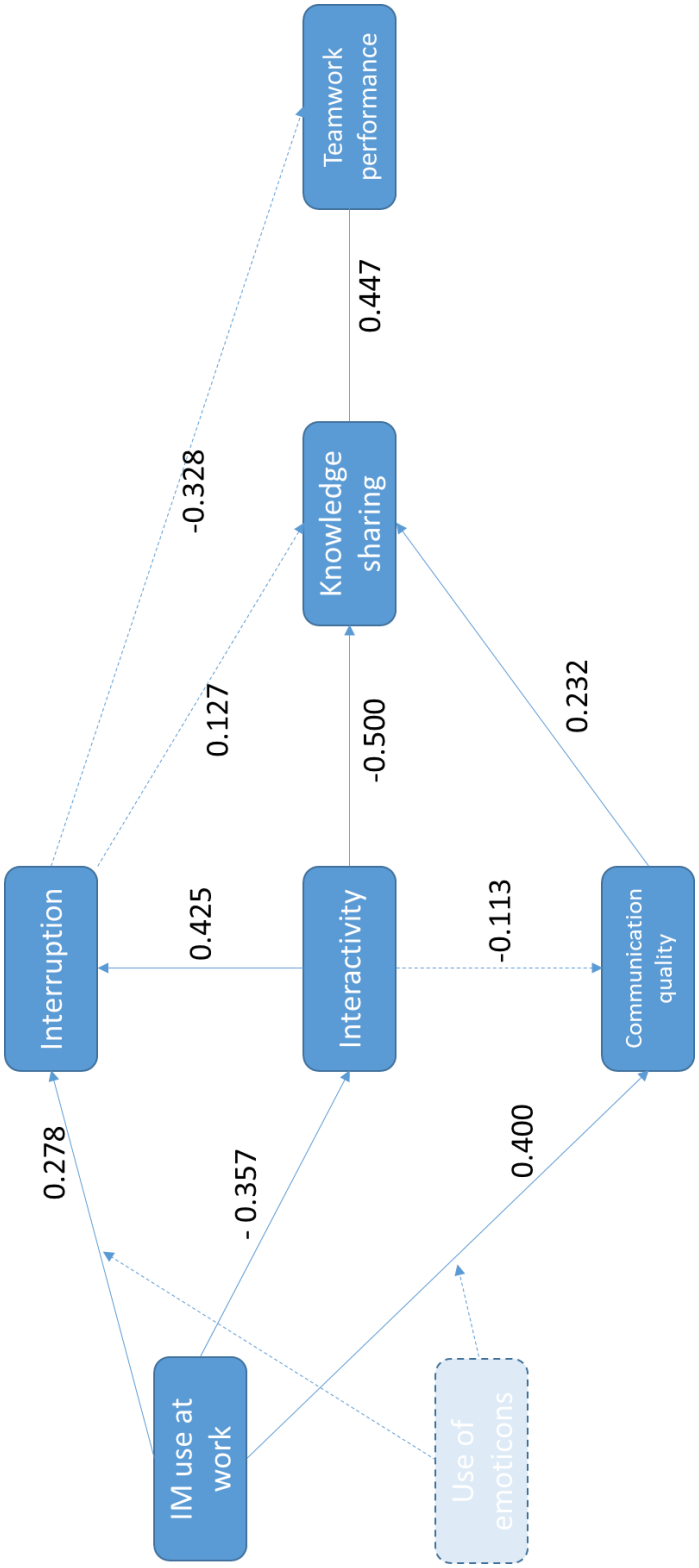

Figure 5-3: Final path model after the analysis with path coefficients. Dashed lines and boxes are not significant.

6 Discussion and conclusion

This section contains a discussion of the results provided in the previous chapter, puts them into the context of the theories discussed before and draws conclusions. It also describes the limitations of this study and provides implications for research and managers.

6.1 Discussion

One proposal of this study was to introduce the use of emoticons as a moderator for the relationship between the use of IM and interruptions as well as the use of IM and communication quality. The results of this study do not support it. The entire construct has failed to provide a significant effect. This could have multiple reasons. One reason is the composition of the construct. While it was mostly based on pre-existing measures, the construct has not been used before in this context. So it is possible that it was not sufficient enough to capture the necessary data (Huang et al., 2008). Another explanation is the type of audience. It has been established in the literature that emotional expressions can be conveyed via IM and the share and subsequently the familiarity with IM that offer a wide range of emoticons has grown rapidly. However, there is not much information about their usage in work related conversations (Derks, Fischer, & Bos, 2008; Huang et al., 2008; Skovholt et al., 2014; Tossell et al., 2012; Wang et al., 2014). Taking the results of the descriptive analysis into consideration, the data also suggest that the use of emoticons in a professional context did not seem to be too far spread. Accordingly, the significance of emoticons in work related communication is not given at the moment based on the perspective of this thesis.

This thesis has yielded significant relationships between the use of IM with interactivity, interruptions and communication quality. While the first relationship shows a negative effect the two latter indicate a positive relationship, confirming the theorized relationships. The positive impact on interruptions is well established in previous research. As IM is inherently focused on a swift and continuous communication with one or multiple collocutors, conversations happen easier and more frequently as messages tend to be shorter as well, which in turn leads to more interruptions (Cameron & Webster, 2013; Song & Wang, 2011; Sykes, 2011).

The positive impact on communication quality has been demonstrated through the inherent properties of IM in the literature before. IM provides a smooth and easy way to access and to facilitate a conversation (Aubert et al., 2013; Garrett & Danziger, 2008; Shaw et al., 2007). The descriptive data of this thesis also indicate an increased use of IM on smartphones at work for job related purposes. Through the mobility, the availability for communication is increased and thus it is easier to engage in conversations timely, which further improves communication quality.

As the use of IM at work has shown a negative impact on interactivity, this might be related to the loss of control over the communication that could happen with IM in professional applications. They often include a list with all contacts in the company and an availability signal. Although there is always the possibility to not respond, an ongoing influx of messages might influence the perception of the interactivity negatively (Gupta et al., 2013).

Interruptions at the work place have for a long time been seen as a negative effect on the individual and team performance (Cummings, 2004; Gupta et al., 2013; Rennecker & Godwin, 2003). This study could not establish this link as the relevant relationship was not significant. This is in line with the results presented by Ou and Davison (2011) that found this relationship to be non-significant. The results are also in line with recent research that has shown a tendency of interruptions to be less of a factor in the workspace. People get used to an environment of constant interruptions be it through emails, calls or IM and they have adjusted their way of working. An increase of IM usage seems to replace other forms of interruptions and therefore mitigates their impact (Garrett & Danziger, 2008; Lebbon & Sigurjónsson, 2016; Mansi & Levy, 2013).

This thesis has also not found support for a significant relationship between interruptions and knowledge sharing with the underlying assumption that more frequent interruptions lead to more possibilities to share information with each other. Following Basoglu et al. (2009) a reason could be that an increased frequency of interruptions negatively affects cognitive load so that it becomes more difficult for a person to comprehend additional information when currently performing another task. Thus, the processing of new knowledge is inhibited (Sykes, 2011).

The relationships between interactivity and communication quality has not shown to be significant, too. This contradicts the results presented by Ou and Davison (2011) that have found this relationship to be significant. It might be an indication that the different cultural background of the samples affects the significance of interactivity, as the data in this study was derived from a German sample as compared to a Chinese one. As communication via IM is also limited due to its textual nature, there is also quite often the usage of IM as a secondary tool of communication as it can be used simultaneously with other ways of communication. This can lead to a mitigated perception of the importance of the interactivity towards communication quality and therefore explain its non-significant relationship (Pazos et al., 2013).

Interactivity's relationship towards knowledge sharing could be established. However, contrary to the theorized hypothesis this relationship seems to be negative. As interactivity thrives to have multiple synchronous conversations, it also increases the cognitive load, as pointed out before and therefore restricts the ability to comprehend the conversation properly as attention might be drifting aside (Basoglu et al., 2009). This could impede an effective communication and therefore negatively affect knowledge sharing (Cameron & Webster, 2013). The more informal nature of IM that is furthered by its interactivity might also lead to negative influences toward knowledge sharing as it might lead to less adequate articulation (Cameron & Webster, 2005). The

counterpart might perceive it negatively and therefore decides to not respond or to delay responses. As communication via IM is also limited due to its textual nature, there is also quite often the usage of IM as an secondary tool of communication as it can be used simultaneously with other ways of communication. On one hand this can lead to a mitigated perception of the importance of interactivity and on the other hand be perceived as negative if it distracted participants from the conversation when they are also engaged in another conversation simultaneously (Cameron & Webster, 2013; Pazos et al., 2013; Sykes, 2011).

This study has also confirmed a significant relationship between interactivity and interruptions. The results indicate a negative effect of interactivity on interruptions. This might be due to its more integrated nature that provides communication as an ongoing flow as compared to the more isolated emails or phone calls. Accordingly, interruptions are not perceived as such but seen as a part of a continuous conversation (Darics, 2014).

Communication quality has a significant positive effect on knowledge sharing in this thesis. Previous studies have already established this relationships and this thesis confirms it (Chen et al., 2013; Kuk, 2006; Mohr & Sohi, 1995). Especially the properties of communication quality are necessary means to enable an effective conversation and consequently the foundation for sharing knowledge (Sarker et al., 2003).

The positive, significant relationship between knowledge sharing and teamwork performance in this study is in line with previous research. As repeated knowledge sharing has led to further knowledge sharing and ultimately knowledge application it enhances the likelihood of a better performance of a team (Choi et al., 2010). It also helps to create awareness about the availability of knowledge that a team can draw on (Stasser & Titus, 1985). This thesis contributes to this research by adapting the CMCIM for the realm of knowledge sharing and shows how interactivity and communication quality can serve as means that cater the effects of the use of IM at work.

6.2 Conclusion

IM has become pervasive in the private lives of many people, but has also become a common tool for communication within teams. This study applied an PLS-SEM approach to design and distribute and analyse a survey that should help to understand the effects of the use of IM on knowledge sharing and teamwork performance and assess the underlying relationships and variables. The results show that there is a significant positive relationship between the use of IM and knowledge sharing, respectively teamwork performance through its influence on communication quality. However, there is also a negative impact on interactivity which negatively affects knowledge sharing. It is also indicated that interruptions do not seem to have a negative impact on teamwork performance. Emoticons as a transmitter of social cues have not demonstrated to be of significant importance for communication in a professional context as of now. IM use leads to a positive impact on the perception of communication quality. Overall, IM

is on the way to become an important communication channel in teamwork tasks, but will mostly serve as a complementary means of communication.

RQ 1: How does use of IM affect teamwork performance in Germany?

→ Use of IM affects research questions through its effects on knowledge sharing which is a direct predictor of it.

RQ 2: How does use of IM affect knowledge sharing among teams in Germany?

→ Use of IM affects knowledge sharing as it has a negative effect on interactivity which in turn has negative impact on knowledge sharing. Use of IM at work also enhances communication quality which improves knowledge sharing.

6.3 Implications for research

This thesis has conducted research on an exploratory level and tried to work out relationships that help to explain the influence of the usage of IM towards teamwork performance and knowledge sharing. Therefore, a research model was introduced that includes the concepts of interruption, interactivity and communication quality as variables that influence knowledge sharing and teamwork performance. Moreover, the use of emoticons as a moderating variable was theorized. The results of this study show that some constructs do not seem to have an significant influence or are not significant on their own. While this was not the intent of the study it is an outcome that can always happen when relying on mostly untested ground (Babbie, 2013). Future research might be able to gain better results and use more profound tools.

This research used an SEM based approach to address the research questions how the use of IM affects teamwork performance and knowledge sharing. The literature review and the establishment of the research model has rendered knowledge sharing as a direct predictor for teamwork performance. Drawing on the results of this study the use of IM at work negatively affects interactivity and positively affects communication quality as variables that in turn have an impact on knowledge sharing and consequently on teamwork performance.

6.4 Implications for managers

IM is a tool that has entered the lives of workers at home and more and more at work. People have grown familiar with its usage and they have adapted their means of communication. Especially among younger people, the so called Generation Y, this style has become ubiquitous and they are partially the workers of today and partially the workers of tomorrow. Therefore, it seems to be reasonable for managers to consider the integration of respective tools in the working environment.

As the results of this study and previous studies indicate, the negative impact of interruptions caused by an extensive usage of IM do not yield a significant effect. It seems as if people are getting used to an constant influx of messages and they have grown familiar to integrate it in their working flow. Previously existing prejudices regarding this issue seem to be less relevant.

However, what can also be seen from this study is that there is a need for companies to develop a concept and culture of how to use IM properly. While there is a positive effect on the communication quality there is also a risk to overwhelm users if the simplicity of the tool leads to an increased influx of messages. This makes it harder to keep track of them and requires an appropriate structure to ensure that urgent and relevant information can be provided and apprehended. If this is considered thoroughly IM allows a company to replace emails in their internal communication and enhance its value in the work of teams, not necessarily as the prioritised tool but as a complementary one.

6.5 Limitations

There are several limitations in this thesis. The first limitation is the sample. While the sample size is sufficiently large, it is a non-probabilistic sample (Hair et al., 2014). Thus, the generalizability of the results is very limited and they cannot be generalized to the entire population (Creswell, 2013). The survey was distributed primarily with a snowball approach, but with a lack of data on the population as a whole, a probabilistic approach was not in the realm of possibilities. Although demographic information of the participants is provided that allow to configure a similar sample, results might be extremely different. It is therefore important to note that the results of this study should not be overestimated and the existence of certain sample biases cannot be excluded.

A second limitation is the research approach. In this study a survey was used as a means to gather data. Being a constant document that should not be changed when dispatched it has very restrictive capacities to capture information. There is no possibility to adjust questions on the go and therefore the realm of the data gathered is limited. Although the survey is built on pre-existing designs and mostly using established questions misconceptions of individual terms and questions cannot be excluded. In addition, this survey is a rather long one with more than 40 items just for the main part. While the potential participants were clearly informed beforehand about the length it cannot be excluded that fatigue or other typical survey related issues have happened at the side of the participants and influenced their answering behaviour (Saunders et al., 2015).

Another limitation is the scope of the survey. The participants were asked to answer the questions based on their experiences with their latest project. This setting was adapted from another study and requests the participants to derive their answers based on their perceptions (Ou & Davison,

2011). It is possible that memories and perceptions are flawed and therefore the results have to be treated accordingly (Biemer & Lyberg, 2003).

For the construction of the research and the analysis a PLS-SEM approach was chosen. While it seems to have been the best choice given the frame and feasibility of this thesis, it is still an approach that has just become popular in recent years. So, there is always the possibility that the process followed might have some flaws that are not discovered yet or some of the inherent properties of the method had an negative impact on the results (Goodhue, Lewis & Thompson, 2012).

6.6 Future Research

In this thesis a quantitative approach with a survey is used to answer the research questions. There is also the possibility to apply an experiment. In a controlled setting, the impact of IM within a could be assessed with a stronger focus on the effects of the properties of the communication tools on the communication process and on the sub-sequential teamwork performance. Using A-B group testing would allow to cover more latent relationships that are maybe also not considered as relevant by participants of a survey as they do not perceive them. This could also help to understand how workers deal with the constant interruptions that are inherently caused by the use of IM, but in this study not perceived as such.

This study has focused on specific constructs that can influence knowledge sharing and subsequently teamwork performance starting from a communication tool perspective in a narrowed down work related context. Previous research has provided evidence that there are also other dimensions that affect teamwork performance and that can be influenced by the use of IM. Especially the topic of trust and interpersonal relationship, respectively building and maintaining a social network are factors that can have an significant influence on teamwork performance (Ou & Davison, 2011; Ou et al., 2010; Wang, Walther, & Hancock, 2009). These angles were beyond the scope of this thesis, but should be considered in future research. A potential research strategy could be to follow a mid- to long-term case study approach that allows helps to take social, intangible factors into consideration. It would enables to track the influence caused through these volatile factors that tend to change over time.

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8 Appendix

Appendix A: Literature Review

Literature Review: Instant Messenger

Author	Country	Method	Participants	Results
Ahad & Lim (2014)	Brunei	survey	students	Frequent use of IM further communication but leads to necessity to respond immediately.
Basoglu, Fuller, & Sweeney (2009)	United States	experiment	students	Frequent interruptions negatively influence decision accuracy.
Begole, Tang, Smith, & Yankelovich (2002)	United States	Case Study	Employees	The transmission of activity rhythms of people can help to find optimal contact time.
Bowman, Levine, Waite, & Gendron (2010)	United States	Experiment	Students	Use of IM doesn't affect academic performance but increases time to complete.
Cameron & Webster (2005)	Canada	Case studies	Employees, managers	IM enables polychronic communication, but interrupts concentration.
Cameron & Webster (2013)	United States	Survey	Employees, students	Perception of multicommunication depends on the initiator, but still evokes uncivility. Process losses can be minimized by choosing the right media fit.
Cho, Trier, & Kim (2005)	Korea	Case study	employees	IM can help to maintain relationships and amplify information gathering in a company. Usage depends on the role in the company.
Conte & Gintoft (2005)	United States	survey	employees	Polychronicity can be benficial for perception of sales persons.

Cui (2016)	China	Semi structured interviews	students	Mobile IM helps to maintain distant relationships. It serves as a complement of communication tools and have developed as a routine that doesn't cause interruptions.
(M. L. Cummings, 2004)	United States	experiment	employees	IM can disrupt primary tasks and reduce human performance unless the system is adaptively filtering messages.
Cutrell, Czerwinski, & Horvitz (2000)	United States	experiment	employees	Interruptions related to the current task are not as disruptive as unrelated interruptions. People comprehending information are hampered by interruptions.
(Czerwinski et al., 2000a)	United States	experiment	employees	Notifications of IM negatively affect information retrieval.
(Czerwinski et al., 2000b)	United States	experiment	employees	IM interruptions should occur in the beginning of a computing task. They are especially harmful during typing of interaction with interfaces.
Darics (2014)	United Kingdom	Content analysis	employees	IM allows to engage in a daylong conversation. Users are aware of unavailability for IM conversations and develop respective manners.
De Vos, Hofte, & De Poot (2004)	Netherlands	Case study	employees	Business IM is primarily used during working time with working contacts and increases reachability. No significant improvements of performance were measured.

Deng, Lu, Wei, & Zhang (2010)	China	survey	students	Mobile IM enables to communicate ubiquitously in a convenient situation.
Dorwal et al. (2016)	India	experiment	employees	Mobile IM use can improve communication and information sharing in laboratory and medical settings.
Fante, Jacobi, & Sexton (2013)	United States	experiment	students	IM usages negatively affects reading comprehension speed. Difficulty doesn't affect comprehension quality.
Fetter, Seifert, & Gross (2010)	Germany	Case study	employees	Manual IM availability signalling is inefficient, but the choice of selective availability can minimize the impact of interruptions.
Fox, Rosen, & Crawford (2009)	United States	experiment	students	IM negatively affects performance of reading comprehension and increases task completion time. The engagement in IM conversation is deliberately and thus precautious measures to continue primary tasks are taken. IM use is negatively related to cognitive performance.
(R. M. Fuller, Vician, & Brown, 2016)	United States	Experiment	students	CMC anxiety negatively affects participation in communication of virtual teams
Garrett & Danziger (2008)	United States	survey	employees	IM use increases communication and minimized interruptions as IM is used to manage interruptions.
González & Mark (2004)	United States	Case study	employees	Interrupting and being interrupted occurs with a similar frequency. Information work is highly fragmented. People rarely work

				longer than twelve minutes uninterrupted.
Gupta, Li, & Sharda (2013)	United States	Experiment	students	IM interruptions negatively affect primary task quality mental workload. Social aspect can moderate impact on task quality.
Handel & Herbsleb (2002)	international	Case study	employees	Group chat is used mainly for work related discussions and in general seen as less intrusive as compared to personal messages.
Cotten (2008)	United States	survey	students	IM is intensely used for contact maintenance. It enhances the mattering of students which increases self-esteem and well-being.
(H. Huang & Leung, 2009)	China	survey	School students	Addictive use of IM diminished academic performance as they lose control over time and neglect duties.
Huang & Yen (2003)	United States	survey	students	The high usage of IM by students will translate into business acceptance. Characteristics of IM usage related to workplace usefulness are not as important for social usefulness and vice versa.
Hudson, Christensen, Kellogg, & Erickson (2002)	United States	experiment	managers	Interruptions are always disrupting, but can also provide new information. They should occur at the relative best time during the day. Perception of the relevance of interruptions is socially constructed.
Hung, Huang, Yen, & Chang (2007)	Taiwan	experiment	Students	IM task completion works better than email task completion. IM is better suited for idea

				generation. Email users contemplate contributions more than IM user who are dependent on simultaneous interaction.
(Isaacs, Kamm, et al., 2002)	United States	Content analysis	employees	IM is primarily used for discussions or setting up impromptu meetings. Frequent users tend to engage in multiple fast-paced conversation during the day.
(Isaacs, Walendowski, et al., 2002)	United States	Content analysis	employees	IM was rarely used for personal matters and mainly for workplace discussions. IM conversations have a similar length as other types of conversations. Collaborative conversations are shorter but more frequently as compare to coordinating conversations. There is barely a move to another communication tool while in a discussion.
Junco & Cotten (2011)	United States	survey	students	IM use diminishes schoolwork but is often not seen as such. IM use is often related to multitasking.
Koo, Wati, & Jung (2011)	Korea	survey	employees	IM use is affected by social influence allowing effective in use in urgent situations. IM is suitable for all types of tasks. In urgent situations with close partners IM will likely be replaced by face to face communication.
Lancaster, Yen, Huang, & Hung (2007)	United States	Survey	Students	IM is seen as offering more functional benefits as compared to emails, but more

				used for private than for work related communication.
Lebbon & Sigurjónsson (2016)	United States	Experiment	Students	IM use doesn't affect task completion time significantly. Users tend to compensate time spent with IM by acting faster and aware of their use of IM.
(D. Li et al., 2005)	United States	survey	students	IM helps to maintain relationships in an interactive and positively affects enjoyment. IM is most likely be used in combination with other tools to sustain.
(H. Li et al., 2011)	United States	Experiment	students	Polychronicity moderates the impact of interruptions. Monochronic people feel more time pressure when interrupted.
Licoppe (2010)	France	Case study	employees	Interruption lead to better adaption and optimization to changing environment. Notifications have become less disruptive.
Mansi & Levy (2013)	United States	experiment	employees	Interruptions don't affect task accuracy, but negatively affects task completion time. Workers will start to ignore IM while engaged in complex task after some time. Interruptions can also provide important information that reduce completion time.
Mark, Gonzalez, & Harris (2005)	United States	Case study	employees	Work fragmentation is common among knowledge workers. Effect of interruptions should be seen in the overall context of the work and not based on an individual task.

Nardi, Whittaker, & Bradner (2000)	United States	Case study	employees	IM is very flexible in supporting work, it allows rich communication. IM allows people to negotiate availability. IM in interruptions are seen as more acceptable as the time of response can be decided.
Ou & Davison (2011)	China	Survey	MBA students	Negative effects of interruptions is outweighed by benefits of IM use. IM interruptions do not occur more frequently than other interruptions. IM use can help to enhance mutual trust when mediated via communication quality and its interactivity.
Ou , Sia, & Hui (2013)	China	Case study	Employees	IM use helps to improve the communication process, interactivity and social networking which subsequently enhances individual work performance.
Ou, Davison, Zhong, & Liang (2010)	China	Survey	Employees	IM helps to build social networks which enhances knowledge sharing and positively affects teamwork performance. Knowledge sharing and social networks fully mediate this effect.
Pazos, Chung, & Micari (2013)	United States	Case study	employees	IM is often used for coordination and general efficiency. It's more often used for collaboration than for conflicts. IM not sufficient for conflicts. Use of IM in multitasking seems to be triggered by organisational context rather than personal preference.

Quan-Haase, Cothrel, & Wellman (2005)	Canada	Case study	employees	IM is focused on work related communication, it creates more connectivity but also provides possibility to delimit from superiors. The availability signal of IM is an important means to plan communication. Organisational status influences the response necessity.
Reinsch, Turner, & Tinsley (2008)		Grounded theory		Mulitcommunication has developed unintentional in organisation and has led to people accept shared attention and later replies.
Rennecker & Godwin (2003)		Grounded Theory		Interruptions of IM might add up and thus diminish productivity.
Rosen, Mark Carrier, & Cheever (2013)	United States	Observation	students	Students tend to stay focused on a task for roughly 6 minutes on average within before switching tasks, caused by technological distractions mostly. People that write messages are more often distracted. Students that frequently use social media seem to have a lower academic performance.
Scheibe & Gupta, (2017)	United States	Survey	employees	Organizations with a rational culture can benefit their creativity using IM to share knowledge
(B. Shaw et al., 2007)	United States	Case study	employees	IM often serves as complementary tool and is often used to establish communication. It serves as a useful means for back-channel communication while engaged in other communication and

				its availability signalling increases effectiveness of communication attempts.
Simon (2006)	United States	Experiment	students	People used to IM adapt to its contingencies and can perform similarly to people working face to face or via video. Visual communication tends to lead to higher satisfaction than written.
(B. Song & Wang, 2011)	China	survey	students	IM should provide users the possibility for customization and enjoyment functionalities.
Sykes (2011)	Canada	Case study	employees	Interruptions are mostly related to work-related tasks. Interruptions are ubiquitous and people learn to get used to it.
Tigelaar, Hiemstra, & Trieschnigg (2012)		overview		
Vartiainen & Jahkola (2013)	Finnland	Case study	employees	IM preferred for informal communication in distributed teams, often used for coordination and initiation of contacts.
(Zheng Wang et al., 2012)	United States	experiment	students	IM use can lead to lower performance as the eyes have to focus on several visual incentives which increases cognitive load. IM use performs slightly worse than voice chat.
Zaman, Anandarajan, & Dai (2010)	United States	survey	students	IM users can feel a flow experience which enhances their perceived concentration and creativity as they tend to be more positively affected and act more explorative.

Literature Review: Emoticons

Author	Country	Method	participants	Results
Amaghlobeli (2012)	France	Content analysis		Three types of emoticons, typographic, graphic, verbal.
Churches, Nicholls, Thiessen, Kohler, & Keage (2014)	Australia	Experiment neuroscience		Human brain can recognize emoticons as face if stuck to natural face configuration
(Derks et al., 2007a)	Netherlands	experiment	School students	Emoticons strengthen intensity of message, but can't reverse the meaning.
(Derks et al., 2007b)	Netherlands	experiment	School students	Social context influences use of emoticons and emoticons cannot resolve negative situations.
Derks, Fischer, & Bos (2008)		Literature review		Emotions are used online and offline with a similar frequency. Computerbased-Communication is better suited for expressing negative emotions.
Dresner & Herring (2010)		Literatur review		Emoticons can display emotions, non emotional expressions or act as hedges.
Ganster, Eimler, & Krämer (2012)	Germany	experiment		Graphical emoticons have a stronger impact on the mood than typographic ones.
Huang, Yen, & Zhang (2008)	United States	survey	students	Emoticons can further interactions and facilitate cooperative behaviour.

Kavanagh (2010)	Japan, United States	Content analysis		High context cultures benefit stronger from the use of emoticons than low context cultures.
Krohn (2004)		Literature review		Communication should be adjusted to generational changes and adapt non-verbal communication in daily life.
Kwon, Kim, & Kim (2013)	Korea	experiment	employees	Emoticons have a positive effect on the acceptance of a message in positive contexts.
Lo (2008)	Taiwan	experiment		Emoticons allow users to recognize the right emotion of the recipient.
Luor, Wu, Lu, & Tao (2010)	Taiwan	Content analysis		Emoticons should be used dependent on the type of communication.
Menchik & Tian (2008)	international	Case study	employees	Emoticons serve as tool of clarification and not so much for emotion transmission.
Park & Sundar (2015)	Korea	Experiment	students	Emoticons can help to increase the social presence of interaction participants.
Park, Baek, & Cha (2014)	International	Content analysis		Individualistic countries tend to use emoticons that stress the shape of the mouth, Collectivistic countries focus on the shape of the eyes.
(J. Park et al., 2013)	international	Content analysis		Western countries tend to use emoticons that stress the

				shape of the mouth, Eastern countries focus on the shape of the eyes.
Provine, Spencer, & Mandell (2007)		Content analysis		Emoticons can not convey as much as a gifted writer and should be seen as a form of colloquial speech.
Skovholt, Grønning, & Kankaanranta (2014)	Norway, Finnland, Denmark	Content analysis	Employees	Emoticons are used as markers of positive attitude, irony and hedges of utterance.
Tossell et al. (2012)	United States	experiment	students	Emoticons are rarely used in private personal messages and tend to be more often used by females.
Walther & D'Addario (2001)	United States	experiment	students	Emoticons fulfil a supportive function. The larger effort to write a text gives it more importance.
(Weiquan Wang et al., 2014)	China	experiment	students	Use of emoticons is context sensitive and provision of negative feedback should be taken carefully.
Yuasa, Saito, & Mukawa (2006)	Japan	experiment neurosciene	Students	Emoticons can be recognized by the brains as emotions.
Yuasa, Saito, & Mukawa (2011)	Japan	experiment neuroscience	Students	Emoticons are a means of enhanced communication.
Yuki, Maddux, & Masuda (2007)	Japan, United States	experiment		Countries that tend to not show emotions focus on the eyes while more expressive countries focus on the mouth.

Appendix B: Survey

Descriptive data: This part serves to retrieve demographic data that helps to put your data into context.

Please state your age

Please state your gender

(1) Male
(2) female

Please state your education level

(1) Pre-College
(2) College
(3) Undergraduate
(4) Graduate/master or above

Please state your position in your company

(1) Non-management employee
(2) Manager
(3) Senior or executive manager

Please state the size of your company

(1) 50 or less
(2) 51-100
(3) 101-500
(4) 501-1000
(5) 1000 and above

Which of the following categories describes the branch of your company best?

(1) PR
(2) Manufacturing
(3) IT
(4) Commerce
(5) Education
(6) Tourism
(7) Entertainment
(8) Publishing
(9) Telecommunication
(10) Services
(11) Government services
(12) Finance and banking
(13) Logistics and transportation
(14) Other: (please state)

The following part serves to gain a better insight into your communication behaviour at work

How many IM contacts do you have (on all applications combined)?

(1) 1-10
(2) 11-20
(3) 21-50
(4) 51-99
(5) 100-200
(6) 201 or more

Please indicate the share of work related IM contacts compared to all your contacts

(1) 0%
(2) 1-20%
(3) 21-40%
(4) 41-60%
(5) 61-80%
(6) 80-100%

Please state how often you use the following communication tools at work
Scale: Not at all (1)–Frequently (7)

(1) email
(2) video conference/-call
(3) intranet
(4) phone

Please assess the following statement
Scale: Strongly disagree (1)–Strongly agree (7)

(1) My company encourages the employees to use IM for work-related communication with colleagues

Please state the number of IM applications (e.g. Lotus Sametime, Lynch, Skype, WhatsApp, Slack) that you use at work. It doesn't have to be an application actively provided by your company.

(1) No
(2) 1
(3) 2
(4) 3
(5) 4
(6) 5 or more

Please assess the following statement in terms of its frequency
Scale: Not at all (1)–Frequently (7)

(1) I use IM on a smartphone at work
(2) I use IM on a desktop/laptop at work

(3) I use IM while I communicate with the help of another communication tool (e.g. phone)
(4) I use IM in my private life
(5) I have used IM before I started to work.

The following part serves to assess interdependencies between the use of IM and different variables toward the performance of your team.

IM Usage at Work,
Scale: Strongly disagree (1)–Strongly agree (7)
(1) I often use IM tools to contact other people for my work.
(2) I regularly use IM tools to communicate with colleagues or customers in my daily work.

The frequency of usage of IM tools to do the following things in my daily work is ...
Scale: Not at all (1)–Frequently (7)

(1) Ask questions.
(2) Answer questions.
(3) discussion
(4) Share files.
(5) Work-related socialization.

Effect of emoticons:, Scale: Strongly disagree (1)–Strongly agree (7)

(1) When I used instant messaging to communicate, I used a great deal of symbols to represent my feelings or emotions
(2) My colleagues who sent me instant messages often used symbols to represent their feelings or emotions
(3) Instant messaging conveys more than just text, other information cues are also conveyed.
(4) When I used instant messaging to communicate, I used a great deal of emoticons to emphasize my utterance.
(5) My colleagues who sent me instant messages often used symbols to emphasize their utterance.
(6) I was irritated when emoticons were contradicting the message or unrelated to the message.
(7) My colleagues were irritated when emoticons were contradicting the message or unrelated to the message.

Interactivity,
Scale: Strongly disagree (1)–Strongly agree (7)

(1) I am able to control my communication at IM tools.
(2) Via IM tools, the other parties can respond to my communication quickly.
(3) Using IM tools allows me to acquire information in an interactive way.

Work interruption,
Scale: Strongly disagree (1)–Strongly agree (7)

(1) My work is always interrupted by IM messages.
(2) I felt IM messages are quite disturbing.
(3) Using IM tools inhibits my concentration on work.

Communication quality
I feel that my communication with colleagues at work is …

(1) 1. Untimely–5. Timely.
(2) 1. Inaccurate–5. Accurate.
(3) 1. Inadequate–5. Adequate.
(4) 1. Incomplete–5. Complete.
(5) 1. Ineffective–5. Effective.
(6) 1. Non-interactive–5. Interactive.

I feel that the colleagues with whom I communicate at work are always:

(7) 1 absent when needed–5. Present when needed.

Sharing explicit knowledge,
Scale: strongly disagree (1)-strongly agree (7)

(1) I and my colleagues share work reports and official documents with each other
(2) I and my colleagues share business manuals, models, methodologies with each other
(3) I and my colleagues share each other's success and failure stories
(4) I and my colleagues share business knowledge obtained from newspaper, magazines, journals, and television

Sharing tacit knowledge,
Scale: strongly disagree (1)-strongly agree (7)

(1) I and my colleagues share know-how from work experience with each other
(2) I and my colleagues share each other's know-where and know-whom knowledge
(3) I and my colleagues share expertise obtained from education and training with each other

Teamwork performance
Outcome satisfaction,
Scale: Strongly disagree (1)–Strongly agree (7)

(1) I am satisfied with the project outcomes produced by my team.
(2) I am pleased with the quality of work we did in my team.
(3) I am satisfied with the final project deliverable submitted by my team.

Group satisfaction, Scale: Strongly disagree (1)–Strongly agree (7)

(4) I am satisfied with my group members.

(5) I was pleased with the way my teammates and I worked together.
(6) I was very satisfied working with this team.

Outcome quality, Scale: Strongly disagree (1)–Strongly agree (7)

(7) The work produced by my team is of a high quality.
(8) The project outcome produced by my team was excellent.
(9) The deliverables of my team were outstanding.

Appendix C: Statistics: Descriptive Statistics

Statistics

		age	gender	education level	position	organization size	industry type
N	Valid	172	172	172	172	172	172
	Missing	0	0	0	0	0	0
Mean		28,84					
Median		26,00					
Std. Deviation		9,179					
Variance		84,250					

Statistics

		IM contacts	work related IM contacts	COM1	COM2	COM3	COM4
N	Valid	172	172	172	172	172	172
	Missing	0	0	0	0	0	0
Mean				5,53	2,40	3,00	3,95
Median				6,00	2,00	2,00	4,00
Std. Deviation				1,152	1,547	1,757	1,783
Variance				1,326	2,392	3,088	3,179

Statistics

		organizational support	number of different IM tools	IMU1	IMU2	IMU3	IMU4
N	Valid	172	172	172	172	172	172
	Missing	0	0	0	0	0	0
Mean		4,67	2,06	3,56	4,66	2,87	5,70
Median		5,00	2,00	4,00	5,00	2,00	6,00
Std. Deviation		2,049	1,085	1,858	2,128	1,651	1,411
Variance		4,197	1,178	3,452	4,529	2,725	1,990

Statistics

		IMU5	IMUW1	IMUW2	IMUW3	IMUW4	IMUW5	IMUW6
N	Valid	172	172	172	172	172	172	172
	Missing	0	0	0	0	0	0	0
Mean		5,03	4,65	4,99	5,13	4,94	3,53	3,84
Median		5,50	5,00	5,00	5,00	5,00	4,00	4,00
Std. Deviation		1,991	1,646	1,600	1,250	1,325	1,645	1,752
Variance		3,964	2,708	2,561	1,562	1,756	2,707	3,069

Statistics

		IMUW7	EMO1	EMO2	EMO3	EMO4	EMO5	EMO6
N	Valid	172	172	172	172	172	172	172
	Missing	0	0	0	0	0	0	0
Mean		4,66	4,60	4,49	4,28	4,33	5,38	4,84
Median		5,00	5,00	5,00	5,00	5,00	6,00	5,00
Std. Deviation		1,526	1,729	1,489	1,785	1,483	1,587	1,509
Variance		2,330	2,990	2,216	3,187	2,199	2,517	2,277

Statistics

		WI1	WI2	WI3	INT1	INT2	INT3	CQ1
N	Valid	172	172	172	172	172	172	172
	Missing	0	0	0	0	0	0	0
Mean		3,74	3,38	3,83	5,51	5,70	5,63	3,96
Median		4,00	3,00	5,00	6,00	6,00	6,00	4,00
Std. Deviation		1,663	1,572	1,591	1,111	1,026	,794	,797
Variance		2,765	2,470	2,531	1,234	1,052	,631	,636

Statistics

		CQ2	CQ3	CQ4	CQ5	CQ6	CQ7	KS1
N	Valid	172	172	172	172	172	172	172
	Missing	0	0	0	0	0	0	0
Mean		3,26	4,07	3,30	3,53	3,74	3,57	5,26
Median		3,00	4,00	3,00	4,00	4,00	4,00	6,00
Std. Deviation		,889	,697	,796	,760	,720	,726	1,576
Variance		,791	,486	,633	,578	,519	,527	2,484

Statistics

		KS2	KS3	KS4	KS5	KS6	KS7	OS1
N	Valid	172	172	172	172	172	172	172
	Missing	0	0	0	0	0	0	0
Mean		4,96	4,61	4,68	5,28	5,15	4,67	5,58
Median		5,00	5,00	5,00	6,00	6,00	5,00	6,00
Std. Deviation		1,605	1,805	1,603	1,390	1,513	1,651	,997
Variance		2,577	3,257	2,570	1,933	2,289	2,726	,993

Statistics

		OS2	OS3	GS1	GS2	GS3	OQ1	OQ2
N	Valid	172	172	172	172	172	172	172
	Missing	0	0	0	0	0	0	0
Mean		5,66	5,60	5,58	5,33	5,61	5,66	5,46

Median	6,00	6,00	6,00	6,00	6,00	6,00	6,00
Std. Deviation	,969	,994	,997	1,180	1,079	,887	1,089
Variance	,938	,989	,994	1,392	1,163	,786	1,185

Statistics

		OQ3
N	Valid	172
	Missing	0
Mean		5,52
Median		6,00
Std. Deviation		1,095
Variance		1,198

Appendix D: Statistics: PLS-Path model

Outer loadings of the reflective measurement model

	Communication quality	IM use at work	Interactivity	Interruption	Knowledge Sharing	Teamwork Performance
CQ1	0,708					
CQ2	0,621					
CQ3	0,619					
CQ4	0,702					
CQ5	0,565					
CQ7	0,815					
GS1						0,406
GS2						0,741
GS3						0,768
IMUW1		0,616				
IMUW2		0,880				
IMUW3		0,850				
IMUW4		0,790				
IMUW5		0,532				
IMUW7		0,603				
INT1			0,075			
INT2			-0,076			
INT3			-0,898			
KS1					0,414	
KS2					0,815	
KS3					0,706	
KS4					0,667	
KS5					0,835	
KS6					0,748	
KS7					0,820	
OQ1						0,885
OQ2						0,869
OQ3						0,864
OS1						0,916
OS2						0,801
OS3						0,886
WI1				0,911		
WI2				0,078		
WI3				0,545		