Dissertation

Determinants of employees' willingness of knowledge sharing intention through enterprise social software:

A qualitative and quantitative comparison of pre-implementation and post-implementation relationships

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Vorwort

Diese Arbeit ist während meiner Zeit als Promotionsstudentin und wissenschaftliche Mitarbeiterin am Lehrstuhl für Marketing der Universität Paderborn im Zeitraum von Oktober 2010 bis April 2015 entstanden. Im Entstehungsprozess dieser Arbeit haben mich zahlreiche Kolleginnen und Kollegen sowie Freunde begleitet und unterstützt, denen ich im Folgenden ganz herzlich danken möchte.

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Executive Summary - German

Heutzutage sind Angestellte dazu aufgefordert, sich den zunehmend komplexeren Arbeitsabläufen und der rasanten Evolution des Wissens anzupassen (Willke, 2001, S. 10). Diese Entwicklung führt dazu, dass vorhandenes Wissen immer schneller obsolet wird (Arthur, 2005, S. 1162; Caspers et al., 2004, S. 33). Unternehmen reagieren auf diese Entwicklungen, indem sie das Konzept des „lebenslangen Lernens“ unterstützen (Sonntag and Schaper, 2007, S. 602) und seitens ihrer Angestellten erwarten, dass diese sich auf dem neuesten Stand halten und ihr Wissen fortlaufend teilen (Reinmann, 2009, S. 7). Aus Praxissicht müssen Angestellte sowohl Zugang zu der aktuellen Wissensbasis des Unternehmens haben, als auch die Möglichkeit bekommen, die vorhandene Wissensbasis mit eigenen Wissensbeiträgen zu erweitern (Conley and Wei, 2009, S. 339). Innovative Informations- und Kommunikationstechnologien erlauben eine immer effizientere Wissensteilung. Je effizienter Wissen im Unternehmen geteilt wird, desto effizienter ist die Kommunikation und Kollaboration in Unternehmen. Entsprechend führt die Wissensteilung zu Kostenersparnissen und einem erhöhten Umsatz auf Basis der gewonnnen Innovationskraft. Dabei spielen insbesondere unternehmenseigene soziale Medien, wie zum Beispiel IBM Connections und Atos blueKiwi eine zunehmend größere Rolle in Unternehmen (Leonardi et al., 2013, S. 2). Das einzigartige Alleinstellungsmerkmal solcher unternehmenseigenen sozialen Medien besteht darin, dass Aktivitäten, wie zum Beispiel das Schreiben von E-Mails, das Verbreiten von Neuigkeiten, das Identifizieren von Experten und das Hochladen von Dateien, die vormals über verschiedene Plattformen (z.B. Informationstafeln und Angestelltenlisten) getätigt wurden, jetzt auf nur einer einzigen Plattform durchgeführt werden können. Unternehmenseigene soziale Medien erlauben darüber hinaus, dass Wissensbeiträge erfasst und gespeichert werden, so dass diese jederzeit und ortsunabhängig allen Angestellten, die über entsprechende Zugriffsrechte verfügen, zugänglich sind. Dabei berücksichtigen unternehmenseigene soziale Medien nicht nur den formalen Austausch von Wissen, sondern auch den Aufbau sozialer Beziehungen. Den Angestellten ist es so möglich, berufliche Kontakte zu knüpfen und soziale Beziehungen zu pflegen. Eine Studie von McKinsey zeigt zudem die Effizienzvorteile unternehmenseigener sozialer Medien auf (Chui et al., 2012). Der Studie zufolge lässt sich durch den Einsatz unternehmenseigener sozialer Medien insbesondere das Aufkommen von E-Mails reduzieren, welches für Unternehmen einen kaum noch tragbaren Umfang angenommen hat (Chui et al., 2012, S. 1). Vor dem Hintergrund, dass Wissensarbeiterinnen und Wissensarbeiter derzeit bis zu 28 Stunden pro Woche allein mit dem Lesen und Schreiben von E-Mails verbringen, wird die Relevanz unternehmenseigener sozialer Medien deutlich, durch deren Einsatz Wissensarbeiterinnen und Wissensarbeiter ihre Produktivität zwischen 20 und 25% steigern können (Chui et al., 2012, S. 1). Allerdings zeigen andere Studien auf, dass unternehmenseigene soziale Medien vermehrt eingesetzt werden, ohne dass dabei bekannt ist, welche Faktoren die Akzeptanz und Nutzung unternehmenseigener sozialer Medien beeinflussen (McKinsey, 2008, S. 1). Dieses fehlende Verständnis führt dazu, dass Angestellte weitestgehend unzufrieden mit dem Einsatz unternehmenseigener sozialer Medien sind (McKinsey, 2008, S. 1).

Das Ziel dieser Dissertation besteht darin, die Einflussfaktoren der Wissensteilung mittels unternehmenseigener sozialer Medien zu identifizieren. Die Ergebnisse sollen Unternehmen zum einen dazu befähigen, potentielle Erfolgsfaktoren zu antizipieren, um maßgeschneiderte Lösungen ergreifen zu können und zum anderen vor ineffektiven Maßnahmen schützen. Das so verbesserte Verständnis hilft Unternehmen dann einerseits die Rendite bei der Implementierung unternehmenseigener sozialer Medien zu maximieren und diese Medien andererseits effizienter und wirtschaftlicher zu betreiben. Die Ergebnisse der Dissertation basieren auf einem Multimethodenansatz - einer Kombination aus einer umfassenden Literaturrecherche, qualitativen Interviews, einer qualitativen Metaanalyse von Fallstudien sowie einer quantitativen Analyse - und weisen somit eine hohe Aussagekraft auf.

Den Ergebnissen zufolge wird die Akzeptanz und Nutzung unternehmenseigener sozialer Medien zur Wissensteilung maßgeblich davon beeinflusst, welchen Nutzen Angestellte der Technologie zuweisen. Bei der Implementierung unternehmenseigener sozialer Medien empfiehlt sich daher eine frühzeitige Entwicklung von Nutzungsszenarien. Die Ergebnisse zeigen: Je mehr Vertrauen Angestellte in unternehmenseigene soziale Medien haben, desto eher sind sie auch bereit diese zu nutzen, um ihr Wissen mit anderen zu teilen. Dementsprechend empfiehlt es sich, Datenschutz- und Vertraulichkeitsregeln hinsichtlich der Nutzung unternehmenseigener sozialer Medien aufzustellen. Die Akzeptanz und Nutzung unternehmenseigener sozialer Medien zur Wissensteilung wird ferner durch vereinfachende Maßnahmen beeinflusst, wie zum Beispiel Schulungen und Handbücher. Auch die persönliche Innovationsfreudigkeit konnte als entscheidender Erfolgsfaktor zur Wissensteilung mittels unternehmenseigener sozialer Medien identifiziert werden. Je höher die persönliche Innovationsfreudigkeit ist, desto höher ist die Bereitschaft unternehmenseigene soziale Medien zur Wissensteilung zu nutzen. Aufgrund dieses Ergebnisses ist es ratsam, innovationsfreudige Angestellte im Unternehmen frühzeitig zu identifizieren und als Botschafter für dieses Thema zu akquirieren. Zudem besteht ein positiver Zusammenhang zwischen sozialen Anreizen zur Wissensteilung und der Wissensteilung mittels unternehmenseigener sozialer Medien. Dieses Ergebnis zeigt auf, dass sich Maßnahmen zur Steigerung der Reputation eignen und sich positiv auf die Akzeptanz und Nutzung unternehmenseigener sozialer Medien zur Wissensteilung auswirken.

Diese Forschungsarbeit schließt eine weitere Forschungslücke, indem aufgezeigt wird, inwiefern sich der Einfluss der einzelnen Faktoren hinsichtlich verschiedener Implementierungsstufen verändert. Die Ergebnisse zeigen, dass insbesondere in der Vor-Implementierungsphase unternehmenseigener sozialer Medien ein Zusammenhang zwischen vereinfachenden Maßnahmen (Schulungen, Helpdesk, etc.) und der Einstellung zur Wissensteilung mittels unternehmenseigener sozialer Medien besteht. Das heißt: je eher Angestellte das Gefühl haben, dass sie ausreichend Unterstützung im Umgang mit unternehmenseigenen sozialen Medien erhalten, desto eher entwickeln sie eine positive Einstellung zur Wissensteilung mittels unternehmenseigener sozialer Medien. Daher empfiehlt es sich bereits vor der Implementierung unternehmenseigener sozialer Medien, Angestellte auf geplante Unterstützungsmaßnahmen hinzuweisen (z.B. Verhaltenskodex, Handbücher, Helpdesk, Ansprechpartner). Darüber hinaus zeigen die Ergebnisse der Vor-Implementierungsphase auf, dass der positive Zusammenhang zwischen Vertrauen in die Technologie und der Verhaltensabsicht zur Wissensteilung mittels unternehmenseigener sozialer Medien für Angestellte ≥ 41 Jahren stärker ist, als für Angestellte ≤ 40 Jahren. Daher ist es ratsam, dass in der Arbeitsgruppe, die sich mit dem Thema Datenschutz und Vertraulichkeit auseinandersetzt, Vertreter der Altersgruppe ≥ 41 Jahren miteinbezogen werden. In der Nach-Implementierungsphase spielt insbesondere die Aufwandserwartung eine wesentliche Rolle, wenn es um die Akzeptanz und Nutzung unternehmenseigener sozialer Medien geht. Das heißt: je benutzerfreundlicher unternehmenseigene soziale Medien wahrgenommen werden, desto eher beabsichtigen die Angestellten, unternehmenseigene soziale Medien zur Wissensteilung zu nutzen. Auf Basis der Ergebnisse ist es sinnvoll, in die Arbeitsgruppe, die sich mit dem Thema Benutzerfreundlichkeit auseinandersetzt, insbesondere Angestellte miteinzubeziehen, die privat selten oder gar keine sozialen Medien nutzen. In der Nach-Implementierungsphase wird der Zusammenhang zwischen der Leistungserwartung und der Einstellung zur Wissensteilung mittels unternehmenseigener sozialer Medien durch die Unterstützung des Managements verstärkt. Demnach entwickeln Angestellte eine positive Einstellung hinsichtlich der Wissensteilung mittels unternehmenseigener sozialer Medien, wenn sie das Gefühl haben, dass das Management sich der Wichtigkeit der Wissensteilung im Unternehmen bewusst ist und Angestellte dazu ermutigt, ihr Wissen im Unternehmen zu teilen. Entsprechend empfiehlt es sich, dass das Management den Angestellten eine bestimme Zeitspanne zur Verfügung stellt, in der sie sich dem Umgang mit Medien widmen können. Darüber hinaus, ist es empfehlenswert, dass Manager eine aktive Rolle in der Wissensteilung mittels unternehmenseigener sozialer Medien einnehmen um mit gutem Beispiel voranzutreten.

Die Ergebnisse dieser Dissertation weisen eine Reihe von Einflussfaktoren auf, welche die Akzeptanz und Nutzung unternehmenseigener sozialer Medien zur Wissensteilung maßgeblich beeinflussen und leisten somit einen wesentlichen Beitrag für Forschung und Praxis. Die folgenden Punkte fassen die wesentlichen Aspekte der vorliegenden Forschungsarbeit zusammen:

- Beitrag zur Strukturierung eines jungen Untersuchungsgegenstands und Theorieentwicklung (durch die Prüfung eines Forschungsmodells, das auf einzelnen Theorieansätzen basiert) sowie zur praktischen Nutzbarkeit unternehmenseigener sozialer Medien im innovativen Wissensmanagement.

- Anwendung eines Multimethodenansatzes auf Basis qualitativer und quantitativer Analysen.

- Aufarbeitung des interdisziplinären Forschungsstands hinsichtlich der Bereiche

Enterprise 2.0 und Wissensmanagement, insbesondere der Wissensteilung.

- Darlegung der Potenziale unternehmenseigener sozialer Medien zur Wissensteilung, insbesondere im Vergleich zu traditionellen Wissensmanagementsystemen.
- Identifikation von Faktoren, die Angestellte motivieren, ihr Wissen mittels unternehmenseigener sozialer Medien zu teilen.
- Quantitativer Untersuchung des Technologie-Organisation-Mensch-Modells (TOM-Modell).
- Aufdecken signifikanter Einflussfaktoren, wie die *„Aufwandserwartung“, „Leistungserwartung“, „vereinfachende Bedingungen“, „Vertrauen in die Technologie“, „persönliche Innovationsfreudigkeit“, „soziale Anreize zur Wissensteilung“*, sowie Moderationsvariablen, wie die *„Selbstwirksamkeit“, „Normen der Wissensteilung“, „Unterstützung des Managements“, „Alter“ und „Erfahrung mit sozialen Medien“*.
- Identifikation der Dominanz des Zusammenhangs zwischen den technologischen Faktoren und der Wissensteilung mittels unternehmenseigener sozialer Medien im Vergleich zu den personellen und organisationalen Faktoren.
- Herausstellen der Bedeutsamkeit der Faktoren differenziert nach Implementierungsphasen (Vor-Implementierungsphase vs. Nach-Implementierungsphase).
- Ableiten maßgeschneiderter Marketingstrategien differenziert nach Implementierungsphasen (insbesondere relevant für Unternehmen, die planen unternehmenseigene soziale Medien einzuführen).
- Ermittlung des stärksten Motivationstreibers: Angestellte wägen die Nutzung unternehmenseigener sozialer Medien zur Wissensteilung danach ab, inwiefern diese Medien ihnen dabei helfen die eigene Leistung und Produktivität zu erhöhen. Die Ergebnisse liefern somit eine empirische Evidenz für den Faktor „*Leistungserwartung*“ als stärksten Einflussfaktor.
- Identifikation von Kontextfaktoren in der **Vor-Implementierungsphase**: Angestellte verschiedener Altersgruppen bewerten die Leistungserwartung sowie Vertrauensaspekte unternehmenseigener sozialer Medien zur Wissensteilung (z.B. Datenschutz- und Vertraulichkeitsangelegenheiten) unterschiedlich.
- Identifikation von Kontextfaktoren in der **Nach-Implementierungsphase**: Angestellte verschiedener Altersgruppen beurteilen vereinfachende Maßnahmen (z.B. Schulungen) in Bezug auf die Nutzung unternehmenseigener sozialer Medien zur Wissensteilung unterschiedlich. Vereinfachende Maßnahmen werden darüber hinaus moderiert durch die Selbstwirksamkeit eines Angestellten sowie durch

bestehende Normen der Wissensteilung. Ferner beeinflussen die Erfahrungen, die Angestellte mit öffentlichen sozialen Medien gemacht haben sowohl die Leistungserwartung als auch die Aufwandserwartung unternehmenseigener sozialer Medien zur Wissensteilung. Die Ergebnisse zeigen ebenfalls, dass die Leistungserwartung maßgeblich davon beeinflusst wird, inwiefern das Management die Wissensteilung unterstützt.

Executive Summary - English

Nowadays, employees are faced with constant changes in work processes and a rapid evolution of knowledge (Willke, 2001, p. 10). For instance, existing knowledge becomes obsolete more quickly, which makes it necessary for employees to continuously update and gather new knowledge (Arthur, 2005, p. 1162; Caspers et al., 2004, p. 33). Organizations have been reacting towards these developments by increasingly supporting the concept of "lifelong learning" (Sonntag and Schaper, 2007, p. 602), for instance by demanding employees to continuously share knowledge and keep abreast of the latest trends at all times (Reinmann, 2009, p. 7). From a managerial perspective, knowledge must be accessible to employees, who in turn must have the opportunity to contribute to the existing inventory of organizational knowledge (Conley and Wei, 2009, p. 339). Innovative information and communication technologies facilitate knowledge sharing in organizations. The more efficient knowledge sharing takes place, the more efficient are communication and collaboration activities. Consequently, knowledge sharing leads to cost reductions and increases the capacity of organizations to generate higher sales through innovation (Lin, 2007b, p. 315). Accordingly, enterprise social software, such as IBM Connections and Atos blueKiwi, plays an increasing important role in organizations (Leonardi et al., 2013, p. 2). The unique characteristic of enterprise social software is its ability to allow employees to carry out various activities, such as writing e-mails, spreading news, identifying experts and uploading files, not through different platforms (such as message boards or employee lists) but rather within one single platform. Enterprise social software enables the recording and storing of knowledge activities, so that these are available for all employees with the corresponding access rights, wherever and whenever required. In addition, enterprise social software does not only encourage formal knowledge sharing but also building of social relationships. Hence, employees are able to establish professional contacts and maintain social relationships. According to a study conducted by McKinsey, which presents the efficiency gains of enterprise social software, enterprise social software reduces the number of e-mails (Chui et al., 2012). Organizations find it increasingly difficult to accept the overwhelming amount of e-mails being written, sent and read within the organization. Against the background that knowledge workers currently spend up to 28 hours per week with reading and writing e-mails, the relevance of enterprise social software becomes apparent, which increases knowledge workers' productivity by 20 to 25% (Chui et al., 2012, p. 1). However, other studies show that enterprise social software is increasingly used without knowing which factors influence its acceptance and use (McKinsey, 2008, p. 1). This lack of understanding leads to the fact that employees are unsatisfied with the use of enterprise social software (McKinsey, 2008, p. 1).

The aim of this thesis is to identify factors which influence knowledge sharing through enterprise social software. On the one hand, the results should enable organizations to anticipate potential success factors in order to take tailor-made solu-

tions into account and, on the other hand, they should prevent organizations from implementing ineffective measures. Such a better understanding helps organizations maximize their return on investments in enterprise social software and operate in a more efficient and economic way. The results of this thesis, which are based on a multi-method approach - a combination of a comprehensive literature review, qualitative interviews with employees, a qualitative meta-analysis of case studies and a quantitative analysis, show a high explanatory power.

The results reveal that the acceptance and use of knowledge sharing through enterprise social software is significantly influenced by the usefulness perceived by employees. Therefore, it is recommendable to develop usage scenarios at an early stage in the implementation process of enterprise social software. Further, the results show that, the more trust there is in the technology, the more employees are willing to use enterprise social software in order to share their knowledge with others. Hence, establishing privacy and confidentiality rules with regard to the use of enterprise social software is recommended. The acceptance and use of knowledge sharing through enterprise social software is also influenced by facilitating conditions, such as trainings and handbooks. Personal innovativeness is also identified as a crucial success factor of knowledge sharing through enterprise social software. The higher the personal innovativeness, the greater is the willingness to use enterprise social software for knowledge sharing. Therefore, it is recommendable to identify innovative employees at an early stage and to acquire them as ambassadors for the use and acceptance of enterprise social software for knowledge sharing. In addition, a positive relationship between social rewards for knowledge sharing and knowledge sharing through enterprise social software exists, which indicates that measures strengthening the reputation are suitable and have a positive effect on the use and acceptance of enterprise social software for knowledge sharing.

This thesis closes another research gap by analyzing how the single factors are influenced in the different implementation stages. The results show that, especially at the pre-implementation stage, a relationship between facilitating conditions (trainings, help desk, etc.) and knowledge sharing attitude through enterprise social software exists. This means that the sooner employees feel they receive sufficient support in dealing with enterprise social software, the sooner they develop positive knowledge sharing attitudes through enterprise social software. Therefore, it is recommended to clearly communicate planned support measures to employees, before the enterprise social software is introduced in the organization (e.g., code of conduct, handbooks, contact persons). In addition, the results indicate that the positive relationship between trust in technology and knowledge sharing intention through enterprise social software is stronger for employees aged $\geq$41 than for employees aged $\leq$40 at the pre-implementation stage. Hence, it is recommended that in the working group concerned with the subject of privacy and confidentiality, representatives of the age group $\geq$41 are involved. At the post-implementation stage, effort expectancy plays a crucial role when it comes to the acceptance and use of enterprise social software, meaning that, the easier enterprise social software is understood, the more likely it is that employees intend to use enterprise social software for knowledge sharing. Based on these results, it is recommended to involve employees, who rarely or never use public social software, in the working group dealing with the subject of ease-of-use. At the post-implementation stage, the relationship between performance expectancy and knowledge sharing attitude through enterprise social software is strengthened by management support. Accordingly, employees develop a positive knowledge sharing attitude through enterprise social software, when they perceive management as being aware of the importance of knowledge sharing in the organization, thus encouraging employees to share their knowledge in the organization. Hence, it is recommendable that management encourages employees to use enterprise social software for knowledge sharing by giving them sufficient time to become familiarized with the enterprise social software and by adopting an active role in knowledge sharing through enterprise social software.

In summary, the results of this thesis show a range of factors, which significantly influence the acceptance and use of enterprise social software for knowledge sharing, and therefore constitute a major contribution to theory and practice. The following points summarize the major aspects of this thesis:

- Contribution towards structuring the recent research domain and theory development through testing a research model based on different theoretical approaches as well as the practical usefulness of enterprise social software in innovative knowledge management.
- Using a *multi-method approach* based on qualitative and quantitative analyses.
- Comprehensive overview of an interdisciplinary state of research according to the fields of Enterprise 2.0 and knowledge management, especially knowledge sharing.
- Analysis of the potential of enterprise social software for knowledge sharing, especially due to a comparison to traditional knowledge management systems.
- Identification of factors, which motivate employees to share their knowledge through enterprise social software.
- Quantitative examination of the technology, organization and men model (TOM model).
- Detection of influential factors, such as *"effort expectancy", "performance expectancy", "facilitating conditions", "trust in technology", "personal innovativeness", "social rewards for knowledge sharing"* as well as moderation factors, such as *"self-efficacy", "norms of knowledge sharing", "management support", "age"* and *"experience with public social software"*.

- Identification of the dominance of the relationship between the technological factors and knowledge sharing through enterprise social software compared to personal and organizational factors.
- Exposure of the factors' relevance differentiated according to implementation stages (pre-implementation stage and post-implementation stage).
- Derivation of tailor-made measures according to the implementation stages (especially relevant for organizations, which plan to introduce enterprise social software).
- Determination of the strongest motivational factor: Employees weigh up the use of enterprise social software for knowledge sharing, judging on whether enterprise social software helps the employees increase their own performance and productivity. The results give empirical evidence for *"performance expectancy"* as the strongest influential factor.
- Identification of contextual factors at the **pre-implementation stage**: Employees of various ages value performance expectancy and view trust issues (e.g., privacy and confidentiality aspects) of enterprise social software for knowledge sharing differently.
- Identification of contextual factors at the **post-implementation stage**: Employees of various ages judge facilitating conditions (e.g., training) with regard to the use of enterprise social software for knowledge sharing differently. In addition, facilitating conditions are moderated by an employee's self-efficacy as well as knowledge sharing norms. Furthermore, employees' experience with social software moderates the performance expectancy and effort expectancy of enterprise social software for knowledge sharing. The results show that performance expectancy is substantially influenced by management support.

Content overview

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List of abbreviations

AMOS	Analysis of moment structures
API	Application programming interfaces
AVE	Average variance extracted
CFI	Comparative fit index
EQS	Equations based structural program
LISREL	Linear structural relations
NFI	Normed fit index
NIE	New institutional economics
NNFI	Non-normed fit index
PAT	Principal agent theory
PLS	Partial least squares
PRT	Property rights theory
RMSEA	Root mean squared error of approximation
RSS	Really simple syndication
SaaS	Software as a service
SECI	Socialization, externalization, combination and internalization
SEM	Structural equation modeling
SLATES	Search, links, authoring, tags, extensions, signals
SmartPLS	Smart partial least squares
TCT	Transaction cost theory
TLI	Tucker lewis index

TOM Technology, organization, man

VIF Variance inflation factor

„Der Fortschritt lebt vom Austausch des Wissens“
(Albert Einstein 1879-1955)

1. Introduction

Recently, the term enterprise social software has been found more frequently in knowledge management literature. However, employees' willingness to share knowledge through enterprise social software has still not been fully determined in academic research.

In Section 1.1, the relevance of the topic is presented, followed by a problem statement in Section 1.2. In Section 1.3, the research gaps and research questions are presented. Finally, the structure of the thesis is outlined in Section 1.4.

1.1. Relevance of the topic

In recent years, a new generation of information systems has rapidly proliferated (Kane et al., 2014, p. 275; Ali-Hassan and Nevo, 2009, p. 2; Treem and Leonardi, 2012, p. 143). These systems, commonly known as social media, have become quite popular, especially because they support interpersonal communication and collaboration (Kane et al., 2014, p. 275). The most well-known social media tools, Facebook, Wikipedia and Twitter, are being used by hundreds of millions of people on a regular day-to-day basis (Kane et al., 2014, p. 275). Further, social media has already spread fairly quickly in the organizational environment (Denyer et al., 2011, p. 375). According to a survey conducted by MIT Sloan Management Review and Deloitte Consulting LLP and Deloitte Services LP, more than 63% of managers assert that social media will be crucial for organizations within three years (Kiron et al., 2012, p. 6). Due to the more efficient communication and collaboration, a study conducted by McKinsey estimates that the use of social media to improve collaboration and communication within and across organizations can lead to a positive economic impact of more than $1 trillion (Chui et al., 2012, p. 1). Most importantly, McKinsey highlights that social media has the potential to increase the productivity of knowledge workers by 20% to 25% (Chui et al., 2012, p. 1). Researchers postulate that social media facilitates knowledge management in organizations thus emphasizing its potential as an effective knowledge management system (McAfee, 2006, p. 22; Steinhüser et al., 2011, p. 1). This potential results from increasingly transparent knowledge flows which differentiate social media from traditional knowledge management systems (for instance e-mail, teleconferencing, intranets, instant messaging) (McAfee, 2006, p. 22; Steinhüser et al., 2011, p. 1).

Knowledge provides the basis for innovation, efficiency, collective learning and flexibility and is the only resource whose value increases with use (Picot, 2000, p. 2). Hence, knowledge is economically relevant since its value is many times greater than the value of tangible capital assets such as land, labor and capital (Beijerse, 1999, p. 94). Lev and Daum (2004, p. 6) stress the rising importance of intangible assets by stating that its value increased from 38% to 62% of market value, whereas tangible assets decreased from 62% to 38% between 1982 and 1992. These facts demonstrate the potential of knowledge as a source of competitive advantage and primary driver of an organization's value (Powell and Dent-Micallef, 1997, p. 375; Bock et al., 2005, p. 88). Therefore, knowledge management has become a powerful leadership tool that gives organizations the foresight and insight necessary for long-term success (Powell and Dent-Micallef, 1997, p. 375; Bock et al., 2005, p. 88). However, success of knowledge management systems depends on the degree to which knowledge is shared throughout the organization (Göhring et al., 2010, p. 10). The more efficient knowledge sharing takes place, the more efficient are communication and collaboration activities (Lin, 2007b, p. 315). Consequently, knowledge sharing leads to cost reductions and increases the capacity of organizations to generate higher sales through innovation (Lin, 2007b, p. 315).

Some organizations have already transformed their corporate network into an enterprise-wide, interactive source of knowledge, based on Enterprise 2.0 functionality (Chui et al., 2012, p. 25). In this context, the term "Enterprise 2.0" describes the use of social software in business which was coined by McAfee in 2006 (McAfee, 2006, p. 1). Given the increasing importance of Enterprise 2.0, the effective compilation and use of existing knowledge will be even more crucial for an organization's success in the future (Chui et al., 2012, p. 72). For these reasons, analyzing the acceptance and use of **enterprise social software** is of great scientific and practical relevance.

1.2. Problem statement

According to Roth (2003, p. 174), 40% to 60% of knowledge management projects fail, especially when companies focus primarily on the technological dimension of the project. Particularly organizational and personal factors remain largely ignored, despite the fact that efficient knowledge sharing processes require knowledge holders to be willing to share their knowledge. This process is often seen as an abandonment of one's own expertise and causes knowledge holders to fear the loss of their unique selling proposition. A study conducted by McKinsey revealed that 22% of users were dissatisfied with the enterprise social software introduced in their organization (McKinsey, 2008, p. 1), especially because their company's leadership and culture do not encourage the use of enterprise social software (McKinsey, 2008, p. 7). Organizations are facing severe difficulties in realizing the benefits of enterprise social software, which shows that its implementation does not automatically ensure its acceptance and expected use by the organizations' employees (Cross and Baird, 2000, p. 69; Alarifi and Sedera, 2013, p. 1).

The introduction of knowledge management systems implies changes throughout the organization (Cross and Baird, 2000, p. 69). So, the implementation of enterprise social software requires adjustments of the organizational structure and of the employees' and managers' behavior (Cross and Baird, 2000, p. 69; Vorakulpipat and Rezgui, 2008, p. 163). Researchers claim that organizations supporting a knowledge sharing culture which is characterized by trust, cooperation and collaboration are able to reap the full economic benefits of enterprise social software (Chui et al., 2012, preface). Nonetheless, they also emphasize the risks to confidentiality, intellectual property and reputation that are associated with enterprise social software (Chui et al., 2012, preface). Protecting employees' personal and property rights have become increasingly important to the organization (Chui et al., 2012, preface).

Finally, due to the fact that it is the people who decide on acceptance and use of enterprise social software for knowledge sharing, organizations have to consider technological, organizational, and personal dimensions when introducing enterprise social software for knowledge sharing. Bullinger et al. (1997, p. 10) suggest the TOM model (**T**echnology, **O**rganization and **M**en model) in order to categorize the factors influencing knowledge management. Besides the TOM model, a number of other systematization approaches for structuring important factors of knowledge sharing exist. Similar to Helm et al. (2007, p. 211), who differentiate between the personal, cultural, structural and knowledge management activities dimensions, Schewe and Nienaber (2011, p. 44) categorize the factors according to the dimensions: human, structure, motivation and communication.

Since the TOM model has been found to be a useful approach towards classifying the determinants of knowledge management (Lee and Choi, 2003, p. 191; Connelly and Kelloway, 2003, p. 294-297; Reinmann, 2004, p. 20; Lin, 2007b, p. 317), it is adopted in this research and applied to the context of knowledge sharing through enterprise social software.

1.3. Research gaps and research questions

Research on the determinants of *knowledge management* is extensive and has a long theory- and research-based history, whereas research on the determinants of *knowledge sharing through enterprise social software* is still in its infancy (Leonardi et al., 2013, p. 6). However, an extensive spread and use of enterprise social software in organizations can be observed (Chui et al., 2012, p. 1), while there is still some uncertainty regarding the determinants influencing its acceptance and use for knowledge sharing (McKinsey, 2008, p. 1). According to the TOM model developed by Bullinger et al. (1997, p. 10), the determinants affecting knowledge management can be grouped into personal, organizational and technological factors. Prior research focuses primarily on the technological level, thus making it difficult to directly examine specific organizational and personal determinants that influence knowledge sharing (Quigley et al., 2007, p. 72; Lin, 2007b, p. 316). Cho et al. (2010, p. 1198) state that the main determinants of knowledge sharing behavior are still unknown. Especially the personal factors in knowledge sharing processes have received little attention (Olivera et al., 2008, p. 24; Wasko and Faraj, 2005, p. 35). Therefore, personal, organizational and technological factors are considered when analyzing enterprise social software use and acceptance for knowledge sharing. Furthermore, this thesis sheds light on whether knowledge sharing through enterprise social software can be (better) predicted when different personal, organizational and technology factors are included. To this end, the main determinants of knowledge sharing behavior and the congruent existence of personal, organizational and technological factors on knowledge sharing through enterprise social software are investigated. This leads to the main research question driving this study:

> **Research question 1:** Which technological, personal and organizational factors influence knowledge sharing through enterprise social software?

In order to explore relevant technological, personal and organizational factors which influence knowledge sharing, a literature review is conducted. Second, in-depth interviews and a meta-analysis of qualitative case studies are executed to validate and supplement prior literature and give first empirical evidence for a theoretical framework in the context of knowledge sharing through enterprise social software. This leads to the next research question:

> **Research question 2:** Are the determinants identified in the knowledge management literature also meaningful for knowledge sharing through enterprise social software?

Another crucial management question refers to the ongoing debate regarding appropriate incentive systems. Dissidents of economic incentives (Eisenberger and Cameron, 1996, p. 1154) argue that task-related rewards can have a negative effect on intrinsic motivation, whereas Kelman (1958, p. 51) and Alfie (1993, p. 55) postulate that economic incentives are suitable for a temporary use. In order to contribute to this controversy, the relationship between rewards for knowledge sharing and employees' willingness to share knowledge through enterprise social software is investigated. This leads to the next research question:

> **Research question 3:** Do social rewards for knowledge sharing and/or economic rewards for knowledge sharing enhance the acceptance and use of enterprise social software for knowledge sharing?

Another interesting stream of research concerns determining whether employees' willingness of knowledge sharing through enterprise social software differs in different implementation stages (Marler et al., 2009, p. 327; Kügler and Smolnik, 2014, p. 2). In particular, the information systems and the social psychology scientists suggest that the formation of attitudes and behavioral intentions changes once employees gain direct experience with the technology (Ajzen, 2002, p. 112). Thus, it is assumed that some relationships in the model will differ between the pre-implementation stage and the post-implementation stage. A detailed investigation of the determinants of employees' willingness to share knowledge through enterprise social software at a pre-implementation stage and at a post-implementation stage will provide important implications for research and practice. This raises the following research question:

> **Research question 4:** Does employees' willingness of knowledge sharing through enterprise social software at a pre-implementation stage differ from their willingness at a post-implementation stage?

After deriving these research questions, a further level of investigation is pursued. Based on prior literature, qualitative interviews and a meta-analysis of case studies, a research model is developed and quantitatively investigated. By means of structural equation modeling, those factors which are of preliminary importance at the pre-implementation stage and at the post-implementation stage respectively, are revealed. This leads to the next research questions:

> **Research question 5:** Which determinants have the strongest relation to knowledge sharing through enterprise social software at each implementation stage?

This study focuses on the individual level of investigation, inferring that the acceptance and use of enterprise social software for knowledge sharing is analyzed from an individual perspective rather than from a team or organizational perspective (Kügler and Smolnik, 2014, p. 3). In the end, it is the individual who decides on accepting and using enterprise social software for knowledge sharing, and not the organization which introduces enterprise social software (Kügler and Smolnik, 2014, p. 3). Consequently, the individual should be able to give insights regarding the most crucial factors of employees' willingness to share knowledge through enterprise social software at the pre-implementation stage and at the post-implementation stage (Kügler and Smolnik, 2014, p. 3).

1.4. Thesis structure

This thesis is divided into eight chapters. In the first chapter, the relevance of the topic knowledge sharing through enterprise social software is demonstrated (see Section 1.1). Afterwards the problem statement (see Section 1.2) as well as the research gaps and research questions are presented (see Section 1.3). The second chapter refers to the conceptual basis, in which the current state of research is illustrated at first (see Section 2.1). This is followed by a historical discourse on knowledge (see Section 2.2) and definitions of important terms relevant to this thesis (see Section 2.3). The origin and growing importance of knowledge sharing through enterprise social software for organizations is discussed in Section 2.4. The third chapter is devoted to the theoretical underpinnings. Therefore, a philosophy of science-based classification is conducted (see Section 3.1), before these philosophies of science-based approaches are presented (see Section 3.2). Following that, different theoretical approaches for explaining the meaning of knowledge are discussed (see Section 3.3). Against the background of a literature review, an interview analysis (see Section 4.1) and a qualitative meta-analysis of case studies are conducted (see Section 4.2) in the fourth section. In the fifth section, the research model is built (see Section 5.1). Subsequently, the hypotheses of the direct effects (see Section 5.2) and moderation effects (see Section 5.3) are presented, followed by the illustration of the conceptual model in Section 5.4. In the sixth chapter, the empirical design decisions and data analysis methodology (see Section 6.1) are outlined. Following that, the data collection (see Section 6.2) and the results of the quantitative analysis are presented (see Section 6.3). In the seventh chapter, the results of the direct effects (see Section 7.1) and moderation effects (see Section 7.2) are discussed. The eight chapter concludes with implications for research (see Section 8.1) and practice (see Section 8.2) as well as limitations and suggestions for future research (see Section 8.3).

2. Conceptual fundamentals

In the second chapter, the conceptual basis is introduced.

Section 2.1 gives an overview of the current state of research. Afterwards, a historical discourse on knowledge is provided (see Section 2.2), before the term knowledge as well as further terms relevant to this thesis are defined (see Section 2.3). In Section 2.4, the emergence of enterprise social software is presented.

2.1. Current state of research

Hitherto, most research on enterprise social software is carried out by scholars within the **c**omputer-**s**upported **c**ooperative **w**ork (CSCW) and **h**uman **c**omputer-**i**nteraction (HCI) communities (Leonardi et al., 2013, p. 6). Scholars in the field of communication explore social software use among youth and students, however they have not analyzed how such instruments are used within organizations (Leonardi et al., 2013, p. 6). Scholars in information systems are just beginning to focus on enterprise social software and its effect on organizational performance (Leonardi et al., 2013, p. 6). Leonardi et al. (2013, p. 6) highlight that scholars in management and organization studies have not started to analyze enterprise social software use yet. This study addresses this research gap by analyzing employees' willingness to share knowledge through enterprise social software from a management and organization studies perspective.

In addition, studies in CSCW and HCI mostly analyze specific technologies and offer detailed descriptions regarding how people use social software (Leonardi et al., 2013, p. 6). While current studies in this established area of research explore the use of integrated enterprise social software platforms (Leonardi et al., 2013), first studies on this new field of research have been primarily concerned with the use of individual social software instruments, such as Wikipedia (e.g., Korfiatis et al., 2006) and Facebook (e.g., Ellison et al., 2007), or with a category of tools, such as wikis (e.g., Majchrzak et al., 2006; Danis and Singer, 2008), blogs (e.g., Huh et al., 2007; Efimova and Grudin, 2007; Jackson et al., 2007) and social networks (e.g., Smith and McKeen, 2007). Furthermore, prior research studies mainly focused on public social software acceptance and use, contrary to current research which also considers the influence of public social software on organizational communication (e.g., Scheepers et al., 2014).

In order to give an overview, past research works are divided into two categories: research studies conducted in a *public context* and research studies conducted in a *business context*. Table 2.1 presents studies that analyze social software use in public. Since this study focuses on knowledge sharing, Table 2.2 and Table 2.3 does not only involve research studies on (enterprise)[1] social software acceptance and use in business, but also research studies on knowledge management and knowledge sharing.

After the research studies in a public context are outlined in Section 2.1.1, the research studies in a business context are presented in Section 2.1.2. Subsequently, recently published studies are discussed in Section 2.1.3; the main findings are summarized in Section 2.1.4.

2.1.1. Research studies in a public context

Research studies investigating social software in public can be categorized into conceptual (e.g., Klamma et al., 2007), qualitative (e.g., Zhao et al., 2008) and quantitative research (e.g., Koroleva et al., 2011; Kim et al., 2007; Wagner and Prasarnphanich, 2007; Ellison et al., 2007), although most research is quantitative and little is qualitative in nature.

Authors:	Research type:	Focus:	Type of IT:	Investigated factors:	Theory:
Koroleva et al., 2011	Quant	ISAU	Social network sites	Active participation, Passive following, Social browsing, Social searching, Private communication	Social capital theory
Zhao et al., 2008	Qual	ISAU	Facebook	Identity construction	x
Hoisl et al., 2007	Field experiment	KS	Wiki	Social rewards: Status, Power, Acceptance, Glory	Maslow's hierarchy of human needs theory
Kim et al., 2007	Quant	ISAU	Video	Intrinsic motivation, Extrinsic motivation, Perceived ease of participation, Perceived trust, Intention to participation	Technology acceptance model, Motivational theory
Wagner and Prasarnphanich, 2007	Quant	ISAU	Wikipedia	Altruism	Game theory
Ellison et al., 2007	Quant	ISAU	Facebook	Off to online, On to offline, Self-esteem, Satisfaction	Social capital theory
Klamma et al., 2007	Conc	Life-long learning	Blogs	Incentives, Usability, Sociability, Trust, Privacy, Security	Social exchange theory, Actor-network theory

Legend: Conceptual (Conc), Qualitative (Qual=Case studies, Interviews), Quantitative (Quant), Knowledge sharing (KS), Information systems acceptance and use (ISAU).

Table 2.1. – Research studies in a public context.
Source: Own table.

[1] The word enterprise is put in parenthesis, because some studies have investigated public social software, while others have focused on enterprise social software.

Moreover, the identified research studies rather focus on the acceptance and use of social software (e.g., Koroleva et al., 2011; Kim et al., 2007) than on knowledge sharing (e.g., Hoisl et al., 2007). A primary focus on the use of specific technologies, such as wikis (e.g., Hoisl et al., 2007), blogs (e.g., Klamma et al., 2007) and social network sites (e.g., Koroleva et al., 2011), is apparent. Additionally, a number of influencing factors (e.g., altruism) are identified by quantitative research. Finally, researchers use different theoretical theories (e.g., social capital theory), as shown in Table 2.1.

2.1.2. Research studies in a business context

Research studies analyzing (enterprise) social software in a business context can be classified into conceptual (e.g., Majchrzak et al., 2013; Fulk and Yuan, 2013), qualitative (e.g., von Krogh, 2012; Pike et al., 2013) and quantitative research (e.g., Scheepers et al., 2014). Hence, most research is conceptual and qualitative, whereby there is a lack of quantitative research. Initial studies focusing on the acceptance and use of social software in organizations have primarily been concerned with the use of individual social software instruments, such as wikis (e.g., Richter and Warta, 2007), blogs (e.g., Zerfaß, 2005) and social networks (e.g., Riemer et al., 2012), while current studies explore the use of integrated enterprise social software platforms (e.g., Leonardi et al., 2013). In addition, quantitative research identifies a number of factors, ranging from technological to personal and organizational aspects (e.g., codification effort, age, rewards), that are believed to influence knowledge sharing behavior of individuals (e.g., Kankanhalli et al., 2005b). Researchers use different theories to explain knowledge sharing behavior, e.g., social motivation theory (e.g., Levin and Cross, 2004), reward and incentive theory (e.g., Cress et al., 2006), etc.. Moreover, some research studies explore knowledge sharing without referring explicitly to a theory (e.g., Ellison et al., 2014; Kügler and Smolnik, 2014; Vaast and Kaganer, 2013) (see Table 2.2 and Table 2.3).[2]

[2] It must be noted that few studies could not be completely be categorized into the business context, since students instead of employees were the analyzed subjects in the experiments (e.g., Cress et al., 2006) and surveys (e.g., Scheepers et al., 2014). However, due to the authors stating that their results have managerial implications, these studies have been assigned to the business rather than to the private context.

Authors:	Research type:	Focus:	Type of IT:	Investigated factors:	Theory:
Ellison et al., 2014	Conc	KS	Enterprise social network sites	The role of organizational affordances	x
Stenmark and Zaffar, 2014	Qual	Social media strategies	Social media	Visibility, Persistence, Editability, Association	x
Mayer et al., 2014	Qual	ISAU	Management support systems	Coordination, Communication, Cooperation, Device	Design theory
Kane et al., 2014	Conc	ISAU	Social media networks	Research agenda	Social network analysis
Kügler and Smolnik, 2014	Qual&Quan	ISAU	Enterprise social software	Consumptive use, Contributive use, Hedonic use, Social use	x
Scheepers et al., 2014	Quan	ISAU	Social media	Information seeking, Hedonic activities, Sustaining of strong ties, Extending weak ties, Sense of community	Granovetter's theory of weak ties
Alarifi and Sedera, 2013	Qual	ISAU	Public social software (Yammer)	Gamification, Rewards, Management involvement, Self-esteem, Social pressure	Control theory
Majchrzak et al., 2013	Conc	KS	Social media	Metavoicing, Triggered attending, Network-informed associating, Generative role-taking	Critical mass theory, Expectancy theory
Pike et al., 2013	Qual	Hiring	Social networking sites	Accessibility (open-restricted), Contextual (relevant-unsuitable), Intrinsic (reliable-questionable)	Information quality theory, Dialectic theory
Fulk and Yuan, 2013	Conc	KS	Enterprise social networking systems	Location of expertise, Motivation to share, Knowledge capitalizaton of social ties	Transactive memory theory, Public goods theory, Social capital theory
Gibbs et al., 2013	Qual	KS	Social media	Visibility-invisibility, Engagement-disengagement, Sharing-control, Openness	Dialectic theory

Legend: Conceptual (Conc), Qualitative (Qual=Case studies, Interviews), Quantitative (Quant), Knowledge sharing (KS), Information systems acceptance and use (ISAU).

Table 2.2. – Research in a business context (Part 1).
Source: Own table.

Authors:	Research type:	Focus:	Type of IT:	Investigated factors:	Theory:
Vaast and Kaganer, 2013	Qual	Social media policies	Social media	Visibility, Persistence, Editability, Association	x
Leonardi et al., 2013	Conc	ISAU	Enterprise social media platforms	Public, private and in-house social media platforms	Social capital theory
von Krogh, 2012	Qual	KM	Social software	Strategic research agenda	Knowledge-based view of the firm
Treem and Leonardi, 2012	Conc	KS	Social media	Visibility, Persistence, Editability, Association	x
Ali-Hassan and Nevo, 2009	Quant	ISAU	Social computing tools	Social computing dimensions: From information to people connections, From utilitarian to hedonic use, From conveyance to convergence, Content generation	Media synchronicity theory
Levy, 2009	Qual	KM	(Enterprise) social software	Age	x
Cress et al., 2006	Qual	KS	Shared databases	Rewards	Public goods theory
Chiu et al., 2006	Quant	KS	Professional virtual communities	Social interaction ties, Trust, Norm of reciprocity, Identification, Shared language, Shared vision, Quantity of knowledge sharing, Knowledge quality, Personal outcome expectation, Community-related outcome expectation	Social capital theory, Social cognitive theory
Kankanhalli et al., 2005b	Quan	KS	KMS	Loss of knowledge power, Codification effort, Organizational reward, Image, Reciprocity, Knowledge self-efficacy, Enjoyment in helping others, Generalized trust, Pro-sharing norms, Identification, Behavior	Social exchange theory, Social capital theory
Bock et al., 2005		KS	x	Attitude, Subjective norms, Organizational climate, Intention	Theory of reasoned action, Social exchange theory

Legend: Conceptual (Conc), Qualitative (Qual=Case studies, Interviews),
Knowledge sharing (KS), Knowledge management (KM), Information systems acceptance and use (ISAU),
Knowledge management systems (KMS).

Table 2.3. – Research in a business context (Part 2).
Source: Own table.

2.1.3. Current studies

Studies that focus on enterprise social software for knowledge sharing (e.g., Kügler and Smolnik, 2014; Ellison et al., 2014; Fulk and Yuan, 2013; Alarifi and Sedera, 2013; Leonardi et al., 2013; Treem and Leonardi, 2012; Gibbs et al., 2013; Stenmark and Zaffar, 2014) are of particular relevance for this research work and are therefore outlined in greater detail hereafter.

Ellison et al. (2014, p. 1) investigate affordances of enterprise network sites for supporting knowledge sharing practices within organizations. Affordances are "constituted in relationships between people and the materiality of the things with which they come in contact" (Treem and Leonardi, 2012, p. 146). Previous literature has identified several affordances which the authors further extend by identifying notions of collective affordances and affordances for organizing, thus expanding the study of social media (Ellison et al., 2014, p. 1). In addition, they analyze how enterprise social network sites shape knowledge sharing (Ellison et al., 2014, p. 6). They conclude that enterprise network sites can constrain, enable, and reshape social capital dynamics, social relationships, the context collapse and network interactions (Ellison et al., 2014, p. 9). These affordances are outlined in the following. **Social capital** is defined as "resources embedded in social relationships and interactions within a network" (Lin, 2001, p. 19). Based on previous research Ellison et al. (2014, p. 10) postulate that intensive use of internal social network sites and measures of social capital are positively associated with each other. This leads to stronger ties, a greater willingness to contribute, and greater access to new people and expertise (Ellison et al., 2014, p. 10). These results are assumed to also be relevant for enterprise network sites. **Social relationships** can be developed through access to personal identity information (Ellison et al., 2014, p. 10). It helps employees engage in "people sense-making" (Ellison et al., 2014, p. 10) which DiMicco et al. (2009, p. 1) defines as "the process a person goes through to get a general understanding or gist of who someone is". The authors assume that identity information may help employees find experts faster, start less artificial conversations, and find common issues which may increase work productivity (Olson and Olson, 2000, p. 168). Based on Boyd (2010, p. 48) and Marwick and Boyd (2011, p. 123), the authors define **context collapse** as "possible complications associated with online self-presentation and identity management in online contexts, in which audiences representing different facets of one's identity co-mingle" (Ellison et al., 2014, p. 11). The authors draw attention to employees' discrepancy of self-presentation to different professional groups, such as management and colleagues (Ellison et al., 2014, p. 11). Based on Podolny and Page (1998, p. 59), the authors define **networked organizational forms** as "organizations in which work is distributed among modular components, hierarchical structures are deemphasized, and communication is central to the organization's functioning" (Ellison et al., 2014, p. 12). The authors argue that enterprise network sites may help make interactions more visible throughout networked organizational forms (Ellison et al., 2014, p. 12).

This would enable employees to view comments on other employees' posts and to tag each employee's content (Ellison et al., 2014, p. 12).

Stenmark and Zaffar (2014, p. 1) analyze the alignment between social media affordances and a centralized top-down approach to information management that dominates in consultants' advice management. The analysis is based on consultants' strategy documents which disclose consultants' recommendations given to organizations looking to engage in social media (Stenmark and Zaffar, 2014, p. 1). Stenmark and Zaffar (2014, p. 1) structure their argumentation according to four affordances: visibility, persistence, editability and association which are explained in the following. **Visibility** is defined as the "ability to make [employees'] behaviours, knowledge, preferences, and communication network connections that were once invisible (or at least very hard to see) visible to others in the organisation." (Stenmark and Zaffar, 2014, p. 2). The researchers state that organizations can benefit from visibility if they include the organization as a whole by pursuing a decentralized strategy (Stenmark and Zaffar, 2014, p. 8). **Persistence** is defined as "communication [that] remains accessible in the same form as the original display after the actor logs out from Facebook or exits the blog application." (Stenmark and Zaffar, 2014, p. 2). Stenmark and Zaffar (2014, p. 5) argue that the amount of available information increases, when organizations pursue a decentralized strategy. **Editability** refers to "individuals [who] can take their own time to carefully craft and edit a communicative act before it is made publicly available." (Stenmark and Zaffar, 2014, p. 3). The authors indicate that repeated editing and updating increase information quality (Stenmark and Zaffar, 2014, p. 8). Again, the authors highlight that a decentralized strategy would enhance the editability affordance (Stenmark and Zaffar, 2014, p. 8). **Associations** are defined as "recognised and established connections" (Stenmark and Zaffar, 2014, p. 3). The researchers state that social media helps employees make their relationships more visible (Stenmark and Zaffar, 2014, p. 8). They argue that such a development is limited in organizations pursuing a centralized strategy (Stenmark and Zaffar, 2014, p. 8). To sum up, the authors use all the aforementioned arguments to finally state that a decentralized strategy aligns best with social media (Stenmark and Zaffar, 2014, p. 8).

Kügler and Smolnik (2014, p. 1) explore employees' enterprise social software use behaviors. On the basis of qualitative empirical data and existing literature, they identify four post-acceptance enterprise social software use behaviors: Consumptive use (knowledge consumption), contributive use (knowledge contribution), hedonic use, and social use (Kügler and Smolnik, 2014, p. 1). These post-acceptance use behaviors are discussed below. **Consumptive use** is defined as "the extent to which employees use an [enterprise social software platform] to acquire knowledge from the platform ('passive use')." (Kügler and Smolnik, 2014, p. 6). **Contributive use** refers to "the extent to which employees use [an enterprise social software platform] to contribute knowledge to the platform ('active use')." (Kügler and Smolnik, 2014, p. 6). **Hedonic use** is defined as "the extent to which employees use [an enterprise social software platform] for the purpose of entertainment." (Kügler and Smolnik, 2014, p. 6). **Social use** refers to "the extent to which employees use [an enterprise social software platform] to establish and maintain social relations with their co-workers." (Kügler and Smolnik, 2014, p. 6). These presented uses have been validated through quantitative empirical data. To this end, the authors collected 233 data sets of employees using enterprise social software platforms in the post-acceptance stage at a communications and high-tech sector organization (Kügler and Smolnik, 2014, p. 7). Their research results allow to assess the extent to which employees use enterprise social software platforms to consume, contribute, socialize and entertain themselves (Kügler and Smolnik, 2014, p. 13).

Alarifi and Sedera (2013, p. 1) analyze mechanisms to enhance employees' engagement in enterprise social networks (e.g., Yammer) by applying control theory (Alarifi and Sedera, 2013, p. 1). The qualitative results indicate that organizations must better understand employees' **extrinsic** (e.g., management pressure) and **intrinsic motivations** (e.g., enjoyment, self-esteem) with regard to the use of enterprise social networks (Alarifi and Sedera, 2013, p. 1). Moreover, the researchers postulate that enterprise social networks act as an utilitarian system, i.e., systems that contribute value towards the interaction between the user and system, with the primary objective of maximizing total benefit and reducing suffering or other negative effects (Anscombe, 1958, p. 12). On the contrary, public social networks (e.g., Twitter) can be regarded as a hedonistic system, i.e., "systems that provide value internal to the interaction between the user and system with the primary objective being a sense of fun", such as games (Alarifi and Sedera, 2013, p. 1). They argue that organizations should be aware of the importance of maintaining and increasing employees' intrinsic motivations in the implementation stage (Alarifi and Sedera, 2013, p. 1). Finally, they identify crucial factors of knowledge sharing, such as management involvement, self-esteem, social pressure, gamification, and rewards (Alarifi and Sedera, 2013, p. 8).

The conceptual paper by Leonardi et al. (2013) examines social technologies in organizations. Their paper involves a definition, a historical perspective on social media use in organizations, as well as prospects for the study of enterprise social media (Leonardi et al., 2013, p. 1). The authors define **enterprise social media** as:

> [...] web-based platforms that allow workers to (1) communicate messages with specific coworkers or broadcast messages to everyone in the organization; (2) explicitly indicate or tacitly reveal particular coworkers as communication partners; (3) post, edit, and sort text and files linked to themselves or others; and (4) view the messages, connections, text, and files communicated, posted, edited and sorted by anyone else in the organization at any time of their choosing (Leonardi et al., 2013, p. 2).

In addition, they describe how enterprise social media has entered the workplace. Three different paths are highlighted:

> (1) use of **publicly available sites** like Facebook, Google+, and Twitter; (2) private implementations of **open source or proprietary software**, either installed on a company's own servers or acquired as a hosted (cloud-based) software service; or (3) **in-house proprietary solutions**, often built as prototypes by software vendors for later incorporation into commercial offerings (Leonardi et al., 2013, p. 4).

They propose future directions for research by developing three different perspectives on enterprise social media: enterprise social media as leaky pipe, enterprise social software as an echo chamber and as a social lubricant (Leonardi et al., 2013, p. 7-14). These perspectives are outlined hereafter. **Enterprise social media as leaky pipe** is conceptually equal to the affordance of visibility. The authors explain that a leaky pipe refers to the directionality and the content of a particular communication (Leonardi et al., 2013, p. 7). Therefore, employees see "to whom the communication is directed and what the parties involved actually said to each other" (Leonardi et al., 2013, p. 7). **Enterprise social software as an echo chamber** is pointed out as the internet's ability to connect similar-minded people (Leonardi et al., 2013, p. 12). **Enterprise social software, as a social lubricant,** refers to building informal networks that allow contacting and communicating with others in an easy way (Leonardi et al., 2013, p. 14). The authors state that all affordances involve advantages and disadvantages, which they list in a comprehensive table (Leonardi et al., 2013, p. 8-10).

Fulk and Yuan (2013, p. 20) investigate how the affordances of enterprise social networking systems can help reduce three basic challenges in sharing organizational knowledge: the location of expertise, employees' motivation to share knowledge and their ability to maintain and develop social ties with other employees, on the basis of knowledge sharing. In order to explain the differences between conventional knowledge management systems and enterprise social networking systems, they draw on transactive memory theory, public goods theory, and social capital theory (Fulk and Yuan, 2013, p. 20). These different theoretical perspectives on enterprise social networking systems will now be discussed. From the perspective of **transactive memory theory**, they state that enterprise social networking systems provide more relevant information, informal social interaction, information on paths to expertise and two-way interaction, than traditional knowledge management technologies do (Fulk and Yuan, 2013, p. 24) (see Section 2.4.3.2 for a more detailed discussion of the differences between enterprise social software and traditional knowledge management systems). From the perspective of **information public goods theory**, enterprise social networking systems may not imply the same costs associated with traditional knowledge management systems (Fulk and Yuan, 2013, p. 25). The researchers argue that enterprise social networking systems make contributions more visible and identifiable and, thus, allow to establish informal relationships that increase identity creation, providing feedback, and allowing (selective) knowledge sharing (Fulk and Yuan, 2013, p. 26). From the perspective of **social capital theory**, the authors state that enterprise social networking systems afford connective and communal relations, concluding that employees are able to connect with a larger number of individuals (Fulk and Yuan, 2013, p. 29). Due to the number of connections, social capital, that is critical to knowledge sharing activities, can be created and extended (Fulk and Yuan, 2013, p. 29).

Gibbs et al. (2013, p. 102) explore ways in which social media affordances do not only increase knowledge sharing in organizations, but also limit knowledge sharing. Drawing on qualitative interviews with employees from an engineering division of a distributed high tech start-up, they identified four different tensions associated with social media: visibility-invisibility, engagement-disengagement, and sharing-control (Gibbs et al., 2013, p. 108), which are outlined in the following. The tension of **visibility-invisibility** refers to online chat tools that enable employees to ask experts particular questions (Gibbs et al., 2013, p. 108). A tension between wanting to help answer colleagues' questions and not always having time, owing to one's own workload, arises (Gibbs et al., 2013, p. 108). The authors express that switching into an invisible mode is a strategic move that enables better time management, as employees can limit their availability and respond only when they choose to (Gibbs et al., 2013, p. 108). The **engagement-disengagement** tension concerns employees' attention allocation (Gibbs et al., 2013, p. 110). Although managers and employees appreciate the interactivity and immediacy of online chat tools, they have voiced that facing pressures related to constant engagement (Gibbs et al., 2013, p. 110). The authors indicate that managers found ways to disengage by monitoring the status of various projects in the threads of the online chat tool, yet limiting their engagement to important problems that required their action (Gibbs et al., 2013, p. 111). The **sharing-control** tension consists of two dimensions: job security-related tension and confidentiality-related tension (Gibbs et al., 2013, p. 112-113). The job security-related tension implies employees' threat that knowledge sharing might make them replaceable, thus leading to the pressure to control rather than share knowledge (Gibbs et al., 2013, p. 112). According to Gibbs et al. (2013, p. 113), this tension can be managed by enabling experts to share their knowledge selectively as well towards a broader audience (e.g., training new hires) (Gibbs et al., 2013, p. 113). The confidentiality-related tension involves employees' concerns assessing the appropriate audience for a piece of information (Gibbs et al., 2013, p. 113). The authors state that this tension can be reduced by offering tools that enable employees to bound and limit their audience, so that they have control to what is shared and with whom (Gibbs et al., 2013, p. 113-114). Further, Gibbs et al. (2013, p. 109) give recommendations concerning how to manage these affordances and preserving openness and ambiguity in organizations.

Majchrzak et al. (2013) identify four affordances of organizational knowledge sharing via enterprise social software: metavoicing, triggered attending, network-informed associating, and generative role-taking. Based on Faraj and Azad (2012, p. 3-4), they define an affordance as "the mutuality of actor intentions and technology capabilities that provide the potential for a particular action" and stress a "symbiotic relationship between human action and technological capability" (Majchrzak et al., 2013, p. 39). In the following, these identified affordances are discussed. **Metavoicing** refers to employees' engagement "in the ongoing online knowledge conversation by reacting online to others' presence, profiles, content and activities." (Majchrzak et al., 2013, p. 41). The researchers suggest that employees who read knowledge contributions as a means for acquiring information are more likely to increase the quality of the conversation than employees who just react to other employees' presence, profiles, contents and activities (Majchrzak et al., 2013, p. 41). **Triggered attending** refers to employees' engagement "in the online knowledge conversation by remaining uninvolved in content production or the conversation until a timely automated alert informs the individual of a change to the specific content of interest." (Majchrzak et al., 2013, p. 42). The authors propose that employees may need to set triggers that defend a conversation from other employees with triggers for disrupting a conversation (Majchrzak et al., 2013, p. 42). **Network-informed associating** is defined "as engaging in the online knowledge conversation informed by relational and content ties." (Majchrzak et al., 2013, p. 43). The researchers conclude that employees may need to purposely associate with contributions and other employees with few links to preserve and intensify the diversity that creates new ideas (Majchrzak et al., 2013, p. 48). **Generative role-taking** is defined as "engaging in the online knowledge conversation by enacting patterned actions and taking on community-sustaining roles in order to maintain a productive dialogue among participants." (Majchrzak et al., 2013, p. 48). The authors conclude that efforts towards making organizational memory of the knowledge conversation explicit and easily discoverable must be enforced, so that managers do not cause employees to reinvent decisions (Majchrzak et al., 2013, p. 48).

Treem and Leonardi (2012, p. 147) state that prior research primarily focuses on the features of specific software in organizations and, therefore, provides limited insights into why the use of technology has particular impacts. The authors develop an affordance approach by focusing on "what combinations of material features allow people to do things that were difficult or impossible to do without the technology". Based on a literature review regarding Web 2.0 and Enterprise 2.0, they identify the affordances of visibility, persistence, editability and association (Treem and Leonardi, 2012, p. 143). Treem and Leonardi (2012) are the first researchers who use the affordance approach in order to analyze social media use in organizations. Stenmark and Zaffar (2014) have already used their affordances approach in order to postulate that a decentralized strategy aligns best with social media use, as outlined in the first part of this section. In the following, the affordances of visibility, persistence, editability and association are defined, since Stenmark and Zaffar (2014) use slightly modified definitions. Treem and Leonardi (2012, p. 150) define **visibility** as "the ability to make their behaviors, knowledge, preferences, and communication network connections that were once invisible (or at least very hard to see) visible to others in the organization". The authors argue that the visibility of social media offers *metaknowledge* about the type of employees and what they may know (Treem and Leonardi, 2012, p. 153). In addition, visibility enables employees to easily locate contents and to view information regarding the status of *ongoing activities in the organization* (Treem and Leonardi, 2012, p. 154). **Persistence** refers to communication that "remains accessible in the same form as the original display after the actor has finished his or her presentation" (Treem and Leonardi, 2012, p. 155). The persistence of contributions in social media enables that *knowledge is sustained over time* (Treem and Leonardi, 2012, p. 157). This, in turn, allows the constant reuse and reanalysis of contents, so that its usefulness in leading to *robust forms of communication* increases (Treem and Leonardi, 2012, p. 157). Since social software provides nearly limitless space, it enhances the *growth of contents* (Treem and Leonardi, 2012, p. 158). **Editability** is defined as the ability to "spend a good deal of time and effort crafting and recrafting a communicative act before it is viewed by others" (Treem and Leonardi, 2012, p. 159). The editability of contents enables employees to *regulate personal expressions*, i.e., they decide for themselves what information they want to display to other employees (Treem and Leonardi, 2012, p. 161). Moreover, they are able to *target content* for specific audiences, i.e., they have an audience in mind when sharing knowledge (Treem and Leonardi, 2012, p. 161). The authors postulate that social media improves information quality, since knowledge contributions can be constantly revised (Treem and Leonardi, 2012, p. 161). **Associations** are defined as "established connections between individuals, between individuals and content, or between an actor and a presentation." (Treem and Leonardi, 2012, p. 162). The authors indicate that social media *supports social connections* as well as *access to relevant information* (Treem and Leonardi, 2012, p. 164-165), and *enables emergent connections* through features, such as rankings and recommendations (Treem and Leonardi, 2012, p. 165). Finally, the authors give implications of social media affordances for organizational socialization processes, knowledge sharing and organizational power by illustrating potential research questions (Treem and Leonardi, 2012, p. 169, 172, 176).

2.1.4. Synthesis

Research studies focusing on knowledge management **with or without** knowledge management systems, and research works exploring the acceptance and use of social software **beyond and within** organizations have been reviewed. The literature review indicates that research papers analyzing the acceptance and use of social software beyond organizations are less concerned with knowledge sharing issues (e.g., Kane et al., 2014). In the context of this thesis, especially research papers focusing on enterprise social software for knowledge sharing (e.g., Kügler and Smolnik, 2014; Ellison et al., 2014; Fulk and Yuan, 2013; Alarifi and Sedera, 2013; Leonardi et al., 2013; Treem and Leonardi, 2012; Gibbs et al., 2013; Stenmark and Zaffar, 2014) are particularly important. These research studies have been divided into conceptual, qualitative and quantitative research. Most of them are conceptual and qualitative, revealing a lack of quantitative research. In addition, most of the studies either focus on the use of public social software in organizations (e.g., Majchrzak et al., 2013; Alarifi and Sedera, 2013) or single private social software instruments, such as enterprise social network sites (e.g., Ellison et al., 2014). Nonetheless, research studies exploring the use and acceptance of integrated private social software platforms for knowledge sharing are limited (e.g., Fulk and Yuan, 2013; Kügler and Smolnik, 2014). The importance and potential impact of enterprise social software in the organizational life is still in its infancy (Leonardi et al., 2013, p. 6) and is therefore in need of a profound theoretical foundation.

2.2. A historical discourse on knowledge

In order to understand the concept of a knowledge-based society, a historical discourse is appropriate.

Therefore, the development from the agricultural society to the knowledge society is outlined in Section 2.2.1, before different perspectives on knowledge with regard to antiquity and modernity are presented in Section 2.2.2.

2.2.1. The development to the knowledge society

Nowadays, society is increasingly developing from an industrial towards a knowledge society (Sonntag et al., 2004, p. 104). Generally, all modern societies have experienced the same transformation process, by developing from an agricultural to an industrial society, then to a service and further to a knowledge society (Brock, 2011, p. 280). However, this process has occurred with considerable time lags for each societal form (Brock, 2011, p. 280). This development is explained by the three-sector theory, which differentiates between extraction of raw materials (primary sector), manufacturing (secondary sector) and services (tertiary sector) (Clark, 1940; Fisher, 1935; Fourastié, 1949; Fourastié, 1954).

Since the empirical analysis is conducted in Germany, the three-sector theory is outlined by using the example of Germany (period until 1980) in the following (Brock, 2011, p. 280). Accordingly, both changes are described, i.e., the change from the agricultural society to the industrial society and from the industrial to the service society. The **agricultural society** is characterized by a high number of employees in the primary sector (e.g., mining, agriculture, forestry and fishery) (Willke, 1998a, p. 48, 50). Researchers argue that, before the Industrial Revolution, all European societies were mainly agricultural (Brock, 2011, p. 280). At the time, the economy was primarily based on non-industrial agriculture, a low division of labor, high levels of self-sufficiency and a low employee commute (Langlois, 2001, p. 15830). The majority of the population was engaged in agricultural production, since trade only took place to a small extent (Willke, 1998a, p. 48). Small towns were embedded in a larger agricultural environment, which supplied the town population with food

(Brock, 2011, p. 250). Knowledge was primarily passed on orally through spoken language, which was bound to context and situations (Nonaka and Takeuchi, 1995, viii). Since education was a privilege to aristocracy, most people could not read or write (Schilcher, 2006, p. 51). Therefore, knowledge was mainly acquired by scholars (Schilcher, 2006, p. 51). Books changed the social sharing of knowledge and made knowledge accessible to a broader public (Reinmann, 2009, p. 23). Researchers state that Germany was an agricultural society until the end of the 19th century (Brock, 2011, p. 280). With considerable time lags, the agricultural society developed towards the **industrial society** (Brock, 2011, p. 280). This society is characterized by a high level of education, striving for progress, performance and success (Brock, 2011, p. 293). In Germany, the industrialization began later than in England and France (Brock, 2011, p. 280). A first wave of industrialization reached Germany in the 1830s and a second wave in the 1870s (Brock, 2011, p. 280). But it was not before the 20th century that Germany had become an industrial society (Brock, 2011, p. 280). The dramatic decline of the primary sector can be traced back to a comparatively slight increase in market demand, which was accompanied by a high level of rationalization to make work processes more effective, especially in agriculture (Brock, 2011, p. 282). Hectare sales increased between 1880 and 1980 and many processes were mechanized, which led to cost-saving effects of human resources (Brock, 2011, p. 282). The rationalization influenced the agriculture sector above all other areas of the industrial sector, especially in the 1950s and 1960s (Brock, 2011, p. 232). At the time, the division of labor led to an increase in productivity (Brock, 2011, p. 232). Furthermore, vertical and horizontal mobility was promoted (Brock, 2011, p. 285). In addition, work volume was considerably reduced due to the diffusion of micro-electronics into the secondary sector (Brock, 2011, p. 282). These developments led to new management concepts that can be traced back to the principles of taylorism (Brock, 2011, p. 282). This concept is characterized by a strict separation between conception labor (management) and the execution of standardized and formally prescribed tasks on the shopfloor (employee) (Nonaka and Takeuchi, 1995, p. 36). However, the industrial society was also characterized by a loss of function of family and kinship (Brock, 2011, p. 305). In addition, different areas of life were separated, leading to an urbanization of society (Brock, 2011, p. 241). In contrast to the agriculture society, rationalization profits could be compensated over a long period of time, especially through the expansion in demand (Brock, 2011, p. 282). Nonetheless, these results could not be further reached in the years before 1980 (Brock, 2011, p. 282). The specialization of knowledge was a characteristic of the industrial society, which led to a gap between scientific knowledge and practical knowledge (Mittelstraß, 1992, p. 16). From a Taylorian perspective, knowledge was a privilege of the management, since the experiences and judgments of the employees were not seen as a source of new knowledge (Nonaka and Takeuchi, 1995, p. 36). Researchers state that Germany was an industrial society until the seventies of the 20th century (Brock, 2011, p. 281; Abelshauser, 1983, p. 120), which was linked to its export orientation and export surpluses (Brock, 2011, p. 281). The

service society is characterized by an increasing private and affluent demand for services, triggered by the rising real income (Willke, 1998a, p. 54; Brock, 2011, p. 282). Hence, the service sector served as a main collector for the available work force, since in the agricultural and industrial society, workload was reduced due to the increase in productivity (Willke, 1998a, p. 54). This was further reinforced by the changes in living conditions and population structure (Willke, 1998a, p. 96). For instance, the demand for leisure activities increased due to declining labor times (Willke, 1998a, p. 96). Furthermore, the higher life expectancy of the population led to an increased demand for care services (Willke, 1998a, p. 77). In addition, the need in planning and execution of the production of goods as well as the distribution of goods to services rose within the manufacturing sector (Willke, 1998a, p. 55). For these reasons, the complexity of social and economic systems grew, which increased the need for regulation, coordination and management (Willke, 1998a, p. 89). Overall, the development led to an increased division of labor and an increased bureaucratization of society, which both are characteristics of the Taylorian approach (Nerdinger, 2014b, p. 19). Since the expansion in demand outreached the rationalization profits in the service society, a permanent increase of employment could be observed (Brock, 2011, p. 282). Fourastié (1949) stated that services were resistant towards rationalization, since work was focused on human beings rather than on products. This optimistic assumption was in line with reality until the year of 1980 (Brock, 2011, p. 282).

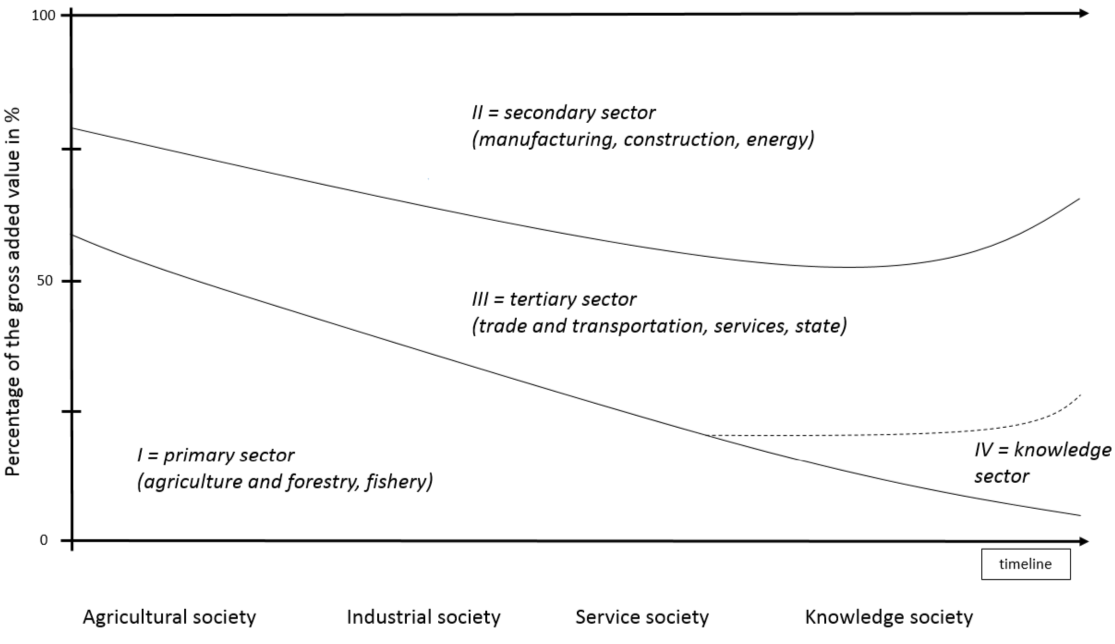

Figure 2.1. – Four-sector hypothesis.
Source: Willke (1998a, p. 46).

Some researchers argue that the three-sector theory has to be extended by a fourth sector: the **knowledge society** (see Figure 2.1) (Willke, 1998a, p. 48). For example, the UNESCO (2005) world report carries the title "Toward Knowledge Societies" and highlights the era of a knowledge society. However, the idea of a knowledge society is anything but new (Reinmann, 2009, p. 9). According to Karl Marx, knowledge workers were already involved in the production process of the industrial society (Reinmann, 2009, p. 9). Consequently, knowledge has always played a role in industries (Reinmann, 2009, p. 9), such as chemicals and machinery, meaning that the knowledge society as a motor or supplement of the industrial society has been around for a long time (see Figure 2.2) (Bullinger et al., 1997, p. 5).

However, economic changes give evidence for the increasing importance of knowledge, which are outlined in the following. Reinmann (2009, p. 9) emphasizes that economic changes can be traced back to products, actions and ideas that have become more knowledge intensive and therefore more immaterial and less visible. As such, a knowledge economy can be regarded as an immaterial economy (Goldfinger, 2002, p. 847), which neither replaces the agricultural and industrial society nor does it change services to pure knowledge activities (Reinmann, 2009, p. 9). Reinmann (2009, p. 9) argues that the understanding of knowledge changes according to the developments of society, resulting in the fact that many knowledge terms and forms stand side by side. She highlights the undeniable progress of modern science and technology in all areas of social life and institutions (Reinmann, 2009, p. 9). According to Reinmann (2009, p. 7), the drivers of such economic changes are the informatization, internationaliza-

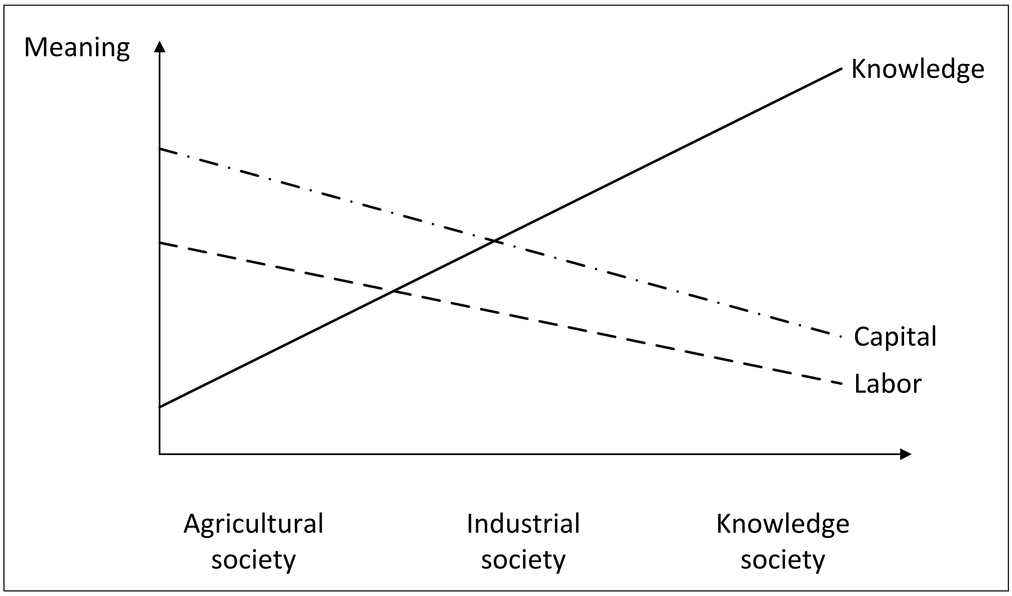

Figure 2.2. – Meaning of knowledge in society.
Source: Bullinger et al. (1997, p. 5).

tion and individualization, which are described in the following. **Informatization** is characterized by an increasing amount of information management systems introduced in organizations (Reinmann, 2009, p. 7; Schmiede, 2006, p. 457). Moreover, it serves in turn as a prerequisite of the **internalization** of the economy, which refers to an integration of the global economy based on capital flows and the international trade (Reinmann, 2009, p. 7; Vormbusch, 2006, p. 2). These developments have led to an **individualization**, i.e., individuals are nowadays increasingly required to have special skills and expertise (Reinmann, 2009, p. 7).

In fact, the logic of the de-materialization has an influence on all economic sectors and changes the way work processes are organized (Schönberger and Springer, 2003, p. 7). Therefore, employees are subject to constant changes in work processes and a rapid evolution of knowledge (Willke, 2001, p. 10). For instance, existing knowledge becomes more quickly obsolete, so that employees need to continuously update and gather new knowledge (Arthur, 2005, p. 1162; Caspers et al., 2004, p. 33). Organizations are reacting towards these developments by increasingly supporting the concept of "lifelong learning" (Sonntag et al., 2004, p. 105), e.g., by demanding employees to continuously share knowledge and keep abreast of the latest trends at all times (Reinmann, 2009, p. 7). From a managerial perspective, knowledge must be accessible to employees and they must have the opportunity to contribute to the existing stock of organizational knowledge (Conley and Wei, 2009, p. 339). These developments highlight that a paradigm shift towards a knowledge society was needed, which is characterized by people participating in the collective construction of knowledge (Willke, 1998b, p. 46).

To sum up, while in former times primarily economic and technical driving forces were present, the knowledge society involves not only social but also educational aspects (Reinmann, 2009, p. 7). Consequently, the term knowledge society integrates the ideas and technological and economic implications of the former sectors (Reinmann, 2009, p. 7). To this end, the knowledge society designs the resulting consequences for everyday life, education and work and, finally, requires lifelong learning (UNESCO, 2005, p. 185; Sonntag and Schaper, 2007, p. 602).

2.2.2. Knowledge perspectives in antiquity and modernity

Questions regarding the concept and definition of knowledge are manifold and mainly based on historical developments and different view points, which are outlined in the following.

The question "What is knowledge?" is one of the fundamental questions of *philosophy* (Nonaka and Takeuchi, 1995, p. 21). In Western epistemology, the concept of knowledge is closely linked to the search for "truth" (Nonaka and Takeuchi, 1995, p. 21). Moreover, **in antiquity**, the ideas of scholars were predominant over scientific research (Schilcher, 2006, p. 51). Socrates assumed that the function of knowledge consists of self-knowledge and the intellectual, moral and spiritual growth of mankind (Drucker, 1993, p. 45; Böhme, 1991, p. 203; Oetzel, 1978, p. 26).

In antiquity, science was focused on the general, on reasons and causes and, finally, on the last and highest principles (Oetzel, 1978, p. 26). Knowledge was not equal to being able to do something or doing something purposeful, nor did it refer to useful skills (Schilcher, 2006, p. 51). The meaning of the Greek term “techné”, which refers to these antique assumptions, ranges from craftsmanship to art (Schilcher, 2006, p. 51). Techné cannot be explained by spoken or written words, it is anchored in practical doing (Drucker, 1993, p. 45; Castoriadis, 1983, p. 196). Accordingly, skills could only be acquired through apprenticeship and experience (Schilcher, 2006, p. 51). In antiquity, scholars devoted their time to themselves (Schilcher, 2006, p. 51). Creating aspects received more attention throughout history and led to the fact that science experienced a change to the constructivism (Oetzel, 1978, p. 28). This development led to controversies that can be traced back to the ancient conflict between Plato (428 - 347 B.C.) and Aristotle (384 - 322 B.C.) (Nonaka and Takeuchi, 1995, p. 22). Plato, who can be seen as an ancestor of rationalism, already believed in an a priori knowledge, which cannot be explained by sensory experience (Nonaka and Takeuchi, 1995, p. 22). Knowledge was derived deductively, i.e., knowledge was deduced from logical thinking (Nonaka and Takeuchi, 1995, p. 21). Mathematics is a typical example of rationalism (Nonaka and Takeuchi, 1995, p. 21). Aristotle, who can be seen as an ancestor of empiricism, claimed in contrast to Plato that sensory experience is the only true source of knowledge and, therefore, an a priori knowledge does not exist (Nonaka and Takeuchi, 1995, p. 22). Knowledge was attained inductively, i.e., findings were derived from sensual experiences (Nonaka and Takeuchi, 1995, p. 22). Experimental science is a typical example of empiricism (Nonaka and Takeuchi, 1995, p. 22). Through the philosophical debate, two approaches evolved: *Knowledge as object* and *knowledge as process*, which are discussed in further detail in Section 2.3.1.1.

Throughout history, knowledge increasingly became a common good and was no longer limited to academic scholarship (Schilcher, 2006, p. 51). Besides scientific knowledge, technical knowledge gained increasing importance (Schilcher, 2006, p. 51). The connection between theoretical and practical knowledge further increased through the work of Galilei (1564-1642), who set a new milestone for linking science and engineering (Mittelstraß, 1992, p. 16). Mechanical issues were considered as artistry, since mechanism was not perceived as being based on natural scientific knowledge but as artistry through which laws of nature could be outwitted (Mittelstraß, 1992, p. 16). Knowledge did no longer only refer to human beings, but also to human actions (Drucker, 1993, p. 35).

In **modernity**, reason received more attention, which was coined by the ancient term “logos” (Schilcher, 2006, p. 52). In those days, both terms techné and logos characterized the understanding of knowledge (Schilcher, 2006, p. 52). This perception is further highlighted by Francis Bacon (1561-1626) (Schilcher, 2006, p. 158). The saying “knowledge is power” is commonly attributed to him (Schilcher, 2006, p. 158).

In addition, the saying is claimed to have been deduced from the Latin aphorism "scientia est potentia" (Büchmann, 1972, p. 436). Bacon saw knowledge as power of nature.[3] From this, he deduced that the goal of science was to control nature in the interests of progress (Hasler Roumois, 2007, p. 29; Böhme, 1991, p. 202; Mittelstraß, 2001, p. 25; Schilcher, 2006, p. 52). Accordingly, Bacon reflected modern society as a technical-oriented system to the benefit of mankind (Schilcher, 2006, p. 52).

The **current understanding of knowledge** is characterized by problem solving (Schilcher, 2006, p. 52). This idea is anything but new and can be traced back to the philosopher and mathematician Gottfried Wilhelm Leibniz (1646-1716) (Krämer, 1988, p. 3). Leibniz regarded formalized problem solving as mechanical treatment based on symbols (Krämer, 1988, p. 4). Moreover, he dreamed of a *universal science* (Schilcher, 2006, p. 52). He had a system, in which knowledge is structured and controllable due to a relationship of dependence, in mind (Schilcher, 2006, p. 52). Such a system would allow the transfer of knowledge, thinking and rationality into a *logical calculation* in which mistakes would be nothing more than calculation errors (Schilcher, 2006, p. 52). Three key elements can be deduced from Leibniz' assumptions: a formalism, which allows a comprehensive knowledge representation, a calculation machine, which enables creating knowledge and a connection process, which leads to a universal science (Toulmin, 1994, p. 163; Mittelstraß, 1992, p. 222).

Compared to ancient science, modern science tries to produce empirical substantial results through methodical and operative procedures, which are mathematically generalizable and reproducible (Oetzel, 1978, p. 27). Moreover, the results are based on the assumption that the world consists of principles in which the unknown and unexpected are a result of yet undetected laws (Greiff, 1976, p. 61).

From a *managerial perspective*, knowledge is nowadays often seen as being equivalent to economic success and technical innovations (Schilcher, 2006, p. 51; Ellison et al., 2014, p. 12). In the *knowledge-based view of the firm* (Grant, 1991; Grant, 1996; Spender, 1996; Teece, 2000; North, 2011), the correct use of knowledge is a key means of optimizing business processes, which is embedded in people, documents and routines (Picot, 2000, p. 1; Bock et al., 2005, p. 88). In the knowledge based view of the firm, advanced information technologies play an important role since they enable an increase in knowledge sharing (Alavi and Leidner, 2001, p. 108).

2.3. Knowledge management and knowledge sharing

A variety of definitions of knowledge can be found in philosophy, social sciences, information technology and business sciences without being able to deduce from these a general and finally satisfactory definition (see Appendix A.1 for a selection of defini-

[3] "Human knowledge and human power meet in one; for where the cause is not known the effect cannot be produced. Nature to be commanded must be obeyed; and that which in contemplation is as the cause is in operation as the rule." (Bacon, 1863, p. 67).

tions). Therefore, it is not reasonable to depict all prevailing definitions because such a differentiation would not necessary lead to a better understanding of the meaning of knowledge. Accordingly, it seems more appropriate to discuss different viewpoints on knowledge.

Section 2.3.1 refers to these different viewpoints on knowledge. In Section 2.3.2 various knowledge management models are discussed. Subsequently, knowledge work is outlined in Section 2.3.3 and various knowledge forms in Section 2.3.4. Afterwards, the process of knowledge sharing is presented in Section 2.3.5. Finally, the main findings are summarized in Section 2.3.6.

2.3.1. Different views on knowledge

One perspective on knowledge differentiates between "knowledge as an object" and "knowledge as a process", while another perspective on knowledge differentiates between "data", "signs", "information" and "knowledge".

Subsequently, the differentiation between knowledge as an object and knowledge as a process is outlined in Section 2.3.1.1 and the distinction between data, signs, information and knowledge is discussed in Section 2.3.1.2.

2.3.1.1. Knowledge as an object vs. knowledge as a process

The perspectives knowledge as an object and knowledge as a process are discussed in the following (North, 2011, p. 45; von Krogh, 1998, p. 134; Schneider, 1996, p. 18; Nooteboom, 2000, p. 114).

From the perspective of **knowledge as an object**, knowledge has to truthfully reflect or match the individual's independent world (von Glasersfeld, 2002, p. 28, 30). This phenomenon can be interpreted as representation of the reality (von Glasersfeld, 2002, p. 28, 30). Cognitive science has been studying artificial intelligence since the mid-fifties and is driven by the findings in the fields of information technology, system theory, psychology and neuro-sciences (Luger, 1994, p. 75, 87). One of the priorities of these studies is the representation of knowledge through formal models of the cognitive system (Luger, 1994, p. 75, 87). Although still no one knows exactly how human knowledge is organized in the brain, it is assumed that individuals consider images consisting of a set of symbols (Luger, 1994, p. 75, 87). Consequently, knowledge becomes an object by assuming that knowledge is an objectively definable commodity (Luger, 1994, p. 75, 87). Therefore, knowledge tends to have an explicit character and is possessed by organizations and tangible objects (Empson, 2001, p. 812). Hence, some researchers state that it is not necessary to link knowledge to people anymore, i.e., knowledge can be saved in books and through information and communication technologies (Newell and Simon, 1972, p. 5). Accordingly, knowledge can be regarded as something detached from its owners (Newell and Simon, 1972, p. 5). This viewpoint refers to knowledge as an object and is predominantly supported by *information* *processing*, which interprets knowledge as divisible, duplicable and portable (Newell and Simon, 1972, p. 5).

In recent years a sociological perspective on knowledge has evolved (Empson, 2001, p. 813). These researchers regard **knowledge as a process** and support a *constructivistic* viewpoint in which reality is considered to be socially constructed (Luhmann, 1984, p. 16; North, 2011, p. 46; Willke, 1998b, p. 13; Amelingmeyer, 2004, p. 43; Schaper, 2007, p. 46). Accordingly, knowledge is rather seen as a tacit social construct that arises, transfers and maintains, within the context of social interactions (North, 2011, p. 46). Knowledge as a process can be divided into “knowing what” (theoretical knowledge) and “knowing how” (practical knowledge) (Polanyi, 1966, p. 7; Ryle, 1990, p. 28; Gronau, 2009, p. 6). Knowing what consists of knowledge that can be transferred through information technologies and is not bound to people (Polanyi, 1966, p. 7; Ryle, 1990, p. 28; Gronau, 2009, p. 6). Therefore, it is a static term and is conceptually equal to knowledge as an object. In contrast, knowing how is bound to people and cannot be analyzed without considering people (Allee, 1997, p. 47). Researchers argue that knowledge is bound to people and cannot be saved through information and communication technologies (North, 2011, p. 46). They assume that individuals just receive information, which is transferred into knowledge through an individual acquisition process, meaning that knowledge which is not absorbed stays information (Machlup, 1962, p. 15; Mambrey, 2008, p. 13). From a constructivist perspective, this process is comparable to a learning process, which depends on the existence of previous knowledge and the learner’s ability to integrate newly acquired knowledge into existing mental models (Machlup, 1962, p. 15; Mambrey, 2008, p. 13). In addition, this definition indicates that efforts made in knowledge management cannot be conducted without taking human aspects into account (Döbler, 2010, p. 389). Unlike traditional production factors, knowledge is not owned by the organization but lies in the heads of its employees (Döbler, 2010, p. 389). Consequently, organizations must motivate their employees to share their valuable wisdom and reduce potential barriers of knowledge sharing (Fulk and Yuan, 2013, p. 20).

Since this thesis investigates knowledge sharing and the social anchoring of the behavior of individuals in an organizational context, the knowledge as a process approach is used as a theoretical foundation in this thesis (see Table 2.4). However, a differentiation between *knowing what* or *knowing how* does not seem to be reasonable since both processes are interconnected with each other (a more detailed explanation is given in Section 2.3.4.1) (Ahlert et al., 2006, p. 43).

	Knowledge as object	Knowledge as process	This thesis
Purpose	Identification of relevant knowledge and development of effective knowledge management mechanisms throughout organizations	Understanding of how knowledge is developed, articulated and shared throughout organizations	Understanding of employees' willingness to share knowledge though enterprise social software
Origin	Economics	Sociology	Economics and sociology
Epistemological assumptions	Knowledge as objective distinguishable commodity	Knowledge as social construct	Knowledge as social construct
Level of analysis	Organizations and their knowledge base	Individuals embedded in a social/organizational context	Individuals embedded in a social/organizational context
Scientific perspective	Cognitive view	Constructivist view	Constructivist view
Knowledge form	Know what	Differentiation between know what and know how	Know what and know how are interconnected with each other

Table 2.4. – Different perspectives on knowledge.
Source: Based on Empson (2001, p. 813).

2.3.1.2. The signs, data, information and knowledge approach

Another perspective on knowledge differentiates between data, signs, information and knowledge. Signs appear at the lowest and knowledge at the highest level of a hierarchy in which the next level can be reached through an enrichment process (Rehäuser and Krcmar, 1996, p. 4), which is outlined below.

Signs are raw numbers (1,2,3) and letters (a,b,c) (Rehäuser and Krcmar, 1996, p. 4). They become data when they are coded and grouped due to syntax rules (Rehäuser and Krcmar, 1996, p. 4). Accordingly, the combination of signs and words are already **data**, e.g., the number "123" and the word "price" (Rehäuser and Krcmar, 1996, p. 4). Data become **information** when they are associated with solving a problem or used to reach a goal (Rehäuser and Krcmar, 1996, p. 5). Hence, information is a result of giving data a meaning, e.g., "today the share price is 123 Euro" (Rehäuser and Krcmar, 1996, p. 5). Therefore, information is contextual and can be interpreted according to a certain context (Rehäuser and Krcmar, 1996, p. 5). If this information is processed by an individual through the understanding of how financial markets work and the ability to give recommendations, one speaks of **knowledge** (Rehäuser and Krcmar, 1996, p. 5). If knowledge is transferred into action, knowledge becomes relevant to the organization **(relevant knowledge)**, e.g., the purchase of a share (see Table 2.5) (Rehäuser and Krcmar, 1996, p. 6).

Classification	Description	Example
Signs	Lowest quantities of data, set of characters	1,2,3,...
Data	Combination of signs	123, price
Information	Result of placing data within a meaningful context and can be conceived as processed data with relevance and purpose	Today the share price is 123 Euro
Knowledge	Integration of information into an individual context of experiences	Understanding of how financial markets work and the ability to make a decision concerning the purchase or sale of a share
Relevant knowledge	Action	Action (purchase of a share) according to organizational goals

Table 2.5. – Distinction between signs, data, information and knowledge.
Source: Based on Rehäuser and Krcmar (1996, p. 4).

North (2011, p. 36) extends this view by developing the *knowledge staircase model* (see Figure 2.3). He does not only differentiate between signs, data, information and knowledge, but also between ability, action (willingness), competence and competitiveness (North, 2011, p. 36). On the lowest step are signs, which become data through syntax rules (North, 2011, p. 36). Data in turn become information based on semantic rules (North, 2011, p. 36). Knowledge develops through the connection between new information with already existing information (North, 2011, p. 37). Ability refers to the extent of the individual's belief in his own ability to share and utilize knowledge (North, 2011, p. 37). Based on the individual's willingness, ability becomes action (North, 2011, p. 37). The individual's competence refers to achieving organizational goals, which finally enhance the organization's competitiveness (North, 2011, p. 38). This thesis primarily focuses on the individual's willingness, i.e., the step between ability and action.

To sum up, the signs, data, information, knowledge perspective offers a more practical approach. This becomes especially important when designing the questionnaire for the quantitative analysis (see Section 4.1.2). Consequently, this thesis uses the signs, data, information, knowledge approach as theoretical foundation, even if it is less elaborated compared to the staircase model.

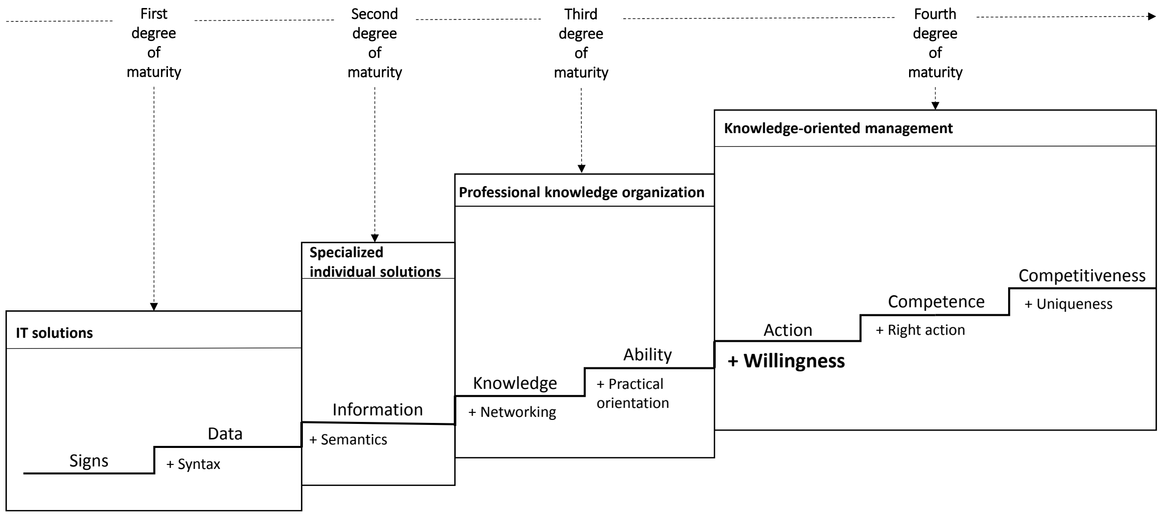

Figure 2.3. – Staircase model.
Source: North (2011, p. 36).

2.3.2. Knowledge management

Knowledge management refers to the deliberate and systematic handling of knowledge resources, besides the targeted use of knowledge in companies (Reinmann-Rothmeier, 2001, p. 18). Knowledge management involves identifying existing knowledge and making it transparent so that it can be shared, used, and continually expanded (see Appendix A.2 for further definitions of knowledge management) (Reinmann-Rothmeier, 2001, p. 18).

In the following, knowledge management models, such as the SECI (socialization, externalization, combination, internalization) model of Nonaka and Takeuchi (1995) (see Section 2.3.2.1), the Munich model of Reinmann-Rothmeier (2001) (see Section 2.3.2.2) and the building block model of Probst et al. (2012) (see Section 2.3.2.3) are introduced, since they have broadly accepted and recognized in scientific research as well as in practice (e.g., Bullinger et al., 1997, p. 11; Ahlert et al., 2006, p. 47; Braun et al., 2009, p. 5; Karabag, 2010, p. 2).

2.3.2.1. Seci model

One of the most frequently cited knowledge management model is the SECI model of Nonaka and Takeuchi (1995). It describes the dynamic processes of knowledge transformation across different levels (Nonaka and Takeuchi, 2012, p. 29). The model is based on the assumption that new knowledge develops through the interplay between tacit and explicit knowledge (Nonaka and Takeuchi, 2012, p. 89). The authors argue that innovation can only evolve when both knowledge forms act together (Nonaka and

Takeuchi, 2012, p. 78). In the following, the processes of socialization, externalization, combination, internalization are outlined.

The process in which tacit knowledge is transferred from one person to another through shared experiences, observations, imitation and practice is referred to as **socialization** (Nonaka and Takeuchi, 2012, p. 80). Surface knowledge (e.g., technical skills) as well as deep knowledge (e.g., codes of conduct) can be shared (Nonaka and Takeuchi, 2012, p. 80). The process in which tacit knowledge is converted into explicit knowledge through interaction and collective reflection is called **externalization** (Nonaka and Takeuchi, 2012, p. 82). It is facilitated through metaphors, scenarios, models, analogies and hypotheses (Nonaka and Takeuchi, 2012, p. 82). Moreover, it offers a starting point for a reformulation of goals, problems and crisis situations (Nonaka and Takeuchi, 2012, p. 83). Through the externalization of knowledge, it can be shared and understood by others, which forms the basis for the development of new knowledge (Nonaka and Takeuchi, 2012, p. 83). **Combination** is the process in which explicit knowledge is transferred to another person (e.g., through communication) (Nonaka and Takeuchi, 2012, p. 86). Knowledge can be summarized, classified and organized with the help of documents, discussions, and computer networks (Nonaka and Takeuchi, 2012, p. 86). New knowledge can be the result of

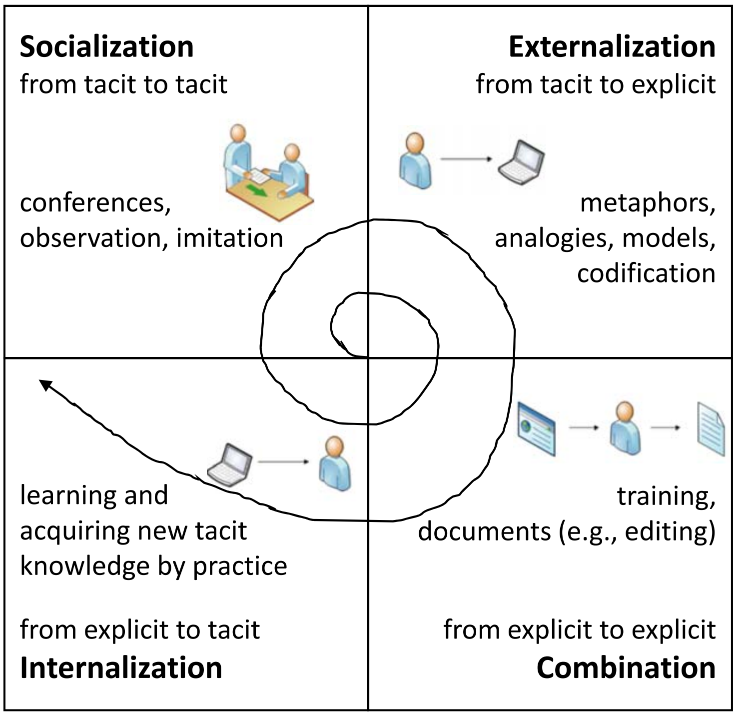

Figure 2.4. – The SECI model.
Source: Based on Nonaka and Takeuchi (2012, p. 90).

such structuring and combination procedures (Nonaka and Takeuchi, 2012, p. 86). Finally, **internalization** refers to the process in which explicit knowledge is transferred into tacit knowledge (Nonaka and Takeuchi, 2012, p. 87). In order to support this process, documents, books and other materials and methods can be used (Nonaka and Takeuchi, 2012, p. 88). If books are read, tacit knowledge can be enriched (Nonaka and Takeuchi, 2012, p. 88). Thus, on the one hand, existing knowledge can be internalized, besides developing new knowledge on the other hand (Nonaka and Takeuchi, 2012, p. 88). The transformation of explicit knowledge into routines and work processes closes the relationship between tacit and explicit knowledge (Nonaka and Takeuchi, 2012, p. 89).

The model is also known as the knowledge spiral, in which knowledge passes through different levels (see Figure 2.4) (Nonaka and Takeuchi, 2012, p. 90). The spiral expresses that knowledge is constantly developed and enriched, while passing through the different levels, which are described in the following (Nonaka and Takeuchi, 2012, p. 93). The interaction between tacit and explicit knowledge diffuses from the individual level to the group level, from the group level to the organizational level and from the organizational level to the inter-organizational level (Nonaka and Takeuchi, 2012, p. 93). Accordingly, the socialization process at the **individual level** can be regarded as the starting point where new knowledge develops (Nonaka and Takeuchi, 2012, p. 80). Afterwards, this knowledge reaches several small groups due to the externalization process **(group level)** (Nonaka and Takeuchi, 2012, p. 82). The combination process ensures that knowledge further spreads across the entire organization **(organizational level)** until it reaches the **inter-organizational level** (Nonaka and Takeuchi, 2012, p. 86).

2.3.2.2. Munich model

The munich model by Reinmann-Rothmeier (2001) refers to the systematic and conscious use of knowledge (see Figure 2.5). A specific feature of this model is the integration of organizational and psychological components (Reinmann-Rothmeier, 2000, p. 11). Reinmann-Rothmeier (2000, p. 11) describes knowledge management as a control loop that contains four networked processes: knowledge representation, knowledge communication, knowledge generation and knowledge use. These processes are outlined in the following.

Knowledge representation focuses on the visualization of tacit knowledge (Reinmann-Rothmeier, 2001, p. 22). Accordingly, organizational knowledge is managed and made transparent for employees, so that knowledge can be found, memorized and stored (Reinmann-Rothmeier et al., 2001, p. 32). Knowledge representation can be facilitated through communication and information systems, knowledge maps or simple mind maps (Reinmann-Rothmeier and Mandl, 2000, p. 19). It additionally ensures that knowledge does not get lost (Herrmann et al., 2003, p. 11). However, knowledge representation depends on three aspects: employees' willingness to

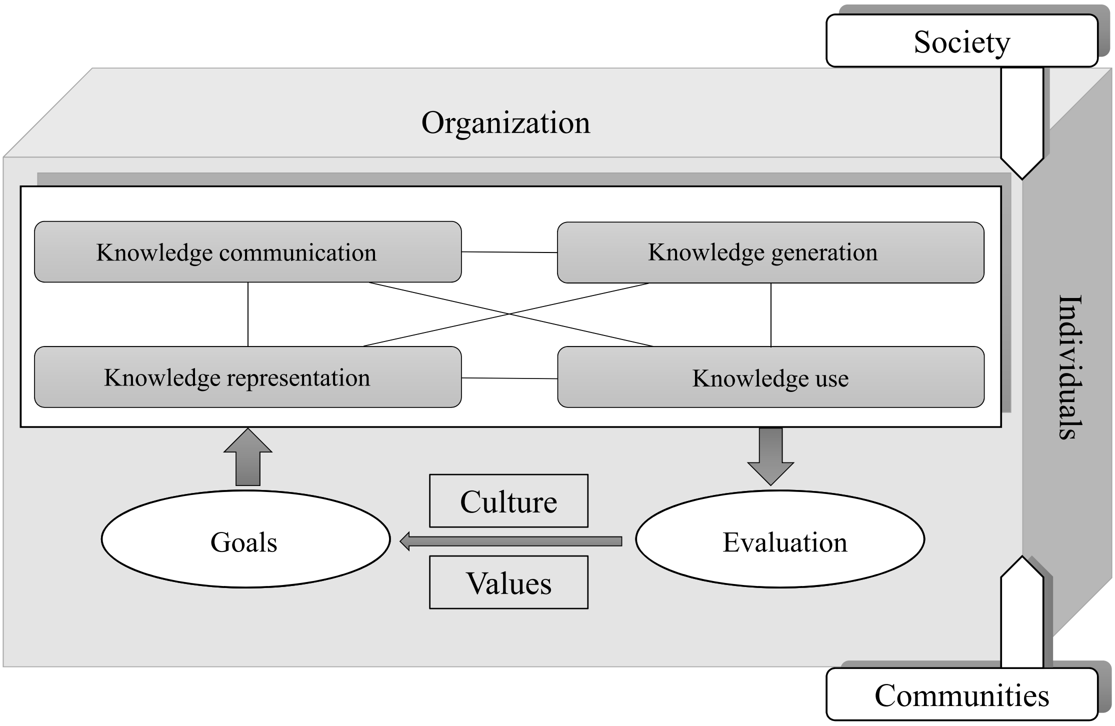

Figure 2.5. – Munich model.
Source: Reinmann-Rothmeier (2000, p. 11).

share knowledge, the consciousness of own knowledge and the capability to verbalize, present and structure knowledge (Herrmann et al., 2003, p. 5). **Knowledge communication** involves the provision, diffusion, sharing and distribution of knowledge (Reinmann-Rothmeier, 2001, p. 24). Trust, teamwork and the willingness to cooperate are essential for an efficient knowledge communication, which depends on reciprocal relationships (Reinmann-Rothmeier, 2000, p. 6). Organizational culture can strengthen or impede knowledge communication (Reinmann-Rothmeier et al., 2001, p. 36). Therefore, knowledge management is of great importance, especially for large and decentralized organizations (Reinmann-Rothmeier, 2000, p. 7). Knowledge communication can be effectively managed through communication technologies (Reinmann-Rothmeier, 2000, p. 10). **Knowledge generation** involves processes to improve creativity, innovation and learning (Reinmann-Rothmeier, 2001, p. 25). Due to the dynamics on the business markets, generating new knowledge and supporting innovations has become crucial for organizations (Reinmann-Rothmeier et al., 2001, p. 14). Moreover, organizational knowledge and organizational learning are important aspects in order to increase the organizational innovation capability, which in turn strengthens the organization's competitive advantage (Reinmann-Rothmeier et al., 2001, p. 38). Knowledge can also be acquired externally, e.g., through cooperation, mergers and recruitment (Reinmann-Rothmeier and Mandl, 2000, p. 20). **Knowledge use** refers to the current transfer of existing knowledge and the use of new knowledge for decision-making (Reinmann-Rothmeier, 2001, p. 23). The circle of comprehensive knowledge management is not completed until knowledge has been used (Reinmann-Rothmeier and Mandl, 2000, p. 20). To this end, the transformation of knowledge into products and services is an important criteria for the evaluation of knowledge management processes (Reinmann-Rothmeier et al., 2001, p. 39). The definition, formulation and establishment of goals and the evaluation of the results ensure that knowledge management does not become an end in itself, yet is rather practiced in a problem-oriented manner (Reinmann-Rothmeier et al., 2001, p. 19).

2.3.2.3. Building block model

One of the most frequently used knowledge management models in theory and practice is the building block model by Probst et al. (2012) (e.g., Adelsberger et al., 2002, p. 531; Braun et al., 2009, p. 5; Bullinger et al., 1997, p. 11). The model consists of six processes (knowledge identification, knowledge acquisition, knowledge development, knowledge sharing, knowledge use and knowledge preservation), which have been extended through two strategic aspects (knowledge goals and knowledge measurement) (Probst et al., 2012, p. 34). The different blocks of the model are outlined in the following (see Figure 2.6).

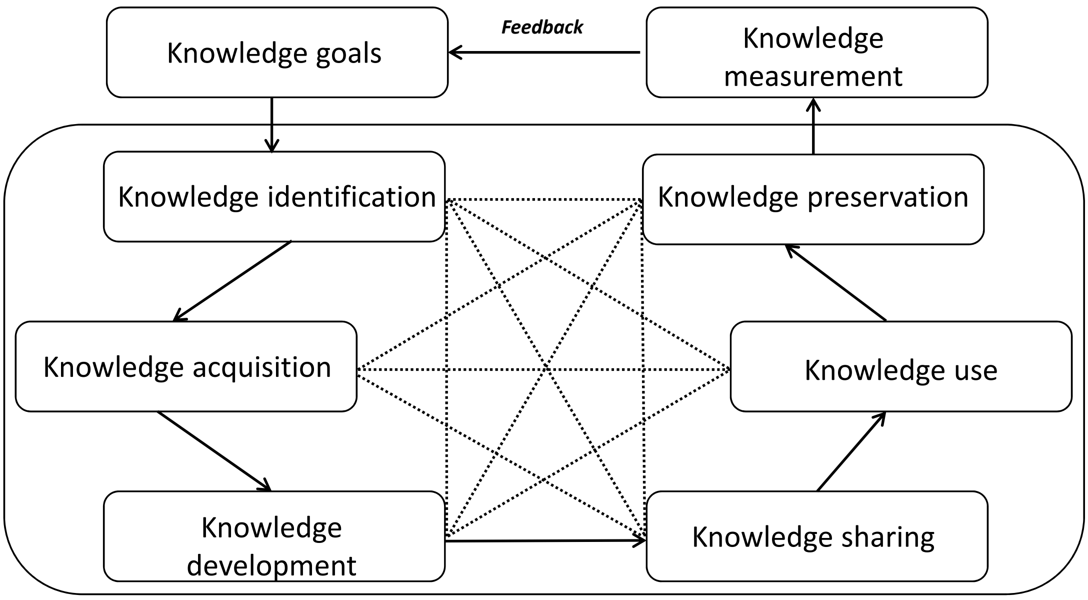

Figure 2.6. – Building block model.
Source: Probst et al. (2012, p. 34).

Knowledge goals ensure that normative and strategic knowledge goals are translated into action (Probst et al., 2012, p. 34). In addition, they indicate which skills should be further developed at which level (Probst et al., 2012, p. 34). Normative knowledge goals refer to an organizational culture supporting knowledge management, whereas strategic goals focus on organizational core capabilities (Probst et al., 2012, p. 34). **Knowledge identification** gives an overview of the existing knowledge; it provides transparency, which is needed in order to avoid duplication of work and other inefficient activities (Probst et al., 2012, p. 31). Organizations are not aware of the knowledge that exists within their institution (O'Dell and Grayson, 1998, p. 1). In order to secure an effective identification of knowledge, information systems, knowledge maps, lessons learned, teamwork and knowledge networks are helpful (Probst et al., 2012, p. 31). However, the risk of information overload arises with the volume of shared information (Probst et al., 2012, p. 266). **Knowledge acquisition** focuses on the acquisition of external knowledge, for instance through customers, suppliers and partners (Probst et al., 2012, p. 31). Moreover, organizations can recruit or temporarily deploy experts (Probst et al., 2012, p. 31). In general, it is possible to distinguish between directly usable knowledge (e.g., to find a new employee with special skills) and potential knowledge (e.g., to invest into a management trainee) (Probst et al., 2012, p. 31). **Knowledge development** refers to management activities that are intended to produce new skills, new products, better ideas and more efficient processes (Probst et al., 2012, p. 31). The areas of research and development, as well as market research especially focus on the development of new knowledge (Probst et al., 2012, p. 31). The creativity of employees and the generation of ideas are important elements to further develop knowledge (Probst et al., 2012, p. 31). **Knowledge sharing** refers to activities making information and experiences available and usable across the organization (Probst et al., 2012, p. 32). According to Probst et al. (2012, p. 32), knowledge sharing is based on the critical questions of who should know what, to what level of detail, and how these processes can be facilitated. Knowledge management systems can increase the efficiency of knowledge sharing. However, success of knowledge management systems depends on the degree to which knowledge is shared throughout the organization (Göhring et al., 2010, p. 10). The more efficient knowledge sharing takes place, the more efficient are communication and collaboration activities (Lin, 2007b, p. 315). **Knowledge use** is a key feature of knowledge management, since knowledge must be used in order to achieve organizational goals (Probst et al., 2012, p. 32). Hence, knowledge management systems that offer just-in-time knowledge increases the level of utilization (Leonardi et al., 2013, p. 2). Moreover, the potential user of knowledge must be aware of the benefits, which can be achieved by adopting new knowledge (Probst et al., 2012, p. 32). **Knowledge preservation** describes the process of making knowledge accessible over time (Probst et al., 2012, p. 32). Therefore, it is a continual process (Probst et al., 2012, p. 32). In order to preserve valuable expertise, organizations must find new ways to ensure that relevant knowledge is stored (Probst et al., 2012, p. 32). Moreover, storage systems and documents must be kept up-to-date, because otherwise such systems will fail (Probst et al., 2012, p. 32). **Knowledge measurement** is important in order to judge the effectiveness of knowledge management activities (Probst et al., 2012, p. 33). An evaluation allows making a statement according to the quality of formulated knowledge goals (Probst et al., 2012, p. 33). Up to now, tested measurement instruments are not available for knowledge managers (Probst et al., 2012, p. 33). Therefore, the high costs of measuring knowledge are often regarded as socially unacceptable (Probst et al., 2012, p. 33).

In this thesis, the building block of Probst et al. (2012) is used as theoretical foundation, since it explicitly refers to knowledge sharing. Moreover, it has been proven to be a suitable model in theory and practice. Especially its practical relevance becomes important when designing the questionnaire for the quantitative analysis (see Section 4.1.2).

2.3.3. Knowledge work

Knowledge work is described as the production and transmission of knowledge (Machlup, 1962, p. 393). Hence, Machlup refers to knowledge work as the production and reproduction of information and knowledge (Machlup, 1962, p. 393). In this thesis, the understanding of Machlup (1962) is adopted since he supports the notion that knowledge can be transferred in form of information that must be absorbed by the receiver to become knowledge again. Knowledge workers include consultants, technicians, scientists, intellectuals, and managers (Schultze, 2000, p. 6). Therefore, knowledge workers can be regarded as a special class of white-collar workers (Schultze, 2000, p. 6). Moreover, this thesis focuses on knowledge practices, i.e., knowledge workers have to absorb knowledge in order to translate it into action, which is a cognitive and cerebral process (Schultze, 2000, p. 6). In addition, knowledge work has become more efficient due to the use of innovative knowledge management systems (Alavi and Leidner, 2001, p. 107). They have enabled knowledge workers to share their knowledge in a codified form (Alavi and Leidner, 2001, p. 115). Furthermore, the creativity of employees and the generation of ideas are important elements to develop personal (idiosyncratic) knowledge (Seiler and Reinmann, 2004, p. 11). Moreover, knowledge work requires a formal education that enables employees to acquire abstract, technical and theoretical knowledge (Frenkel et al., 1995, p. 775; Starbuck, 1992, p. 736).

To sum up, this thesis regards knowledge work as a form that

- produces and reproduces information and knowledge
- is cerebral
- is frequently scripted
- requires the use of creativity in order to produce idiosyncratic knowledge

- requires a formal education to acquire abstract, technical and theoretical knowledge

2.3.4. Knowledge forms

The quality and quantity of approaches that systematize knowledge forms have become nearly unmanageable (Roehl, 2000, p. 20). For instance, Romhardt (1998, p. 51-52) provides a list of 40 dichotomies of knowledge forms, whereas Seidel (2003, p. 37) has analyzed different papers on knowledge forms from which he deduces twelve knowledge types. Furthermore, Roehl (2000, p. 21) distinguishes between seven business and two sociological taxonomies, which he finally reduces to a single taxonomy.

Therefore, only the most frequently used differentiations are outlined in the following, which are tacit and explicit knowledge (see Section 2.3.4.1), individual and collective knowledge (see Section 2.3.4.2) as well as relevant knowledge forms in organizations (see Section 2.3.4.3).

2.3.4.1. Tacit and explicit knowledge

The approaches of Polanyi (1959), Nonaka and Takeuchi (1995), Ryle (1949) and Anderson (2001) are the oldest and most frequently used ones in the knowledge management literature (Blaich, 2004, p. 29). While Polanyi and Nonaka and Takeuchi distinguish between tacit and explicit knowledge, Ryle and Anderson use different dichotomies (Blaich, 2004, p. 29). Ryle differentiates between knowing how (practical knowledge) and knowing that (theoretical knowledge), while Anderson distinguishes between declarative and procedural knowledge (Blaich, 2004, p. 29). Subsequently, these approaches are outlined below by following the argumentation of Ahlert et al. (2006, p. 44-47).

Polanyi (1959, p. 12) argues that:

> What is usually described as knowledge, as set out in written words or maps, or mathematical formula, is only one kind of knowledge; while unformulated knowledge, such as we have of something we are in the act of doing, is another form of knowledge.

The definition of Polanyi reveals that knowledge can be divided into tacit and explicit knowledge. Based on the assumption “We know more than we can tell”, Polanyi (1985, p. 14) states that *tacit knowledge* is by its nature neither verbalizable nor formalizable. According to Polanyi (1975, p. 42), tacit knowledge can be understood as a treasure trove of experience or intuition of an individual, which indicates that actions are connected with an individual’s capabilities. Consequently, tacit knowledge is always bound to a subject, it is personal and outside of a formal expression, involves subjective insights and is deeply rooted in the activities and experiences of individuals (Kumbruck, 2003, p. 51). In contrast, *explicit knowledge* is easy to communicate and can be shared with other people; it can be stored, distributed and found in books and databases (Nonaka and Takeuchi, 2012, p. 76). Yet, tacit and explicit knowledge are not completely independent knowledge forms (Polanyi, 1985, p. 27), because tacit knowledge is based on explicit knowledge (Polanyi, 1975, p. 41).

Tsoukas (1996, p. 14) picks up Polanyi's idea and states that tacit knowledge is inextricably linked with explicit knowledge, because "[t]acit knowledge [. . .] is the necessary component of all knowledge". Tacit knowledge is often crucial for understanding explicit knowledge (Cohendet and Meyer-Kramer, 2001, p. 1564). Hence, tacit knowledge, e.g., of experienced experts, helps to interpret, accompany or facilitate explicit knowledge (Choo et al., 2000, p. 46; Haefliger and von Krogh, 2004, p. 125). Through an intensive preoccupation with explicit knowledge, an individual's tacit knowledge base is extended (Cohendet and Meyer-Kramer, 2001, p. 1564; Cowan, 2001, p. 1356). Consequently, knowledge can be equally regarded as input and output of a codification process, i.e., on the one hand, tacit knowledge is needed to initiate the codification process and, on the other hand, it is the result of the codification process (Cohendet and Meyer-Kramer, 2001, p. 1564; Cowan, 2001, p. 1356).

Leonard and Sensiper (1998, p. 113) also refer to Polanyi's (1959) differentiation between explicit and tacit knowledge (see Figure 2.7) and state that:

> Knowledge exists on a spectrum. At one extreme it is almost completely tacit, [...]. At the other end of the spectrum, knowledge is almost completely explicit [...]. Most knowledge, of course, exists in between the extremes.

In summary, Polanyi (1959) holds a constructivist view on knowledge and regards it as something bound to people, which consists of tacit and explicit components (Sveiby, 1996, p. 380; Burmann, 2002, p. 198). According to Polanyi (1975, p. 41), tacit knowledge cannot be objectified.

Polanyi's approach became especially popular through the publication of **Nonaka and Takeuchi (1995)**. As outlined in Section 2.3.2.1, they state that new knowledge is developed through a permanent conversion of explicit and tacit knowledge. They understand tacit knowledge as insights, perceptions and intuition, which are deeply ingrained in an individual's experiences, values and feelings (Ahlert et al., 2006, p. 46). Tacit knowledge consists of a technical and cognitive dimension (Ahlert et al., 2006, p. 46). The technical dimension describes practical skills, which cannot be easily verbalized (Ahlert et al., 2006, p. 46). The cognitive dimension reflects the mental models, views of reality and future expectations of a person (Ahlert et al., 2006, p. 46). A central factor concerning the development of new knowledge is the articulation of such mental models (Nonaka and Takeuchi, 2012, p. 76). According to Nonaka and Takeuchi (2012, p. 74), explicit knowledge can be expressed by words and numbers. Explicit knowledge can be easily shared through data, scientific formula, established procedures and universal principles (Nonaka and Takeuchi, 2012, p. 76). Consequently, knowledge is a dynamic human process, which involves personal

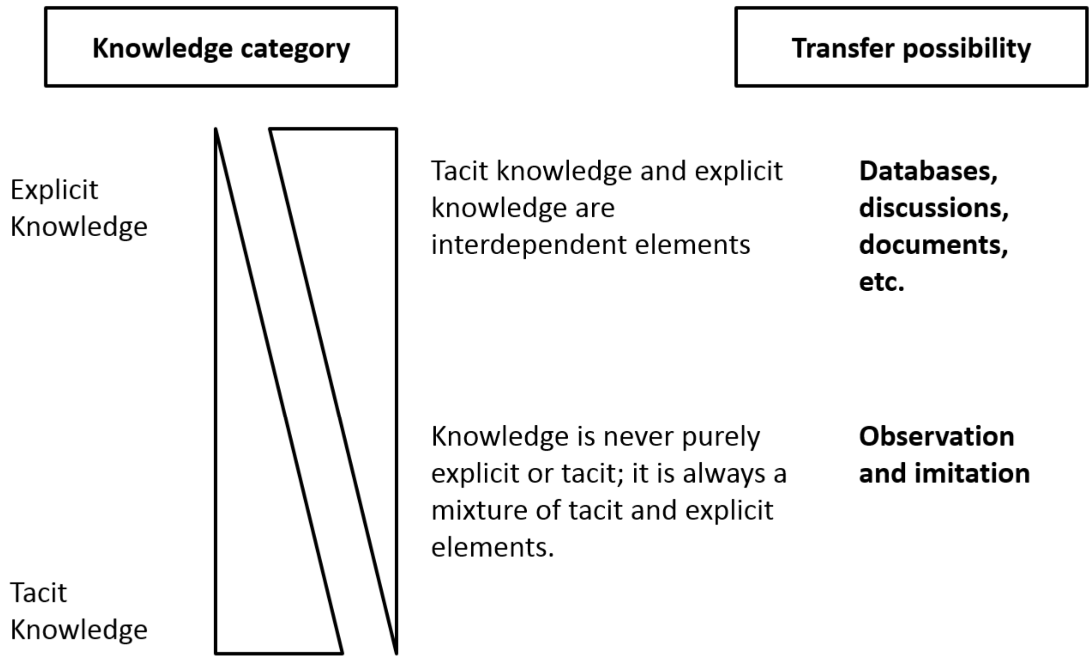

Figure 2.7. – Transferability of knowledge.
Source: Ahlert et al. (2006, p. 66).

beliefs of the truth and, therefore, is bound to people (Nonaka and Takeuchi, 2012, p. 74). In contrast to Polanyi (1959), they consider explicit and tacit knowledge not as complementary knowledge forms, but rather as separate ones (Ahlert et al., 2006, p. 47). Moreover, Nonaka and Takeuchi support another opposing viewpoint on tacit knowledge compared to Polanyi (Ahlert et al., 2006, p. 46). While Polanyi suggests a hierarchical structure of individuals perceptions and actions with explicit knowledge at the highest level and tacit knowledge (which is inexplicable) at the lowest level, Nonaka and Takeuchi argue that tacit knowledge is potentially explicable (Ahlert et al., 2006, p. 46).

However, the differentiation between tacit and explicit knowledge is anything but new (see Figure 2.8). **Ryle's (1949)** concept of *knowing how* is conceptually identical to tacit knowledge, whereas Ryle's (1949) *knowledge that* is conceptually equal to explicit knowledge (Ahlert et al., 2006, p. 44-45). Knowing how refers to practical knowledge, whereas knowing that refers to theoretical knowledge (Ahlert et al., 2006, p. 44).

Anderson (2001, p. 238) distinguishes between declarative and procedural knowledge, whereby declarative knowledge conforms to Ryle's theoretical knowledge, and procedural knowledge to Ryle's practical knowledge. *Declarative knowledge* corresponds to explicit knowledge, which is conscious and can be shared (e.g., facts), whereas *procedural knowledge* refers to how things can be done (e.g., specific work practices) (Anderson, 2001, p. 238; Sonntag and Schaper, 2007, p. 602). Procedural knowledge is often tacit and is based on problem solution processes, logical thinking and decision making (Anderson, 2001, p. 238). Compared to Ryle's approach, Anderson's approach is regarded as more sophisticated (Ahlert et al., 2006, p. 46).

This thesis argues that knowledge always consists of a combination of explicit and tacit components (Ahlert et al., 2006, p. 65), whereby parts of tacit knowledge components can be explicated (Burmann, 2002, p. 241). Nonetheless, the explication depends on individuals' competency to be conscious of knowledge and individuals' capability to verbalize it which refers to individuals' self-efficacy (Lin, 2007a, p. 138). Until recently, it has been argued that the transfer of explicit knowledge can be supported by information technology, whereas the transfer of tacit knowledge components is only to a limited extent possible through information technology (O'Dell and Grayson, 1999, p. 14). With regard to enterprise social software, which integrates several Web 2.0 functionalities, this limitation is still existent but softened, e.g. through a podcast in which a special procedure is explained with words and actions. Consequently, it is not reasonable to differentiate between tacit and explicit knowledge forms, when investigating employees' willingness to share knowledge through enterprise social software.

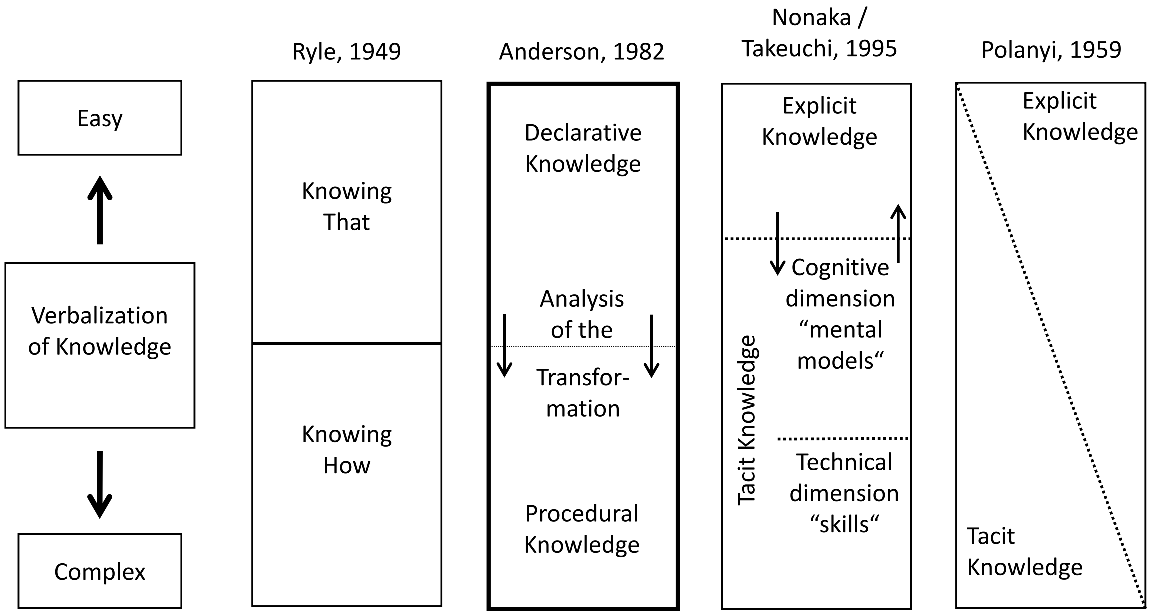

Figure 2.8. – Differentiation between tacit and explicit knowledge.
Source: Blaich (2004, p. 29).

2.3.4.2. Individual and collective knowledge

Individual knowledge is important as well as the connections and relationships between its holders (Ahlert et al., 2006, p. 47). This is especially the case in organizations, because no one is capable of knowing everything: no employee has neither the complete knowledge necessary to build a plane, nor the knowledge to offer a complex service (Ahlert et al., 2006, p. 49). However, since each employee contributes to a part of the organizations whole knowledge base (Ahlert et al., 2006, p. 49), making individual knowledge usable is a core competency of organizations (Burmann, 2002, p. 204). Accordingly, an organizational aim is to shift knowledge from the individual to the collective (Burmann, 2002, p. 204). Collective knowledge is conceptually equal to the organizational knowledge base, which enhances organizational problem solving capabilities (Ahlert et al., 2006, p. 47). Seiler and Reinmann (2004, p. 11) support a structural genetics approach. They differentiate between idiosyncratic knowledge and objectified knowledge (see Figure 2.9).

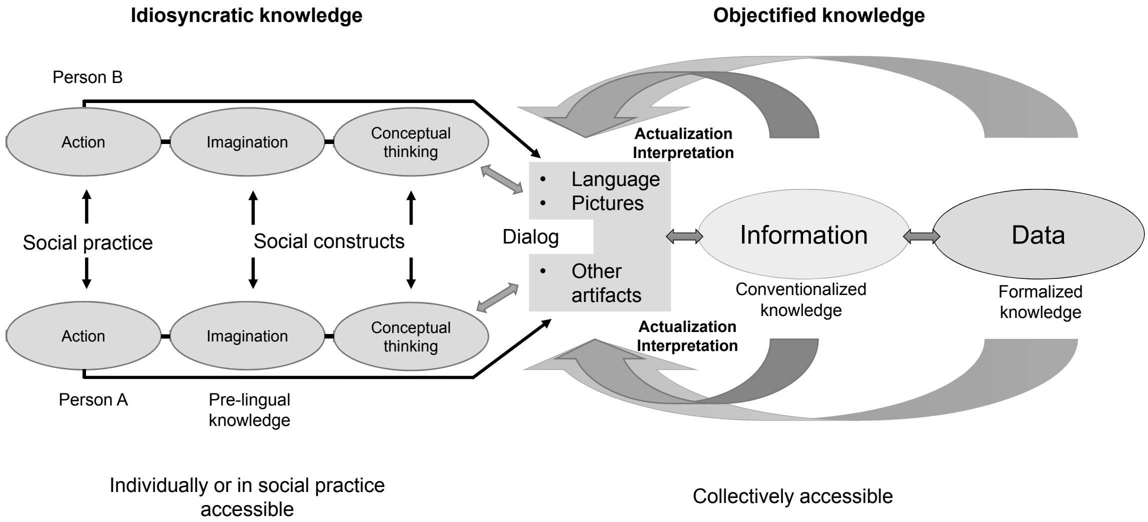

Figure 2.9. – Differentiation between personal and objectified knowledge.
Source: Seiler and Reinmann (2004, p. 11).

While idiosyncratic knowledge is individually accessible, objectified knowledge is collectively accessible (Seiler and Reinmann, 2004, p. 11). Moreover, **idiosyncratic knowledge** is conceptually equal to personal knowledge, which can be regarded as a tacit social construct that arises, transfers and maintains in the context of social interactions (Reinmann, 2005, p. 8). To this end, knowledge develops in the minds of employees. Seiler and Reinmann (2004, p. 10) further divide personal knowledge into action-oriented knowledge, intuitive knowledge and conceptual knowledge. Action-oriented knowledge is regarded as original knowledge (Seiler and Reinmann, 2004, p. 11). It consists of actions and perceptions, which control each other and is expressed by individuals, who show their knowledge through the way they act and solve problems (Seiler and Reinmann, 2004, p. 11). Intuitive knowledge is independent from actions and perceptions and can be activated through imagination (Seiler and Reinmann, 2004, p. 11). Furthermore, it cannot be articulated, since it is based on intuitive imaginations (Seiler and Reinmann, 2004, p. 11). Conceptual knowledge develops through different transformation processes of action based knowledge and intuitive knowledge (Seiler and Reinmann, 2004, p. 11). It can be reflectively reconstructed and thus articulated (Seiler and Reinmann, 2004, p. 11). Personal knowledge that has been verbalized or codified becomes objectified knowledge (Seiler and Reinmann, 2004, p. 11). Seiler and Reinmann (2004, p. 10) further divide **objectified knowledge** into collective and formalized knowledge. Collective knowledge is equal to information (Seiler and Reinmann, 2004, p. 10). Knowledge can only be transferred through the medium of information (Seiler and Reinmann, 2004, p. 10). Information in turn has to be absorbed by the receiver in order to become knowledge again (Seiler and Reinmann, 2004, p. 10). Formalized knowledge refers to information that has become data based on criteria and rules, which then can be further processed (Seiler and Reinmann, 2004, p. 10).

Knowledge management systems facilitate knowledge sharing. Thus, objectified knowledge can be passed on and is no longer bound to the knowledge provider. Hence, enterprise social software helps to change individual knowledge into organizational knowledge and therefore facilitates knowledge sharing.

2.3.4.3. Relevant knowledge forms in organizations

Baecker (1998, p. 8) distinguishes between five organizational knowledge forms, which are important from a practical perspective. These knowledge forms consist of product knowledge, social knowledge, leadership knowledge, expert knowledge and environmental knowledge (Baecker, 1998, p. 8), which are explained in the following:

- *Product knowledge* refers to knowledge about products, technologies and production processes in order to guarantee service provision.
- *Social knowledge* refers to the role of organizations in society and how they are embedded within society. From the perspective of social knowledge, individuals behave differently depending on whether they act in a business context or in a social context.
- *Leadership knowledge* involves knowledge about how an organization has to be managed. Leadership knowledge is seldom explicated directly in order to avoid compromising authority structures.
- *Expert knowledge* refers to experts' know-how, which is highly relevant for organizations. It must be explicated, so that employees can make use of it.

- *Environment knowledge* refers to knowledge about organization-specific codes of conduct and rules of the game.

This thesis does not distinguish between these knowledge forms, since all of them are crucial for achieving organizational goals.

2.3.5. Knowledge sharing

Several contradictions and discrepancies characterize the use of the term "knowledge sharing". To better understand the meaning of knowledge, the knowledge sharing process is described at first (see Section 2.3.5.1). Afterwards, different perspectives on knowledge sharing are discussed (see Section 2.3.5.2). In addition, knowledge sharing through enterprise social software represents a form of computer-mediated communication, which is outlined in Section 2.3.5.3.

2.3.5.1. The knowledge sharing process

From a scientific perspective, knowledge sharing is a process in which at least two parties are involved (Hendriks, 1999, p. 92). One that possesses knowledge (sender) and the other that acquires knowledge (receiver) (Hendriks, 1999, p. 92). Accordingly, the process of knowledge sharing involves two actions: transmission (sending or presenting knowledge to a potential recipient or medium) and absorption by that person or group (Davenport and Prusak, 1998, p. 101). Figure 2.10 illustrates a simplified model of knowledge sharing that has been developed by Hendriks (1999, p. 92). The process of knowledge sharing consists of two sub-processes: *externalization* and *internalization* (Hendriks, 1999, p. 92).

The knowledge sender externalizes knowledge by communicating it either immediately, personally and orally (directly, i.e., from person to person) or codifying it through writing (indirectly, e.g., via information storage systems) (Wang and Noe, 2010, p. 117; Hendriks, 1999, p. 92). Knowledge itself cannot be shared in a strict sense, since it is tied to a knowing subject (Hendriks, 1999, p. 92). Therefore, it is externalized through information (Hendriks, 1999, p. 92). The knowledge receiver internalizes information, which then becomes knowledge again by restructuring and making sense of it, e.g., through learning by doing or reading (Hendriks, 1999, p. 92; Maier, 2002, p. 61). Generally, an agreement between the externalized knowledge and internalized knowledge is desirable (Ahlert et al., 2006, p. 71). Ideally, knowledge sharing leads to the development of "better knowledge" based on the internalized knowledge and the receivers' experiences (Ahlert et al., 2006, p. 71). Through the combination of shared knowledge with the existing pre-knowledge and its usage, knowledge can be revised - only then can a continuous improvement of organizational knowledge be guaranteed (Ahlert et al., 2006, p. 71). Knowledge sharing requires that both the knowledge sender and receiver have cognitive skills and the cultural-motivational willingness to engage in the knowledge-sharing process, i.e., they have

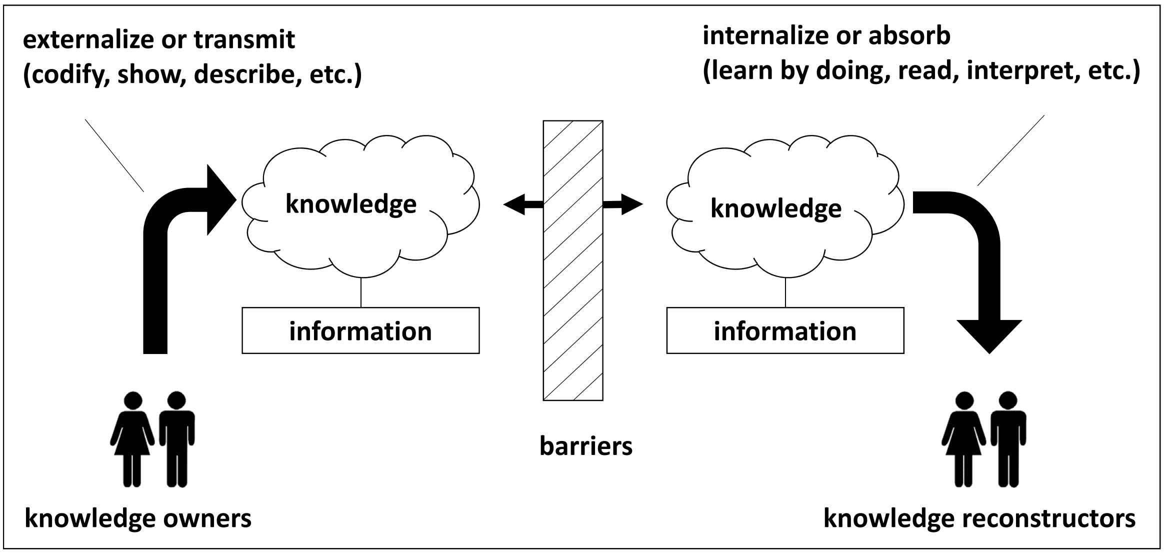

Figure 2.10. – A simplified model of knowledge sharing.
Source: Hendriks (1999, p. 93).

the ability (e.g., self-efficacy) and willingness to share knowledge (Kubisch, 2006, p. 339).

In this thesis, knowledge sharing that takes place through enterprise social software is explored. The knowledge sender externalizes knowledge by codifying it, whereas the knowledge receiver internalizes knowledge, which he or she has found through enterprise social software, in the form of information. The internalization of knowledge should help employees to make better decisions than before the division of knowledge. In contrast to personal communications, the sender, who externalizes his or her knowledge through enterprise social software, often does not know who finally makes use of his or her contributions (Abouzahra and Tan, 2014, p. 1770).

2.3.5.2. Different perspectives on knowledge sharing

First of all, the term knowledge sharing should be differentiated from the term knowledge transfer.[4] This is especially important, since some researchers use the terms interchangeably, making it difficult to clarify any differences between them (Jonsson, 2008, p. 39; Paulin and Suneson, 2012, p. 82). Whereas knowledge transfer refers to an unidirectional process, knowledge sharing is a two-way process (Connelly and Kelloway, 2003, p. 294). Moreover, the term knowledge transfer has been typically used to describe the movement of knowledge between different units, divisions, or

[4]Further synonyms used in research are the terms “knowledge distribution” (e.g., Probst et al., 2012, p. 32), “knowledge combination” (e.g., Thiel, 2002, p. 29) or “knowledge diffusion” (e.g., Bresman et al., 1999, p. 444), which are less frequently used and, therefore not discussed in this thesis.

organizations (e.g., Szulanski et al., 2004; Alavi and Leidner, 2001; Hansen, 1999), while the term knowledge sharing is more frequently used by authors of knowledge management research exploring interpersonal knowledge sharing (e.g., Su et al., 2010; Matzler et al., 2008; Lin, 2007a). Therefore, the term knowledge sharing instead of knowledge transfer is used in this thesis. In the following, a variety of definitions of the term knowledge sharing will be outlined and discussed.

1. Knowledge sharing is a process that involves exchanging knowledge between individuals and groups (Davenport and Prusak, 1998, p. 99).

2. Knowledge sharing is a concept that facilitates learning through sharing into usable ideas, products, and processes (Foy, 1999, p. 15).

3. In a strict sense, knowledge cannot be shared. Knowledge is not like a commodity that can be passed around freely, it is tied to a knowing subject. To learn something from someone else, i.e., to share his or her knowledge, an act of reconstruction is needed. It takes knowledge to acquire knowledge and, therefore, to share knowledge (Hendriks, 1999, p. 92).

4. Knowledge sharing is basically the act of making knowledge available to others within the organization. Knowledge sharing between individuals is the process by which knowledge held by an individual is converted into a form that can be understood, absorbed, and used by other individuals. The use of the term sharing implies that this process of presenting individual knowledge, in a form that can be used by others, involves some conscious action on the part of the individual who possesses the knowledge (Hickins, 2000, p. 101).

5. Knowledge sharing is a set of behaviors that involve the exchange of information or assistance to others. It is separate from information sharing, which typically involves management making information regarding the organization available to employees. Whereas knowledge sharing contains an element of reciprocity, information sharing can be unidirectional and unrequested (Connelly and Kelloway, 2003, p. 294).

6. Knowledge sharing implies that every knowledge sharing process consists of both bringing (or “donating”) and getting (or “collecting”) knowledge [...] (van den Hooff and de Ridder, 2004, p. 118).

7. The process of knowledge sharing involves members contributing (donating) knowledge and seeking (collecting) knowledge for reuse (Chen and Hung, 2010, p. 226).

Several contradictions and discrepancies characterize the above mentioned definitions. Davenport and Prusak (1998, p. 99) and van den Hooff and de Ridder (2004, p. 118) describe knowledge sharing as a voluntary act, i.e., individuals consciously participate in the knowledge sharing process even though there is no compulsion to do so. Foy (1999, p. 15) and van den Hooff and de Ridder (2004, p. 118) argue that individuals pursue a specific purpose by participating in the knowledge sharing process. Moreover, Foy (1999, p. 15) states that "learning" is an artifact from the knowledge sharing process. Hendriks (1999, p. 92) and Hickins (2000, p. 101) clearly point out that knowledge per se cannot be shared. Thereby, they distinguish between information and knowledge. Moreover, Hickins (2000, p. 101) argues that knowledge sharing is more than just motivating people to share their knowledge. He states that knowledge sharing is about capturing knowledge, which is in the individuals' heads (Hickins, 2000, p. 101). According to Hickins (2000, p. 101), only 2% of information is written down. Hence, the challenge is to transform such knowledge into a shareable form. Connelly and Kelloway (2003, p. 294) differentiate between knowledge sharing and information sharing. They argue that information sharing occurs in one direction, i.e., from the owner to the recipient, whereas knowledge sharing is a two-way and mutual process based on reciprocity (Connelly and Kelloway, 2003, p. 294). Another discussion refers to the different elements of the knowledge sharing process, e.g., by distinguishing between contributing knowledge (e.g., writing an article) (e.g., Chen and Hung, 2010), donating knowledge (e.g., sharing knowledge when asked to do so) (e.g., van den Hooff and de Ridder, 2004), utilizing knowledge (e.g., utilizing knowledge in order to solve problems at work) (e.g., Kügler and Smolnik, 2014), collecting knowledge (e.g., asking questions) (e.g., van den Hooff and de Ridder, 2004) and seeking knowledge (e.g., reading an article) (e.g., Chen and Hung, 2010). Other researchers differentiate between active (e.g., contributing and donating knowledge) and passive participation (e.g., seeking knowledge) (e.g., Matschke et al., 2014, p. 552). While some researchers argue that the process of knowledge sharing involves both aspects of contributing and using knowledge (e.g., Chen and Hung, 2010), other researchers focus on one aspect at a time (e.g., Chiu et al., 2006; Kankanhalli et al., 2005a).

In order to reap the benefits of enterprise social software, it is essential that knowledge contributors are willing to share their knowledge and knowledge seekers are willing to use other people's knowledge (Kankanhalli, 2002, p. 29; Leonardi et al., 2013, p. 2).[5] In addition, this thesis uses the term knowledge instead of information since, from an economic perspective, only knowledge that brings value to the business processes of an organization and leads to competitive advantages, when it is used, is regarded as an asset (Teece, 1998, p. 63; Craig, 1993, p. 40).

[5]Knowledge management researchers argue that the factors influencing knowledge sharing and knowledge use are different, however are coexisting behaviors; "although they have unique motivational features, contribution and seeking are a pair of closely interrelated and inseparable behaviors – for the presumed benefits of [knowledge management systems] to occur, both must happen" (He and Wei, 2009, p. 828).

2.3.5.3. Computer-mediated knowledge sharing

This thesis analyzes knowledge sharing through enterprise social software which is a form of computer-mediated communication (McAfee, 2009, p. 69). Several definitions of the term computer-mediated communication are available. The definition of December (1995, p. 1) is adopted in this thesis, because it highlights the complexity of communication processes:

> Computer-mediated communication is a process of human communication via computers, involving people, situated in particular contexts, engaging in processes to shape media for a variety of purposes.

In addition, computer-mediated communication encompasses several theories. Döring (2003) differentiates between eleven theories of computer mediated communication, which are further divided into three groups: theories of media choice, theories of media characteristics and theories of medial communication behavior. These theories can be further splitted into several models, which are not outlined in greater detail, since their contents are of minor relevance with regard to the research aim and questions of this thesis.

Moreover, computer-mediated knowledge sharing can be divided into direct and indirect communication (Koch and Richter, 2009, p. 12). Direct communication is characterized by a sender and a receiver who directly exchange messages with each other (e.g., through a mailing list) (Koch and Richter, 2009, p. 248). Indirect communication refers to information artifacts, such as messages, which are stored in data bases (e.g., in a blog) (Koch and Richter, 2009, p. 247).

In addition, computer-mediated knowledge sharing can be characterized by the number of communication partners and the speed of delivery (Beck, 2010, p. 19), which are outlined in the following. Computer-mediated knowledge sharing can take place either through individual or group communication (Beck, 2010, p. 20). Individual communication is a one-to-one communication, i.e., a conversation takes place between two individuals (Beck, 2010, p. 20). The best known channel for individual communication is via e-mail, which has nowadays become a standard system in business (Beck, 2010, p. 22). E-mails have some advantages over traditional forms (e.g., letters) since they are faster and cheaper (Beck, 2010, p. 19). But despite these advantages, the multitude of e-mails has led to an information overload (Atos SE, 2015). In order to make the internal communication more effective, some companies have already substituted internal e-mails through the use of enterprise social software (Atos SE, 2015). Atos SE, an international technology services company, for example, pursues such a zero e-mail strategy (Atos SE, 2015). Finally, a group conversation is characterized by a many-to-many conversation, for instance by posting information on a bulletin board system (Beck, 2010, p. 20).

Computer-mediated knowledge sharing can also be divided into synchronous and asynchronous communication (Akkinen, 2005, p. 15). E-mail is an example of asynchronous communication, i.e., information is not transferred immediately (Akkinen, 2005, p. 15). In contrast, synchronous communication (e.g., instant messaging) refers to a text that can be immediately transferred, which enables the receiver to react directly (Beck, 2010, p. 26).

In comparison to traditional computer-mediated knowledge sharing, messages, which are sent through enterprise social software to an intended audience, allows that many others, for whom the communication was not intended, to learn that two people are communication partners, besides learning about the content that they communicated about (Leonardi et al., 2013, p. 7). Enterprise social software not only makes the message public, but also indicates who the sender and recipients are (Leonardi et al., 2013, p. 7). Zhao and Rosson (2009, p. 5) find that the broadcast nature of microblogs and other enterprise social software tools serves as a "people-based RSS feed" that might help "keep a pulse on what is going on in others' minds". Similarly at Hewlett-Packard Development Company, L.P., a tool that aggregated enterprise social software content from throughout the company is viewed by employees as "a way to orient themselves in the organization" with respect to what and who others know (Brzozowski, 2009, p. 7) (see Section 2.4.3.2 for the differences between knowledge sharing through traditional knowledge management systems and enterprise social software).

2.3.6. Synthesis

In this chapter different viewpoints on knowledge and various knowledge management models have been discussed. The discussion of knowledge as an object and knowledge as a process shows that the latter approach is suitable for this thesis, since it allows for investigating knowledge sharing and the social anchoring of individuals' behavior in an organizational context. Moreover, the building block model serves as a theoretical basis, since it clearly highlights the importance of knowledge sharing and has been widely used in knowledge management literature (e.g., Adelsberger et al., 2002, p. 531; Braun et al., 2009, p. 5; Bullinger et al., 1997, p. 11). The debate on explicit and tacit knowledge provides two different perspectives regarding knowledge. However, they do not stand for two different things. They are inseparably linked with each other through knowledge and can be regarded as two sides of a coin (Schilcher, 2006, p. 136). Therefore, explicit and tacit knowledge are not regarded and managed separately in this thesis (Schilcher, 2006, p. 135; Gronau, 2009, p. 6). According to Rehäuser and Krcmar (1996, p. 4) (signs, data, information, knowledge approach) and Seiler and Reinmann (2004, p. 11) (differentiation between idiosyncratic knowledge and objectified knowledge), knowledge is regarded as information that is purposeful, embedded in individual experiences and has to be absorbed to become knowledge. To this end, only information can be shared through databases (Rehäuser and Krcmar, 1996, p. 12). This view can be applied to knowledge sharing through enterprise social software, which represents a form of computer-mediated communication (McAfee, 2009, p. 69).

The knowledge sender shares knowledge through enterprise social software that was once relevant to him or her. Due to the codification process, knowledge is objectified (Seiler and Reinmann, 2004, p. 11). Objectified knowledge can be set equal to information (Reinmann, 2005, p. 13). Accordingly, information is the medium to transfer knowledge from one individual to another (Reinmann, 2005, p. 13). Consequently, all contributions made in enterprise social software are information, which is independent of the people who created it. Information that is relevant to a knowledge receiver becomes knowledge again (Reinmann, 2005, p. 13). Therefore, all contributions made in enterprise social software are information, however not every piece of information becomes knowledge. This thesis focuses on knowledge that is relevant to both the knowledge sender and knowledge receiver (Bettoni et al., 2004, p. 321; North et al., 2004, p. 41).

To sum up, this thesis uses the term knowledge instead of information, since, from an economic perspective, only knowledge brings value to the business processes of an organization and leads to competitive advantages, when it is used, and is thus regarded as an asset (Teece, 1998, p. 63; Craig, 1993, p. 40). Knowledge sharing through enterprise social software is based on the following theories...:

- Knowledge as process (constructivist perspective)
- The data, signs, information and knowledge approach
- The building block model

...and assumptions:

- Knowledge is personal since knowledge contributions are made by people
- Knowledge is contextual
- Explicit and tacit knowledge are inseparably linked with each other through knowledge
- Knowledge is regarded as an information that is purposeful, embedded in individual experiences and has to be absorbed to become knowledge
- Information (objectified knowledge) can be shared through enterprise social software
- Knowledge is economically relevant when it is used to pursue organizational goals

2.4. Web 2.0 and Enterprise 2.0

In this section, the emergence of enterprise social software is discussed.

In Section 2.4.1, the phenomenon of Web 2.0 is described at first, before social software, including applications assigned to Web 2.0, is defined in Section 2.4.2. Enterprise social software refers to the use of Web 2.0 applications in an organizational context and is described in Section 2.4.3. Finally, the main findings are summarized in Section 2.4.4.

2.4.1. Web 2.0

Web 2.0 can be regarded as an integration platform for web services for which Web 1.0 paved the way by providing the necessary technology (Knorr, 2003, p. 90). The term Web 2.0 received first international recognition after O'Reilly (2005) published his article "What is Web 2.0" in 2005, in which he developed seven paradigms that characterize Web 2.0 and its applications (O'Reilly, 2005). O'Reilly (2005) defines Web 2.0 as:

> [...] the business revolution in the computer industry caused by the move to the internet as platform, and an attempt to understand the rules for success on that new platform. Chief among those rules is this: Build applications that harness network effects to get better the more people use them.

Compared to Knorr (2003, p. 90), who regards Web 2.0 solely as an integration platform, O'Reilly (2005) has extended this rather technical viewpoint by the paradigm of "harnessing collective intelligence" (O'Reilly, 2006). Thus, O'Reilly (2005) considers both the internet users and their generated content, i.e., users do not only consume but also produce content, which is an essential aspect of Web 2.0. O'Reilly (2005) formulates seven paradigms, which characterize Web 2.0 and its applications:

- The web as a platform: The internet is seen as an open platform characterized by protocols and open standards that integrate web services.
- Harnessing collective intelligence: The collective intelligence can be used, which is a result of user-generated content that is available through Web 2.0 applications, such as wikis and blogs.
- Data are the "next intel inside": Data are the real capital of Web 2.0. In times in which software and interfaces are increasingly based on open access, organizations can gain competitive advantages through the effective use of their data.

- End of the software release cycle: Software is not seen as a product any more, rather as a service. Software is constantly evolving so that a classic life cycle is practically non-existent.
- Lightweight programming models: Easy and loosely-linked interfaces via web services allow a fast data dissemination and an easy possibility to further develop existing services.
- Software above the level of a single device: Services are used even across system boundaries, e.g., on the computer or the mobile phone.
- Rich user experience: Modern techniques allow the development of web applications which resemble desktop applications. Therefore, web applications are mostly perceived as easy-to-use.

These paradigms indicate that Web 2.0 is a phenomenon that includes technological, socio-cultural and economic influences (Blinn et al., 2011, p. 29).

2.4.2. Social software

Social software includes developments and applications that are assigned to Web 2.0 (Szugat et al., 2006, p. 17). However, it is not a synonym for Web 2.0, but rather a subset of it (Blinn et al., 2011, p. 33). Moreover, social software is an umbrella term for a wide variety of applications which facilitate human communication, interaction and collaboration in networks (Blinn et al., 2011, p. 33). Applications, such as blogs, wikis and social networks, have in common that they make relationships, persons and knowledge visible (Burg and Pircher, 2006, p. 26). Furthermore, social software is characterized through an easy and spontaneous participation (Blinn et al., 2011, p. 34). Coates (2005, p. 1) describes social software as "software that supports, extends, or derives added value from human social behavior". Hence, social software applications contribute to building virtual communities, maintaining social contacts and disseminating knowledge (Blinn et al., 2011, p. 33). This mainly happens without fixed rules, but rather with the help of self-organization, meaning that users themselves decide how they perform their tasks and that only a limited number of conventions regulate the use of social software (Blinn et al., 2011, p. 33-34).

Several classifications of social software exist: according to Schmidt and Mayer (2006, p. 37), social software has an influence on information management, identity management and connection management. Their classification is based on the approach by Teufel et al. (1995, p. 11), who formerly classified groupware solutions into interaction types. Koch (2008, p. 422) has used and extended Schmidt and Mayer's (2006) approach by distinguishing between information management, communication and identity and network management (see Figure 2.11). Accordingly, connection management has been renamed as communication, while identity management has been

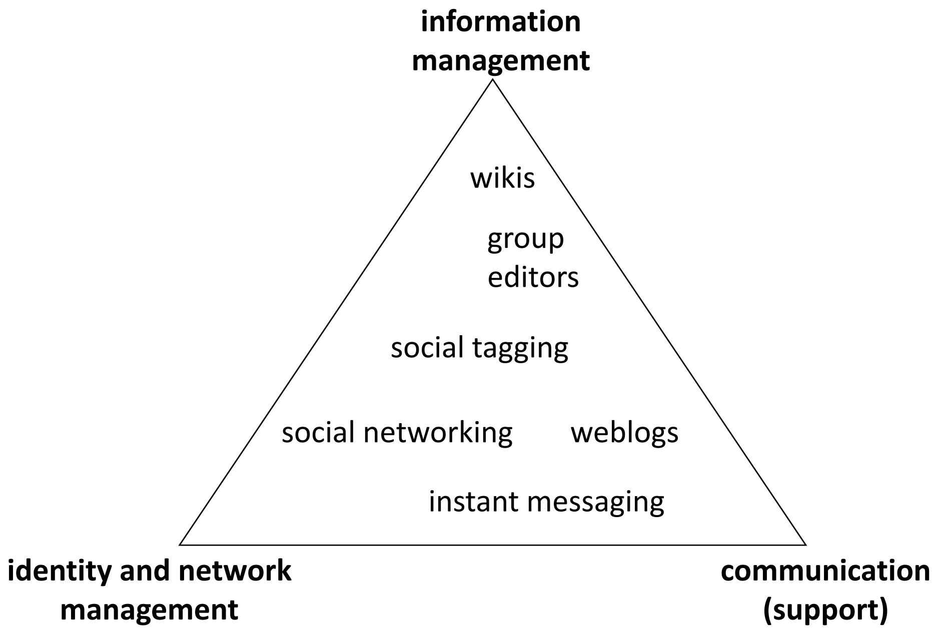

Figure 2.11. – Social software triangle.
Source: Koch (2008, p. 422).

renamed as identity and network management (Koch, 2008, p. 422). Koch (2008, p. 422) describes information management as applications, which allow the provision, exchange and tagging of existing information. Communication refers to software applications, which support organizational communication (Koch, 2008, p. 422). Finally, identity and network management refer to social networking applications, which allow for building and maintaining relationships (Koch, 2008, p. 422).

Hence, in Section 2.4.2.1, the applications of the social software triangle are explained. Moreover, other often discussed Web 2.0 applications, to which the social software triangle does not refer, are outlined in Section 2.4.2.2.

2.4.2.1. Applications of the social software triangle

Based on the theoretical framework of the social software triangle by Koch (2008, p. 422), selected applications (wiki, group editors, social tagging, weblog, social networks and instant messaging) are presented in the following.

In 1995, Ward Cunningham developed the first **wiki**, which he called the WikiWikiWeb (Leuf and Cunningham, 2008, p. 15). The term wiki is derived from the Hawaiian and means “fast” (Blinn et al., 2011, p. 38) and refers to an open and easy-to-use web-based software systems (Ebersbach and Glaser, 2005, p. 131). The contents published on wikis can be edited by a large number of users (Ebersbach and Glaser, 2005, p. 131). Each user is able to write, edit, supplement or delete articles (Blinn et al., 2011, p. 38). Moreover, contents are gathered in an effective way, thus making collective knowledge accessible (Blinn et al., 2011, p. 38). To sum up, wikis are characterized through three essential functions (Ebersbach and Glaser, 2005, p. 131):

- Editing mode: An edit button can be found on each page that leads the user to the editing mode.
- Internal linking: A reference to another page of the wiki can be posted on each page.
- Storing of previous versions: A history documents all changes which have been made to the wiki. Accordingly, it is possible to go back to a previous version, e.g., in order to correct a mistake.

The wiki received international recognition with the launch of Wikipedia in 2001 (Yang and Lai, 2011, p. 131; Cho et al., 2010, p. 1198). Nowadays, Wikipedia is worldwide the most known wiki (Yang and Lai, 2011, p. 131; Cho et al., 2010, p. 1198). In 2015, the number of articles posted into the English Wikipedia exceeded the threshold of 4.7 million (Wikipedia, 2015).

Group editors aim at enabling synchronous collaboration (Koch and Richter, 2009, p. 42), so that users can jointly edit documents (Ellis et al., 1991, p. 42). Group editors transparently manage the locking and synchronization of data (Koch and Richter, 2009, p. 42). Some group editors inform users about the actions of other users (Koch and Richter, 2009, p. 42). Recently, Google docs has been developed that allows for collaboratively working on documents in real-time, which can be downloaded at no charge (Gibbs et al., 2013, p. 107). Wikis are another example of group editors (Klein and Schumann, 2011, p. 7).

The indexation of contents by users refers to the term **social tagging** (Blinn et al., 2011, p. 39). A collection of social tags is known as folksonomy, which is derived from the terms of folks and taxonomy (Alby, 2008, p. 127). There are no clear rules that regulate the tagging of contents (Blinn et al., 2011, p. 39). An advantage of social tagging is the possibility to label contents with different tags, so that content can be easily found (Blinn et al., 2011, p. 39). In addition, social tagging makes users aware of different contents (Richter and Koch, 2007, p. 23). A disadvantage of social tagging is that numerous classification versions can complicate the retrievability (Richter and Koch, 2007, p. 24).

The term **weblog** is derived from the terms website and logbook and can be regarded as a public online diary (Alby, 2008, p. 21; Wolff, 2007, p. 5), though the use of the abbreviated version blog is more common (Blinn et al., 2011, p. 37). From a technological perspective, blogs consist of texts and hyperlinks similar to websites (Blinn et al., 2011, p. 38). Therefore, texts are often supplemented by pictures, linkings to websites, other blogs or sources (Blinn et al., 2011, p. 37). The authors of blogs are called bloggers, who primarily publish their subjective opinions to specific topics (Blinn et al., 2011, p. 37). Moreover, bloggers can comment on chronologically appearing posts (Blinn et al., 2011, p. 37). Accordingly, a blog can serve as a discussion platform (Blinn et al., 2011, p. 38).

Social networks can be regarded as social structures, which develop through human interaction (Richter and Koch, 2007, p. 27). People have the possibility to present their own profile on such networks, in addition to connecting with others and maintaining their existing contacts, specifically in social networks (Blinn et al., 2011, p. 41). Moreover, social networks offer the possibility to form groups (Richter and Koch, 2007, p. 28). Nowadays, Facebook is worldwide the most popular social network with over 1.35 billion monthly active users worldwide in the third quarter of the year 2014 (Facebook, 2015).

Instant messaging is a medium that enables users to send and receive short, text-based messages and to communicate without delays (Froehle, 2006, p. 6). It is a chat that is characterized by an ad-hoc communication, which is often timely limited (Blinn et al., 2011, p. 40). Moreover, the communication via chats can be archived (Blinn et al., 2011, p. 40). As pointed out in Section 2.3.5.3, instant messaging is a form of synchronous communication. Instant messaging has some advantages because it allows for quickly clarifying questions, coordinating social meetings, scheduling work tasks and keeping in touch with other people (Isaacs et al., 2002, p. 11). However, the low language variety is a disadvantage of instant messaging, since it only supports words and typing language (Koo et al., 2011, p. 447).

2.4.2.2. Other forms of social software

The social software triangle does not refer to microblogs, social bookmarking, podcasts, really simple syndication, mashups or forums. Since these are often discussed Web 2.0 applications in knowledge management, they are outlined in the following.

Microblogging means that users are only allowed to write a certain amount of text into a blog (Böhringer and Gluchowski, 2009, p. 507). These tweets are published in real time and shown to those users, who follow a specific writer (Fischer and Reuber, 2011, p. 3). An example of a microblog is Twitter, which allows users to write tweets with a maximum of 140 signs (Kietzmann and Silvestre, 2012, p. 109). Twitter had 284 million monthly active users in January 2015 (Twitter, 2015).

Social bookmarking is a special form of social tagging, which is limited to the annotation of hyperlinks (Blinn et al., 2011, p. 40). Bookmarkings can be tagged, evaluated and commented (Ajjan and Hartshorne, 2008, p. 72). Additional information that is available through social tagging is used in order to optimize search results and to recommend thematically related contents (Blinn et al., 2011, p. 40). Consequently, search services scan not only websites, but also user-generated contents (Blinn et al., 2011, p. 40). Therefore, when searching for information, social bookmarking services are a supplement to classic search engines (Gräfe et al., 2007, p. 11).

Moreover, different online services offer their members the possibility to manage and archive their bookmarkings (Blinn et al., 2011, p. 40).

Podcasts are audio and video files, which can be downloaded on computers or mobile phones in order to be listened to, or watched (Blinn et al., 2011, p. 40). The term is derived from the iPod, a MP3 player created by Apple, and the term broadcast (Alby, 2008, p. 73). People can subscribe to a podcast through audio programs, such as iTunes.

Really simple syndication (RSS) allows users to easily oversee which changes have been done on a website (Blinn et al., 2011, p. 41). The provision of files in an RSS format is called RSS feed (Hammersley, 2003, p. 42) which can be individually designed by the creator and which can contain headings and linkings to contributions on other websites (Blinn et al., 2011, p. 41). The format is readable via RSS readers (Blinn et al., 2011, p. 41). When a user subscribes to a RSS feed, he or she is automatically informed about updates and news (Blinn et al., 2011, p. 41). Therefore, RSS feeds are a means to promptly inform users about news (Blinn et al., 2011, p. 41).

Mashups are applications that combine data from different sources (Ebersbach and Glaser, 2008, p. 137). Therefore, open **a**pplication **p**rogramming **i**nterfaces (API) are used in order to integrate different sources to websites (Ebersbach and Glaser, 2008, p. 137). Through the open API of Google maps, website providers are able to integrate a Google map to their websites (Koch and Richter, 2009, p. 11). The open API of Flickr, an image hosting and video hosting website, is also often used in order to integrate pictures to websites (Koch and Richter, 2009, p. 11). Consequently, the value of websites can be increased through mashups (Richter and Koch, 2007, p. 34).

Forums are an example of an asynchronous communication between several participants (Blinn et al., 2011, p. 40). In a forum, contributions are sorted by thematic threads (Büttgen et al., 2009, p. 201). Forums are used to give geographically distributed user groups access to expert knowledge and to allow them to exchange their experiences (Blinn et al., 2011, p. 41).

2.4.3. Enterprise 2.0

Enterprise social software refers to the use of Web 2.0 applications in an organizational context (Leonardi et al., 2013, p. 5; Koch and Richter, 2009, p. 15). Therefore, an organization that has introduced enterprise social software is called Enterprise 2.0 (AIIM, 2009, p. 4; Göhring et al., 2010, p. 9; Denyer et al., 2011, p. 375). To this end, Enterprise 2.0 aims at exploiting the opportunities and potentials of Web 2.0 in order to support a more efficient working practice and improve business relationships (Blinn et al., 2011, p. 43). According to McAfee (2009, p. 1), the participation of users leads to networking effects that can improve collaboration, communication and knowledge management in organizations. McAfee (2009, p. 1) defines Enterprise 2.0 as "the use of emergent social software platforms within companies, or between companies and their partners or customers". This definition involves the use of social software in the intra- and inter-organizational context. In addition, McAfee (2006, p. 70) characterizes Enterprise 2.0 through the acronym SLATES (search, links, authoring, tags, extensions, signals), which is described in the following:

- Search: Search functions facilitate the finding of information in the intranet.
- Links: A link serves as an indicator for important information. Users can publish and link contents.
- Authoring: Users publish contents, e.g., through wikis or blogs.
- Tags: Users tag contents and, therefore, categorize and structure information.
- Extensions: Recommendations and proposals of related articles and contributions are given.
- Signals: Users are automatically informed about new contents through syndication processes.

In the following, enterprise social software is defined (see Section 2.4.3.1). Afterwards, enterprise social software is compared with traditional knowledge management systems (see Section 2.4.3.2). Finally, it is explained how enterprise social software has advanced into the organizational context (see Section 2.4.3.3).

2.4.3.1. A definition of enterprise social software

Organizations use social software in two primary ways (Leonardi et al., 2013, p. 2). First, organizations make use of social software in order to communicate with external partners, such as customers, vendors and the public at large (Leonardi et al., 2013, p. 2). Organizations often apply a multipronged strategy in order to get in contact with their external partners (Piskorski, 2011, p. 120). Therefore, they use various public social software platforms, such as Facebook, MySpace and Twitter (Leonardi et al., 2013, p. 2). Second, organizations implement enterprise social software for their internal communication (Leonardi et al., 2013, p. 2), which represents a research stream that has been less commonly studied so far (Leonardi et al., 2013, p. 2). Organizations often use an integrated enterprise social software platform in order to facilitate their employees' internal communication and collaboration (Koplowitz, 2011, p. 10). Enterprise social software integrates several Web 2.0 applications, which often resemble public social software, such as Facebook and Wikipedia, within one single platform (Richter et al., 2011, p. 3; Drakos et al., 2013, p. 13). Examples for such software platforms are IBM Connections, the Jive platform, Microsoft's SharePoint 2010 Communities and Atos blueKiwi (an overview of social software platforms can be found in Drakos et al., 2013) (Leonardi et al., 2013, p. 2). **In the context of this thesis, it**

consequently makes less sense to distinguish between individual tools and rather more sense to investigate these tools as part of an integrated enterprise social software platform (Leonardi et al., 2013, p. 2; Kügler and Smolnik, 2014, p. 3). Therefore, this study focuses on intra-organizational social software acceptance and use, whereas public social software acceptance (e.g., Facebook, Twitter, etc.) lies beyond the scope of this research. Although McAfee's definition of Enterprise 2.0 involves the inter-and intra-organizational use of social software, it does not provide a suitable definition for this thesis. Instead, since Leonardi et al's (2013, p. 2) definition focuses on the intra-organizational use of social software, it offers a more suitable definition for this thesis and is therefore used as a theoretical foundation. Leonardi et al. (2013, p. 2) define enterprise social software as:

> Web-based platforms that allow workers to (1) communicate messages with specific coworkers or broadcast messages to everyone in the organization; (2) explicitly indicate or tacitly reveal particular coworkers as communication partners; (3) post, edit, and sort text and files linked to themselves or others; and (4) view the messages, connections, text, and files communicated, posted, edited and sorted by anyone else in the organization at any time of their choosing.

The activities (1), (2) and (3) are not unique features of enterprise social software and are also provided by many contemporary knowledge management systems in organizations (Leonardi et al., 2013, p. 2). For example, communication can take place via e-mail (Leonardi et al., 2013, p. 2). Moreover, message boards on the intranet allow employees to spread information to a broad and unknown audience (Leonardi et al., 2013, p. 2). In addition, coworkers can be identified through team member lists (Leonardi et al., 2013, p. 2). Many knowledge management systems also allow employees to upload files, images and videos (Leonardi et al., 2013, p. 2). **Hence, the unique characteristic of enterprise social software is its ability to allow employees to do these three activities within one single platform** (Leonardi et al., 2013, p. 2). Employees' activities are recorded, stored, and available for all employees (Leonardi et al., 2013, p. 2). Thus, activity (4) enables employees to find information at anytime and from any place in the future (Leonardi et al., 2013, p. 2).

2.4.3.2. Enterprise social software vs. traditional knowledge management systems

Knowledge management systems can be regarded as the tools and systems that facilitate knowledge sharing in organizations (Davenport and Prusak, 1998, p. 13). In former times, organizations mainly used intranets and file storage, which resulted in redundancy and a lack of transparency, because the huge number of systems and applications were not cross-linked (Riege, 2005, p. 30). Therefore, traditional knowledge management systems have become less important, while new knowledge management systems, such as enterprise social software, are currently growing in significance

(Leonardi et al., 2013, p. 2). Enterprise social software increases the transparency in organizations, because users are able to see conversations between other employees, while being able to distinguish whether these employees maintain a social or work-related connection to each other (Leonardi et al., 2013, p. 1). Therefore, enterprise social software is not only an additional channel, through which communication travels, but also a platform upon which social interactions take place (Leonardi et al., 2013, p. 2). In contrast to face-to-face interactions that take place in offices, conference rooms and hallways, enterprise social software allows each employee to participate in conversations irrespectively of time and space (Leonardi et al., 2013, p. 2). Enterprise social software offers four substantial benefits that distinguishes it from traditional knowledge management systems: visibility, persistence, editability and associations (see Table 2.6) (Leonardi et al., 2013, p. 2), which are outlined in the following.

First, communicative actions are not only visible to employees, but also stay visible over time (Leonardi et al., 2013, p. 2). The range of people, networks and texts are expanded from which employees can learn across the organization due to the **persistence** of communication activities (Leonardi et al., 2013, p. 2). According to

Benefits	Meaning
Visibility	Enterprise social software allow users to make their behaviors, knowledge, preferences, and communication network connections that were once invisible (or at least very hard to see) visible to others in the organization. Work behavior, meta-knowledge and organizational activity streams are three types of actions that are made visible through the use of enterprise social software in organizations.
Persistence	Communication remains accessible in the same form as the original display after the actor logs out from the system. The information provided by the actor remains available to other users and does not expire or disappear. Three ways in which the advantage of persistence affects organizations are sustaining knowledge over time, creating robust forms of communication and growing content.
Editability	Individuals can take their own time to carefully craft and edit a communicative act before it is made publicly available. The advantage lies in shaping organizational behavior through regulating personal expressions, targeting content and improving information quality.
Associations	Associations denote recognized and established connections. Associations in enterprise social software come in two forms; a person to another individual or an individual to a piece of information. When enterprise social software afford association with other individuals or content, it supports social connections, gives access to relevant information, and enables emergent connections.

Table 2.6. – The benefits of enterprise social software.
Source: Based on Treem and Leonardi (2012, p. 143) and Stenmark and Zaffar (2014, p. 1).

Leonardi et al. (2013, p. 2), the increased opportunities for social learning are the most important benefits of enterprise social software. **Visibility** refers to communicative activities in which employees engage (Leonardi et al., 2013, p. 2). These were once nearly invisible to other employees, such as the content of messages, employees' communication networks and the outputs created by each employee (Leonardi et al., 2013, p. 2). Consequently, enterprise social software facilitates seeing what was said and who said it, even if the user has not participated in that specific conversation (Leonardi et al., 2013, p. 2). Moreover, many employees do not seek knowledge from their colleagues because they simply are not aware that certain knowledge exists in the organization (Fulk and Yuan, 2013, p. 23). The exposure of communication through enterprise social software solves this problem. **Editability** represents a further benefit of enterprise social software, which allows employees to post, revise and change published contents collaboratively (e.g., wikis) (Vaast and Kaganer, 2013, p. 80). Finally, enterprise social software can create and sustain relationships between employees (e.g., social networks) (Treem and Leonardi, 2012, p. 162). Such **associations** can either bring people together or bring people and information together, for instance, when an employee makes a contribution, a link between the author and the content is created and made available (Vaast and Kaganer, 2013, p. 80).

Industry analysts assume that enterprise social software will further gain economic relevance (Leonardi et al., 2013, p. 2). This development is said to lead to a dramatic change in the way employees communicate with each other, which in turn will tremendously change communication in organizations (Leonardi et al., 2013, p. 2). This trend is further supported by the worldwide revenue for the enterprise social software market, which was $767.4 million in 2011, representing a growth rate of 39.8% compared with the previous year (Fauscette and Thompson, 2012, p. 1). In 2011, the top three software providers were IBM, Jive Software, and Communispace, which account for 30% of the total market (Fauscette and Thompson, 2012, p. 1).

2.4.3.3. A historical view on enterprise social software use

Enterprise social software has typically advanced into the organizational context through three different ways, which are outlined by following the argumentation of Leonardi et al. (2013, p. 4-6):

1. Use of public social software, such as Facebook, Wikipedia and Twitter (see Section 2.4.3.3.1).
2. Use of private social software, either as open source or proprietary software, which is installed on an organization's own server or acquired as a cloud-based service (see Section 2.4.3.3.2).
3. In-house proprietary solutions, which are often programmed as prototypes by software providers, who first make their own experiences with the software before selling it to their customers (see Section 2.4.3.3.3).

2.4.3.3.1. Public social software

With the emergence of social software, employees have increasingly begun to communicate with each other by using social software instruments (DiMicco and Millen, 2007, p. 1; Efimova and Grudin, 2007, p. 1). Furthermore, public social software platforms, such as Facebook, allow organizations to create profiles. Therefore, they use such platforms for marketing and after-sales activities (Kaplan and Haenlein, 2010, p. 64). Moreover, these platforms allow organizations to discuss new ideas and product innovations with customers (Leonardi et al., 2013, p. 4). However, previous research has identified several problems regarding the use of public social software: these problems range from security issues, proprietary information leakage, hierarchy problems to personal/work boundary issues (Skeels and Grudin, 2009, p. 6). Accordingly, organizations have increasingly opted towards implementing in-house social media instruments (Leonardi et al., 2013, p. 4).

2.4.3.3.2. Private social software

Some organizations have already implemented social software in their business environment by using open source or proprietary social software (Leonardi et al., 2013, p. 5). Proprietary social software can either be implemented on organizational servers or through the acquisition of cloud-based services known as “software as a service” (SaaS) (Leonardi et al., 2013, p. 5). Among the earliest examples, organizations implemented single enterprise social software instruments (Leonardi et al., 2013, p. 5). For instance, wikis were implemented in order to improve work processes, collaboration and knowledge re-use (Danis and Singer, 2008, p. 1; Majchrzak et al., 2006, p. 1), while blogs were used in order to facilitate employees’ access to knowledge and to enhance collaboration across the organization (e.g., at IBM and Microsoft) (Huh et al., 2007, p. 1; Efimova and Grudin, 2007, p. 1). Jackson et al. (2007, p. 2) find that blogging increased employees’ identification and social ties and that blogs provided the possibility to help other employees solve problems and give feedback on ideas. Open source social software, such as TWiki, Foswiki, Tiki Wiki, and StatusNet, have facilitated the implementation in organizations (Leonardi et al., 2013, p. 5). In the last few years, vendors have started to come up with proprietary enterprise social software solutions (Leonardi et al., 2013, p. 5). Rather than offering single tools, these solutions mostly integrate the full variety of social software tools including wikis, blogs, social networks, microblogs and other functionalities (e.g., uploading and sharing files and other digital resources) (Leonardi et al., 2013, p. 5). Examples of such integrated enterprise social software providers are Salesforce’s Chatter, Microsoft’s Sharepoint, Yammer, IBM’s Connections, Jive from Jive Software, Oracle’s Social Network, Cisco’s Webex Social, blueKiwi from Atos, Cynapse’s Cyn.in, Tibbr, Telligent, MangoApps, Socialtext, Socialcast, and Ingage Networks (Leonardi et al., 2013, p. 5). Customers for these platforms include large and well-known organizations, such as Procter and Gamble, Dow, SAP, SteelCase, Deloitte, American Express, etc. (Leonardi et al., 2013, p. 5).

2.4.3.3.3. In-house developed proprietary solutions

Computer and information technology companies have become increasingly interested in developing enterprise social software solutions (Leonardi et al., 2013, p. 5). One reason for this interest stems from the fact that enterprise social software is said to increase the productivity of knowledge workers (Leonardi et al., 2013, p. 5). Secondly, their interest is justified through commercial reasons, i.e. organizations seek to make profits by selling enterprise social software solutions to their clients (Leonardi et al., 2013, p. 5). First prototypes can be traced back to the Beehive system of IBM and the WaterCooler system of Hewlett-Packard Company, L.P., which were developed to support product innovations and after-sales services (Leonardi et al., 2013, p. 5; DiMicco et al., 2008, p. 711). Both systems are outlined in the following. The **Beehive system** was launched in mid 2007 and had 30,000 users after one year (DiMicco et al., 2008, p. 712). DiMicco et al. (2008, p. 715) found that the new system helped employees form new social ties with their colleagues and strengthen their weak tie relationships within the organization. Another study concludes that the use of Beehive increased employees' social capital, because employees had access to knowledge and were able to connect with other employees (Steinfield et al., 2009, p. 1). Beehive was discontinued in 2011, but many of its features were used for a new internal tool called SocialBlue (Leonardi et al., 2013, p. 6). Hewlett-Packard Company, L.P. developed the **WaterCooler system** in order to bring together the separate social software tools that were already implemented in the organization (Brzozowski, 2009, p. 219). A study conducted by Brzozowski (2009, p. 228) shows that the system facilitated employees' access to unknown employees and knowledge. Recently, IBM Connections, Microsoft Sharepoint and Atos blueKiwi have become quite popular as enterprise social software providers and, therefore, are presented in the following. **IBM Connections** incorporates features of earlier prototypes (Leonardi et al., 2013, p. 6). Information between the interconnected components can be linked and evaluated (Leonardi et al., 2013, p. 6). Therefore, IBM Connections enables users to identify the contributors of messages and contact them if questions arises (Leonardi et al., 2013, p. 6). All documents are tagged, so that users can be found (i.e. social tagging) (Leonardi et al., 2013, p. 6). Moreover, users are able to set up RSS feeds to continuously be informed about news (Leonardi et al., 2013, p. 6). **Microsoft Sharepoint** offers social software features for its commercial Sharepoint version (Leonardi et al., 2013, p. 6). Sharepoint involves features that resemble those of public social software (Leonardi et al., 2013, p. 6). For example, user profiles (e.g., my sites) have components that can be recognized from Facebook, Twitter, and Google+ (Leonardi et al., 2013, p. 6). **blueKiwi**, a software that involves social media applications, was acquired by Atos SE in 2008 (Atos SE, 2015). blueKiwi helps to manage an internal social business network, including core functionality such as user profiles and pages, social sharing, blogs, polls, and customized capabilities (Atos SE, 2012, p. 46). Moreover, Atos SE has already introduced its "zero email initiative" by declaring the end to internal e-mails by 2014 (Atos SE, 2015).

2.4.4. Synthesis

This thesis analyzes enterprise social software that is used for internal communication in organizations - a research stream that is heretofore less commonly studied (Leonardi et al., 2013, p. 2). Accordingly, this study focuses on intra-organizational social software acceptance and use, whereas public social software use and acceptance (e.g., Facebook, Wikipedia, etc.) do not lie in the scope of this thesis. Therefore, proprietary software and in-house proprietary solutions represent the main point of analysis. This thesis looks at these solutions without focusing on a specific software provider. In addition, this thesis investigates Web 2.0 applications as part of an integrated enterprise social software platform. Therefore, individual tools, such as wikis, blogs and social networks, are not regarded. Based on Leonardi et al. (2013, p. 2), this thesis defines enterprise social software as:

> Web-based platforms that allow workers to (1) communicate messages with specific coworkers or broadcast messages to everyone in the organization; (2) explicitly indicate or tacitly reveal particular coworkers as communication partners; (3) post, edit, and sort text and files linked to themselves or others; and (4) view the messages, connections, text, and files communicated, posted, edited and sorted by anyone else in the organization at any time of their choosing.

The activities (1), (2) and (3) are not unique features of enterprise social software, since they are also provided by many traditional knowledge management systems (Leonardi et al., 2013, p. 2). However, its ability to allow employees to do activities (1), (2) and (3) within one single platform is one of the unique characteristic of enterprise social software (Leonardi et al., 2013, p. 2). Moreover, activity (4) refers to another unique characteristics of enterprise social software, which enables employees to see what was said and who said it, even if a user has not participated in the conversation (Leonardi et al., 2013, p. 2). This aspect refers to the advantage of visibility (Leonardi et al., 2013, p. 2). Enterprise social software can be further differentiated from traditional knowledge management systems through benefits regarding persistence, editability and associations (Leonardi et al., 2013, p. 2). Persistence refers to communication that remains accessible over time, whereas editability allows users to collaboratively post, revise and change contents (Leonardi et al., 2013, p. 2). Finally, associations denote recognized and established connections between individuals (Leonardi et al., 2013, p. 2).

3. Theoretical framework

In the third chapter, the theoretical framework is outlined.

A philosophy of science-based classification represents the basis of a scientific work (Raffée and Abel, 1979, p. 1). Accordingly, the approaches of induction and deduction as well as the concepts of social realism by Popper (1934) are outlined in Section 3.1. In addition, five theoretical strategies of management science (best practice, reference framework or approach research, theoretical eclecticism, universal theory, model building), are discussed in Section 3.2. Finally, Section 3.3 refers to different theoretical approaches to explain the meaning of knowledge.

3.1. Philosophy of science-based classification

Based on a literature review and qualitative analyses, hypotheses are deduced. Therefore, the question arises whether the results of a random sample can be used in order to verify the hypotheses.

In philosophy of science, this question automatically leads to the problem of **induction** (Gadenne, 1976, p. 27). Inductive reasoning refers to moving from specific observations to broader generalizations (Gadenne, 1976, p. 27). The members of the Vienna Circle formulated the verifiability of scientific hypotheses with the help of empiricism or formal logic as a maxim (Hunt, 1991, p. 271), which was based on the logical *positivism* (Brown, 1977, p. 21). From the perspective of philosophy of science, empirical observations are principally not adequate in order to confirm general hypotheses (Kornmeier and Müller, 2001, p. 635). **Deduction** works the opposite way, moving from more general information to more specific (Popper, 2005, p. 3, 8). Popper's **critical rationalism** is based on a deductive reasoning (Popper, 2005, p. 15). According to Popper (2005, p. 16), empiricism plays an important role for the scientific progress of a discipline. However, Popper denies the possibility to prove the accuracy of hypotheses and claims that scientific hypotheses should be formulated in a falsifiable manner (Popper, 2005, p. 17). In fact, he propagates the principle of falsification to which hypotheses can only be refuted (Popper, 2005, p. 15). Therefore, the empirical investigation of theories should be conducted iteratively (Leplin, 1984, p. 41). If a confrontation between theory and reality leads to a falsification, a new theory is built (Hunt, 1991, p. 289), i.e., empirical investigations of theories cannot be confirmed, at best they lead to a falsification.

The critical rationalism, which originates from applied sciences (Kosiol, 1973, p. 4) plays insufficient attention to the requirements of social and economic sciences (Hunt, 1991, p. 268). In contrast to social and economic sciences, applied sciences have to cope with almost ubiquitous and extraordinary long term invariances (Kosiol, 1973, p. 4). Accordingly, for social and economic sciences, two fundamental shortcomings arise (Hollmann, 2012, p. 46). First, the approximation to reality is limited (Hollmann, 2012, p. 46). Scientific objects are influenced by a variety of cultural, historical and situational context factors (Witte, 1981, p. 18). Since it is nearly impossible to control for all relevant factors, a falsification of the hypotheses is impossible (Baumgarth, 2003, p. 7). In addition, the measurement of complex constructs are often defective (Homburg, 2000, p. 58). Due to the problematic nature of measurement errors, an investigation of hypotheses can lead to biased results, which again impedes a reliable falsification (Anderson, 1983, p. 21).

Popper (1934) developed the **scientific realism**, which corresponds better with the requirements of social and economic sciences (Baumgarth, 2003, p. 7; Homburg, 2000, p. 58). It offers a synthesis of the principle of verification by the Vienna Circle as well as of the principle of falsification by Popper (1934). On the one hand, hypotheses which repeatedly correspond to the empirical reality are verified iteratively and, therefore, apply as evidence for an existing correlation (Carnap, 1953, p. 48). On the other hand, hypotheses can be rejected through a negative confrontation with the empirical reality (Hunt, 1992, p. 308). Furthermore, this approach takes the characteristics of empirical research projects better into account, which are characterized through the non-controllability of all relevant factors and the measurement error of the theoretical constructs (Homburg, 2000, p. 58). Scientific realism can be regarded as a hybrid approach in order to gain inductive and deductive findings, which is thus widely used and accepted in social science and economics (Homburg, 2000, p. 61).

In this thesis, the scientific realism provides a philosophy of science-based framework, which is the basis for the deduction of a theoretical model and its empirical verification (Baumgarth, 2003, p. 7; Homburg, 2000, p. 61). Therefore, this study follows a positivist view in which observation and experience of phenomenons are the basis for scientific progress (Anderson, 1983, p. 19). This implies that the determinants of employees' willingness to share knowledge through enterprise social software are not only theoretically discussed but are also subject to empirical investigation.

3.2. Philosophy of science-based approaches

The deduction of hypotheses required by Popper (Popper, 2005, p. 8) asks for an appropriate theoretical foundation. Accordingly, five theoretical strategies of management science (best practice, reference framework or approach research, theoretical eclecticism, universal theory, model building) are outlined in the following (Nienhüser, 1996, p. 48-54).

The **best practice strategy** summarizes actions that have shown to be effective in practice and gives concrete recommendations (Nienhüser, 1996, p. 48). Best practice research is increasingly developing in the field of Enterprise 2.0 research (e.g., Back et al., 2014). The disadvantage of best practice research is the limited generalizability of the findings (Lamnek, 2005, p. 180). According to the **reference framework or approach research** (Nienhüser, 1996, p. 49), variables are deduced through literature review, which are relevant for the research question. Afterwards, the identified variables are put into relation (Nienhüser, 1996, p. 49). This procedure happens ad-hoc, i.e., hypotheses are not deduced from literature (Hollmann, 2012, p. 47). In order to investigate cause-and-effect relationships, other approaches are more appropriate (Hollmann, 2012, p. 47). From the viewpoint of **theoretical eclecticism**, another theory is used for each problem (Nienhüser, 1996, p. 50). This approach is criticized because, while the choice of theories for single problems can be explained, the connection between the implications of results remain an unsolved problem (Nienhüser, 1996, p. 51). This is particularly a problem if assumptions of individual theories differ from each other, which can lead to very different conclusions for the same constellations of variables (Iseke, 2007, p. 66). Moreover, it is possible that several implications can be given without being able to exclude one of these (Iseke, 2007, p. 66). Another strategy aims at developing a **universal theory**, through which all problems can be explained by one theory (Nienhüser, 1996, p. 51). Even though such a universal theory is desirable from the viewpoint of the attitudinal theory, social psychology is far away from this goal (Eagly and Chaiken, 1993, p. 89). In addition, such a theory would have problems explaining concrete situations due to the high degree of abstraction (Iseke, 2007, p. 66). Nienhüser (1996, p. 52) highlights the **model building approach**. First, he distinguishes a model object from a theoretical object (Nienhüser, 1996, p. 52). A model object is a schematic representation of an object (Bunge, 1973, p. 92), whereas a theoretical model consists of assumptions deduced from general theories, which refer to the elements of the model object (Nienhüser, 1996, p. 53). Therefore, the model building process starts with the building of a simplified model object, which is linked to general scientific assumptions in order to explain, design and criticize prevailing conditions of society (Nienhüser, 1996, p. 54).

Since the model building approach allows to explain concrete situations based on theoretical assumptions and allows to assess implications for practice, it is used as theoretical foundation in this thesis.

3.3. The meaning of knowledge from different theoretical perspectives

Researchers propose that the inclusion of factors from multiple, yet complementary theories into a single model for statistical testing is likely to produce more valid and stable research findings (Kankanhalli, 2002, p. 148; Cheng and Cho, 2011, p. 488). However, it has so far not been attempted to either systematically compare or integrate the determinants, which have already been identified as influential factors of *knowledge* *management*, into a cohesive theoretical framework within the context of *knowledge sharing through enterprise social software* (Lin, 2007b, p. 316). First, theories which are proposed to be suitable as a theoretical basis are examined. Afterwards, this thesis aims to show how these theories fit together in order to build a congruent theoretical foundation, besides outlining the assumptions and contributions of the chosen theories.

In the following, different theoretical approaches that explain the meaning of knowledge are presented and adapted to the context of knowledge sharing. Whereas the new institutional economics (see Section 3.3.1) and game theory (see Section 3.3.2) provide a general overview, socio-psychological theories allow for deducing relevant determinants that may influence employees' willingness to share knowledge through enterprise social software (see Section 3.3.3).

3.3.1. New Institutional Economics

From the New Institutional Economics (NIE) perspective, knowledge sharing through enterprise social software serves benefits as well as costs for the employees. Since NIE allows a broad perspective on benefits and costs aspects, it is outlined below.

NIE constitutes a relatively recent economic theory, which examines the effects of institutions on economic entities, such as households and businesses (Picot et al., 2008, p. 34). In particular, NIE focuses on institutions that facilitate the rationalization of information and communication (Picot et al., 1997, p. 107). Early economists recognized the importance of institutions (Erlei et al., 2007, p. 26). Among these were Adam Smith and David Hume, who focused on the constraints of informal institutions and the significance of institutionalized property rights (Erlei et al., 2007, p. 27). In addition, John Stuart Mill highlighted the significance of habits for the formation of market prices (Erlei et al., 2007, p. 27). However, both neoclassical and Keynesian economists neglected the importance of institutions (Erlei et al., 2007, p. 27). The NIE can be traced back to the essay "The Nature of the Firm", which was published in 1937 by Ronald Coase (Erlei et al., 2007, p. 41). Since the mid-20th century, NIE has gained great influence in economics, particularly through the work of Nobel laureate Douglass North (Wischermann and Nieberding, 2004, p. 24).

NIE is based on the assumptions of bounded rationality, opportunistic behavior and methodological individualism, which are outlined in the following (Picot et al., 2008, p. 38). According to neoclassical economics, information and knowledge are effortlessly available to all individuals (Mühlenkamp, 2006, p. 392). Additionally, it assumes that individuals can absorb, process and apply information in a fast and unlimited manner (Mühlenkamp, 2006, p. 392). In contrast, NIE postulates that individuals are characterized by **bounded rationality**, and that knowledge can only be acquired and used with effort and cost (Kaas and Fischer, 1993, p. 687). Hence, bounded rationality refers to individuals' limited information processing capability and incomplete knowledge (Picot and Dietl, 1990, p. 179). NIE postulates that even when individuals seek to make rational decisions, their capacity to make decisions is limited (Picot et al., 2008, p. 38). Therefore, Williamson argues that "contracting agents are thus assumed to be subject to bounded rationality" (Williamson, 1983, p. 520). This assumption explains the necessity for a systematic analysis of knowledge.

In addition, NIE is also based on the assumption that individuals seek to maximize their utility or, as Williamson puts it, "where circumstances permit, [the agents] are given to opportunism." (Williamson, 1983, p. 521). Hence, **opportunistic behavior** refers to individuals who strive to maximize their own benefits at the cost of others (self-interest seeking with guile) (Williamson, 1975, p. 26). Moreover, gaps in information and incomplete specifications allows individuals to gain advantages over others (Picot et al., 2008, p. 44).

The concept of **methodological individualism** is based on the assumption that social structures such as enterprises should be analyzed by focusing on the aims and decisions of individuals who operate within these structures (Picot et al., 2008, p. 38). Therefore, Picot et al. (2002, p. 39) state that:

> Social processes and institutions must be explained by theoretical statements about individual behavior or action. In comparison to the perspective of methodological collectivism, the group is not seen as an entity, which is characterized by its own interests and actions.

Some elements of institutional economics have particular relevance to organizational theory and knowledge management (Sukowski, 2002, p. 18). These include property rights theory (see Section 3.3.1.1), transaction cost theory (see Section 3.3.1.2), and principal agent theory (see Section 3.3.1.3), which are outlined below by following the work of Picot et al. (2008) in order to ensure consistent terminology.

3.3.1.1. Property rights theory

Property rights theory (PRT) (Coase, 1960; Alchian and Demsetz, 1972; Picot et al., 2002), an important component of NIE, focuses on so-called property rights on goods (Picot et al., 1997, p. 116). Property rights are immaterial and can be defined as those rights to action that are related to a good and based on legal regulations and contracts (Picot et al., 1997, p. 116; Picot et al., 2008, p. 39). PRT considers the relationship between property rights, external effects, and transaction costs (Picot et al., 2008, p. 39), which are outlined in the following. PRT helps predict how individuals will behave when they hold property rights on a good (Picot et al., 2008, p. 39). The theory assumes that individuals act differently, depending on the rights assigned to them (Picot et al., 2008, p. 39). Generally, **property rights** can be divided into (Picot et al., 1997, p. 54):

- rights to use a good *(usus)*
- rights to change the form and substance of a good *(abusus)*

- rights to reap the profits from a good, respectively to bear its losses *(usus fructus)*
- the right to sell the good and to receive the liquidation proceeds *(capitalization and/or liquidation rights)*

According to PRT, the value of a good to an individual depends on the rights associated with the good (Picot et al., 2008, p. 39). It is important to distinguish whether an individual holds all property rights on a good (total allocation) or only partial rights (partial allocation) (Picot et al., 2008, p. 40). When the rights to a good are distributed between several parties, each party holds *attenuated property rights* (Picot et al., 2008, p. 40). Attenuated property rights are associated with the risk of **external effects**, which can be positive or negative and occur when individuals hold partial rights (Picot et al., 2008, p. 40). For instance, a driver may make use of his or her right to drive his car (Sukowski, 2002, p. 22). However, he or she does not have to bear all the costs associated with the use of his or her car, such as pollution, road wear and risk of accidents (Sukowski, 2002, p. 22). The full costs are covered by the community (Sukowski, 2002, p. 22). The assumption of opportunistic behavior predicts that the driver will not cut back on driving to reduce pollution or road wear because he or she does not have to pay those costs of his or her action (Picot et al., 2008, p. 40). Therefore, the individual costs are lower than the total costs (Sukowski, 2002, p. 22). According to PRT, *negative external costs* occur when the costs incurred by a single individual are paid by the community instead of by the individual (Sukowski, 2002, p. 23). Conversely, *positive external costs* arise when the community receives a benefit from an action that is paid for by an individual (Picot et al., 2008, p. 54). This is the case when the individual costs are greater than the total costs, such as when an individual invests in education and is expected to provide that knowledge freely to other employees of his or her firm (Sukowski, 2002, p. 23). The employee has incurred considerable effort in order to acquire the knowledge (Sukowski, 2002, p. 23). However, as an employee of the firm, he or she does not have the right to charge his or her colleagues for information (Sukowski, 2002, p. 23). PRT predicts that an individual will not share his or her knowledge until he or she receives an incentive, such as recognition by others, or believes that others will reciprocate by providing him or her with answers to future queries for knowledge (Sukowski, 2002, p. 23). However, if the knowledge holder does not receive some sort of benefit to offset the cost, he or she will refuse to share his or her knowledge (Sukowski, 2002, p. 23). Below, negative external effects and positive external effects are summarized (Sukowski, 2002, p. 24):

- Negative external effects (total costs are greater than the individual costs) result in an inefficient use of resources, because the community has to bear the full costs even though only one individual in the community benefits from the use of the good.
- Positive external effects (total costs are lower than the individual costs) lead individuals to refuse to take actions that benefit the community at the individual's

own expense. Accordingly, total benefits are reduced and a loss arises for the community.

According to PRT, external effects can lead to a *loss of welfare* when different parties hold partial rights to a good (Picot et al., 2008, p. 40). In these situations, an exchange of a good does not take place, even though this exchange would be positive for the community (Sukowski, 2002, p. 23). When all the rights to a good are allocated to a single party, the loss of welfare is minimized, because there are no external effects (Sukowski, 2002, p. 24). As a result, the cost to the individual and the cost to the community are congruent, and exchanges of goods that benefit individuals will also benefit the community (Sukowski, 2002, p. 26). This overall allocation of rights to a good to an individual is called *internalization of external effects* (Picot et al., 2008, p. 41). The degree of internalization of external effects determines the amount of loss of welfare (Picot et al., 2008, p. 41). External effects (positive and negative) always lead to a loss of welfare for the community (Sukowski, 2002, p. 24). The willingness to share knowledge is reduced, when employees do not possess all rights to their knowledge (Sukowski, 2002, p. 24). This behavior has negative consequences for the company, because the missing knowledge reduces the productivity and innovation capacity of a company (Sukowski, 2002, p. 24). Moreover, the company has to acquire the needed knowledge externally at an increased cost (Sukowski, 2002, p. 24). In order to avoid external effects and the associated loss of welfare, careful control of the allocation of rights is necessary (Picot et al., 2008, p. 42). The efforts required to exercise this control are called **transaction costs** (Picot et al., 2008, p. 42). The most obvious transaction costs are the expenses incurred through maintaining a system of laws and regulations that provides a greater internalization of external effects (Picot et al., 2008, p. 42). Transaction costs arise through the development, allocation, transfer, and enforcement of property rights and negotiations (Picot et al., 2008, p. 41). The sum of welfare losses and transaction costs is called the total effect (Picot et al., 2008, p. 41). The goal of a company or any other economic actor is to minimize the total effect by achieving the maximum possible internalization of external effects (Picot et al., 1997, p. 58). A reduction in welfare losses achieved by internalizing external effects is only economically beneficial, as long as it is not offset by an increase in transaction costs (Picot et al., 2008, p. 41). The key findings of Figure 3.1 are summarized in the following, as proposed by Sukowski (2002, p. 26):

- The allocation of property rights with regard to knowledge leads to positive external effects . The knowledge holder's willingness to share knowledge is limited, because the social benefit outweighs the individual benefit, and he or she has to bear the full costs (e.g., effort to acquire and codify the knowledge).
- The total allocation of property rights to a good minimizes external effects and thus minimizes the loss of welfare.

- When the rights to an employee's knowledge are equally distributed among all employees, the property rights structure is highly diluted.
- Internalization of external effects is necessary. Therefore, the knowledge holder has to be rewarded for sharing his knowledge. This creates transaction costs.
- The objective is to achieve an optimal combination of low transaction costs and welfare losses.

Property rights should be allocated to the knowledge holder (Jensen and Meckling, 1996, p. 26). The allocation of property rights leads to positive external effects and, thus, to a loss of welfare (Sukowski, 2002, p. 26). In a company where property rights to knowledge lie in the hands of all employees rather than the individual knowledge holder, PRT predicts that the knowledge holder will not be willing to share his knowledge voluntarily (Sukowski, 2002, p. 27). When a company expects employees to share their knowledge voluntarily, the employees' property rights to knowledge are diluted (Sukowski, 2002, p. 27). Since the company expects its employees to share knowledge, which they have obtained through great effort, the individual costs are greater than the full costs (Sukowski, 2002, p. 27). The community (in this case, the company) benefits from the knowledge of each individual, even though the individuals have to bear the full costs themselves (Sukowski, 2002, p. 27). For this reason, the individual will not be willing to share his or her knowledge because the social benefit is greater than the individual benefit (Sukowski, 2002, p. 27). These positive external effects

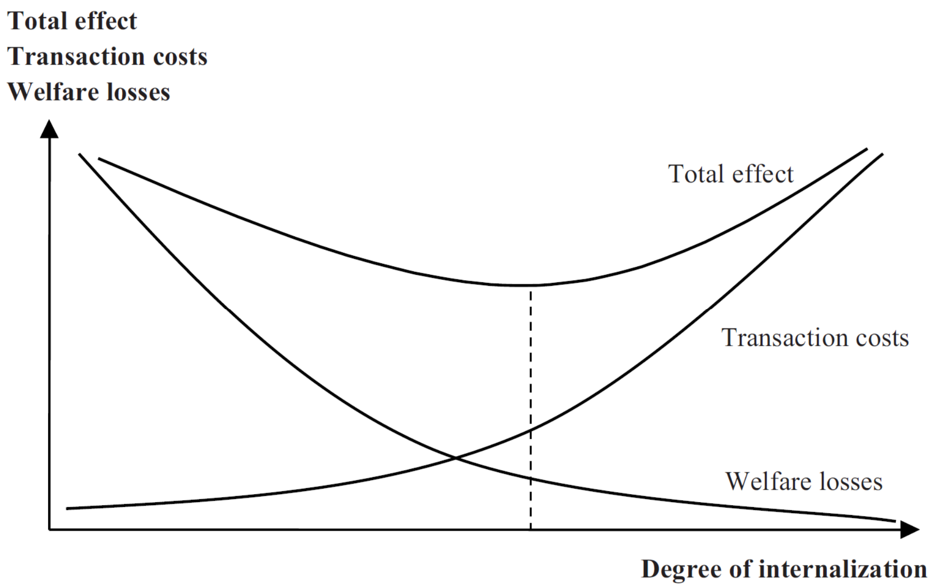

Figure 3.1. – Trade off between welfare losses through external effects and transaction. Source: Picot et al. (2008, p. 42).

lead to a loss of welfare for the organization because it is assumed that knowledge is not shared voluntarily (Sukowski, 2002, p. 27).

Enterprise social software requires employees to give up property rights to their knowledge. Moreover, the codification of knowledge is time-consuming, i.e., the knowledge sender has to bear the full costs, while all other employees can benefit from his or her contributions. From the perspective of PRT, employees' will not share their knowledge until they receive an incentive, such as recognition or bonuses by others, or believe that others will reciprocate by providing answers to future queries for knowledge.

3.3.1.2. Transaction cost theory

Transaction cost theory (TCT) focuses on transactions and was developed by Coase in 1937 (Coase, 1937). Coase described the concept of TCT by considering the costs of using the price mechanism of markets (Coase, 1937, p. 21), yet he never used the actual term "transaction costs" (Erlei et al., 2007, p. 41).[1] Forty years later, Coase's theoretical approach was reconsidered by Williamson (Werani, 2004, p. 144), who deduced management implications, especially with regard to the question of vertical integration (the so-called "make or buy decision") (Klein et al., 1978, p. 298). Since then, TCT has been applied to many other areas to describe and explain the exchange of goods (Sukowski, 2002, p. 27). TCT considers the costs associated with chosen integration and/or organizational forms and those incurred to "keep the economic system going" (Arrow, 1969, p. 48). Therefore, the goal of TCT is to identify an organizational form that minimizes the transaction costs for given production costs and capacity (Picot et al., 2008, p. 42). The main factors influencing the degree of transaction costs are determined by Picot et al. (1997, p. 68):

- *Uncertainty:* Uncertainty is expressed by unpredictable changes, for instance in due dates, prices, conditions, and quantities.
- *Environment's specificity:* Environment's specificity describes specific investments, for instance in qualifications or assets.
- *Strategic importance:* Strategic importance is described by a product's competitive position. If a product is specifically and strategically important, the fundamental capabilities can be seen as core competencies (Prahalad and Hamel, 1990, p. 79; Picot et al., 2008, p. 44).
- *Frequency of transaction:* Transaction costs decrease with an increasing number of identical transactions, so that synergies and economies of scale can be realized.

[1] The term "transaction costs" was first used by Kenneth J. Arrow, who defines the term as the "cost of running the economic system" (Arrow, 1969, p. 48).

- *Spirit in which transactions occur:* The spirit in which transactions occur includes all of the organization's relevant social, legal, and technological conditions (Williamson, 1975, p. 37-39; Picot et al., 2008, p. 45).
- *Opportunism:* Opportunism is expressed by individuals who try to maximize their own benefits by exploiting others who have limited information, and are characterized by bounded rationality.
- *Bounded rationality:* Bounded rationality refers to individuals' limited information processing capabilities.

This differentiation makes transaction cost theory an important analysis tool for strategic decision making (Sukowski, 2002, p. 27). There are three types of institutional arrangements: market-based organizations, hierarchical organizations and hybrid organizations (see Figure 3.2) (Picot et al., 2008, p. 46). The continuum of organizational forms ranges between the two extreme forms of market and hierarchy (Picot et al., 2008, p. 45). Hybrid organizations include long-term entrepreneurial cooperatives, strategic alliances, joint ventures, franchise systems, licensing, dynamic networks, etc. (Picot et al., 2008, p. 45). With increasing specific investments and rising uncertainty, hierarchical organizations are more efficient than market-based organizations, owing to the absence of verifiable control mechanisms (Picot et al., 2008, p. 45). Moreover, hierarchical organizations have the highest fixed transaction costs because of bureaucracy costs (Picot et al., 2008, p. 45). Accordingly, they are advantageous for transactions which are characterized by middle range specificity (Williamson, 1991, p.

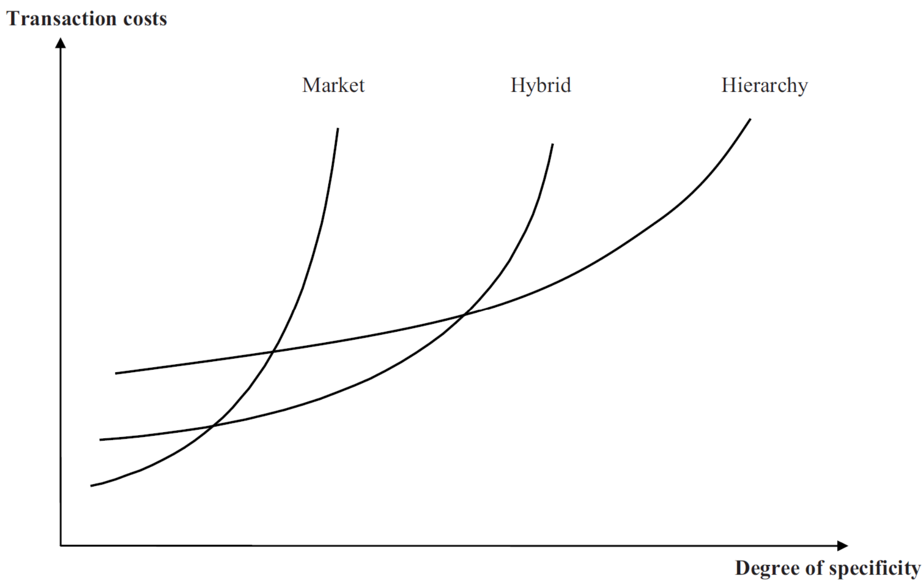

Figure 3.2. – Integrated forms and specificity.
Source: Williamson (1991, p. 284) and Picot et al. (2008, p. 46).

284; Picot et al., 2008, p. 46). Market transactions have the lowest fixed costs since they are not based on longer-term contractual relationships (Picot et al., 2008, p. 46). Coase (1937, p. 404) argues that organizations can only prevail when they are able to handle the coordination associated with the exchange of goods and services at lower transaction costs than the market. This is, for instance, the case when they can exchange goods internally more cheaply compared to buying the goods from an external partner in the market (Picot et al., 2008, p. 43). With the help of TCT, all the costs of initiating, negotiating, and ensuring an agreement (ex ante costs) can be described (Picot et al., 2008, p. 42). At the same time, TCT accounts for additional costs which incur through re-negotiations and changes (ex post costs) (Sukowski, 2002, p. 28).[2] TCT considers monetary and non-monetary efforts, thus covering the following costs (Picot et al., 2008, p. 42):

- Initiation (e.g., research, travel, consultation)
- Agreement (e.g., negotiation, legal department)
- Execution (e.g., process control)
- Control (e.g., quality and due date monitoring)
- Adaptation (e.g., additional costs due to subsequently submitted qualitative, costs or target date changes)

TCT can be used to explain the costs of knowledge sharing through enterprise social software from the perspective of knowledge seekers, knowledge contributors and the organization (Sukowski and Reinhardt, 2001, p. 5). **Initial costs** include the costs necessary to organize an exchange of a good or service (Picot, 1982, p. 270; Williamson, 1985, p. 20). With regard to knowledge sharing, initial costs arise due to the fact that knowledge seekers have to search for knowledge (Sukowski, 2002, p. 28). Therefore, transaction costs depend on how difficult it is to find relevant knowledge. Since enterprise social software reduces time and effort spent searching for knowledge (e.g., documentation and manuals) and thus allows employees to find knowledge quickly, transaction costs are reduced for knowledge seekers. **Agreement costs** refer to negotiations between buyers and sellers, who negotiate a price for a product or a service (Picot, 1982, p. 270; Williamson, 1985, p. 20). With regard to knowledge sharing, this would imply that knowledge seekers and knowledge receivers have to negotiate a price concerning the value of knowledge (Durth, 2001, p. 306). In most organizations, knowledge is seen as a public good, so agreement costs do not arise as long as employees agree with their organizations' pro-sharing norms (Kankanhalli et al., 2005b, p. 117). In organizations in which knowledge is seen as a private good, rewards for knowledge contributions may be necessary (Kankanhalli et al., 2005b, p.

[2] Goshal and Moran (1996) offer a critical discussion of TCT.

117). **Execution costs** are defined as the degree of effort which is needed for a service provision (Picot, 1982, p. 270; Williamson, 1985, p. 20). In the context of knowledge sharing, execution costs arise for the knowledge contributor, who has to transfer the required knowledge (Sukowski, 2002, p. 29). Transaction costs are lower when knowledge can be easily codified (e.g., manuals and processes) in comparison to knowledge which is more difficult to codify (e.g., experiences) (Sukowski, 2002, p. 29). Therefore, rewards may be a valuable instrument in order to motivate employees to share their knowledge (Wasko and Faraj, 2000, p. 160). Such a reward mechanism could be applied to contributions posted in enterprise social software. A disadvantage is that the value of knowledge is difficult to estimate (Picot, 2000, p. 8). Therefore, reward systems might increase the quantity of contributions to the detriment of high quality contributions (Sukowski, 2002, p. 33). Since companies are not able to judge the quality of contributions ex ante, knowledge contributions could be rewarded ex post (but even then it is still difficult to establish verifiable quality criteria) (Durth, 2001, p. 306). However, enterprise social software allows for publishing content that can be revised and changed collaboratively. Therefore, if first contributions might be of low quality, employees can work on these contributions due to the edit function of enterprise social software (e.g, wiki). **Control costs** refer to the evaluation of the received service provision (Sukowski, 2002, p. 30; Picot et al., 2008, p. 344). Concerning knowledge sharing, control costs arise for knowledge seekers, which are difficult to measure, because of the absence of verifiable quality criteria for knowledge contributions (Sukowski, 2002, p. 31). **Adaptation costs** arise when a good or a service have been exchanged in an unsatisfactory state, due to poor quality work or errors in design or execution (Picot et al., 2008, p. 344). Adaptation costs for knowledge sharing through enterprise social software are difficult to measure, because of the absence of reliable criteria.

To sum up, from a transaction cost theory perspective, enterprise social software allows knowledge seekers to find information quickly, which may increase the perceived usefulness of enterprise social software. Therefore, initial costs are reduced from the perspective of knowledge seekers. The execution costs refer to the degree of effort for knowledge contributors to codify knowledge, which depends on the type of knowledge. In order to motivate employees to share knowledge through enterprise social software, knowledge sharing norms and rewards are important. Finally, control and adaptation costs are difficult to measure with regard to knowledge sharing.

3.3.1.3. Principal agent theory

Principal agent theory (PAT) examines the relationship between two parties based on the division of labor, which is characterized by information asymmetry and uncertainty (see Table 3.1) (Picot et al., 2008, p. 47). The party with an information advantage is called the agent and the party with an information deficit is called the principal, whereby the principal delegates tasks to the agent (Picot et al., 2008, p. 47).

Assuming that this information asymmetry is the result of opportunistic behavior and limited information, PAT resolves the information asymmetry by designing an optimal contract that manages the relationship (Picot et al., 2008, p. 47). According to Jensen and Meckling (1976, p. 308), agency costs can be divided into three components: the principal's monitoring and control costs, the agent's signaling and guarantee costs and the remaining loss of welfare *(residual loss)*. For instance, the knowledge seeker (principal) has to search for information in order to evaluate knowledge contributions (Sukowski, 2002, p. 31). The knowledge contributor (agent) has to prove that his or her knowledge is of high quality (Sukowski, 2002, p. 31). Consequently, signaling costs arise for the knowledge contributor (Sukowski, 2002, p. 31). For instance, the contributor's reputation can serve as an indicator for his or her expertise (Sukowski, 2002, p. 31). By monitoring whether the knowledge shared is of high quality, the knowledge seeker is incurred with control costs (Sukowski, 2002, p. 31). The limited information asymmetry can be divided into three categories (Picot et al., 2008, p. 48): hidden characteristics, hidden action and hidden intention, which are outlined in the following.

Information asymmetry / Differentiation criteria	**Hidden characteristics**	**Hidden action**	**Hidden intention**
Information problem of the principal	Qualitative characteristics of the performance of the contractual partner are not known	Efforts of contractual partner not known, not observable, no basis for judgment	Intention of contractual partner are unknown
Cause of problem or essential influencing factors	Concealment of characteristics	Monitoring possibilities and costs	Resource dependency
Behavioral leeway of agent	Prior to the signing of contract	After the signing of contract	After the signing of contract
Problem	Adverse selection	Moral hazard	Hold up
Type of problem-solving	Removal of information asymmetry by: Signaling/ screening; Self-selection Interest assimilation	Interest assimilation Reduction of information asymmetry (monitoring)	Interest assimilation

Table 3.1. – Overview of principal agent theory.
Source: Picot et al. (2008, p. 50).

The **hidden characteristics** problem arises before a contractual agreement is reached (ex ante), i.e., the principal is not informed about the agent's characteristics or services, nor is he or she able to make judgments on the agent's quality of work, which raises the risk of adverse selection (Picot et al., 2008, p. 48). Signaling, screening and self selection contracts can reduce the information asymmetry between the principals and agents (Picot et al., 2008, p. 48). With regard to knowledge sharing, it is difficult to assess the quality of knowledge contributions (Sukowski, 2002, p. 31). However, the knowledge contributor's reputation may be an important signal for the quality of shared knowledge. Thus, a rating system can give a hint concerning a contributor's reputation, which can be integrated into the enterprise social software. Therefore, enterprise social software can serve as a means for reducing information asymmetries.

The problem of **hidden action/information** arises after a contractual agreement is reached (ex post) (Picot et al., 2008, p. 49). Even if the principal can monitor the agent's actions, he or she lacks the knowledge required to judge the agent's behavior (Picot et al., 2008, p. 49). Agents might take advantage of the options they have and could behave contrary to the principal's interests (Picot et al., 2008, p. 49). For example, an agent could fulfill his or her tasks carelessly or very slowly (Picot et al., 2008, p. 49). In this case, the problem of moral hazard arises (Picot et al., 2008, p. 49). Monitoring, sanctions and incentive systems can reduce such an information asymmetry (Picot et al., 2008, p. 49). Concerning knowledge sharing, employees might not be motivated to share their knowledge. Therefore, rewards maybe an important organizational measurement.

The problem of **hidden intention** arises after a contractual agreement is reached (ex post) (Picot et al., 2008, p. 50). Even if the principal has opportunities to monitor the agent's actions, he or she might not know the agent's intentions (Picot et al., 2008, p. 50). If the principal makes investments that he or she cannot make undo (sunk costs), he or she becomes dependent on the agent (Picot et al., 2008, p. 49). After signing the contract, the principal cannot force the agent's actions in a certain direction (Picot et al., 2008, p. 49). The hold-up problem arises if the agent exploits this situation in order to gain a personal advantage (opportunistic behavior) (Picot et al., 2008, p. 49). Interest alignments can reduce the risk of the hold-up problem (Picot et al., 2008, p. 49). With regard to knowledge sharing, knowledge holders might strategically act by providing only parts of knowledge through enterprise social software. Especially, when they assume others to inappropriately use their knowledge contributions.

From the perspective of principal agent theory, enterprise social software can serve as a means to reduce information asymmetries by integrating rating systems to signal the contributor's reputation. In addition, rewards may be an important instrument in order to motivate employees to share knowledge. However, knowledge contributors might only share parts of their knowledge, especially when they assume others to inappropriately use their knowledge contributions, which refer to low levels of interpersonal trust.

To sum up, NIE is an appropriate theory in explaining the meaning of knowledge. From the NIE perspective, knowledge sharing through enterprise social software serves benefits as well as costs for the employees. In order to further specify human evaluations of benefits and costs, the assumptions of game theory are discussed in the following.

3.3.2. Game theory

From a game theory perspective, the behavior of an individual results from his or her evaluation and comparison of the anticipated payoffs of alternative strategic options (Parkhe, 1993, p. 805). The problem of knowledge sharing through enterprise social software can be regarded as a public-goods dilemma, which is a specific case of a multi-person prisoner's dilemma.

In the following, the general concept of a prisoner's dilemma is explained (see Section 3.3.2.1), before the multi-person prisoner's dilemma is outlined (see Section 3.3.2.2).

3.3.2.1. Prisoner's dilemma

Employees who are willing to share their knowledge with other members of the organization, so that work redundancies are avoided and new knowledge can be developed, represent a major factor contributing towards successful knowledge management (Moser and Schaffner, 2004, p. 227). Empirical research confirms that the unwillingness of employees to share knowledge constitutes a profound problem in knowledge management (KPMG Consulting, 2001, p. 17). From a game theory point of view, this problem can be explained by the *prisoner's dilemma* (Wilkesmann and Rascher, 2004, p. 22). In a prisoner's dilemma, a situation is given in which two players can carry out two strategies (Seidel, 2003, p. 111; Jahnke et al., 2006, p. 7; Braun et al., 2009, p. 26). The first strategy refers to an individual who shares knowledge with another player and therefore cooperates (Jahnke et al., 2006, p. 7). The second strategy is described by an individual who does not share knowledge and therefore defects (Jahnke et al., 2006, p. 7). Accordingly, the first strategy is called knowledge sharing, whereas the second strategy is called defection (Jahnke et al., 2006, p. 7). In Table 3.2 the outcomes for both players are presented.

		Player 2	
		W (knowledge sharing)	D (defection)
Player 1	W (knowledge sharing)	**(8/8)**	(-1/10)
	D (defection)	(10/-1)	**(5/5)**

Table 3.2. – Prisoner's dilemma.
Source: Jahnke et al. (2006, p. 7).

If both players choose to share their knowledge, then both players get an outcome of 8, whereas if they choose the defection strategy, they receive an outcome of 5 (Jahnke et al., 2006, p. 7). If player 1 chooses the knowledge sharing strategy and player 2 the defection strategy, then player 2 receives an exorbitant outcome of 10, whereas player 1 receives a negative outcome (Jahnke et al., 2006, p. 7). The same applies if both behave vice versa (Jahnke et al., 2006, p. 7). Therefore, the *defection strategy* constitutes the *dominant strategy*, i.e., regardless of the other players' actions, it is always more beneficial to defect (Jahnke et al., 2006, p. 7). The dilemma of the game is that the individual rational strategies lead to a *pareto sub-optimal equilibrium*, i.e., each player receives only an outcome of 5 (Jahnke et al., 2006, p. 7). Due to missing incentives, the cooperative equilibrium in which each player gets an outcome of 8 cannot be reached, since a one-sided deviation leads to an outcome of 10 and is therefore worthwhile (Jahnke et al., 2006, p. 7). Consequently, the collective rational equilibrium and the individual rational equilibrium are not equal (Jahnke et al., 2006, p. 7).

Individuals can be influenced to choose a knowledge sharing strategy by increasing the *outcomes* (Jahnke et al., 2006, p. 8). Table 3.3 shows that *two Nash-equilibria* can be reached, when both players receive an outcome of 11 (Jahnke et al., 2006, p. 8). Then, knowledge sharing becomes the *dominant equilibrium* (Jahnke et al., 2006, p. 7). Both players choose the knowledge sharing strategy in order to maximize their outcomes (Jahnke et al., 2006, p. 7). A defection strategy would be irrational, because the non-cooperative player would voluntary give up units of outcome (Jahnke et al., 2006, p. 7).

		Player 2	
		W (knowledge sharing)	D (defection)
Player 1	W (knowledge sharing)	**(11/11)**	(-1/10)
	D (defection)	(10/-1)	**(5/5)**

Table 3.3. – Dominant equilibrium.
Source: Jahnke et al. (2006, p. 8).

3.3.2.2. Multi-person prisoner's dilemma

The multi-person prisoner's dilemma indicates that each employee is better off if he or she withholds knowledge and behaves according to his or her own interest (Cress and Martin, 2006, p. 2). However, the more employees show such a behavior, the worse all employees come off (Cress and Martin, 2006, p. 2). Consequently, knowledge sharing through enterprise social software can be regarded as a *public-goods dilemma*, which is a specific case of a multi-person prisoner's dilemma (Cress and Martin, 2006, p. 2). If all employees withhold their knowledge, then enterprise social software would not have any content and no employee could use his or her colleagues' knowledge. In such a scenario, employees' knowledge is seen as a resource, the contents of enterprise social software as public goods and the employees' decision to share their knowledge through enterprise social software as a *social dilemma*. Public goods are characterized by two criteria: the jointness of supply and impossibility of exclusion, which are outlined below (Cress and Martin, 2006, p. 2).

The **jointness of supply** refers to the fact that the use of a good does not diminish the quantity and quality of the good for other users , i.e., the value of knowledge does not diminish through its use (Cress and Martin, 2006, p. 2). The **impossibility of exclusion** means that group members cannot be excluded from benefiting from the common pool, even if they do not participate (Cress and Martin, 2006, p. 2). This is particularly the case for enterprise social software, because it provides free access to all employees. Nonetheless, organizations can limit the criteria of jointness of supply by allowing the formation of closed groups within the software in which knowledge is only available for the members of a specific group (Cress and Martin, 2006, p. 2). However also in this case, the members of such a specific group cannot be excluded from benefiting from the common pool, even if they do not participate (Cress and Martin, 2006, p. 2). Moreover, closed groups help to comply with security and confidentiality aspects (Cress and Martin, 2006, p. 2).

To sum up, some knowledge is available to all employees, who can benefit from the common pool (Cress and Martin, 2006, p. 2). Therefore, some employees can benefit from others' contributions even if they contribute nothing (Cress and Martin, 2006, p. 2). Such a phenomenon is called free-riding (Connolly and Thorn, 1990, p. 513; Cress and Martin, 2006, p. 2). Employees tend to free-ride because knowledge sharing requires time and effort (Orlikowski, 1993, p. 248; Huber, 2001, p. 74). For instance, written contributions have to be worked out properly, so that the message can be understood by other employees (Orlikowski, 1993, p. 248; Huber, 2001, p. 74). In addition, participating in enterprise social software competes with the daily work of employees. Employees' unwillingness to share knowledge may be due to their interest in maximizing their own outcome and minimizing costs, thus possibly causing a social dilemma (Cress and Martin, 2006, p. 2). Dawes (2000, p. 111) provides a suitable definition of a social dilemma:

> A social dilemma is a situation in which each member of a group has a clear and unambiguous incentive to make a choice that – when made by all members – provides poorer outcomes for all than they would have received if none had made the choice.

The multi-prisoner's dilemma has two inequalities, which describe the outcome of cooperation (knowledge sharing) and defection (withholding knowledge) on the individual and on the group level (Cress and Martin, 2006, p. 2). On the individual level, the defection strategy is the dominant strategy because an individual can benefit from other contributors even if he or she free-rides (Cress and Martin, 2006, p. 2). On the group level, the defection strategy is a deficient strategy (Cress and Martin, 2006, p. 2): if no employee shares his or her knowledge, enterprise social software does not contain any content and is therefore useless for employees. The defection strategy is a pareto inferior Nash-equilibrium (Cress and Martin, 2006, p. 2). The organization's outcome is higher when all employees share instead of withholding their knowledge (Cress and Martin, 2006, p. 2). However, rational employees are prone to withholding their knowledge in order to maximize their own outcome (Cress and Martin, 2006, p. 2). From the group perspective, the knowledge sharing strategy maximizes the common outcome (Cress and Martin, 2006, p. 2). Thus, a typical multi-person prisoner's dilemma is given.

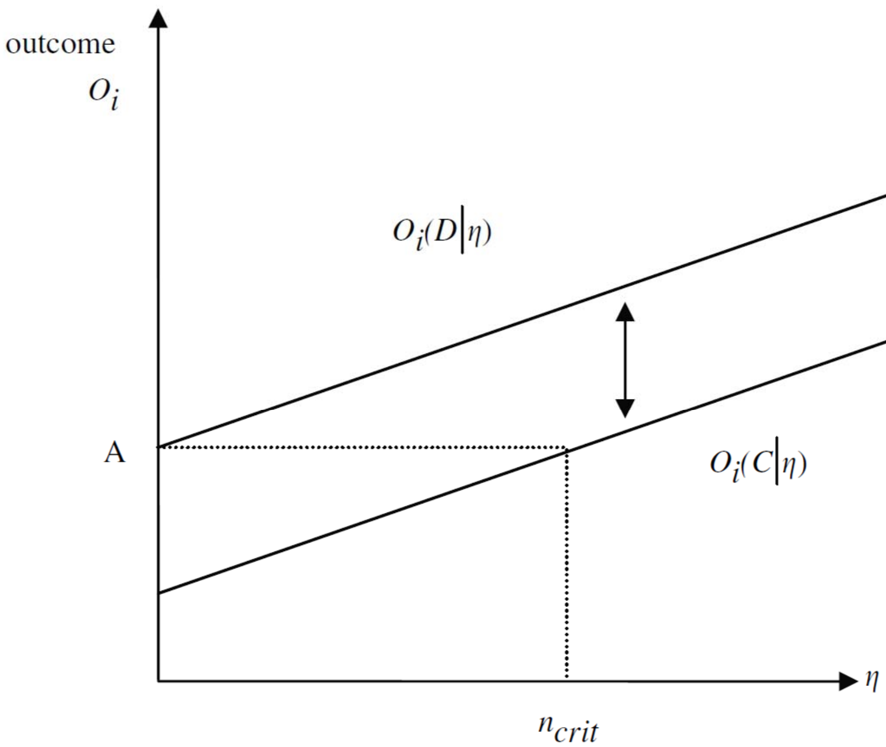

Figure 3.3. – Graphical definition of the critical mass n_{crit} (the lines show person i's outcome for defection $O_i(\text{D}|\eta)$ and cooperation $O_i(\text{C}|\eta)$ if η group members cooperate. A is the outcome for total defection).
Source: Cress and Martin (2006, p. 5).

In addition, costs and benefits define the critical mass (Oliver et al., 1985, p. 522). The critical mass "is the exact number of contributors for whom – on the group level – the benefit from the achieved public good exceeds the costs for contribution" (Cress and Martin, 2006, p. 2). On the group level, the critical mass is described by the number of employees who share their knowledge so that the benefits exceed the costs of knowledge sharing (Cress and Martin, 2006, p. 4). In Figure 3.3, the critical mass is illustrated by a linear-production function (Cress and Martin, 2006, p. 4). The lower function ($O_i(\text{C}|\eta)$) stands for an employee who shares his or her knowledge and thus cooperates, whereas the upper function (O_i(D|η) refers to an employee who withholds his or her knowledge and thus defects (Cress and Martin, 2006, p. 4). c stands for the cooperation cost and is represented through the distance between the two parallels (Cress and Martin, 2006, p. 4). The outcome increases linearly with the number of employees who share their knowledge (η) (Cress and Martin, 2006, p. 4). The critical mass (n_{crit}) is reached, when through an increasing number of cooperating employees, the group outcome exceeds the output for total individual defection (A) (Cress and Martin, 2006, p. 5). If employees share their knowledge below the critical mass, the group benefit is lower than if no one had cooperated (Cress and Martin, 2006, p. 5). On a group level, it is only beneficial to share knowledge above the critical mass, whereas, on an individual level, it remains unprofitable for an employee to share his or her knowledge, since the defection strategy (O_i(D)) always produces higher outcomes than the cooperation strategy (O_i(C)) (Cress and Martin, 2006, p. 5).

From a game theory perspective, knowledge sharing through enterprise social software refers to a multi-person prisoner's dilemma in which employees tend to free-ride, because knowledge contributions require effort. In order for employees to choose to share their knowledge, the outcomes associated with opting for this strategy have to be increased. Hence, an analysis of knowledge sharing through enterprise social software is crucial in order to identify relevant determinants that have an impact on the *knowledge sharing dilemma*.

To sum up, since NIE and game theory allow a broad perspective on benefits and costs aspects, additional theories should help to further specify these benefits and costs. In addition, this research investigates knowledge sharing on an individual level[3], i.e., individuals are in the center of analysis. Accordingly, theories that deal with motivational aspects and interpersonal relationships are outlined in the following.

3.3.3. Socio-psychological theories

In order to identify crucial determinants of knowledge sharing through enterprise social software, an extensive literature review has been conducted. The literature review reveals that knowledge management researchers increasingly make use of socio-psychological theories in order to investigate individuals' motivation to share knowledge (Kankanhalli et al., 2005b, p. 113; Andolšek, 2011, p. 1). In addition, socio-psychological theories allow a more differentiated view on efforts and rewards associated with knowledge sharing. For instance, the motivation model differentiates between extrinsic and intrinsic motivation (Staehle, 1999, p. 166) (see Section 3.3.3.1). In addition, conceptual models in acceptance research explain the acceptance and use of technical innovations (Davis et al., 1989, p. 982; Venkatesh et al., 2012, p. 157), which are of special interest when investigating knowledge sharing through enterprise

[3]For instance, in the transaction cost theory "a unit of transfer of legal control" (Commons, 1931, p. 6) is transferred, whereas in theories that focus on interpersonal relationships, resources, values, feelings and knowledge are shared (Wiswede, 2000, p. 95).

social software (see Section 3.3.3.2). Finally, the factors deduced from conceptual models in acceptance research are combined with human and organizational factors, deduced from social capital theory (see Section 3.3.3.3) and exchange theories (see Section 3.3.3.4). Accordingly, selected theories are presented in the following, from which relevant determinants are deduced.

3.3.3.1. Motives, rewards and motivation

Motivation theories have been developed, which try to explain the causes and reasons of human behavior (Nerdinger, 2014a, p. 420). According to Heckhausen (1989, p. 10), motivation can be described by various effects that influence individuals' behavior. Hence, individuals behave according to associated outcomes and efforts (Heckhausen, 1989, p. 4). Motivation is a hypothetical construct and, consequently, a black-box, which stands between personal and contextual conditions and behavior (Staehle, 1999, p. 200). The main contribution of motivational theories to business administration is the explication of how incentives have to be designed, for instance in order to bond employees to the organization and to motivate them to achieve satisfying results (Jensen and Murphy, 1990, p. 225).

In the following the motivation model of Staehle (1999, p. 167) is outlined. Staehle (1999, p. 167) argues that in order to satisfy **needs**, the willingness of an individual to act has to be turned into **action**, which leads to the satisfaction of needs (see Figure 3.4). **Motives** have to be differentiated from motivation; a need which is focused on an objective and the willingness to satisfy a specific need associated to the objective is called a motive (Nerdinger, 2014a, p. 420). Some researchers assume that motives are inherent characteristics but are influenced by social experiences (Schanz, 1991, p. 18). In contrast to motivation, motives consist of isolated needs, desires, wishes and striving, which can be regarded as the building blocks of motivation (von

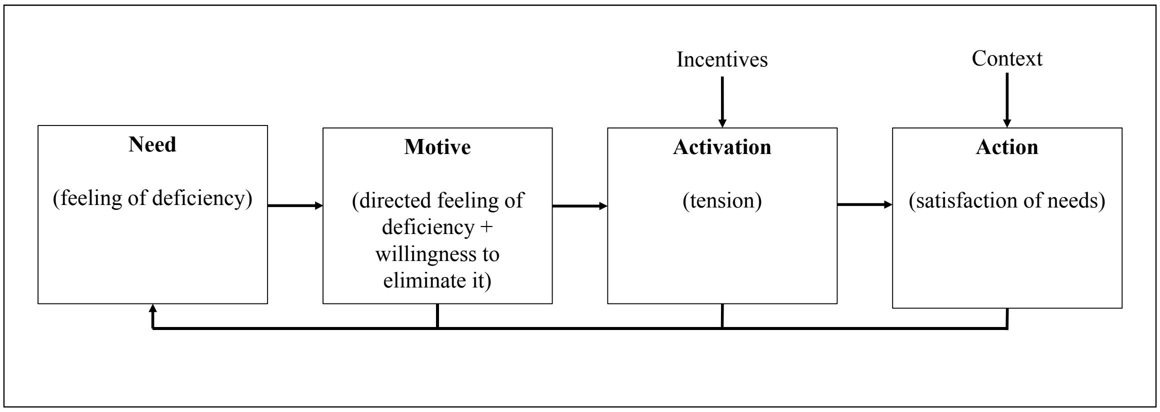

Figure 3.4. – Motivation model.
Source: Based on Staehle (1999, p. 167).

<table>
<tr><th colspan="4">Extrinsic motivation</th><th>Intrinsic motivation</th></tr>
<tr><th colspan="2">Monetary rewards</th><th colspan="2">Non-monetary rewards</th><td rowspan="4">Work itself is a reward</td></tr>
<tr><td colspan="2">Financial rewards
(compensation (in a broader sense))</td><th rowspan="2">Social rewards</th><th rowspan="2">Organizational rewards</th></tr>
<tr><th>Direct financial rewards</th><th>Indirect financial rewards</th></tr>
<tr><td>Compensation in a narrow sense</td><td>Fringe benefits</td><td>Information
recognition
status
power
etc.</td><td>Organizational culture
career prospects
scope for action
security
etc.</td></tr>
</table>

Table 3.4. – Incentives and rewards.
Source: Jahnke et al. (2006, p. 14).

Rosenstiel, 1999, p. 50). However, motives are only relevant if individuals are aware of them and if they are cognitively processed (von Rosenstiel, 2010, p. 18). The behavior of individuals is not only influenced by motives but also by external factors and situations (von Rosenstiel, 1999, p. 50). Accordingly, a behavior is performed or **activated** either because of an individual's intrinsic or extrinsic motivation (Thom and Friedli, 2003, p. 69).

Hence, motivation is always a product of individual motives and external incentives (Jahnke et al., 2006, p. 10; Staehle, 1999, p. 167). Moreover, it is important that incentives correspond with motives (Jahnke et al., 2006, p. 10; von Rosenstiel, 2010, p. 33). Incentives can be categorized as negative or positive (Graumann, 1969, p. 20; Raab et al., 2010, p. 213). A positive incentive reinforces the motive and leads to an early perception by individuals (e.g., money, recognition) (Graumann, 1969, p. 20). A negative incentive reduces the strength of a motive (e.g., sanctions) (Raab et al., 2010, p. 213). It may even reduce the strength of a motive to such an extent that it falls behind the level of an individual's perception (Raab et al., 2010, p. 213). However, even if slightly negative incentives are present, they may encourage individuals to take an action (Comelli and von Rosenstiel, 2003, p. 9).

In order to differentiate between extrinsic and intrinsic motivation, Table 3.4 gives an appropriate overview, which is outlined in the following. With regard to **intrinsic motivation**, the satisfaction of a need is directly transformed into an action (Schanz, 1991, p. 15). Accordingly, Frey and Osterloh (2002, p. 8) state:

> In the case of intrinsic motivation, [...] the activity itself or the corresponding end goal satisfies a direct need in its own right.

Extrinsic motivation is a means of needs satisfaction, as Frey and Osterloh (2002, p. 8) state:

> Extrinsic motivation serves to satisfy indirect or instrumental needs. As such, money is almost always the means to an end - paying for a vacation or buying a car, for instance - and not an end in itself. In a career context, extrinsic motivation stems from the desire to directly satisfy one's non-workrelated needs. In this instance, a job is simply a tool with which to satisfy one's actual needs by means of the salary it pay.

Extrinsic motivation can be divided into monetary and non-monetary rewards (Staiger, 2004, p. 260-261). Examples of **monetary rewards** are fix payments, bonuses and profit-sharing (Mergel and Reimann, 2000, p. 15). They can be further divided into direct and indirect financial rewards (Jahnke et al., 2006, p. 13). Direct financial rewards refer to compensations in a narrow sense, whereas indirect material rewards refer to "fringe benefits" (Jahnke et al., 2006, p. 13). Fringe benefits involve additional services offered by the organization, such as company cars and occupational pensions (Jahnke et al., 2006, p. 13). These additional services are independent of the company's success (Jahnke et al., 2006, p. 13). **Non-monetary rewards** are subjectively evaluated by individuals due to their non-monetary character (Jahnke et al., 2006, p. 13). Accordingly, the controllability of such rewards is more difficult than of monetary rewards (Jahnke et al., 2006, p. 13). Non-monetary rewards can be divided into social rewards and organizational rewards (Staiger, 2004, p. 260). For instance, social rewards consist of recognition, status and power (Staiger, 2004, p. 261). Organizational rewards involve, for instance, career options, security issues, organizational culture and the scope for action (Staiger, 2004, p. 260). von Rosenstiel (1999, p. 50) states that incentives can bring people to take an action, i.e., incentives can influence people's motives.[4]

Knowledge management literature differentiates between social rewards (e.g., recognition, status) for knowledge sharing and economic rewards for knowledge sharing (e.g., job security, financial rewards) (Kankanhalli et al., 2005b, p. 119); this differentiation is also used in this thesis.

[4]The theoretical approaches of motivation can be divided into content and process theories (Nerdinger, 2014a, p. 420). *Content theories* try to name the contents of motivation (Nerdinger, 2014a, p. 427). The most known and used approach is Maslow's motivation pyramid (1954/1981) (Nerdinger, 2014a, p. 428). *Process theories* try to explain the process of motivation (Nerdinger, 2014a, p. 427). The best known process theory is Vroom's (1964) valence-instrumentality-expectancy theory, which serves as a basis of newer motivational process theories (Staehle, 1999, p. 212; Nerdinger, 2014a, p. 427). These theoretical approaches are not outlined in greater detail, since their contents are of minor relevance with regard to the research aim and questions of this thesis.

3.3.3.2. Conceptual models in acceptance research

Conceptual approaches, which explain the acceptance of technical innovations can be found in diffusion research, information systems research and marketing and consumer behavior research (e.g., Robinson Jr. et al., 2005; Venkatesh et al., 2012; Peris et al., 2013). In order to identify which models in acceptance research are relevant for this thesis, knowledge management literature has been reviewed. Accordingly, the relevant explanatory models, which have already been validated in the literature and are appropriate for the context of this thesis, are *variations of the behavioral and attitudinal theories of Fishbein and Ajzen* (theory of reasoned action, theory of planned behavior, technology acceptance model, unified theory of acceptance and use of technology).

Hence, the theory of reasoned action is outlined in Section 3.3.3.2.1. In addition, the theory of planned behavior is explained in Section 3.3.3.2.2, while the technology acceptance model is described in Section 3.3.3.2.3 and the unified theory of acceptance and use of technology is pointed out in Section 3.3.3.2.4. Finally, the main findings are summarized in Section 3.3.3.2.5.

3.3.3.2.1. Theory of reasoned action

The theory of reasoned action by Fishbein and Ajzen (1975, p. 16) is based on the assumption that the behavior of individuals is controlled by the cognitive intention to execute a behavior (see Figure 3.5) (Fishbein and Ajzen, 1975, p. 16). Intention in turn determines the attitude of an individual, which refers to the degree of positive and negative evaluations of the consequences according to a behavior (Fishbein and Ajzen, 1975, p. 16). Consequently, attitude develops from the belief that a behavior leads to a certain result and the individual's evaluation of it (Fishbein and Ajzen, 1975, p. 16). Fishbein and Ajzen (1975, p. 16) assume that the social environment influences the intentions of individuals. Therefore, they integrate a social norm component into their model, which consists of subjectively perceived expectations of relevant reference persons, the decision to execute or reject a behavior and the motivation of an individual to act according to these normative expectations (Fishbein and Ajzen, 1975, p. 16, 325). According to the theory of reasoned action, individuals execute a behavior, when they evaluate a behavior as positive and when they believe that persons important to them also evaluate this behavior as positive (Fishbein and Ajzen, 1975, p. 16). The extent of both determinants (attitude and subjective norm) is dependent on the respective situation, i.e., it depends on whether an individual acts as a single individual or as a member of a group (Fishbein and Ajzen, 1975, p. 16). Generally, the subjective norm is outweighed by the attitude (Frey et al., 1993, p. 372). The theory of reasoned action is appropriate to explain decisions with deliberate control of behavior, but the theory does not describe a behavior that is not within the control of an individual executing the behavior (Sheppard et al., 1988, p. 326). This lack of concretion was criticized by some researchers (e.g., Sheppard et al., 1988, p. 326) and led to an extension of the theory of reasoned action to the theory of planned behavior, which is outlined below.

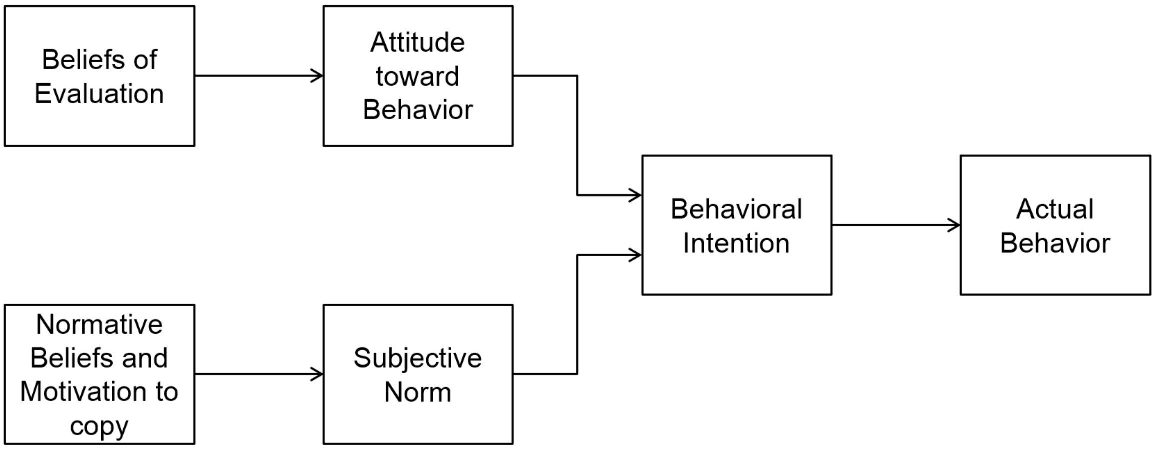

Figure 3.5. – Theory of reasoned action.
Source: Based on Fishbein and Ajzen (1975, p. 16).

3.3.3.2.2. Theory of planned behavior

The limitations of the theory of reasoned action in dealing with behaviors over which people have incomplete volitional control and researchers increasing criticism of these limitations made an extension of the model necessary (Ajzen, 1991, p. 181). Therefore, Ajzen (1985, p. 13) developed the theory of planned behavior, which is based on the theory of reasoned action and the self-efficacy approach by Bandura (1977). He extended the model by integrating the determinant of perceived behavioral control, which is defined as the degree to which individuals believe that they are able to turn intended behavior into real behavior (see Figure 3.6) (Ajzen, 1985, p. 13; Ajzen and Madden, 1986, p. 458). The determinant of perceived behavioral control is influenced by control beliefs, which consist of internal (e.g., personal skills, will power and emotions) and external disturbance variables (e.g., time limits, dependency on the behavior of others) (Ajzen and Madden, 1986, p. 456). Moreover, it has a direct influence on the intention and behavior (Ajzen and Madden, 1986, p. 456). Similar to the theory of reasoned action, the theory of planned behavior assumes that behavior is influenced by intention, whereby intention in turn is determined by the attitude and subjective norm, which are influenced by behavioral and normative beliefs (Ajzen and Madden, 1986, p. 456).

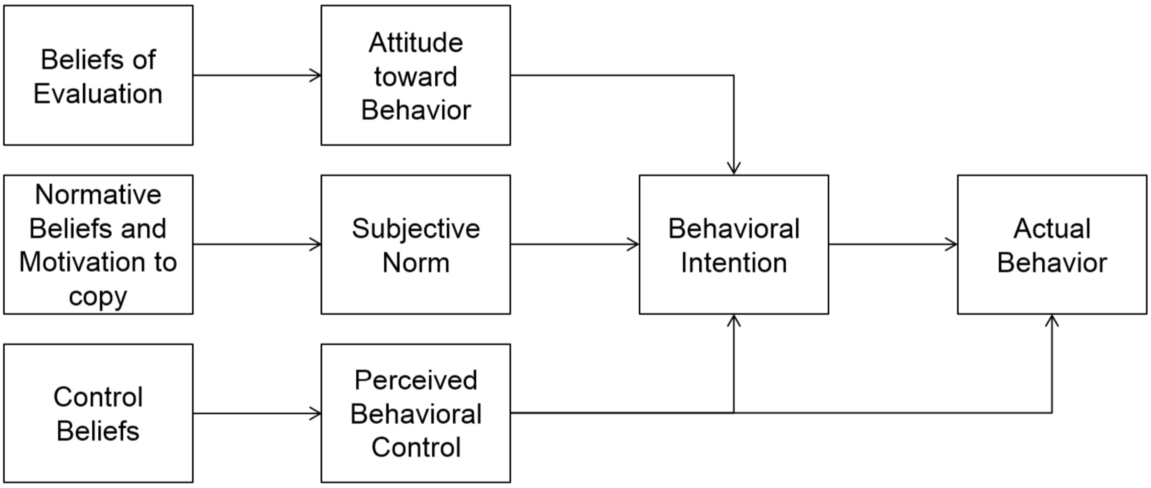

Figure 3.6. – Theory of planned behavior.
Source: Based on Ajzen (1991, p. 182).

3.3.3.2.3. Technology acceptance model

The technology acceptance model by Davis (1989, p. 24) is based on the theory of reasoned action and has been developed in order to explain the acceptance of information technologies (Davis, 1989, p. 24; Davis et al., 1989, p. 985). Davis (1989) picked up the often expressed criticism that the determinants of the theory of reasoned action and the theory of planned behavior lack a precise concretion by postulating that perceived usefulness and perceived ease of use of a technology have an influence on individuals' attitudes and intentions, which in turn influence the use of a technology (see Figure 3.7) (Davis, 1989, p. 24). Perceived usefulness refers to the user's "subjective probability that using a specific application system will increase his or her job performance within an organizational context" (Davis, 1989, p. 985), whereas perceived ease of use is described as "the degree to which the [...] user expects the target system to be free of effort" (Davis, 1989, p. 985). Perceived ease of use and perceived usefulness are both influenced by external variables (Davis, 1989, p. 985). However, Davis (1989) did not integrate a subjective norm component into his model.

The technology acceptance model was first used for communication technologies in organizations (e.g., Schepers and Wetzels, 2007; King and He, 2006; Legris et al., 2003). Later, several authors have adopted this theory to the context of knowledge sharing (e.g., Hsu and Lin, 2008; He and Wei, 2009). In addition, a variety of studies show that the technology acceptance model consistently outperforms the theory of reasoned action and the theory of planned behavior with regard to explained variance (e.g., Davis et al., 1989; Venkatesh et al., 2003; Mathieson, 1991) (Bagozzi, 2007, p. 244). While some researchers criticize the technology acceptance model shortcomings

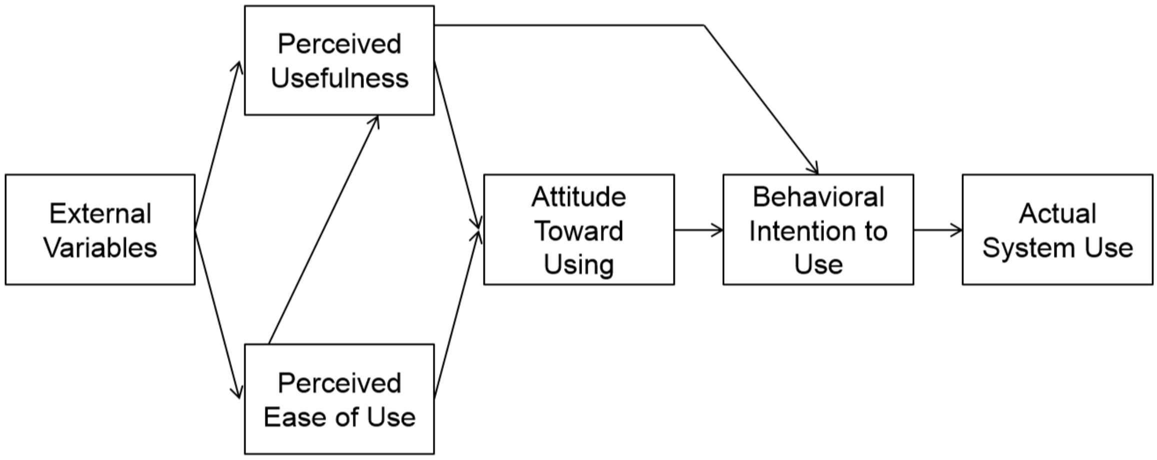

Figure 3.7. – Technology acceptance model.
Source: Based on Davis et al. (1989, p. 985).

(e.g., Lee et al., 2003; Bagozzi, 2007[5]), other researchers have further worked on the model by integrating further determinants into it (e.g., Venkatesh and Davis, 2000). For instance, the original model was extended by developing the technology acceptance model 2 (Venkatesh and Davis, 2000) and technology acceptance model 3 (Venkatesh and Bala, 2008). Moreover, Venkatesh et al. (2003) developed the unified theory of acceptance and use of technology. While the technology acceptance model 2 and technology acceptance model 3 have received little scientific attention, the relevance of the unified theory of acceptance and use of technology has increased and therefore is outlined in the following.

3.3.3.2.4. Unified theory of acceptance and use of technology

Based on a comprehensive literature review, Venkatesh et al. (2003, p. 447) develop the unified theory of acceptance and use of technology (see Figure 3.8). This theory is a result of an analysis and a comparison of eight theoretical models of acceptance research focusing on the prediction of individual use of technology. Four constructs have been deduced by the authors: performance expectancy, effort expectancy, social influence, and facilitating conditions. Moreover, they reveal gender, age, experience (technologies that are already familiar to the individual) and voluntariness of use as moderators. All constructs are outlined in the following. **Performance expectancy** is defined as "the degree to which an individual believes that the use of the system will help achieve gains in job performance" (Venkatesh et al., 2003, p. 447). It is conceptually and empirically identical to the technology acceptance model's construct of "perceived usefulness" (Venkatesh et al., 2003, p. 447; Brown et al., 2010, p. 13). Gender and age moderate the relationship between performance expectancy and intention,

[5]For instance, Bagozzi (2007, p. 245) criticizes the linking between intentions to actual use.

to an extent that for men and younger employees, the positive effect is stronger than for women and older employees (Venkatesh et al., 2003, p. 450). **Effort expectancy**

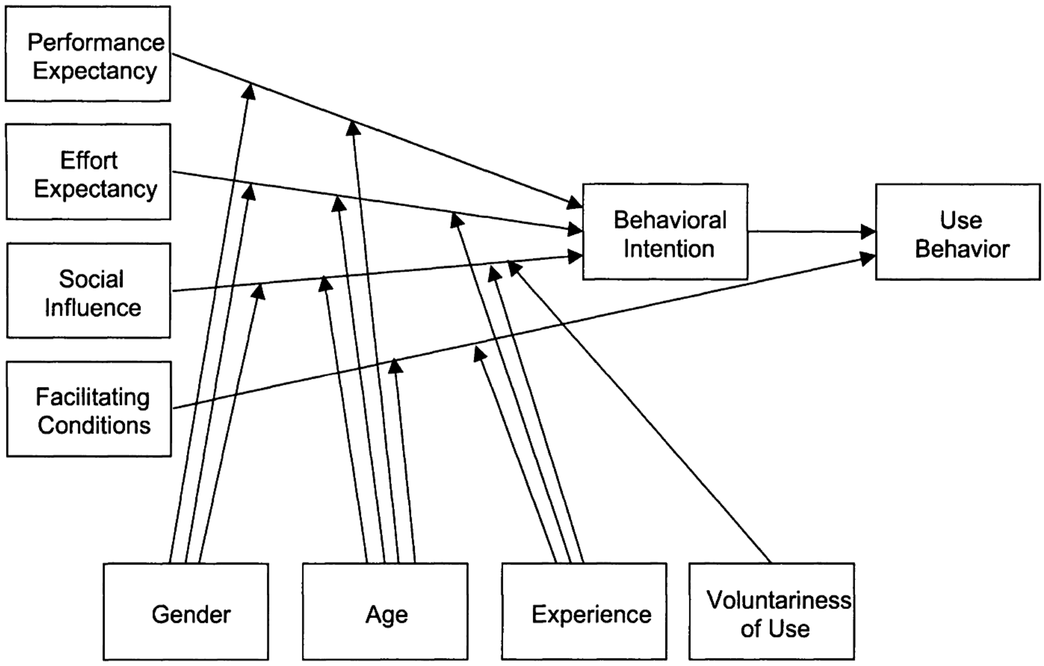

Figure 3.8. – Unified theory of acceptance and use of technology.
Source: Venkatesh et al. (2003, p. 447).

is defined as “the degree of ease associated with using the system” (Venkatesh et al., 2003, p. 450). It is conceptually and empirically identical to the technology acceptance model’s construct of “perceived ease of use” (Venkatesh et al., 2003, p. 450; Brown et al., 2010, p. 13). Gender, age and experience moderate the relationship between effort expectancy and intention, to the extent that for women, older employees and employees with little experience the positive effect is stronger than for men, younger employees and employees with considerable experience (Venkatesh et al., 2003, p. 450). **Social influence** is defined as “the degree to which an individual perceives that important others believe he or she should use the system” (Venkatesh et al., 2003, p. 451). Gender, age, voluntariness and experience moderate the relationship between social influence and intention, to the extent that, under condition of obligatory use, the positive effect is stronger for women, older employees and employees with little experience than for men, younger employees and employees with considerable experience (Venkatesh et al., 2003, p. 453). **Facilitating conditions** are defined as “the degree to which the individual believes that organizational and technical infrastructure is available to support the use of the system” (Venkatesh et al., 2003, p. 453). Age and experience moderate the relationship between facilitating conditions and behavior, to the extent that for older employees who have considerable experience the positive effect is stronger than for younger employees who have little experience (Venkatesh et al., 2003, p. 455). In addition, Venkatesh et al. (2003, p. 468) empirically show that intention has a positive effect on use. The unified theory of acceptance and use of technology has been increasingly used for investigating collaboration technology use (e.g., Brown et al., 2010).[6]

3.3.3.2.5. Conclusions

The variations of the behavioral and attitudinal theories of Fishbein and Ajzen (theory of reasoned action, theory of planned behavior, technology acceptance model, unified theory of acceptance and use of technology) are appropriate in explaining a variety of human behavior, since their components have a high degree of explanation power, as several empirical studies have shown (e.g., Fishbein and Ajzen, 1975; Ajzen, 1985; Davis, 1989; Venkatesh et al., 2003). Another advantage lies in their verifiability, i.e., definitions, operationalizations and causal relationships of the models already exist (e.g., Fishbein and Ajzen, 1975; Ajzen, 1985; Davis, 1989; Venkatesh et al., 2003). The theory of reasoned action and the theory of planned behavior have been used as a theoretical foundation for numerous empirical studies that explore face-to-face knowledge sharing (e.g., Lin and Lee, 2004; Bock et al., 2005; Lin, 2007a), whereas the technology acceptance model and the unified theory of acceptance and use of technology have been applied to knowledge sharing with regard to a certain technology (e.g., Gefen et al., 2003; Brown et al., 2010). Generally, these empirical studies have been extended by integrating additional determinants. Since this thesis investigates knowledge sharing through enterprise social software, the technology acceptance model and the unified theory of acceptance and use of technology are appropriate as a theoretical basis for this thesis. The technology acceptance model is the most utilized model in studying information systems (Bagozzi, 2007, p. 245). Moreover, in a qualitative meta-analysis, it has been stated that the technology acceptance model is an appropriate model since it shows a high degree of explanatory power (Legris et al., 2003, p. 202). Nonetheless, researchers of the qualitative meta-analysis claim that it lacks human and social change process variables (Legris et al., 2003, p. 202; Lee et al., 2003, p. 767). In addition, researchers criticize that the use of the unified theory of acceptance and use of technology provide very general information and that more specific information is needed to measure a system's performance on various outcomes, and to identify factors that respondents feel might be barriers to system use (Bagozzi, 2007, p. 245).

Therefore, this thesis uses the core determinants of both theories (technology acceptance theory and unified theory of acceptance and use of technology), which are **effort**

[6] The unified theory of acceptance and use was criticized by some researchers (see Bagozzi, 2007 for a discussion regarding the model's shortcomings).

expectancy[7], **performance expectancy**[8], **facilitating conditions**, **gender**, **age**, **experience**, **attitude** and **intention** in order to combine these with human and social process variables deduced from social theories.[9]

When exploring knowledge sharing through enterprise social software the individual's desire for fulfillment of his or her own interests in favor of groups and organizational interests are of special interest in this thesis. Since social capital helps explaining such behavior, the social capital theory is outlined below.

3.3.3.3. Social capital theory

Social capital has been explored by many researchers (e.g., Burt, 1992; Putnam, 2000; Lin, 2001), resulting in the development of a variety of different theories. The theories of Nahapiet and Ghoshal (1998) and of Cohen and Prusak (2001) have been applied in previous research exploring the nature of knowledge (e.g., Fuchs, 2004, p. 84). Compared to the theory of Cohen and Prusak (2001), the theory of Nahapiet and Ghoshal (1998) has been used more often in the specific context of knowledge sharing (e.g., Kankanhalli et al., 2005b, p. 16). Accordingly, it is also applied in this thesis.

Nahapiet and Ghoshal define social capital as "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit" (Nahapiet and Ghoshal, 1998, p. 243). The presence of social capital can facilitate cooperation and collaboration (Kankanhalli, 2002, p. 42). Nahapiet and Ghoshal (1998, p. 242) assume that social capital is a prerequisite in order to use and build intellectual capital. Accordingly, Nahapiet and Ghoshal (1998, p. 245) state that:

> The term 'intellectual capital' [...] refers to the knowledge and knowing capability of a social collectivity, such as an organization, intellectual community, or professional practice. [...] Intellectual capital thus represents a valuable resource and a capability for action based in knowledge and knowing.

[7]Effort expectancy is conceptually equal to the technology acceptance model's construct of perceived ease of use.

[8]Performance expectancy is conceptually equal to the technology acceptance model's construct of perceived usefulness.

[9]In this thesis, knowledge sharing norms instead of social influence is investigated, which is explained in the following section. In contrast to social influence (the degree to which an individual perceives that important others believe he or she should use the new system) and subjective norm (person's perception that most people who are important to him think he should or should not perform the behavior in question), knowledge sharing norms refer to the behavior rather than the technology by investigating the prevalence of norms that are intended to facilitate knowledge sharing in organizations. Voluntariness of use is also not investigated since at the pre-implementation stage it is not always clear if enterprise social software will be implemented on an obligatory or voluntary basis.

Moreover, they describe the production and use of knowledge as a complex reflexive process, which is determined by three central dimensions (Nahapiet and Ghoshal, 1998, p. 245). These can be divided into the structural dimension of social capital, cognitive dimension of social capital and relational dimension of social capital (see Figure 3.9), which are outlined in the following.

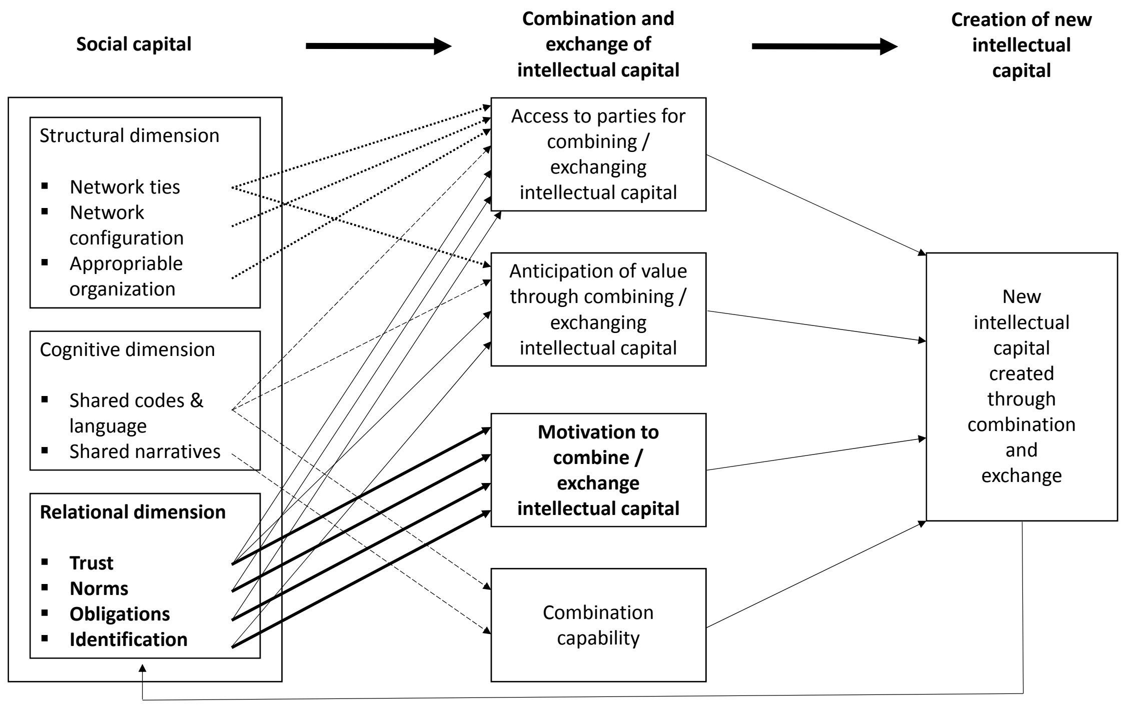

Figure 3.9. – Social capital in the creation of intellectual capital.
Source: Based on Nahapiet and Ghoshal (1998, p. 251).

The **structural dimension of social capital** refers to the structure of a network, i.e., the main focus lies on the connections between actors (Nahapiet and Ghoshal, 1998, p. 252). This dimension consists of the number of connections, the configuration of the network and the access and acquisition of intangible resources, which allow the diffusion and combination of intangible resources (Nahapiet and Ghoshal, 1998, p. 252).

The **cognitive dimension of social capital** refers to language that can be shared through codes, symbols and narratives (Nahapiet and Ghoshal, 1998, p. 253). In order to understand these codes, symbols and narratives, individuals have to make sense of them (Nahapiet and Ghoshal, 1998, p. 253). Therefore, cognitive skills are important since they have a sense-making function and a function to anticipate shared values (Nahapiet and Ghoshal, 1998, p. 253).

The relationship between social capital and intellectual capital shows the importance of the **relational dimension of social capital** (Nahapiet and Ghoshal, 1998, p. 254).

When people interact with each other over a long period of time, a personal relationship evolves, which is called “relational embeddedness” (Nahapiet and Ghoshal, 1998, p. 244). This term considers the relations between people, which in turn influence their behavior (Nahapiet and Ghoshal, 1998, p. 244). Because of such relations people strive for social rewards (e.g., approval and prestige) (Nahapiet and Ghoshal, 1998, p. 244). The core factors of this dimension are trust, norms, obligations[10] and identification (Nahapiet and Ghoshal, 1998, p. 244). All three dimensions have an influence on the ability of an organization to produce and share intellectual capital (Nahapiet and Ghoshal, 1998, p. 244).

In the following, it is explained how the different dimensions of social capital help create intellectual capital. As Figure 3.9 illustrates, all dimensions are dialectical related to each other (Nahapiet and Ghoshal, 1998, p. 251). The arrows of the figure show the causal relationships between the dimensions of social capital and the characteristics of the combination and exchange of intellectual capital (access to parties, anticipation of value, motivation to combine and combination capability), which positively influence the creation of new intellectual capital (Nahapiet and Ghoshal, 1998, p. 250; Kankanhalli, 2002, p. 42). All dimensions have different influences on the processes, with which organizational skills develop, and that allow the creation, sharing and combination of new knowledge forms (Nahapiet and Ghoshal, 1998, p. 250; Kankanhalli, 2002, p. 42). The structural dimension of social capital affects the access to parties for combining/exchanging intellectual capital (Nahapiet and Ghoshal, 1998, p. 250; Kankanhalli, 2002, p. 42). In addition, the structure of network relationships influences the anticipation of the value of knowledge (Nahapiet and Ghoshal, 1998, p. 250; Kankanhalli, 2002, p. 42). The cognitive dimension of social capital has an influence on all characteristics of the combination and exchange of intellectual capital and therefore serves as a prerequisite in order to combine all knowledge forms, i.e., if each actor speaks the same language, cognitive skills would facilitate the access to knowledge forms and the anticipation of the value of knowledge (Nahapiet and Ghoshal, 1998, p. 250; Kankanhalli, 2002, p. 42). The relational dimension of social capital also has an influence on all characteristics of the combination and exchange of intellectual capital (Nahapiet and Ghoshal, 1998, p. 251; Kankanhalli, 2002, p. 42). For instance, trust is an important factor that facilitates the access to existing knowledge resources and the anticipation of the value of these resources (Nahapiet and Ghoshal, 1998, p. 250; Kankanhalli, 2002, p. 42). Moreover, it increases the motivation across employees to share knowledge (Nahapiet and Ghoshal, 1998, p. 250; Kankanhalli, 2002, p. 42). In turn, new intellectual capital created through combination and exchange has a recursive influence on the development of the dimensions of social capital (Nahapiet and Ghoshal, 1998, p. 250; Kankanhalli, 2002, p. 42). To this end, social capital helps to overcome the individual’s desire for fulfillment of his

[10]In this thesis, reciprocity is considered as a form of social obligation (Cialdini, 2009, p. 31).

or her own interests in favor of group and organizational interests (Leana and van Buren, 1999, p. 547).

The cognitive dimension refers to cultural differences, such as language. Cultural factors are not considered in this thesis, as this would be going beyond the scope of this thesis. Accordingly, cultural aspects should be considered in greater detail in future research. The same applies in respect of the structural dimension. **In the context of this thesis, the relational dimension is explored**, since it addresses the motivation to combine/exchange intellectual capital (see Figure 3.9, the relevant factors and rows are marked in bold). The relational dimension refers to networks of interpersonal relationships, which traditionally developed through face-to-face interactions (Kankanhalli, 2002, p. 42). While several researchers have already adapted this view to online interactions (e.g., Cohen and Prusak, 2001; Baker, 2000; Kankanhalli et al., 2005b), this study applies the relational dimension to the context of knowledge sharing through enterprise social software. Therefore, it is theorized that employees using enterprise social software do not only share and seek knowledge in order to solve problems but also to develop social relationships, which are based on **interpersonal trust**, **knowledge sharing norms**, **reciprocity** and **organizational identification**.[11] Consequently, social capital may stimulate employees to exert efforts associated with knowledge sharing (Kankanhalli et al., 2005b, p. 113; Piwinger and Zerfaß, 2007, p. 189; Schewe and Nienaber, 2011, p. 50; Fulk and Yuan, 2013, p. 20). However, the social capital theory is limited in addressing the costs and benefits of exchange and the classification of costs, necessitating the introduction of additional theories, as the foundation for exploring the impact of knowledge sharing through enterprise social software. Consequently, exchange theories are introduced to supplement the social capital theory to address the research questions.

3.3.3.4. Exchange theories

Exchange relationships have been explored by many researchers (e.g., Homans, 1958; Homans, 1961; Thibaut and Kelley, 1959; Walster et al., 1973; Rusbult, 1980), which led to the development of a variety of different theories. The social exchange theory posits that people strive to maximize their own benefits and minimize their costs (Huston and Burgess, 1979, p. 4-5; Molm, 1997, p. 4). The basis of social exchange theory is the assumption that interactions represent a mutual transfer of physical and psychological resources. Therefore, interactions can be understood as an exchange of economic and social rewards and costs (Blau, 1964, p. 14). Researchers refer to the exchange theory by Homans (1958) and the exchange theory by Thibaut and Kelley (1959), when exploring knowledge exchange relationships (e.g., Bock and Kim, 2002, p. 15; Casimir et al., 2012, p. 463). Both theories posit that people are guided by their

[11] Following the approach of Kankanhalli (2002, p. 42), the determinants derived from social capital are conceptualized as moderators that govern the conditions under which the individual factors would impact enterprise social software use for knowledge sharing.

rational self-interest and that their behavior is influenced by the associated rewards and costs (Kankanhalli, 2002, p. 26).

Hereafter, Homans' exchange theory (see Section 3.3.3.4.1) and Thibaut and Kelley's exchange theory (see Section 3.3.3.4.2) are outlined by following the argumentation of Goddard et al. (2012, p. 282-284).

3.3.3.4.1. Homans' exchange theory

According to Homans (1958, 1961), individuals interact with each other in order to receive worthwhile and fair results, i.e., they expect profits from an interaction (Homans, 1958, p. 597; Goddard et al., 2012, p. 282). Moreover, their expectations concerning profits depend on normative perceptions, which in turn are influenced by equivalent or distributive justice (Homans, 1958, p. 600; Goddard et al., 2012, p. 282). In his original equivalent justice approach, Homans (1958) argues that individuals do not only receive a benefit or a reward from an interaction, but also have to accept that egoistic goals stay behind (Homans, 1958, p. 603; Goddard et al., 2012, p. 282). Therefore, Equations (3.1) and (3.2) were deduced (Homans, 1958, p. 603; Müller and Crott, 1984, p. 219; Goddard et al., 2012, p. 282):

$$profit_{(\text{Person A})} = reward_{(A)} - costs_{(A)} \quad \text{in relation to} \tag{3.1}$$

$$profit_{(\text{Person B})} = reward_{(B)} - costs_{(B)} \tag{3.2}$$

Homans (1958) states that even if the rewards and costs of two or more individuals are different, the profits stay the same for both (Müller and Crott, 1984, p. 219; Goddard et al., 2012, p. 282). Consequently, Equation (3.3) was formulated (Müller and Crott, 1984, p. 219; Goddard et al., 2012, p. 282):

$$profit_{(\text{Person A})} = profit_{(\text{Person B})} \tag{3.3}$$

The absolute profit equality leads to the same results of profits for all individuals, irrespective of the individual input (Homans, 1958, p. 603; Goddard et al., 2012, p. 282). However, individual differences and circumstances influenced by different situations are not considered (Müller and Crott, 1984, p. 220; McClinttock et al., 1984, p. 201; Goddard et al., 2012, p. 282).

In 1961, Homans corrected his rather undifferentiated and relatively idealistic assumption of a principle of distributive justice that focuses on absolutely the same profits of all interaction partners to the principle of relative profit equivalence (Goddard et al., 2012, p. 282). Accordingly, he assumes that a person expects from an interpersonal relationship that the profits will be proportional to the investments, i.e., the higher the investments, the higher the profits (Homans, 1961, p. 264). Such investments refer to individual characteristics (e.g., age, experience, intelligence, etc.) (Müller and Crott, 1984, p. 220; Goddard et al., 2012, p. 282). Accordingly, he deduced Equation (3.4) (Homans, 1961, p. 264; Müller and Crott, 1984, p. 220; Goddard et al., 2012, p. 282):

$$\frac{profit_{(\text{Person A})}}{investment_{(\text{Person A})}} = \frac{profit_{(\text{Person B})}}{investment_{(\text{Person B})}} \tag{3.4}$$

If the principle of relative profit equivalence is not met, for instance, if an interaction partner receives an advantage from the point of view of another partner, the disadvantaged person gets unsatisfied and upset, while the advantaged person rather feels guilty than satisfied (Homans, 1961, p. 264; McClinttock et al., 1984, p. 202; Goddard et al., 2012, p. 282). Consequently, both interaction partners feel dissatisfied with the results of the interaction and strive for restoring the equivalent justice (Homans, 1961, p. 264; Goddard et al., 2012, p. 282). This can be either done by reducing the profits of a partner or the input-costs relation (Homans, 1961, p. 264; Müller and Crott, 1984, p. 221; Goddard et al., 2012, p. 282).

According to the foregoing explanations, it can be deduced that employees aggregate the individual expected rewards and costs to an expected net benefit (Goddard et al., 2012, p. 282). However, the quantity and value of knowledge contributed and also the quantity and nature of return cannot be specified (Kankanhalli, 2002, p. 20; Abrams et al., 2003, p. 72; Chen and Hung, 2010, p. 227; Cho et al., 2010, p. 1202). In the following, the social exchange theory by Thibaut and Kelley (1959) is outlined, which received broad acceptance in knowledge management literature.

3.3.3.4.2. Thibaut and Kelley's exchange theory

The social exchange theory by Thibaut and Kelley (1959) investigates the outcomes of an exchange. According to this theory, interaction partners strive to maximize their outcomes either in cooperation or at the expense of the other partner (Fischer and Wiswede, 1997, p. 390). The development of a long-term social relationship increases with more positive outcomes, i.e., the difference between results and inputs is regarded as positive (Goddard et al., 2012, p. 283). Thibaut and Kelley (1959, p. 21) developed a payoff matrix in order to support their assumptions (see Figure 3.10). They assume that each interaction partner has a number of behavioral alternatives (Thibaut and Kelley, 1959, p. 14; Goddard et al., 2012, p. 283). Each alternative has a value of (V), which is associated with costs and benefits for both partners (Thibaut and Kelley, 1959, p. 14; Goddard et al., 2012, p. 283). The value of one alternative does not have to be equal for all partners (Goddard et al., 2012, p. 283). The lines of the matrix illustrate the different result-input relations for person A (Goddard et al., 2012, p. 283). The columns represent the result-input relations for person B (Goddard et al., 2012, p. 283). The interaction partners are influenced by exogenous variables, such as individual needs, and endogenous variables, such as experiences (Thibaut and Kelley, 1959, p. 14-15; Goddard et al., 2012, p. 283). Each combination leads to a specific

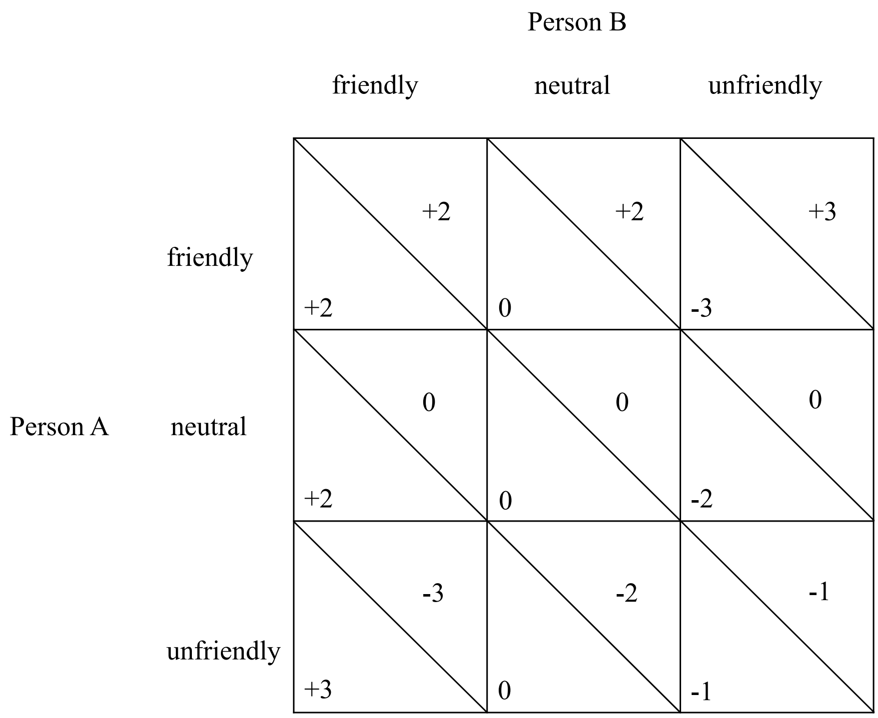

Figure 3.10. – Payoff matrix of social relationships.
Source: Goddard et al. (2012, p. 283).

result for both interaction partners (Thibaut and Kelley, 1959, p. 15; McClinttock et al., 1984, p. 205; Goddard et al., 2012, p. 283). The results provide evidence for the satisfaction of the interaction partners and the stability of their relationship (Fischer and Wiswede, 1997, p. 390; Goddard et al., 2012, p. 283); a further conclusion states that mutual or separate actions bring more earnings (Goddard et al., 2012, p. 283). Moreover, agreements can increase the total sum (Wiswede, 1991, p. 102; Goddard et al., 2012, p. 283).

Thibaut and Kelley (1959) assume that the value of a relationship can only be measured through a comparative index (see Figure 3.11) (Goddard et al., 2012, p. 284). Accordingly, they assume that individuals evaluate the value of a relationship on the basis of two indicators (Goddard et al., 2012, p. 284). The first one is the comparison level (CL), which is derived from actual experiences (Thibaut and Kelley, 1959, p. 21; Goddard et al., 2012, p. 284). With regard to a customer-client relationship, a customer will draw on the experience he or she has already made with a product or an organization (Goddard et al., 2012, p. 284). This refers to a sort of average measure of made experiences, which is an indicator with which customers evaluate how good or bad the current result of a relationship is (Goddard et al., 2012, p. 284). Positive experiences with the product or the organization increase the CL, whereas

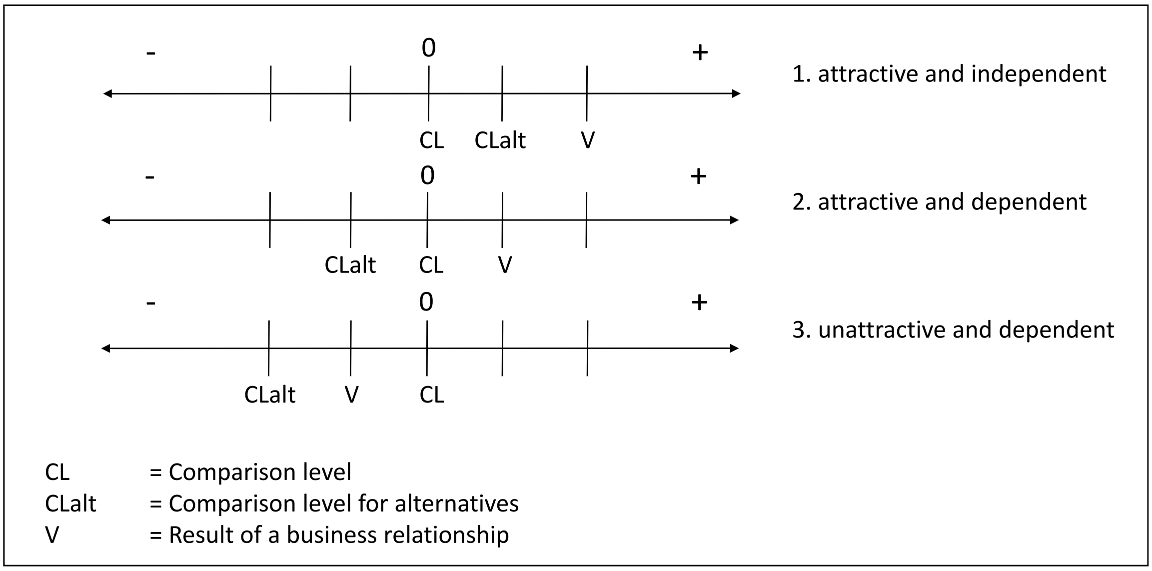

Figure 3.11. – Attractiveness and dependency in social relationships.
Source: Goddard et al. (2012, p. 284).

negative experiences reduce the CL (Goddard et al., 2012, p. 284). A comparison between the value (V) of the current relationship and the CL is not sufficient to evaluate whether a customer will terminate a relationship or not (Goddard et al., 2012, p. 284). Therefore, a second indicator has to be introduced, which is called comparison level for alternatives (CLalt) (Thibaut and Kelley, 1959, p. 21; Goddard et al., 2012, p. 284). This indicator is a kind of average measure of benefits and costs of alternatives, whereas the best alternative is particularly considered (Goddard et al., 2012, p. 284). The simultaneous consideration of V, CL and CLalt allows to deduce statements according to the attractiveness and dependency of relationships (Goddard et al., 2012, p. 284):

1. The current V is above CL and CLalt. The relationship is attractive to the customer, since V is higher than the attractive alternative CLalt. The customer is independent due to this alternative, but he or she could terminate the relationship and still would be above the CL.

2. The current V is above CL. Thus, the relationship is attractive. Since CLalt lies below CL, the customer has no attractive alternative and therefore is dependent.

3. The current V is below CL, the relationship is unattractive. Since CLalt is below the current V, a customer would be worse off if he or she had terminated the relationship. The customer is dependent in an unattractive relationship.

3.3.3.4.3. Conclusions

The traditional social exchange approach does not consider knowledge as an exchange resource (Jarvenpaa and Staples, 2000, p. 132). However, scientists from information systems and organizational behavior research have already adapted Thibaut and Kelley's exchange theory to knowledge sharing (e.g., Constant et al., 1994; Kankanhalli et al., 2005b). Therefore, Thibaut and Kelley's exchange theory is also used as a theoretical foundation in this thesis. Hence, prior research has indicated that knowledge sharing involves costs for the knowledge sender, such as time, energy, potential loss of ownership and power, so that rewards become increasingly important (Ba et al., 2001, p. 229; Beer and Nohria, 2000, p. 137; Hall, 2001b, p. 1; Davenport et al., 1998, p. 50; Jarvenpaa and Staples, 2000, p. 134, 147; Ruggles, 1998, p. 82). Moreover, knowledge management researchers postulate that knowledge recipients feel obligated to repay a favor (Jarvenpaa and Staples, 2000, p. 131). Accordingly, employees expect some future return, which is not specified ex ante (Blau, 1964, p. 16).

Previous research with regard to knowledge sharing has used the social exchange theory in order to investigate extrinsic and intrinsic motives. For instance, the *intrinsic motives* **self-efficacy** and **altruism** have already been investigated (e.g., Wasko and Faraj, 2000; Brockner, 1988; Gardner and Pierce, 1998; Gecas, 1989; Stajkovic and Luthans, 1998; Cho et al., 2010). With regard to *extrinsic motives*, the following factors have already been analyzed: **reciprocity** (e.g., Gomez-Mejia and Balkin, 1990; Malhotra and Galletta, 1999; Bock et al., 2005; Deluga, 1998; Major et al., 1995; Parkhe, 1993; Sparrowe and Linden, 1997; Wasko and Faraj, 2000; Yamagishi and Cook, 1993; Kankanhalli et al., 2005b), **management support** (e.g., Kim and Kankanhalli, 2009; Tan and Zhao, 2003), **social rewards for knowledge sharing** (e.g., Wasko and Faraj, 2000; Hall, 2001a; Lin, 2007b; Kollock, 1998; Kankanhalli et al., 2005b) and **economic rewards for knowledge sharing** (e.g., Ba et al., 2001; Beer and Nohria, 2000; Hall, 2001b; Davenport et al., 1998; Jarvenpaa and Staples, 2000; Ruggles, 1998; Kankanhalli et al., 2005b; Lin, 2007b).[12]

From a social exchange perspective, it is assumed that increasing the benefits and reducing the costs for knowledge sharing can encourage employees to contribute to enterprise social software (Markus, 2001, p. 79; Wasko and Faraj, 2000, p. 39). Therefore, following the above mentioned approaches, it is expected that the determi-

[12] It is noteworthy that most of the current published research papers did not exist at the beginning of this thesis in 2011 (e.g., Kügler and Smolnik, 2014; Ellison et al., 2014; Leonardi et al., 2013). Therefore, it becomes clear why most of the identified factors analyzed in this research are based on a literature review that covers the years 2005 to 2012 (e.g., Kankanhalli et al., 2005b; Bock et al., 2005; Lin, 2007b; Venkatesh et al., 2012; etc.).

nants of self-efficacy, altruism, reciprocity, management support, social rewards, and economic rewards for knowledge sharing influence an employee's willingness to share knowledge through enterprise social software.

3.3.4. Synthesis

At the beginning of this section NIE and game theory have been presented and adapted to the context of knowledge sharing in order to provide a general overview of different perspectives on knowledge. Compared to NIE and game theory, socio-psychological theories allow for a more differentiated view on the determinants that influence employees' willingness to share knowledge. Therefore, socio-psychological theories, which have been increasingly used by knowledge management researchers, have been discussed in order to identify relevant determinants of employees' willingness to share knowledge through enterprise social software. The identified determinants, which are the basis for qualitative and quantitative research are selected from theories, which do not contradict but supplement each other. Hence, the theories (e.g., NIE and exchange theories) have in common that they agree in postulating that actors behave according to the expectation of outcomes. Each of the theoretical approaches provides a contribution to answer the research questions. Table 3.5 gives an overview of the identified determinants and their associated theories. In conclusion, this thesis combines social theories (social capital theory, social exchange theory) with theories of acceptance research (technology acceptance model and unified theory of acceptance and use of technology) to develop a theoretical framework in order to understand why employees share knowledge through enterprise social software.

After deducing relevant factors from socio-psychological theories, the identified factors have been classified as belonging to one of the following categories:

- Technological factors
- Rewards for knowledge sharing
- Personal factors
- Organizational factors
- Demographic factors

The categorization into into technological, personal and organizational factors has been deduced from the TOM model (Bullinger et al., 1997, p. 10). In addition, this thesis aims to investigate the significance of rewards for knowledge sharing. Since there are controversial views with regard to social and economic rewards for knowledge sharing (Eisenberger and Cameron, 1996, p. 1154; Alfie, 1993, p. 55), both will be regarded in this thesis. In addition, prior literature suggests that knowledge sharing via technology

Theory	Determinants
Unified theory of acceptance and use of technology	Effort expectancy Performance expectancy Facilitating conditions Intention Gender Experience Age
Technology acceptance model	Attitude
Social capital theory	Organizational identification Knowledge sharing norms Interpersonal trust
Social exchange theory	Self-efficacy Altruism Reciprocity Management support Economic rewards for knowledge sharing Social rewards for knowledge sharing

Table 3.5. – Factors deduced from theories.
Source: Own table.

is influenced by demographics, such as gender, age and experience (Venkatesh et al., 2003, p. 447).

Hence, factors, that directly refer to the technology, are regarded as technological factors, such as effort expectancy, performance expectancy and facilitating conditions. In addition, rewards for knowledge sharing are investigated (economic rewards for knowledge sharing and social rewards for knowledge sharing). Moreover, personal factors refer to human and individual characteristics which influence their behavior, such as self-efficacy, altruism, reciprocity, and interpersonal trust. Furthermore, factors that refer to the development of a framework to support knowledge sharing are assigned to organizational factors, for instance management support, knowledge sharing norms and organizational identification. Finally, demographic factors, such as gender, experience and age are explored. The classification of determinants is summarized in Table 3.6.

Classification	Determinants
Technological factors	Effort expectancy Performance expectancy Facilitating conditions
Rewards for knowledge sharing	Economic rewards Social rewards
Personal factors	Self-efficacy Altruism Reciprocity Interpersonal trust
Organizational factors	Management support Knowledge sharing norms Organizational identification
Demographic factors	Gender Experience Age

Table 3.6. – Classification of the determinants.
Source: Own table.

4. Qualitative analysis

Based on a theoretical discussion, a first understanding of enterprise social software and employees' willingness to accept and use this new technology has been developed. In order to validate and supplement prior literature, context-specific interviews and a qualitative meta-analysis of case studies are conducted and presented in this chapter. *Qualitative interviews* are conducted for two reasons. On the one hand, the aim is to provide first evidence for the theoretical assumptions, while, on the other hand, they should also provide insights into employees' *expectations* concerning knowledge sharing through enterprise social software *(pre-implementation stage)*. Accordingly, discovering whether factors mentioned in previous literature are also mentioned by the interviewees, constitutes an interesting outcome of this thesis. At the beginning of this research work, it was planned that the same employees who would have been interviewed at the pre-implementation stage of enterprise social software would again be questioned after enterprise social software had been implemented. Unfortunately this was not possible, since the organizations were not prepared to make further resources available. Therefore, a *qualitative meta-analysis of case studies* has been chosen as an alternative approach in order to obtain insights into employees' *experiences* with enterprise social software *(post-implementation stage)*. The meta-analysis contributes to the study by examining whether the factors mentioned by the interviewees or prior literature can also be found in the analyzed case studies, thus giving first empirical evidence on whether the same relevant factors can be found at the pre-implementation stage and at the post-implementation stage of enterprise social software for knowledge sharing.

Hence, the interview analysis is described in Section 4.1 and the qualitative meta-analysis of case studies is presented in Section 4.2.

4.1. Interview analysis

The aim of the qualitative interviews is outlined in Section 4.1.1. In Section 4.1.2, the interview guideline is described and Section 4.1.3 refers to the interview design. Section 4.1.4 provides information about the validity of the data. Since employees of two organizations are interviewed, these organizations are briefly presented in Section 4.1.5 and Section 4.1.6. Through the interviews, the deficits of the organizations' current knowledge management are detected and are summarized in Section 4.1.7. The identification of the main factors influencing knowledge sharing through enterprise social software is the primary objective of the interview analysis. Therefore, qualitative results in form of representative quotations are outlined in Section 4.1.8. Finally, the main findings and quantitative results (frequencies, e.g., number of statements) are summarized in Section 4.1.9.

4.1.1. Aim of the qualitative interviews

The interview analysis is qualitative in nature and consists of two phases. First, a literature review is conducted to explore knowledge sharing determinants. Second, in-depth interviews are executed to validate and supplement prior literature and give first empirical evidence for a theoretical framework in the context of the pre-implementation stage of enterprise social software. The interviews are conducted as a means for preliminary support for the proposed constructs. Moreover, the purpose is to discover further important determinants. To support the constructs found in the analyzed literature, seven employees of a multinational IT services and consulting corporation and seven employees of an internationally operating automotive part supplier are interviewed. At the time of the interviews, both companies were planning to introduce enterprise social software. Hence, enterprise social software had not yet been introduced in their companies, although employees had already been informed about the initiatives planned. The interviews provide first insights into their opinions and expectations regarding the planned introduction of enterprise social software through which knowledge should be shared.[1]

4.1.2. Interview guideline

Since research on the determinants of knowledge management is extensive, the interviews are conducted based on theoretical assumptions (Galliers and Leidner, 2009, xiii). They should reveal whether the factors, which have already been identified according to face-to-face knowledge sharing and electronic knowledge sharing, also apply in the context of enterprise social software. A structured guideline is used in order to directly compare the results, thus increasing their reliability (Gaedke and Robra-Bissantz, 2012, p. 2005). The questions used in the structured interviews have been developed based on knowledge management as well as information systems literature (Sukowski, 2002, p. 201; Stocker and Tochtermann, 2012, p. 251; Bullinger et al., 1997, p. 17; Romhardt, 1998, p. 373).

According to the signs-data-information-knowledge approach, the knowledge receiver internalizes information, which then becomes knowledge again by restructuring and making sense of it, for instance, through learning by doing or reading (Hendriks, 1999, p. 92; Maier, 2002, p. 61). Therefore, questions of the interview guideline that

[1]See Matschke et al. (2014, p. 552) for a similar comparison between users' **expectations** (the authors also conducted qualitative interviews in order to identify relevant success factors) and **experiences** (the authors used a questionnaire in order to evaluate users' experiences) in terms of acceptance and use of Web 2.0 technologies.

are assigned to the knowledge receiver should actually refer to information (e.g., "How often do you receive information...”), whereas questions that are assigned to the knowledge sender should refer to knowledge (e.g., "How often do you share knowledge...?") (Hopf, 2009, p. 8). Since such inconsistencies are difficult for the interviewees to follow, in this thesis all questions used for the interview guideline refer to knowledge (Hopf, 2009, p. 8).

The types of questions of the interview guideline involve several open-ended questions as well as "yes" and "no" responses, typically asking the respondents to elaborate on "why" they responded accordingly (see Herjanic and Campbell (1977, p. 129) and Silverman et al. (2001, p. 939) for a similar procedure). The conceptual validation process is adopted from Moore and Benbasat (1991, p. 192). Hence, the conceptual validation procedure has been carried out by an unstructured sorting (without headlines) in round one and structured sorting (with headlines: knowledge management, individual's knowledge sharing, interpersonal knowledge sharing, knowledge management systems, public social software, acceptance and use of enterprise social software) in the second round. For each sorting round, three different judges (student research assistants) are chosen. Questions are structured and similar questions deleted according to the judges' recommendations. The first interview guideline consists of 55 questions. The experiences gained from the first interviews are used to further refine the guideline. Based upon the interviewees' reactions towards the questions, some questions have been deleted, so that the final version of the interview guideline consists of 44 questions.

In the following, the structure of the interview guideline is explained. The interview guideline consists of seven parts. It begins with an introduction, general questions and a differentiation between signs, data, information and knowledge. In order to get an insight into the company's overhaul knowledge management, the first part of the interview guideline contains questions regarding the company's knowledge application, knowledge storing, knowledge sharing, knowledge generation, knowledge acquisition and knowledge identification. These classifications refer to the building blocks of knowledge management by Probst et al. (2012, p. 34), which have been outlined in Section 2.3.2.3. The questions aim to identify the prevalent problems in the company's current knowledge management and to identify areas in which the use of enterprise social software could enhance work situations. The second part consists of questions concerning individuals' reasons to share knowledge, whereas the third part asks about interpersonal knowledge sharing behavior. In part four, knowledge management systems are generally discussed. Although this thesis does not focus on specific enterprise social software tools, the most common enterprise social software tools (blogs, wikis and social networks) (Chui et al., 2009, p. 1; Ali-Hassan and Nevo, 2009, p. 3) have been defined, since otherwise it would have been difficult to discuss tools of which the interviewees have never seen or used before. Accordingly, definitions of these tools were given to the interviewees before asking the next questions. The fifth part includes questions on public social software and employees' opinions on corporate blogs, corporate wikis and corporate social networks. Part six involves questions with regard to the acceptance and predicted use of enterprise social software. The interview guideline ends by asking some personal questions and thanking the interviewees for their support.

4.1.3. Interview design: A qualitative content analysis approach

Employees, management and the project team were interviewed to develop an integrative view of the forces influencing individuals' willingness to share knowledge through enterprise social software. In order to ensure a wide diversity of views, a heterogeneous group was randomly selected by the company (see Table 4.1) (Kitzinger, 1994, p. 104). All interviews were face-to-face, lasted from 40 to 70 minutes and were audio-taped and transcribed. The interviews were analyzed following the guidelines outlined by Mayring (2000) in order to strengthen the generalizability and internal validity of the results. Thus, the *qualitative content analysis approach* was used. Both deductive (grounded on literature) and inductive (generated by the answers) category building and coding were employed (Mayring, 2000, p. 11, 14). For qualitative data analysis, the software package "maxqda" was used. First, themes (factors) were developed based on the prior literature review (see also Boyatzis (1998) and Miles and Huberman (1994)). Statements containing the same theme were then grouped to form categories. A coding guideline was developed containing definitions, examples and coding rules. An iterative process was used to further refine categories and sub-categories until a satisfactory representation that accounted for the variety of statements was reached. This procedure guaranteed formative reliability (Mayring, 2000, p. 11, 14). The whole interview transcripts were subjected to searches for knowledge sharing determinants. Therefore, not only those parts of the interviews were analyzed, which included questions regarding influential factors of knowledge sharing (e.g., "What are the reasons for employees not wanting to share their knowledge?"), but also the whole interview, thus trying to find all statements referring to relevant knowledge sharing determinants. Finally, the entire data were once again worked through in order to account for summative reliability (Mayring, 2000, p. 11, 14).

4.1.4. Validity of the data

Several procedures were used to ensure the validity of the results. The first method consisted of participant checks (Lamnek, 2005, p. 155). For this check, the respondents were asked to revise and confirm the analysis and interpretation of the interview findings. The majority of the respondents indicated that the summaries accurately reflected their opinions, except for some wording corrections. To avoid a coding bias, six people coded the interviews (Mayring, 2000, p. 113). Before the coders started, they were comprehensively introduced into the research subject and coding guidelines were distributed. All transcripts were reviewed in order to find statements pertaining

Position	Gender	Age	Job tenure
Employee	male	36-40	7
Employee	female	16-25	3
Employee	male	51-55	28
Employee	female	41-45	25
Employee	male	56-60	39
Employee	male	36-40	15
Lower management	male	51-55	32
Lower management	female	31-35	1
Lower management	male	51-55	39
Lower management	male	31-35	10
Middle management	male	46-50	23
Middle management	male	46-50	10
Middle management	male	41-45	33
Middle management	male	36-40	1

Table 4.1. – Descriptive statistics of the interview analysis.
Source: Own table.

to the developed coding system. Any disputes were discussed, until a consensus was reached.

4.1.5. Organization A

Organization A is a management consulting firm, with more than 70,000 employees and several locations across the world and an annual revenue of more than 8 billion Euro. The international technology services company belongs to one of the European leaders in management infrastructure and critical IT activities, especially in the fields of payments as well as transaction and high-tech services. Core business operations are designed to provide information technology management services, such as high-tech transactional services, consulting and technology services and systems integration services. Generally, information technology management services is a knowledge-intensive industry. The company's competitive advantage heavily depends on the firm's ability to use its knowledge resources to create solutions for its clients. Hence, in consulting firms, knowledge plays an important competitive advantage (Sarvary, 1999, p. 95). To the nature of a matrix organization, many projects take place simultaneously, which represents a challenge for knowledge management.

4.1.6. Organization B

Organization B represents a globally operating company with more than 30,000 employees. The company belongs to the 100 largest industrial companies in Europe and reaches a turnover of more than 5.0 billion Euro. As one of the 50 worldwide leading automotive suppliers, the company's core business lies in the automotive sector focusing on lighting and electronics. Through production and development sites in emerging countries, a high percentage of its revenues are already generated outside of Europe. The overall strategy focuses on providing capacities directly where they are needed. This requires strong networks within the organization and through joint ventures. In order to prevent the loss of technological dominance, reliable mechanisms of knowledge protection are needed. Similarly to organization A, the implemented matrix organization involves a challenge for knowledge management activities.

4.1.7. Shortcomings of current knowledge management systems

The problems with the companies' current knowledge management systems have been analyzed in both organizations. Based on the interviews, several deficits of the current knowledge management were successfully identified. In the following, the problems are discussed by giving representative statements.[2][3]

Desperate search for information: The interviewees complained that it is hard to find the knowledge they need to perform their job satisfactorily through the existing knowledge management tools. As one participant expressed it:

> Generally, we are chasing after the knowledge. Yes, this is an indication that we have to fight everyday in order to gain access to knowledge, experts, appointments, etc. (interview 1b).[4]

Lack of networking: The interviewees complained that it is very difficult to find experts. Currently, the only efficient way to find expert advice consists of establishing a social network, which requires years to be built. One participant illustrated this by saying:

> [...] it is quite difficult to identify experts because so many people work here. If you do not have a contact in the department, who can tell you whom to contact, then it is really difficult, especially for new employees, who have only been in the company for a few weeks (interview 3b).[5]

[2] The syntax of the representative statements has been changed in order to improve the sentences' quality while trying not to change their meaning. The sentences were modified after the transcripts were coded by all six coders.

[3] The problems of the companies current knowledge management systems are presented together, because evidence could be found that the problems identified were expressed by the employees of both companies (see Appendix B.4).

[4] Original statement from the interview: *In der Regel rennen wir dem Wissen hinterher. Ja, es ist ein Indiz, wir müssen jeden Tag kämpfen, um an das Wissen ranzukommen, Experten, Termine etc.*

[5] Original statement from the interview: *[...] es ist schon schwierig, weil so viele Leute hier arbeiten, bei [...], also wenn man nicht irgendwie einen Kontakt in der Abteilung hat, den man ansprechen*

Flood of e-mails: The interviewees complained about the number of e-mails, which they receive daily. As one interviewee put it:

> It is a problem for me to cope with the "flood of e-mails" and part of such a flood results from "ping-pong e-mails", which do not involve any important facts (interview 7b).[6]

The interviewees stated that, based on the limitations of e-mails, they expect enterprise social software to improve communication. Therefore, one interviewee pointed out:

> You have the entire knowledge at a glance [in a wiki]. E-mails also contain unnecessary information, for example the footer is often longer than the whole actual body of the e-mail. Therefore, I think that knowledge can be better presented in a wiki (interview 3b).[7]

Parallel systems: The interviewees criticized the high number of knowledge repositories of their company, such as the intranet, file servers, document/content management systems and the e-mail system. They complained that the number of parallel working systems make it impossible to find a specific piece of knowledge quickly. As one interviewee commented:

> We always have isolated solutions [...]. We document the results of our day-to-day work or generally those of projects [...], for example on servers. Some people also use the PDM system (product data management system), that is something else, but most things are on servers, that means that we have [a server], just like other departments have [their information] on another data bank (interview 4b).[8]

Missing tools: According to the interviewees the companies are in need of a new tool, which enables connecting the overhaul knowledge base, so that knowledge related to a specific theme can be directly retrieved. Consequently, one employee stated:

kann, der vielleicht weiß, wen man dann ansprechen könnte, dann o.k., aber ansonsten ist das echt schwierig, gerade für Außenstehende, wenn die erst ein paar Wochen im Unternehmen sind.

[6] Original statement from the interview: *Das ist für mich z.B. auch durchaus ein Problem meiner „E-Mail-Flut" Herr zu werden und ein Teil dieser E-Mail-Flut resultiert aus diesen „Ping-pong-E-Mails", wo keine wirklichen Fakten drinstehen.*

[7] Original statement from the interview: *Man hat das ganze Wissen auf einen Blick [in einem Wiki]. E-Mails enthalten auch überflüssige Informationen, wie zum Beispiel die Fußzeile, die ist häufig länger als die ganze Information, die in der E-Mail steht. Deshalb finde ich, dass man Wissen über Wikis besser darstellen kann.*

[8] Original statement from the interview: *Ja, wir haben natürlich immer Insellösungen, [...]. Wir dokumentieren unsere Ergebnisse von unserer täglichen Arbeit oder generell von Projekten, [...], zum Beispiel auf Servern. Manche benutzen auch das PDM-System, das ist dann was anderes, aber die meisten Sachen sind halt auf Servern, das heißt, wir haben [einen Server] dann für uns und genau so haben die anderen Abteilungen [Informationen] für sich irgendwo in irgendeiner Datenbank.*

> Of course, we speak about the project at that moment and aspects that did not work well, but there is no appropriate medium, which allows to store that information, and which, on the one hand, does not require a lot of effort to document the [information] and, on the other hand, allows to retrieve [information]. An appropriate tool for documentation is missing (interview 4b).[9]

Poor usability: The interviewees stated that they are dissatisfied with the usability of the existing systems. As one participant expressed it:

> It is a good tool, when you know how to use it. However, it is difficult to explain how to use it to a new colleague, because it is not easy to handle. For example, it has no drag-and-drop function and the bookmark-menu seems to come from the stone-age. [...]. The overwriting of bookmarks did not work for some time. Now, they have already fixed a part of that problem [...]. So, if you can use the system, then fine, but it is still not easy to handle compared to other systems (interview 2b).[10]

In order to assess the strength of the problems, it was counted how often each problem was mentioned (see Matschke et al. (2014, p. 552) for a similar procedure). Table 4.2 illustrates the most frequently raised problems and displays the number of times each problem was referred to by the participants. The left column refers to the *number of interviewees*, who made at least one statement according to a specific problem, whereas the right column indicates the total *number of statements* associated with a specific issue.

[9] Original statement from the interview: *Also man spricht in dem Augenblick natürlich über das Projekt und was da nicht gut gelaufen ist, man hat aber kein vernünftiges Medium, das so festzuhalten, wo man auf der einen Seite denkt, man hat jetzt nicht soviel Arbeit, die man da reinstecken muss um [Informationen] zu dokumentieren und auf der anderen Seite auch [Informationen] wiederfindet, [...]. Das fehlende Medium einfach der Dokumentation.*

[10] Original statement from the interview: *Das ist ein gutes Tool, wenn man damit umgehen kann. Wenn man es einem neuen Kollegen vermitteln muss, ist es schwierig, weil es im Handling etwas sperrig ist. Es gibt zum Beispiel keine Drag-and-Drop-Funktion, das Bookmark-Menü ist extrem steinzeitlich. [...]. Das Überschreiben von Bookmarks ging mal eine zeitlang nicht. Das haben sie jetzt halbwegs gelöst [...]. Also wenn man das System bedienen kann, ist es okay, aber es ist vom Handling her etwas sperrig im Vergleich zu anderen Systemen.*

Current problems	# interviewees	# statements
Desperate search for information	11	25
Lack of networking	10	15
Flood of e-mails	7	13
Parallel systems	6	11
Missing tools	5	9
Poor usability	10	16

Table 4.2. – Shortcomings of the current knowledge management infrastructure (14 interview partners).
Source: Own table.

4.1.8. Influencing factors

Based on the interviews, influencing factors of employees' willingness to share knowledge through enterprise social software have been identified. In the following, technological factors, rewards for knowledge sharing, personal factors, organizational factors and demographic factors are discussed by giving representative statements.[11][12]

Hence, comments regarding technological factors are presented in Section 4.1.8.1. In addition, responses, which refer to rewards for knowledge sharing are discussed in Section 4.1.8.2. Moreover, statements according to personal factors are outlined in Section 4.1.8.3. Finally, comments, which refer to organizational factors, are pointed out in Section 4.1.8.4, whereas responses according to demographic factors are presented in Section 4.1.8.5.

4.1.8.1. Technological factors

For the technological factors of effort expectancy, performance expectancy and facilitating conditions, representative statements are given below. Moreover, two new technological factors have been identified through the interviews: trust in technology and personal innovativeness.

Effort expectancy: The interviewees commented that enterprise social software should be intuitive and comfortable to use so that it is perceived as *easy to use*. Consequently, one employee pointed out:

[11]The syntax of the representative statements has been changed in order to improve the sentences' quality while trying not to change their meaning. The sentences were modified after the transcripts were coded by all six coders.
[12]The interview results are presented together because evidence could be found that the factors identified in literature were expressed by employees of both companies (see Appendix B.1, B.2 and B.3).

> It must be intuitive, then acceptance comes along by itself (interview 1b).[13]

Moreover, the employees postulated that templates would be an appropriate measure to *structure* the contents in enterprise social software. As one participant put it:

> [...] what annoys me [of a wiki] is that there is [...] no template, pattern or structure, which sets out how something should be described. We should determine that. That implies that [patterns] should help to describe a problem, the approach to solve it and its solution. [When] I am [looking] for a specific problem-area [...], it should be structured and not criss-crossed (interview 4b).[14]

In addition, the interviewees highlighted that enterprise social software should be *visually appealing* in order to be accepted by the employees. As one interviewee said:

> What might be helpful is a certain enthusiasm for the tool. It starts with its appearance, nowadays, you do not raise anybody's enthusiasm with the run-of-the-mill SAP appearance (interview 2b).[15]

Performance expectancy: The interviewees expressed concerns with regard to the *system integration*. Therefore, they feared that enterprise social software will become an additional tool they have to work with. As one employee pointed out:

> If I have to [work with] too many tools, then I would leave out some tools or there are again too many tools with separate themes and then again I do not know where I have to search for information and in the end I use the intranet again (interview 7a).[16]

The interviewees argued that if enterprise social software enables employees to *find information* in order to accomplish their tasks successfully, people will quickly adopt to the new technology. Moreover, employees were of the opinion that they could react more flexibly to given tasks by using enterprise social software. As one employee put it:

[13] Original statement from the interview: *Das muss intuitiv sein und dann kommt die Akzeptanz von alleine.*

[14] Original statement from the interview: *[...] was mich [an einem Wiki] stört, dass es nicht [...] ein Template oder ein Pattern, eine Struktur, wie etwas letztendlich zu beschreiben ist, gibt. Und das müssten wir festlegen. Das heißt, dass man eben [patternmäßig] sagt, es gibt ein Problem, die Vorgehensweise und Lösung. [Wenn] ich nach einem bestimmten Problemfeld [suche] [...], dass es immer gleichmäßig strukturiert aufgebaut ist und nicht kreuz und quer.*

[15] Original statement from the interview: *Was vielleicht auch ganz hilfreich ist, wenn eine gewisse Begeisterung für das Tool gegeben ist. Es fängt bei der Optik an, also mit der 0815-SAP-Optik reißen Sie heute keinen mehr zu Begeisterungsstürmen empor.*

[16] Original statement from the interview: *Wenn ich wieder zu viele Tools habe, dann lasse ich wieder welche weg oder es steht in zu vielen wieder getrennte Themen und dann weiß ich wieder nicht, wo ich suchen muss und dann nehme ich doch wieder das Internet*

> [...] and I find information relatively or really quickly, then no one [will not use it]. They are all waiting for it. Everybody is waiting for it. No one is happy working with the current [...] systems or other systems which we have. They are all annoyed by them. They simply want to have a system, which they can use to find what they need. Currently, you have to know which system to use in order to find a specific piece of information. But if you do not know, where to find this information, then you are lost (interview 1b).[17]

In addition, the employees complained that it is difficult to find particular experts, especially when they have to deal with a specific and unfamiliar issue. They said that they currently identify experts rather indirectly through recommendations from colleagues. Accordingly, interviewees expected that a main benefit of enterprise social software would be the opportunity to quickly *identify experts*, so that they can efficiently deal with particular problems. As one employee commented:

> [...] if I have questions regarding specific themes, [then] I can have a look [within the enterprise social software] in order to identify who is the expert for this issue and who can I contact for this issue (interview 2a).[18]

Moreover, the interviewees stated that the success of enterprise social software is related to the *quality* of its entries and that low quality comments will impede its acceptance. One participant illustrated this by saying:

> If the entered data [in enterprise social software] is bad, [since] for example theoretically any piece of rubbish can be written in blogs, then no one will look into them again (interview 3a).[19]

Furthermore, the interviewees stated that project work is very demanding, i.e., they are already working under high pressure and, therefore they can rarely imagine having additional time to take an active role in enterprise social software. They assumed that employees do not have the time to make the *effort* of formulating and posting comments, creating an account and keeping themselves informed through enterprise social

[17] Original statement from the interview: *[...] und ich finde wirklich auch Informationen relativ, wirklich richtig zügig, dann wird [das keiner nicht nutzen]. Die warten ja alle dadrauf. Jeder wartet da drauf. Keiner ist happy, sag ich mal, mit dem heutigen [...] System arbeiten zu müssen oder mit anderen Systemen, die wir haben. Das nervt die alle. Die wollen einfach ein System haben, wo die reingehen und genau das finden, was die brauchen. Sie müssen ja heute wissen, in welches System sie reingehen müssen, um eine spezifische Information zu finden. Aber wenn sie dieses Wissen darüber nicht haben, wo sich diese Information befindet, dann sind sie verloren.*

[18] Original statement from the interview: *[...] und wenn ich vielleicht Fragen zu bestimmten Themen habe, dass ich [in unternehmenseigene soziale Medien dann] nachschauen kann, wer ist da der Experte zu dem Thema, wen kann ich da ansprechen.*

[19] Original statement from the interview: *Wenn die Daten, die [in unternehmenseigenen sozialen Medien] liegen, schlecht sind, [weil] z.B. bei Blogs, da kann man ja theoretisch allen möglichen Mist reinschreiben, dann guckt man da nicht nochmal rein.*

software. Moreover, the interviewees worried that employees will waste their time in enterprise social software to the detriment of their main tasks. As one interviewee put it:

> With regard to a wiki I can quickly say where the barrier is. A wiki thrives from the fact that I somehow bring knowledge to it. I must be willing to make the documentation and classification. That means the effort is quite high (interview 4b).[20]

Trust in technology: The determinant "trust in technology" could be identified as a further important determinant of employees' willingness to share knowledge through enterprise social software through the interviews. The interviewees indicated that trust in the competence and security of enterprise social software is a critical issue of its acceptance and use. The following quote illustrates employees' *data protection* concerns:

> I think that data-protection is also a problem. We have a large employee representative committee, which is based on the Works Constitution Act and has rights of determination. When you communicate such themes, the first thing I hear from our employee representative committees is: please, do not forget the data-protection guidelines (interview 1a).[21]

In addition, the employees were concerned about *confidentiality* issues. Accordingly, the interviewees revealed that they would feel uncomfortable sharing their knowledge through enterprise social software because of authorization concerns. As one participant pointed out:

> Can I share knowledge with him? Am I allowed to share knowledge with him at all, when it comes to sensitive data, which I am not allowed to share with everybody. Since we operate internationally, it might be possible that the company in Spain is not authorized to see the data of an Italian company, [so] here of course, we cannot share knowledge (interview 2b).[22]

[20] Original statement from the interview: *Also bei einem Wiki kann ich ja sagen, wo ist die Barriere. Ein Wiki lebt ja davon, dass ich irgendwie das Wissen da reinbringe. Ich muss ja sozusagen bereit sein, die Dokumentation zu machen und Zuordnungen zu machen. Das heißt, der Aufwand ist recht groß.*

[21] Original statement from the interview: *Ich denke mal, ein Problem ist sicherlich auch das Thema Datenschutz. Wir haben auch bei uns einen großen Betriebsrat mit Bestimmungsrechten, Betriebsverfassungsgesetz. Und wenn Sie mit solchen Themen kommunizieren, dann ist das erste, was ich immer von unseren Betriebsräten höre: Denkt bitte an datenschutzrechtliche Vorgaben.*

[22] Original statement from the interview: *Kann ich das Wissen mit ihm teilen? Darf ich das Wissen überhaupt mit ihm teilen, wenn es um sensible Daten geht, die ich jetzt nicht jedem geben darf. Da wir ja ein internationaler Bereich sind, kann es natürlich sein, dass die Company in Spanien jetzt nicht die Daten von Italien sehen soll, da können wir das Wissen natürlich nicht teilen.*

Furthermore, the interviewees were concerned about *losing control* over their contributions. As one interviewee stated:

> [...] the problem of social networking is, and therefore I am not active here, that it is too hot for me. I have no control, or at least I have the feeling of losing control over what I have posted or shared because, in doubt, I do not really [know] who can read this now. Can all of my 150 friends read that or have I only addressed a certain group? (interview 7b).[23]

Facilitating conditions: According to the interviewees, management should take the necessary steps to facilitate the handling with enterprise social software, for instance, to provide employees with the adequate *support and assistance* in order to become familiar with the new system. In addition, the interviewees indicated that support should not only involve technical support, but also aspects, such as the appointment of ambassadors, the establishment of peer assistance and training programs. They assumed that employees, who perceive that they are given the necessary support in order to cope with enterprise social software will show higher rates of adoption. Furthermore, they recommended programs which involve younger employees helping older ones. Consequently, one interviewee stated that:

> [One should] [...] provide the necessary support. That one does not just receive a memo saying that [enterprise social software] has been introduced and if you want to use it, you have to write articles and if you do not want [to write articles], then you only read [what is written in enterprise social software] but that one can rely on assistance (interview 5b).[24]

In addition, they were concerned that some employees might have problems differentiating between business contributions and private contributions. Therefore, interviewees asked for *guidelines* regarding the use of enterprise social software. The following quote illustrates this finding:

> There should be clear rules saying who is allowed to post what, that it is clearly written: "No private things and so on". From my point of view,

[23] Original statement from the interview: *[...] das Problem, was ich bei Social Networking sehe, und deswegen bin ich da nicht aktiv, das ist mir zu heiß. Ich habe keine Kontrolle oder hab zumindest das Gefühl, dass ich die Kontrolle, von dem was ich blogge oder share, verliere, weil im Zweifel [weiß ich] gar nicht, wer kann das denn jetzt lesen? Können das jetzt alle meine 150 Freunde lesen oder hab ich jetzt nur eine Gruppe adressiert.*

[24] Original statement from the interview: *[Man sollte] [...] da auch den nötigen Support anbieten. Das man nicht plötzlich eine Info kriegt, so [unternehmenseigene soziale Medien] gibt es jetzt und wenn du es nutzen willst, stellst du halt Artikel rein und wenn [du keinen Artikel schreiben willst], dann liest du halt nur [was in den unternehmenseigenen sozialen Medien steht], sondern dass man auch auf Beratung zurückgreifen kann.*

> such preparatory actions have to be set up when introducing [enterprise social software] (interview 7b).[25]

Personal innovativeness: The determinant "personal innovativeness" could be identified as a further important determinant of employees' willingness to share knowledge through enterprise social software through the interviews. The interviewees revealed that the use of enterprise social software might be dependent on how technically savvy people are. As one interviewee stated:

> I am not very good with familiarizing myself with new things. In this respect, I am useless, because I always find new things very difficult (interview 1a).[26]

4.1.8.2. Rewards for knowledge sharing

In the following, representative statements for social rewards for knowledge sharing and economic rewards for knowledge sharing are presented.

Economic rewards for knowledge sharing: The interviews revealed a controversy according to monetary rewards for knowledge sharing through enterprise social software. While four employees were in favor of monetary rewards, ten employees clearly argued against them. As one dissident of monetary rewards pointed out:

> I cannot give someone three Euros more, when he spends an hour on social software and I do not know what he is actually doing on it. I do not see the link between monetary rewards, i.e., rewards that are actually performance-oriented or related to the work [...], [and] social software. I do not believe that the performance is measurable based on how intensive I use such a blog. I fail to understand that (interview 5b).[27]

On the contrary, another employee suggested that monetary rewards might be an appropriate measure to motivate employees with a low affinity to technology to share their knowledge through enterprise social software. Accordingly, this interviewee commented:

[25] Original statement from the interview: *Und auch da bedarf es ganz klarer Regeln, wer darf da was posten, also dass man da auch ganz klar reinschreibt: „Keine privaten Dinge und solche Dinge", dass gehört dann aus meiner Sicht dann als vorbereitende Maßnahme dazu, wenn man [unternehmenseigene soziale Medien] einführt.*

[26] Original statement from the interview: *Ich bin, was neue Dinge angeht, ganz weit weg. Da können Sie mich nicht für gebrauchen, weil ich tue mich da immer sehr schwer [...].*

[27] Original statement from the interview: *Ich kann ja nicht jemandem drei Euro mehr geben, weil er sich eine Stunde am Tag in dieser Social Software verbringt und ich weiß gar nicht, was er darin macht. Ich sehe den Zusammenhang zwischen monitärer Vergütung, also Vergütung, die ja eigentlich leistungsbezogen ist oder sich zumindest in irgendeiner Art und Weise auf die Tätigkeit bezieht [...] [und] der Social Software nicht. Also ich glaube nicht, dass das messbar in dem Sinne von Leistung ist, wie intensiv ich so einen Blog nutze. Das erschließt sich mir gerade nicht.*

> That might be differently evaluated. There are people, who say: "Good, if the boss gives me a one hundred-Euro bill in order to use such a thing, then of course I am pleased to do so". But there are some inhibitions, which vary from person to person. For me this is daily business. I am an engineer. I think it is good. I am not a computer guy. I can deal with Excel and PowerPoint etc.. With regard to further tools, I first have to get acquainted with them through reading and looking. If someone put me under pressure, then I would rather work with [enterprise social software] tomorrow than without pressure, positively or negatively seen. Therefore, monetary rewards might be useful for specific groups of persons, whereas for others they might not be necessary (interview 1a).[28]

In addition, the interviewees assumed that some people are not involved in knowledge sharing activities because they *fear to lose their job*, when they share their valuable knowledge with others. As one interviewee indicated:

> Fear of losing your own job for example. [. . .], when only I know certain things, then I am worth something, because others always have to ask me. That is how it is. Mostly, it is a result of fear. [. . .] I have personally never really asked myself how my job will continue. Fear, proper fear about becoming jobless [. . .], when that happens, then I think one tends to cling [on to knowledge] and somehow say that an employee is a rival, when I give him something, then I raise his status and make myself weaker (interview 6a).[29]

Social rewards for knowledge sharing: The interviews revealed a controversy according to social rewards for knowledge sharing through enterprise social software. While four employees argued against social rewards, ten employees were in favor of them. As one dissident of social rewards stated:

[28] Original statement from the interview: *Das mag unterschiedlich bewertet werden. Es gibt Leute, die sagen: „Gut, wenn der Chef mir da einen Hunderter gibt, wenn ich sowas nutzen soll, dann mache ich das natürlich gerne". Da sind Hemmschwellen, die sind bei Menschen unterschiedlich hoch. Für mich ist das Tagesgeschäft. Ich bin Entwicklungsingenieur. Ich finde sowas gut. Ich bin nicht so der Computerfritze. Ich komme mit Excel und Powerpoint und allem gut klar. Aber alles, was da so links und rechts ist, da muss ich mich immer erst einlesen und gucken. Also mir würde man vielleicht, wenn man mir da irgendwo Druck machen würde auf der einen Seite, dann würde ich mit [unternehmenseigenen sozialen Medien] vielleicht eher morgen arbeiten, als wenn ich diesen Druck vielleicht nicht hätte, ob positiv oder negativ gesehen. Von daher können Anreize sicherlich für gewisse Personengruppen gut sein, aber bei vielen vielleicht gar nicht nötig.*

[29] Original statement from the interview: *Angst um den eigenen Job zum Beispiel. [. . .], also wenn ich nur bestimmte Dinge weiß, bin ich wertvoll, weil andere müssen mich immer fragen. Das ist so. Also meistens ist es so angstgetrieben. [...] ich habe mir auch nie persönlich Gedanken gemacht, wie es jobmäßig weitergeht. Also Angst, richtig Angst, ich werde arbeitslos [. . .], wenn das anfängt, dann glaube ich, klammert man [sich] so ein bisschen [ans Wissen] und sagt irgendwie, der Mitarbeiter ist ein Konkurrent, wenn ich dem was gebe, dann werte ich ihn auf und ich schwäche mich selber.*

> No, I would not welcome such a points system because if one writes something one would think about how other would rate that on basis of points and others would see that one has only received a point. [...]. Forget about it (interview 3a).[30]

While one proponent of social rewards expressed his or her opinion by saying:

> General reward systems, yes. Also a kind of points system or whatever, if it has an effect on his vita, career, etc., then in any case (interview 4b).[31]

4.1.8.3. Personal factors

For the personal factors of self-efficacy, altruism, reciprocity and interpersonal trust, representative statements are given below.

Self-efficacy: The interview results disclose that employees feel unsure how to formulate their knowledge, so that everybody can understand it. In addition, they are convinced that other employees can provide more valuable knowledge than they can. Furthermore, employees feel unsure about whether other employees are interested in their contributions. The following quotes illustrate these findings:

> The reason could be that employees do not always know how to handle information or knowledge. “Am I authorized to share that or not? For whom is this important?” (interview 5b).[32]

> [I would share my knowledge] if I had the knowledge and had the confidence to do so [...] (interview 3b).[33]

Altruism: The interviewees said that they share their knowledge in order to help others. One interviewee illustrated this by saying:

> There is something like a “help mentality”, that works quite well in our department. People give support, when someone has a problem (interview 5a).[34]

[30] Original statement from the interview: *Nein, so ein Punktesystem fände ich nicht gut, weil man sich ja überlegen würde, wenn man etwas reinschreibt, wie das dann bewertet wird anhand von Punkten und der nächste der guckt, der hat nur einen Punkt gekriegt. [...]. Das können Sie vergessen.*

[31] Original statement from the interview: *Generelle Anreizsysteme, ja. Auch eine Art Punktesystem oder was auch immer, wenn sich das später für seinen Lebenslauf, seine Karriere usw. auswirkt, dann auf jeden Fall.*

[32] Original statement from the interview: *Die Ursache könnte schon sein, dass Mitarbeiter nicht immer wissen, wie sie mit Informationen oder Wissen umzugehen haben. „Darf ich das jetzt verbeiten oder darf ich das nicht? Für wen ist das wichtig?“*

[33] Original statement from the interview: *[Ich würde mein Wissen teilen], wenn ich das Wissen habe und mir das zutraue [...].*

[34] Original statement from the interview: *Es gibt so eine „Helfermentalität“, das klappt bei uns in der Abteilung ganz gut. Dass die Leute einen auch unterstützen, wenn man Probleme hat.*

Reciprocity: The interviewees anticipated that other colleagues would help them, if they had a problem. In order to reciprocate, they perceive it as an obligation to help others as well, when they are in need. The following quotes give evidence for reciprocal relationships:

> [...] usually I get into a situation, where I need something and I know that someone owes me something (interview 6a).[35]

> It is important that others do not only keep their knowledge to themselves, but are willing to share their knowledge with others so that one is also willing [to share one's knowledge] (interview 6b).[36]

Interpersonal trust: The interview results indicate that when people do not trust each other, they fear that their knowledge contributions could be misused. Accordingly, interviewees voiced concerns about potential misuses, ranging from taking undue advantage of confidential information to advancing one's personal agenda at the expense of other employees. As one interviewee put it:

> I have been completely exploited [by someone], [who has used my knowledge] mercilessly [for his] benefit [...], and due to this [knowledge] he was able to impress his boss so heavily that he became group leader (interview 6a).[37]

4.1.8.4. Organizational factors

Representative statements for the organizational factors of management support, knowledge sharing norms and organizational identification are enumerated below. Moreover, a new organizational factor has been identified through the interviews: monitoring.

Management support: The interviewees revealed that a consistent *knowledge management strategy* is important. The following quote demonstrates this finding:

> One has to agree to a consistent knowledge sharing strategy [...]. That would already facilitate things (interview 7b).[38]

[35] Original statement from the interview: *[...] in der Regel komme ich in eine Situation, ich brauche auch mal/der schuldet mir was.*

[36] Original statement from the interview: *Wichtig ist nur, dass jeder das Wissen nicht nur für sich selbst behält, sondern bereit ist, das mit anderen zu teilen, so dass man auch selber bereit ist [sein Wissen zu teilen].*

[37] Original statement from the interview: *[Ich wurde] so richtig [von jemanden] ausgenutzt, [der mein Wissen] gnadenlos [zu seinem] Vorteil genutzt hat [...] und hat seinen Chef so beeindrucken können mit dem [Wissen], dass er dann Gruppenleiter geworden ist.*

[38] Original statement from the interview: *Man muss sich zu einer einheitlichen Wissensteilungs-Strategie bereiterklären [...]. Das würde die Sache schon vereinfachen.*

Another interviewee criticized the lack of *awareness* of the importance of knowledge by managers by saying:

> No one uses the term knowledge. But I definitely think [...] that it [has] become more present to this moment, that [...] managers [know] that they have to keep and promote the knowledge of [their] employees, who in the end earn the money (interview 7a).[39]

The interviewees highlighted that *time* is a critical success factor of knowledge sharing. This is especially the case in project management, where project teams must be able to respond quickly to changes in customer requirements. Consequently, time for knowledge sharing is limited. One interviewee illustrated this by saying:

> The problem is often that [we] lack the time to pass on certain know-how, which one [...] has obtained and that might be interesting for other colleagues. Information is often not shared, because when I want to inform other colleagues, I have to prepare [the information], or at least I have to take the time to explain it to them, which often comes too short in daily business (interview 6b).[40]

In addition, the interviewees said that superiors should encourage knowledge sharing by *pointing out the benefits* of knowledge sharing behavior. As one interviewee put it:

> That means that we also have to show people that knowledge sharing only has positive effects: For the workers themselves, for the whole company and, of course, for the colleagues (interview 1b).[41]

Moreover, the participants argued that they would be more convinced about the benefits of knowledge sharing through enterprise social software, if managers took a *leading role* in knowledge sharing activities through enterprise social software. The following quote gives evidence for this finding:

[39] Original statement from the interview: *Den Begriff nutzt keiner. Aber ich denke mal [...] es [ist] auf alle Fälle momentan doch um einiges präsenter geworden, dass [...] die Führungsebene [weiß], dass sie das Wissen [ihrer] Mitarbeiter, die dann im Endeffekt das Geld verdienen, halten beziehungsweise fördern müssen.*

[40] Original statement from the interview: *Das Problem ist oft, dass [uns] die Zeit einfach fehlt, um gewisse Kenntnisse, die man [...] erworben hat, die vielleicht auch interessant sind für andere Kollegen, zu teilen. Ja, dass es daran oft scheitert, dass diese Informationen nicht weitergegeben werden, weil wenn ich andere Mitarbeiter informiere, dann muss ich ja auch [Informationen] so ein bisschen aufbereiten, zumindest mir die Zeit nehmen, denen das zu erklären, da ist es leider oft so, dass das im Tagesgeschäft einfach zu kurz kommt.*

[41] Original statement from the interview: *Das heißt, wir müssen den Leuten auch zeigen, dass sie, wenn sie Wissen teilen, dass das nur positive Effekte hat: Für die Mitarbeiter selber, für das ganze Unternehmen und natürlich für die Kollegen.*

> [...] as soon as the added value [of enterprise social software] is clear, a superior should also be interested in taking a leading role by using it (interview 2b).[42]

Knowledge sharing norms: The interviewees said that knowledge sharing depends on how open companies are for ideas and criticism. Hence, they conveyed that *openness for ideas and feedback* are an ongoing challenge in their daily business environment. The interview results reveal that feedback mechanisms are still not well established in the companies. As one participant pointed out:

> [Our] feedback culture [...] could still be improved. I think that not enough open feedback is given so that one would simply say: "Here I have got a suggestion for improvement" (interview 5b).[43]

Furthermore, the employees stated that they do not feel as if they were in the position to freely express their opinion. Therefore, the interviewees explained that they hesitate to express *criticism* because this might have negative effects on their career. As one interviewee stated:

> Yet, I have not expressed any criticism. Therefore, I have never asked myself the question how this would be, but I could imagine that depending on who receives the criticism, it might not been seen positively. I would not go to a company meeting and criticize something. I have never experienced someone doing that (interview 4b).[44]

The interviewees mentioned that especially the *cooperation* between the single divisions of the company could be improved. As one employee commented:

> In my opinion, [knowledge sharing] could be improved significantly, especially the cooperation [...] and the exchange of information between the departments (interview 2b).[45]

Moreover, the interviewees explained how they cope with the *knowledge-is-power mentality.* As one interviewee expressed:

[42] Original statement from the interview: *[...] sobald der Mehrwert [unternehmenseigener sozialer Medien] klar geworden ist, müsste gerade auch der Vorgesetzte ein Interesse daran haben, so etwas in einer Vorreiterrolle zu nutzen.*

[43] Original statement from the interview: *[Unsere] Feedbackkultur [...] könnte man noch verbessern. Ich glaube, es wird noch viel zu wenig offenes Feedback gegeben, dass man einfach mal sagt: „Mensch, hier hätte ich einen Verbesserungsvorschlag".*

[44] Original statement from the interview: *Ich habe bis jetzt noch nicht kritisiert. Deshalb habe ich mir diese Frage noch nicht gestellt, wie das ist, aber ich könnte mir vorstellen, dass es, je nachdem, an wen es gerät, nicht so gut angesehen wird. Ich würde mich nicht auf einer Betriebsversammlung hinstellen und irgendetwas kritisieren. Habe ich auch noch nie erlebt, dass das einer gemacht hat.*

[45] Original statement from the interview: *[Die Wissensteilung] könnte man meiner Meinung nach noch stark verbessern, insbesondere die Zusammenarbeit [...] und den Informationsaustausch zwischen den Abteilungen.*

> Yes, basically what we have just discussed is that some people consider their knowledge as a source of power and think that they are in a better position by keeping it for them and not sharing it. I try to dissuade my colleagues from such thinking because, for me, this is the wrong way. But in my opinion, this is the primary reason why people keep a low profile with their know-how and its sharing (interview 7b).[46]

In addition, the interviewees highlighted the importance of *tolerating mistakes* in organizations. As one interviewee put it:

> We know that we make mistakes. There is potential to use these negative experiences in order to become better. That is the starting point. You are allowed to make a mistake once, but not twice. We are making mistakes too often [...] and that is not good. We also have to [...] [mention] negative experiences. Here, we have to become more open so that I can say: "Okay, we share this". No one is put into the dock for that because it is just bad, when knowledge is kept back and at some time it pops up and then we are in a dead end and already have the client's gun pointing at the chest. That's not right (interview 1b).[47]

Organizational identification: Some interviewees stated that they feel a strong sense of belonging to their organization. As one interviewee stated:

> I have a relative long driving distance and if I did not see the [organization's] potential, then I probably would not be here anymore. Then, I could also say I drive 20km. I see a great potential here [...] and we are [good], and we have to be even better. That is the motivation. We have good prerequisites with our laboratories, [...] or people. For me, it is important that there are ways, and [it is vital] to go these ways, but that can only be done together (interview 1b).[48]

[46] Original statement from the interview: *Ja, im Prinzip auch das was wir gerade besprochen haben, das ist dass einzelne Leute eben halt ihr Wissen halt auch als Macht ansehen und dann auch denken, dass wenn sie ihr Wissen behalten und nicht sharen, in einer besseren Position sind. Das versuche ich den Kollegen immer auszureden, weil es aus meiner Sicht der völlig falsche Weg ist. Aber aus meiner Sicht ist das der primäre Grund, wenn sich Leute mit ihrem Know-how und der Know-how-Weitergabe eher bedeckt halten.*

[47] Original statement from the interview: *Wir wissen, dass wir Fehler machen. Da gibt es Potentiale also diese negativen Erfahrungen, die muss ich nutzen, um besser zu werden. Das ist der Ausgangspunkt. Man darf einen Fehler einmal machen, aber nicht zweimal. Und wir machen Fehler zu häufig [...] und das ist nicht gut. Einfach auch im Sinne von wenn wir das jetzt mal [...] negative Erfahrung [nennen]. Auch da müssen wir dann offener werden. Offener werden, dass ich dann auch sage „Ok, wir teilen das". Es wird keiner auf die Anklagebank gesetzt deswegen, weil es nur einfach schlecht ist, wenn man es zurückhält und irgendwann poppt es hoch und dann sind wir in einer Sackgasse und haben schon die Pistole des Kunden auf der Brust. Das geht nicht.*

[48] Original statement from the interview: *Ich habe einen relativ weiten Anfahrtsweg, und wenn ich*

Monitoring: The determinant "monitoring" could be identified as a further important determinant of employees' willingness to share knowledge through enterprise social software. The interviewees said that enterprise social software could be exploited by the management as a control mechanism. Moreover, the interviewees worried that enterprise social software could also be used as a tool to compare employees' experiences and skills with each other. They argued that when having to lay off employees, decisions can be made based on employees' profiles provided by the enterprise social software. Moreover, the interviewees feared that their activities in the enterprise social software could be interpreted as having nothing to do. They expressed a fear of monitoring activities by the management and were afraid that their knowledge entries would be controlled by managers. As one employee commented:

> I have already heard that there are certain people, who think they should control what their workers write. That is obviously something which in that context would be totally counterproductive (interview 5a).[49]

4.1.8.5. Demographic factors

In the following, representative statements are outlined for the demographic factors of experience and age, while no statement has been found for gender differences.

Experience: The majority of the interviewees have already gained experience with some form of social software. However, nearly all of them stated to be rather passive users. For example, some expressed that they are active on Xing or Facebook and use Wikipedia in order to find information, whereas only a few interviewees revealed to be active bloggers. The experiences made with public social software are commented by one interviewee:

> Our team has not gained much experience with this topic. People, who use Facebook, might be more familiar with this topic. I do not use Facebook. But, as I said, I am a little bit active on Twitter, so I know how the mechanisms work (interview 6a).[50]

nicht die Potentiale [des Unternehmens] sehen würde, dann wäre ich warscheinlich nicht mehr da. Dann könnte ich auch sagen, ich fahre 20km. Ich sehe unheimliches Potential da, [...], wir sind [gut] und das müssen wir heben. Und das ist eigentlich die Motivation. Ich sage jetzt mal so gute Vorraussetzungen wie wir sie haben, mit den Laboren die wir haben, [...], oder auch die Leute die wir haben. Für mich ist wichtig, dass es da halt diese Wege gibt, und die Wege auch zu gehen, aber die kann man nur gemeinsam gehen.

[49] Original statement from the interview: *Ich habe da schon gehört, dass es gewisse Leute gibt, die meinen, die müssten das kontrollieren, was ihre Leute da so schreiben. Das ist natürlich etwas, was in dem Zusammenhang total kontraproduktiv wäre.*

[50] Original statement from the interview: *Bei uns in der Mannschaft gibt es eigentlich noch nicht so viel Erfahrung mit dem ganzen Thema. Die Leute, ich denke, die von Facebook vielleicht irgendwie kommen, die kennen sich da mehr aus. Ich mache kein Facebook. Aber wie gesagt, über Twitter bin ich ja auch so ein bisschen aktiv, da weiß ich also, wie die Mechanismen funktionieren.*

Age: The interviewees assumed that the majority of older employees have not had any experience with social software and might be very critical towards its use. They presumed that older people would rather tend to stick to well established procedures. Such a phenomenon refers to the not-invented-here syndrome. Accordingly, one interviewee said:

> I could imagine that older colleagues say: "We do not want to cope with that, it would mean a huge change and I want to stick with the things I know" (interview 3b).[51]

4.1.9. Synthesis

The results of the interviews have been discussed by giving representative statements. Of course, such statements will not "prove" anything in the strict sense. However, they can be used to investigate a deeper understanding of employees' anticipated knowledge sharing behavior regarding enterprise social software (Hoepfl, 1997, p. 47). They can also answer the question of whether the factors identified in literature are thought through the individual level and can be regarded as causal to employees' anticipated knowledge sharing behavior through enterprise social software. In addition, most of the factors have been mentioned as being both motivating and hindering in terms of knowledge sharing, depending on their nature (e.g., if employees trust each other, it is assumed that employees are more willing to share their knowledge through enterprise social software, whereas if employees do not trust each other, it is assumed that employees are less willing to share their knowledge through enterprise social software).

The guided interview has been developed to give first empirical evidence of the assumed factors and to compare the different interviews with one another. The comparison of the determinants identified through the qualitative interviews with those of the literature review has revealed that nearly all of the determinants from the literature review have been mentioned. In addition, three new factors have been identified through the interviews: **trust in technology**, **personal innovativeness** and **monitoring**. Trust in technology and personal innovativeness[52] have been categorized as technological factors because both refer to the use of technology. Monitoring is an action conducted by management and, therefore, has been classified as an organizational factor.

The synthesis of the determinants identified from both prior literature and conducted interviews shows that employees' willingness to share knowledge through enterprise social software at the pre-implementation stage can be divided into five cate-

[51] Original statement from the interview: *Ich könnte mir vorstellen, dass die Älteren sagen: „Damit möchten wir uns nicht befassen, dass ist eine zu große Umstellung und ich möchte bei altbekannten Sachen bleiben".*

[52] Hence, personal innovativeness could also be regarded as a personal factor. However, the interviews give evidence that personal innovativeness directly influences the use of technology.

gories: technological factors, rewards for knowledge sharing, personal factors, organizational factors and demographic factors.

- **Technological factors**, including effort expectancy, performance expectancy, trust in technology, facilitating conditions and personal innovativeness.
- **Rewards for knowledge sharing**, including economic rewards for knowledge sharing and social rewards for knowledge sharing.
- **Personal factors**, including self-efficacy, altruism, reciprocity and interpersonal trust.
- **Organizational factors**, including management support, knowledge sharing norms, organizational identification and monitoring.
- **Demographic factors**, including experience and age.

In order to assess the strength of the determinants, it was counted how often the determinants were mentioned (see Matschke et al. (2014, p. 552) for a similar procedure). Table 4.3 displays the number of times each determinant was referred to by the participants. The left column refers to the *number of interviewees*, who made at least one statement according to a specific determinant, whereas the left column indicates the total *number of statements* associated with a specific determinant. The factors performance expectancy (technological factor, 83 statements), knowledge sharing norms (organizational factor, 63 statements) and management support (organizational factor, 61 statements) were mentioned most frequently. Surprisingly, interviewees did not make as many statements referring to personal factors as anticipated before. That might be due to the limitations of face-to-face interviews, in which social desirability appears to have a strong influence on the response behavior (Matschke et al., 2014, p. 553). Questions concerning personal factors are often sensitive, and the answers may be distorted in an employee's desire to appear socially acceptable (Matschke et al., 2014, p. 553). In addition, interviews are predicated on hypothetical behavior (Matschke et al., 2014, p. 553). Thus, it is challenging for interviewees to name specific factors (Matschke et al., 2014, p. 553).

In the following, a meta-analysis of qualitative case studies is outlined in order to investigate which factors influence employees' willingness to share knowledge through enterprise social software at the *post-implementation stage* (see Dunlop et al. (2012) for a similar procedure). Moreover, the analysis strives to show whether the determinants of knowledge sharing through enterprise social software at the post-implementation stage differ from those at the pre-implementation stage. In addition, the purpose is to discover further important constructs and to establish a greater understanding regarding how enterprise social software is being implemented in organizational practice.

Factors	# interviewees	# statements
Technological factors		
Performance expectancy	14	83
Personal innovativeness*	13	19
Effort expectancy	12	19
Trust in technology*	11	39
Facilitating conditions	11	27
Rewards for knowledge sharing		
Economic rewards (4 proponents vs. 10 dissidents)	14	17
Social rewards (10 proponents vs. 4 dissidents)	12	13
Personal factors		
Interpersonal trust	8	9
Reciprocity	7	7
Altruism	6	9
Self-efficacy	6	6
Organizational factors		
Management support	14	61
Knowledge sharing norms	14	63
Organizational identification	5	6
Monitoring*	4	5
Demographic factors		
Age	8	8
Experience	5	7

Table 4.3. – Interview results (14 interview partners) (*=New factors identified through interview analysis).
Source: Own table.

4.2. Meta-analysis of qualitative case studies

In the following, a qualitative meta-analysis of case studies is presented in order to obtain insights into employees' experiences with enterprise social software (post-implementation stage). This study aims to shed light on whether the factors mentioned by prior literature or the interviewees can also be found in the analyzed case studies, providing first empirical evidence on whether the same relevant factors can be found at the pre-implementation stage and at the post-implementation stage of enterprise social software for knowledge sharing.

To this end, in Section 4.2.1, the research methodology is outlined and in Section 4.2.2, the identified influencing factors of knowledge sharing through enterprise social software are presented. Finally, the main findings are summarized in Section 4.2.3.

4.2.1. Context and research methodology

To examine the determinants of knowledge sharing through enterprise social software at the post-implementation stage, a meta-analysis of existing Enterprise 2.0 case studies is employed by using a univariate technique (Dunlop et al., 2012, p. 28).

A team of scientists from different universities have published a wide range of case studies analyzing the implementation, acceptance and use of (enterprise) social software. These case studies are publicly available on the website “www.e20cases.org”, which has been published by professor Andrea Back, professor Michael Koch, professor Petra Schubert and assistant professor Stefan Smolnik. The case studies have been categorized into four different groups: orange, gold, silver and bronze. High quality case studies are represented by the color orange. They are written according to a predefined structure and have already passed through a peer-reviewing process. In this thesis, only case studies are analyzed that have been categorized as orange, since their predefined structure allows to directly compare the contents, which increases the reliability of the results. Moreover, the case studies categorized as orange are particularly focused on knowledge sharing. Table 4.4 gives an overview of the analyzed case studies, which have been published between 2009 and 2012. Most of the organizations can be assigned to the information technology sector, as well as the information and communication sector. In addition, small and medium sized companies as well as multinational companies have been analyzed. The number of employees varies between ten and more than 5,000 employees. While some organizations have introduced public social software (e.g., Skype), others have implemented enterprise social software (e.g., IBM Connections). Furthermore, a great variety of tools have been introduced, especially weblogs and wikis.

Organization	Source	Sector	# of employees	Software	Tools
DocHouse	Surrey and Diehl, 2012	IT	10 - 49	Lotus Quickr	Social Software Suite
Siemens Building Technologies Division	Müller and Stocker, 2012	IT	>5,000	Self-developed software	Forum, Microblog, Social Networking Platform
ADTELLIGENCE	Walter and Altendorf, 2010	IT, Commercial and Market Research	10 - 49	Facebook, Skype, SlideShare, SugarCRM, Twitter, WordPress, Xing, YouTube	Instant Communication, Microblog, Social Networking Platform, Video, Weblog, Wiki
Börse Berlin	Stieglitz, 2011	Finance	10 - 49	IP:Board 3	Forum, Instant Messaging, Mashup, Weblog
SFS Services SE	Cervellieri et al., 2011	Retail	1,000 - 5,000	MediaWiki	Wiki
Fritz and Macziol	Steinhüser and Gerz, 2011	IT	250 - 999	IBM Connections	Feed, Forum, Microblog, Social Bookmarking, Social Networking Platform, Social Software Suite, Weblog, Wiki
Rheinmetall SE	Koch and Bentele, 2011	Automotive	>5,000	IBM Connections, Lotus Quickr, Lotus Sametime	Feed, Forum, Instant Communications, Instant Messaging, Social Bookmarking, Social Networking Platform, Social Software Suite, Video, Weblog, Wiki
ESG	Koch and Thönnißen, 2011	Electrical industry	1,000 - 5,000	Confluence	Forum, Social Software Suite, Weblog, Wiki
Siemens SE	Mörl et al., 2011	Electrical industry	>5,000	Liferay	Microblog, Social Networking Platform, Weblog
Pentos SE	Stocker et al., 2010	Information and communication	10 - 49	Lotus Notes, Self-developed software	Weblog
Communardo Software PLC	Böhringer and Röhrborn, 2009	Information and communication	50 - 249	Self-developed software	Microblog
ABB	Steinhüser and Räth, 2010	Electrical industry	>5,000	Sharepoint	Weblog, Wiki
Capgemini	Richter et al., 2011	Information and communication	>5,000	Yammer	Microblog
T-Systems Multimedia Solutions	Bukvova and Kalb, 2010	Information and communication	1,000 - 5,000	Confluence	Social Networking Platform, Weblog, Wiki

Table 4.4. – Overview of analyzed case studies.
Source: Own table.

4.2.2. Influencing factors

The authors of the case studies have used qualitative interviews in order to identify barriers and motives of employees' acceptance and use of (enterprise)[53] social software. The factors identified through the meta-analysis of qualitative case studies are presented in Table 4.5 and 4.6 and outlined in the following.

The results of the meta-analysis reveal that **performance expectancy** is an important factor of employees' willingness to share knowledge at a post-implementation stage of (enterprise) social software. The case studies report that *acceptance and visible benefits* are drivers of (enterprise) social software success (e.g., Müller and Stocker, 2012, p. 21). Moreover, it is stated that employees had problems understanding the value of (enterprise) social software (e.g., Cervellieri et al., 2011, p. 10). Accordingly, the authors recommend highlighting its benefits, such as better networking, finding knowledge easily, better communication and collaboration (e.g., Surrey and Diehl, 2012, p. 9). Visible benefits are conceptually comparable to performance expectancy, which has already been identified within the literature review and qualitative interviews at the pre-implementation stage. Furthermore, *integration into the existing business and work processes* and *integration into the existing IT infrastructure* have also been linked to performance expectancy, since the interviews revealed that integration processes are perceived as indispensable prerequisites in order to find (enterprise) social software useful.

Moreover, **effort expectancy** has been identified as an important determinant of knowledge sharing at a post-implementation stage of (enterprise) social software. The case studies illustrate that the *ease* with which a profile can be created increases the acceptance of (enterprise) social software in the organization (e.g., Steinhüser and Gerz, 2011, p. 4). Furthermore, the results of the meta-analysis reveal that the aspect of *get[ing] started easily* is an important factor regarding employees' willingness to share knowledge at a post-implementation stage of (enterprise) social software (e.g., Stocker et al., 2010, p. 9). Ease-of-use and getting started easily are conceptually comparable to effort expectancy, which has already been identified as a critical factor within the literature review and qualitative interviews at the pre-implementation stage.

Furthermore, **facilitating conditions** have been identified as important determinants of knowledge sharing at a post-implementation stage of (enterprise) social software. The case studies reveal that training and user guidelines increased the acceptance and use of (enterprise) social software (e.g., Koch and Thönnißen, 2011, p. 7, 16). *Compliance and user guidelines* are conceptually comparable to facilitating conditions, which have also been identified within the literature review and qualitative interviews at the pre-implementation stage.

In addition, **management support** has been identified as an important factor of employees' willingness to share knowledge at a post-implementation stage of (enter-

[53] The word enterprise is put in parenthesis, because some case studies have investigated public social software use in organizations, while others have focused on enterprise social software.

prise) social software. The case studies report that management support had a positive effect on (enterprise) social software use (e.g., Richter et al., 2011, p. 18). For example, the authors state that managers, who highlighted the benefits of (enterprise) social software, positively influenced employees to use the software (e.g., Stieglitz, 2011, p. 20).

Moreover, **knowledge sharing norms** have been identified as an important determinant of knowledge sharing at a post-implementation stage of (enterprise) social software. This factor conceptually belongs to the broad term of *organizational culture* and has already been identified within the literature review and qualitative interviews at the pre-implementation stage. The case studies show that employees' motivation to use (enterprise) social software is based on an open organizational culture, which is characterized by accepting criticism and learning from mistakes (e.g., Steinhüser and Gerz, 2011, p. 17).

Organization [case study number]	**Factors meta-analysis**	**Factors literature/interviews***
DocHouse [1]	Acceptance and visible benefits Management support Integration into existing business and work processes Integration into the existing IT infrastructure	Performance expectancy Management support Performance expectancy Performance expectancy
Siemens Building Technologies Division [2]	Acceptance and visible benefits	Performance expectancy
ADTELLIGENCE [3]	Acceptance and visible benefits	Performance expectancy
Börse Berlin [4]	Management support Integration into existing business and work processes	Management support Performance expectancy
SFS Services SE [5]	Acceptance and visible benefits Ease of use Organizational culture Integration into existing business and work processes	Performance expectancy Effort expectancy Knowledge sharing norms Performance expectancy
Fritz and Macziol [6]	Enable to get started easily Organizational culture Management support	Effort expectancy Knowledge sharing norms Management support
Rheinmetall SE [7]	Acceptance and visible benefits Management support	Performance expectancy Management support
ESG [8]	Compliance and user guidelines Enable to get started easily Management support	Facilitating conditions Effort expectancy Management support

Table 4.5. – Success factors and barriers of enterprise social software use (Part 1) (*=Conceptually comparable factors or belonging to a factor, which has already been identified through literature review or interview analysis).
Source: Own table.

Organization [case study number]	Factors from meta-analysis	Factors from literature/interviews*
Siemens SE [9]	Acceptance and visible benefits Compliance and user guidelines Enable to get started easily Integration into the existing IT infrastructure	Performance expectancy Facilitating conditions Effort expectancy Performance expectancy
Pentos SE [10]	Acceptance and visible benefits Enable to get started easily Organizational culture Management support	Performance expectancy Effort expectancy Knowledge sharing norms Management support
Communardo Software PLC [11]	Management support Integration into the existing IT infrastructure	Management support Performance expectancy
ABB [12]	Acceptance and visible benefits Ease of use Enable to get started easily Organizational culture Management support	Performance expectancy Effort expectancy Effort expectancy Knowledge sharing norms Management support
Capgemini, S.A. [13]	Compliance and user guidelines Enable to get started easily Management support	Facilitating conditions Effort expectancy Management support
T-Systems Multimedia Solutions [14]	Acceptance and visible benefits Enable to get started easily Integration into existing business and work processes Integration into the existing IT infrastructure Organizational culture Management support	Performance expectancy Effort expectancy Performance expectancy Performance expectancy Knowledge sharing norms Management support

Table 4.6. – Success factors and barriers of enterprise social software use (Part 2) (*=Conceptually comparable factors or belonging to a factor, which has already been identified through literature review or interview analysis).
Source: Own table.

4.2.3. Synthesis

A meta-analysis of qualitative case studies has been conducted in order to give first empirical evidence for factors that apparently influence employees' willingness to share knowledge through enterprise social software at a post-implementation stage. The results of the univariate analysis reveal the predominant importance of technological factors, followed by organizational factors. It is interesting to note that none of the personal factors could be determined through the case study meta-analysis. Moreover, it becomes evident that no new factors have been identified. The results provide first evidence that the factors influencing employees' willingness to share knowledge through enterprise social software at a post-implementation stage differ from those at the pre-implementation stage.

- **Technological factors**, including effort expectancy, performance expectancy and facilitating conditions.
- **Organizational factors**, including management support and knowledge sharing norms.

In order to assess the strength of the factors, the amount of times each factor was mentioned within the case studies was counted; the results are displayed in Table 4.7, which reveals that performance expectancy (technological factor, eleven case studies), management support (organizational factor, ten case studies) and effort expectancy (technological factor, eight case studies) were the most frequently mentioned factors.

	Determinants	**# Case studies**	**Case study number:**
Technological factors	Performance expectancy	11	[1], [2], [3], [4], [5], [7], [9], [10], [11], [12], [14]
	Effort expectancy	8	[5], [6], [8], [9], [10], [12], [13], [14]
	Facilitating conditions	3	[8], [9], [13]
Organizational factors	Management support	10	[1], [4], [6], [7], [8], [10], [11], [12], [13], [14]
	Knowledge sharing norms	5	[5], [6], [10], [12], [14]

Table 4.7. – Results of the meta-analysis of qualitative case studies (14 case studies). Source: Own table.

5. Hypotheses and research model

In previous chapters, an understanding of enterprise social software and employees' willingness to use this new technology has been developed, based on a theoretical discussion and qualitative findings.

At first, an interdisciplinary research model is developed in this chapter (see Section 5.1). Then, an overview of the influencing factors is provided and hypotheses are derived from both the literature review as well as qualitative analyses. Hypotheses referring to the direct effects of the research model are presented in Section 5.2, while moderation effects of the research model are outlined in Section 5.3. Afterwards, the hypotheses are summarized in a research model, which is explained at the end of this chapter (see Section 5.4).

5.1. Building an interdisciplinary research model

The interview analysis and the case study meta-analysis revealed the predominant importance of the technological factors. Therefore, it is assumed that technological factors directly influence employees' knowledge sharing behavior through enterprise social software. Since the unified theory of acceptance and use of technology involves most of the identified technological factors (e.g., effort expectancy, performance expectancy and facilitating conditions), it is used as an approved base model. This theory proposes that technological factors have a direct influence on intention (Venkatesh et al., 2003, p. 447). Therefore, it is assumed that all identified **technological factors**, which have been deduced from the *unified theory of acceptance and use of technology* (effort expectancy, performance expectancy and facilitating conditions), *social capital theory* (trust in technology) and *diffusion of innovations theory* (personal innovativeness) have a direct influence on knowledge sharing intentions through enterprise social software. Based on the *technology acceptance model*, it is further assumed that technological factors have a direct impact on knowledge sharing attitudes through enterprise social software.

Within the research literature, an ongoing debate regarding appropriate incentive systems exists. Dissidents of economic incentives (Eisenberger and Cameron, 1996, p. 1154) argue that task-related rewards can have a negative effect on intrinsic motivation, whereas Kelman (1958, p. 51) and Alfie (1993, p. 55) postulate that economic incentives are suitable for a temporary use. In order to contribute towards this discussion, the direct relationship between **rewards for knowledge sharing** and knowledge sharing behavior is investigated. Based on *social exchange theory*, it is assumed that social rewards for knowledge sharing and economic rewards for knowledge sharing have a direct effect on knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software.

Personal factors are increasingly explored as moderator variables in communication research (e.g., Chernyak-Hai and Tziner, 2012, p. 53; Yap et al., 2012, p. 477). Based on these research studies, this study postulates that personal factors, which have been deduced from *social exchange theory* (self-efficacy, altruism and reciprocity) and *social capital theory* (interpersonal trust), moderate the relationship between technological factors and knowledge sharing attitudes through enterprise social software, as well as between technological factors and knowledge sharing intentions through enterprise social software.

On basis of the *social capital theory*, it is assumed that **organizational factors**, such as organizational identification and knowledge sharing norms, moderate the relationship between technological factors and knowledge sharing attitudes through enterprise social software, in addition to knowledge sharing intentions through enterprise social software (see Kankanhalli (2002, p. 43) for a similar argumentation). To be consistent, all other organizational factors are also investigated as moderators. Therefore, the constructs deduced from *social exchange theory* (management support) and *control theory* (monitoring) are expected to moderate the relationship between technological factors and knowledge sharing attitudes through enterprise social software, and between technological factors and knowledge sharing intentions through enterprise social software.

In addition, the *unified theory of acceptance and use of technology* postulates that **demographic factors**, such as age, experience and gender moderate the relationship between technological factors and intention (Venkatesh et al., 2003, p. 447). Based on this theory, it is predicted that demographic factors moderate the relationship between technological factors and knowledge sharing attitude through enterprise social software, as well as between technological factors and knowledge sharing intention through enterprise social software.

To sum up, technological factors and rewards for knowledge sharing are assumed to directly predict knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software, whereas personal factors, organizational factors and demographic factors are assumed to moderate the relationship between technological factors and knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software. Since prior knowledge management rarely considers personal factors, organizational factors or demographic factors as moderators of knowledge sharing behavior, this research follows an exploratory approach into investigating potential moderating effects. The research model is illustrated in Figure 5.1.

5.2. Direct effects

As outlined before, technological factors and rewards for knowledge sharing are assumed to directly predict knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software.

Hence, in Section 5.2.1 the direct effects of the technological factors on knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software are outlined. In Section 5.2.2, the direct effects of rewards for knowledge sharing on knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software are presented. Finally, in Section 5.2.3, the direct effect of knowledge sharing attitude through enterprise social software on knowledge sharing intention through enterprise social software is examined.

5.2.1. Technological factors

In this section, hypotheses are deduced from literature and the qualitative interviews with regard to the technological factors of effort expectancy (see Section 5.2.1.1), performance expectancy (see Section 5.2.1.2), facilitating conditions (see Section 5.2.1.3), trust in technology (see Section 5.2.1.4) and personal innovativeness (see Section 5.2.1.5).

5.2.1.1. Effort expectancy

In the unified theory of acceptance and use of technology, effort expectancy is found to be an important determinant of behavioral intention (Venkatesh et al., 2003, p. 450). Effort expectancy is defined "as the degree of ease associated with the use of the system" (Venkatesh et al., 2003, p. 450). Thus, technologies that are perceived to be less complicated to use have higher possibilities to be accepted and used by potential users (Ajjan and Hartshorne, 2008, p. 73). According to prior literature, the easier functions of new technology are understood, the more likely it is that potential users accept and use the functions (Marler et al., 2009, p. 331). Quantitative research posits positive relationships between effort expectancy and intention (Venkatesh et al., 2003, p. 447) and that perceived ease of use, which pertains to effort expectancy, positively affects attitude (Davis, 1989, p. 320). Based on the evidence in literature as well as in the qualitative data, it is hypothesized:

> H1a: Effort expectancy has a positive effect on knowledge sharing *attitude* through enterprise social software.
>
> H1b: Effort expectancy has a positive effect on knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Venkatesh et al. (2003, p. 460) and adapted according to the research context (see Table 5.1). For the pre-implementation questionnaire, the conjunctive is used, e.g., the indicator "It is easy to learn how to use organizational social media[1]" has been rephrased into "I think it would be easy to learn how to use organizational social media".

Factor	Label	Indicator (PRE)	Indicator (POST)	Source
Effort expectancy	Ee_1	Ich kann mir vorstellen, dass unternehmenseigene soziale Medien einfach zu benutzen wären.	Ich finde unternehmenseigene soziale Medien sind einfach zu benutzen.	I would find the system easy to use (Venkatesh et al., 2003, p. 460).
	Ee_2	Ich kann mir vorstellen, dass es einfach zu erlernen wäre, wie man unternehmenseigene soziale Medien benutzt.	Es ist einfach zu lernen, wie man unternehmenseigene soziale Medien benutzt.	Learning to operate the system is easy for me (Venkatesh et al., 2003, p. 460).
	Ee_3	Ich kann mir vorstellen, dass die Anwendung unternehmenseigener sozialer Medien einfach wäre.	Die Anwendung unternehmenseigener sozialer Medien ist einfach.	It would be easy for me to become skillful at using the system (Venkatesh et al., 2003, p. 460).

Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).

Table 5.1. – Operationalization of effort expectancy (see Appendix C.1 for a translation of the German items).
Source: Own table.

5.2.1.2. Performance expectancy

In the unified theory of acceptance and use of technology, performance expectancy is a strong determinant of behavioral intention (Venkatesh et al., 2003, p. 447). Performance expectancy is defined "as the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003, p. 447). Prior literature finds that, the higher performance expectancy is perceived by an individual, the more likely it is for the individual to adopt a new technology (Agarwal and Prasad, 1998, p. 205). Quantitative research demonstrates that performance expectancy has a positive effect on intention (Venkatesh et al., 2003, p. 447) and that perceived usefulness, which pertains to performance expectancy, positively affects attitude (Davis, 1989, p. 320; Taylor and Todd, 1995b, p. 163). Therefore, the following set of hypotheses are proposed:

[1]The term "organizational social media" instead of the term "enterprise social software" has been used for the questionnaire since the term "social media" is better known than "social software" in Germany.

H2a: Performance expectancy has a positive effect on knowledge sharing *attitude* through enterprise social software.

H3b: Performance expectancy has a positive effect on knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Venkatesh et al. (2003, p. 460) and Davis (1989, p. 340) and adapted according to the research context (see Table 5.2). For the pre-implementation questionnaire, the conjunctive is used, e.g., the indicator "Using organizational social media improves my performance in my job" has been rephrased into "I think that using organizational social media would improve my performance in my job".

Factor	Label	Indicator (PRE)	Indicator (POST)	Source
Performance expectancy	Pe_1	Ich kann mir vorstellen, dass die Nutzung unternehmenseigener sozialer Medien meine Arbeitsleistung verbessern würde.	Die Nutzung unternehmenseigener sozialer Medien verbessert meine Arbeitsleistung.	Using CHART-MASTER would improve my job performance (Davis, 1989, p. 340).
	Pe_2	Ich kann mir vorstellen, dass die Nutzung unternehmenseigener sozialer Medien meine Produktivität erhöhen würde.	Die Nutzung unternehmenseigener sozialer Medien erhöht meine Produktivität.	Using CHART-MASTER in my job would increase my productivity (Venkatesh et al., 2003, p. 460).
	Pe_3	Ich kann mir vorstellen, dass mir die Nutzung unternehmenseigener sozialer Medien eine schnellere Erledigung von Aufgaben erlauben würde.	Die Nutzung unternehmenseigener sozialer Medien erlaubt mir eine schnellere Erledigung von Aufgaben.	Using the system enables me to accomplish tasks more quickly (Venkatesh et al., 2003, p. 460).
	Pe_4	Ich kann mir vorstellen, dass unternehmenseigene soziale Medien nützlich für meine Arbeit wären.	Die Nutzung unternehmenseigener sozialer Medien ist für meine Arbeit nützlich.	I would find CHART-MASTER useful in my job (Venkatesh et al., 2003, p. 460).

Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).

Table 5.2. – Operationalization of performance expectancy (see Appendix C.2 for a translation of the German items).
Source: Own table.

5.2.1.3. Facilitating conditions

Facilitating conditions are a key construct of the unified theory of acceptance and use of technology and are defined "as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system"

(Venkatesh et al., 2003, p. 453). Moreover, facilitating conditions are a construct conceptually similar to perceived behavioral control (Venkatesh et al., 2003, p. 445; Brown et al., 2010, p. 17). Previous literature highlights that training opportunities are highly relevant in order to make employees familiar with a new system (Bartol et al., 2009, p. 226; Bock et al., 2005, p. 101). Quantitative studies reveal that facilitating conditions positively affect behavioral intention (Venkatesh et al., 2003, p. 468; Jeon et al., 2011, p. 256; Eggert and Serdaroglu, 2011, p. 180; Venkatesh et al., 2012, p. 169). Therefore, it is expected that facilitating conditions are a relevant factor influencing knowledge sharing intention through enterprise social software. This assumption is extended by the additional prediction that facilitating conditions also have a positive impact on knowledge sharing attitude through enterprise social software. Accordingly, it is assumed that facilitating conditions enhance knowledge sharing intention through enterprise social software and knowledge sharing attitude through enterprise social software.

Thus, it is hypothesized:

> H3a: Facilitating conditions have a positive effect on knowledge sharing *attitude* through enterprise social software.

> H3b: Facilitating conditions have a positive effect on knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Kim and Kankanhalli (2009, p. 576) and adapted according to the research context (see Table 5.3). For the pre-implementation questionnaire, the conjunctive is used, e.g., the indicator "My organization provides guidance (e.g., code of conduct) on how to work with organizational social media" has been rephrased into "It would be important that my organization provides guidance (e.g., code of conduct) on how to work with organizational social media".

5.2.1.4. Trust in technology

According to Chai et al. (2012, p. 312), the multidimensional aspect of trust has to be recognized, which, besides interpersonal trust, relates to trust in technology. The factor trust in technology has been identified through the qualitative interviews and can be explained through social exchange theory (Chai et al., 2012, p. 312). Trust in technology is defined as "the degree to which employees trust the competence and security of technologies" (Teo et al., 2008, p. 105). Previous literature highlights that technology use depends on privacy and security issues (Koch, 2003, p. 89; Teo et al., 2008, p. 105). For instance, privacy concerns involve the fear that personal data are passed on to third parties or made available for general access (Koch, 2003, p. 89). Moreover, trust in technology encompasses user rights administration, which secures that only data can be found, which has been approved (Koch, 2003, p. 89).

Factor	Label	Indicator (PRE)	Indicator (POST)	Source
Facilitating conditions	Cond_1	Es wäre wichtig, dass mein Unternehmen Richtlinien (z.B. Verhaltenskodex) zum Umgang mit unternehmenseigenen sozialen Medien zur Verfügung stellt.	Mein Unternehmen stellt Richtlinien (z.B. Verhaltenskodex) zum Umgang mit unternehmenseigenen sozialen Medien zur Verfügung.	The company provides me guidance on how to change to the new way of working with the New Office Plus system (Kim and Kankanhalli, 2009, p. 576, based on Triandis, 1979, p. 205).
	Cond_2	Es wäre wichtig, dass mein Unternehmen die notwendigen Handlungshilfen (z.B. Handbücher, Nutzungsszenarien) zum Umgang mit unternehmenseigenen sozialen Medien zur Verfügung stellt.	Mein Unternehmen stellt die notwendigen Handlungshilfen (z.B. Handbücher, Nutzungsszenarien) zum Umgang mit unternehmenseigenen sozialen Medien zur Verfügung.	I am given the necessary support and assistance to change to the new way of working with the New Office Plus system by the company (Kim and Kankanhalli, 2009, p. 576, based on Triandis, 1979, p. 205).
	Cond_3	Es wäre wichtig, dass mein Unternehmen die notwendige Unterstützung (z.B. Help desk, Ansprechpartner, Botschafter, Schulungen) zum Umgang mit unternehmenseigenen sozialen Medien zur Verfügung stellt.	Mein Unternehmen stellt die notwendige Unterstützung (z.B. Help desk, Ansprechpartner, Botschafter, Schulungen) zum Umgang mit unternehmenseigenen sozialen Medien zur Verfügung.	I am given the necessary support and assistance to change to the new way of working with the New Office Plus system by the company (Kim and Kankanhalli, 2009, p. 576, based on Triandis, 1979, p. 205).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).				

Table 5.3. – Operationalization of facilitating conditions (see Appendix C.3 for a translation of the German items).
Source: Own table.

One of the main issues with knowledge sharing through technology is the related loss of control over that knowledge (Chai et al., 2012, p. 322). Once it is divulged, it becomes available for others and can be further communicated (Hustinx, 2010, p. 1). Additionally, deleting or rectifying one's own contributions can be a real challenge (Hustinx, 2010, p. 1). Quantitative research finds that trust in technology is positively related to behavior (Chai et al., 2012, p. 322). In addition, Suh and Han (2003, p. 151) reveal that trust in technology is positively associated with attitude and intention. Teo et al. (2008, p. 118) also demonstrate that trust in technology has a positive effect on intention. Based on the literature review and the results of the interviews, it is assumed that high levels of trust in technology increase employees' knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software. Therefore, it is hypothesized:

> H4a: Trust in technology has a positive effect on knowledge sharing *attitude* through enterprise social software.

H4b: Trust in technology has a positive effect on knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from McKnight et al. (2002, p. 355) and adapted according to the research context (see Table 5.4). One indicator is self-developed, based on Koch (2003, p. 71). For the pre-implementation questionnaire, the conjunctive is used, e.g., the indicator "Organizational social media has enough safeguards to protect my personal data from misuse (data protection)" has been rephrased into "Organizational social media has enough safeguards that would protect my personal data from misuse (data protection)".

Factor	Label	Indicator (PRE)	Indicator (POST)	Source
Trust in technology	TrustT_1	Ich bin zuversichtlich, dass unternehmenseigene soziale Medien genügend Schutzmaßnahmen haben, die meine personenbezogenen Daten vor Missbrauch schützen würden (Datenschutz).	Ich bin zuversichtlich, dass unternehmenseigene soziale Medien genügend Schutzmaßnahmen haben, die meine personenbezogene Daten vor Missbrauch schützen (Datenschutz).	The Internet has enough safeguards to make me feel comfortable using it to transact personal business (McKnight et al., 2002, p. 355).
	TrustT_2	Ich bin zuversichtlich, dass ich in unternehmenseigenen sozialen Medien Kontrolle über meine digitale Identität ausüben könnte, d.h. ich könnte neue Daten einpflegen, einsehen und den Zugriff darauf regulieren.	In unternehmenseigenen sozialen Medien kann ich Kontrolle über meine digitale Identität ausüben, d.h. ich kann neue Daten einpflegen, einsehen und den Zugriff darauf regulieren.	Self-developed item based on Koch (2003, p. 71).
	TrustT_3	Ich bin zuversichtlich, dass unternehmenseigene soziale Medien insgesamt eine sichere Arbeitsumgebung darstellen würden.	Insgesamt stellen unternehmenseigene soziale Medien eine sichere Arbeitsumgebung dar.	In general, the Internet is now a robust and safe environment in which to transact business (McKnight et al., 2002, p. 355).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).				

Table 5.4. – Operationalization of trust in technology (see Appendix C.4 for a translation of the German items).
Source: Own table.

5.2.1.5. Personal innovativeness

Personal innovativeness has been revealed through the qualitative interviews and can be explained through the diffusion of innovations theory. The factor personal innovativeness is defined "as the willingness of an individual to try out any new information technology" (Agarwal and Prasad, 1998, p. 206). According to the diffusion of innovations theory personal innovativeness is a personality trait that influences attitudinal formations (Hurt et al., 1977, p. 58). Prior literature suggests that personal innovativeness enhances consumers' attitude formation (Rowley, 1996, p. 26). In addition, Limayem et al. (2000, p. 423) expect personal innovativeness to have an effect on the formation of favorable attitudes toward online shopping. Quantitative research demonstrates that personal innovativeness has an influence on intention (Agarwal and Prasad, 1998, p. 113). In this thesis, it is expected that employees, who are more likely to try out new technologies, are more likely to form a positive knowledge sharing attitude through enterprise social software and are also more likely to use enterprise social software in future. Therefore, the following set of hypotheses are proposed:

> H5a: Personal innovativeness has a positive effect on knowledge sharing *attitude* through enterprise social software.

> H5b: Personal innovativeness has a positive effect on knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Agarwal and Prasad (1998, p. 210) (see Table 5.5). For the pre-implementation questionnaire and the post-implementation questionnaire, the same indicators are used, since they do not directly refer to the acceptance and use of enterprise social software.

Factor	Label	Indicator (PRE & POST)	Source
Personal innovativeness	Innov_1	Es mag es, neue Informationstechnologien auszuprobieren.	I like to experiment with new information technologies (Agarwal and Prasad, 1998, p. 210).
	Innov_2	In meinem privaten Umfeld bin ich oft der Erste, der neue Informationstechnologien ausprobiert.	Among my peers, I am usually the first to try out new information technologies (Agarwal and Prasad, 1998, p. 210).
	Innov_3	Ich informiere mich regelmäßig über neue Technologien.	In general, I am hesitant to try out new information technologies (Agarwal and Prasad, 1998, p. 210).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).			

Table 5.5. – Operationalization of personal innovativeness (see Appendix C.5 for a translation of the German items).
Source: Own table.

5.2.2. Rewards for knowledge sharing

In this section, hypotheses are deduced from literature with regard to social rewards of knowledge sharing (see Section 5.2.2.1) and economic rewards of knowledge sharing (see Section 5.2.2.2).

5.2.2.1. Social rewards for knowledge sharing

The concept of social rewards for knowledge sharing is linked to the social exchange theory, in which:

> Favors make us grateful, and our expressions of gratitude are social rewards that tend to make doing favors enjoyable, particularly if we express our appreciation and indebtedness publicly and thereby help establish a person's reputation as a generous and competent helper (Blau, 1964, p. 16).

Previous literature indicates that social rewards with regard to knowledge sharing can help individuals gain extrinsic benefits such as feelings of respect and status (Blau, 1964, p. 16; Gottschalg and Zollo, 2007, p. 309; Wasko and Faraj, 2000, p. 160). Therefore, this thesis defines social rewards for knowledge sharing as the degree to which an employee believes that showing his or her expertise could enhance personal reputation, because he or she earns recognition, respect and a better image by peers and experts (Hsu and Lin, 2008, p. 68). In quantitative research, the role of social rewards for knowledge sharing is somewhat unclear. For example, Liao et al. (2013, p. 900) and Jeon et al. (2011, p. 256) find support for the positive relationship between social rewards for knowledge sharing and knowledge sharing attitude, whereas Cho et al. (2010, p. 1207) provide empirical evidence showing that social rewards for knowledge sharing is a non-significant predictor of knowledge sharing attitude. In addition, some researchers demonstrate that social rewards for knowledge sharing have a positive impact on knowledge sharing behavior (Kankanhalli et al., 2005b, p. 132; Lin, 2007b, p. 324). Chang and Chuang (2011, p. 15) differentiate between the quality and quantity of shared knowledge. They find that reputation for knowledge sharing has positive effects on the quality of shared knowledge, but not on the quantity of shared knowledge (Chang and Chuang, 2011, p. 16). While the results of prior research are mixed, this thesis expects that social rewards for knowledge sharing have a positive impact on knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software. Accordingly, it is assumed that employees share their knowledge, because they believe that they can enhance their status in the organization by showing others that they possess valuable expertise (Davenport and Prusak, 1998, p. 80; Wiig, 2000, p. 7). Therefore, the following hypotheses are proposed:

> H6a: Social rewards for knowledge sharing have a positive effect on knowledge sharing *attitude* through enterprise social software.

> H6b: Social rewards for knowledge sharing have a positive effect on knowledge sharing *intention* through enterprise social software.

Factor	Label	Indicator (PRE & POST)	Source
Social rewards	SocRew_1	Mein Wissen zu teilen, verbessert mein Ansehen im Unternehmen.	Sharing my knowledge through electronic knowledge respositories improves my image within the organization (Kankanhalli et al., 2005b, p. 142, based on Moore and Benbasat, 1991, p. 216).
	SocRew_2	Mein Wissen mit anderen Mitarbeitern zu teilen, verbessert meine Anerkennung.	When I share my knowledge through electronic knowledge respositories, the people I work with respect me (Kankanhalli et al., 2005b, p. 142, based on Kalman, 1999, p. 142).
	SocRew_3	Ich werde von anderen Mitarbeitern für meine Wissensteilung geschätzt.	Sharing my knowledge through electronic knowledge respositories improves others recognition of me (Kankanhalli et al., 2005b, p. 142, based on Green, 1989, p. 119).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).			

Table 5.6. – Operationalization of social rewards for knowledge sharing (see Appendix C.6 for a translation of the German items).
Source: Own table.

Operationalization The indicators are adopted from Kankanhalli et al. (2005b, p. 142) and adapted according to the research context (see Table 5.6). For the pre-implementation questionnaire and the post-implementation questionnaire, the same indicators are used, since they do not directly refer to the acceptance and use of enterprise social software.

5.2.2.2. Economic rewards for knowledge sharing

The social exchange theory posits that "people prefer to be sure of the rewards they receive for the services they render" (Blau, 1964, p. 137). In line with the social exchange theory, Thompson et al. (1991, p. 128) expect that rewards will motivate individuals to change their behavior. In this thesis, economic rewards for knowledge sharing are defined as the degree to which an employee believes that it is important to receive a bonus, payment, job security or career advancement, when showing his or her knowledge (Bock et al., 2005, p. 107). Prior research reports that people fear losing their power position, when sharing their unique knowledge (Peariasamy and Mansor, 2008, p. 88). Hence, people are afraid of making themselves replaceable by sharing their knowledge (Peariasamy and Mansor, 2008, p. 88). Therefore, researchers argue that rewards are important in order to motivate employees to share their valuable knowledge with others (Peariasamy and Mansor, 2008, p. 88; Ba et al., 2001, p. 227; Beer and Nohria, 2000, p. 136; Davenport et al., 1998, p. 50; Jarvenpaa and Staples, 2000, p. 134; Ruggles, 1998, p. 82). In quantitative research, the role of economic rewards for knowledge sharing is somewhat unclear. For example, Hu and Randel (2014, p. 234) provide empirical evidence for the positive relationship between economic rewards for knowledge sharing and knowledge sharing attitude, whereas Liao et al. (2013, p. 900) and Shu and Chuang (2011, p. 686) find economic rewards for knowledge sharing to be a non-significant predictor of knowledge sharing attitude. In addition, Huang et al. (2013, p. 133) differentiate between on-system rewards and off-system rewards and find that on-system rewards have a positive and significant effect on knowledge sharing attitude, while off-system rewards have no effect on knowledge sharing attitude. Hence, the results of prior research are mixed. However, in line with Hu and Randel (2014, p. 234), this thesis expects that economic rewards for knowledge sharing have a positive impact on knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software. Hence, it is assumed that employees share their knowledge, when economic rewards for knowledge sharing are granted (Kankanhalli et al., 2005b, p. 132; Lin, 2007b, p. 324). Consequently, it is hypothesized:

> H7a: Economic rewards for knowledge sharing have a positive effect on knowledge sharing *attitude* through enterprise social software.

> H7b: Economic rewards for knowledge sharing have a positive effect on knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Kankanhalli et al. (2005b, p. 183) and adapted according to the research context (see Table 5.7). For the pre-implementation questionnaire and the post-implementation questionnaire, the same indicators are used, since they do not directly refer to the acceptance and use of enterprise social software.

5.2.3. Attitude and intention

In this section, the relationship between knowledge sharing attitude through enterprise social software (see Section 5.2.3.1) and knowledge sharing intention through enterprise social software (see Section 5.2.3.2) is discussed.

5.2.3.1. Knowledge sharing attitude through enterprise social software

According to behavioral theories (e.g., the theory of reasoned action, the theory of planned behavior and the technology acceptance model), attitude has a positive impact on intention and is defined as “an individual’s positive or negative feelings (evaluative affect) about performing the target behavior” (Fishbein and Ajzen, 1975, p. 216). Prior research has found that the degree of one’s positive feelings about sharing one’s knowledge is a key determinant of knowledge sharing intention (Bock et al., 2005, p. 108; Lin and Lee, 2004, p. 124). Accordingly, the next hypothesis is proposed:

Factor	Label	Indicator (PRE & POST)	Source
Economic rewards	EcoRew_1	Es ist wichtig, dass Mitarbeiter für ihre Wissensteilung eine höhere Jobsicherheit bekommen.	It is important to get more job security when I share my knowledge through electronic knowledge repositories (Kankanhalli et al., 2005b, p. 183).
	EcoRew_2	Es ist wichtig, dass Mitarbeiter für ihre Wissensteilung ein höheres Gehalt bekommen.	It is important to get a higher salary when I share my knowledge through electronic knowledge repositories (Kankanhalli et al., 2005b, p. 183).
	EcoRew_3	Es ist wichtig, dass Mitarbeiter für ihre Wissensteilung Bonuszahlungen bekommen.	It is important to get a higher bonus when I share my knowledge through electronic knowledge repositories (Kankanhalli et al., 2005b, p. 183).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).			

Table 5.7. – Operationalization of economic rewards for knowledge sharing (see Appendix C.7 for a translation of the German items).
Source: Own table.

H8: Knowledge sharing attitude through enterprise social software has a positive effect on knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Bock et al. (2005, p. 108) and Lin and Lee (2004, p. 124) and adapted according to the research context (see Table 5.8). For the pre-implementation questionnaire, the conjunctive is used, e.g., the indicator "I find knowledge sharing with other employees through organizational social media good" has been changed into "I find that knowledge sharing with other employees through organizational social media would be good".

Factor	Label	Indicator (PRE)	Indicator (POST)	Source
Knowledge sharing attitude through enterprise social software	Att_1	Ich finde, dass die Wissensteilung mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien gut wäre.	Ich finde die Wissensteilung mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien gut.	My knowledge sharing with other organizational members is good (Bock et al., 2005, p. 108, based on Davis, 1989, p. 988).
	Att_2	Ich finde, dass die Wissensteilung mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien vorteilhaft wäre.	Ich finde die Wissensteilung mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien vorteilhaft.	Encouraging knowledge sharing with colleagues is beneficial (Lin and Lee, 2004, p. 124, based on Davis, 1989, p. 988).
	Att_3	Ich finde, dass die Wissensteilung mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien sinnvoll wäre.	Ich finde die Wissensteilung mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien sinnvoll.	My knowledge sharing with other organizational members is a wise move (Bock et al., 2005, p. 108, based on Davis, 1989, p. 988).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).				

Table 5.8. – Operationalization of knowledge sharing attitude through enterprise social software (see Appendix C.8 for a translation of the German items).
Source: Own table.

5.2.3.2. Knowledge sharing intention through enterprise social software

The theory of reasoned action, the theory of planned behavior and the technology acceptance model suggest that intention influences an individual's behavior (Fishbein and Ajzen, 1975, p. 288; Davis, 1989, p. 320; Venkatesh et al., 2003, p. 467). Warshaw and Davis (1985, p. 214) define intention as "the degree to which a person has formulated conscious plans to perform or not perform some specified future behavior". Previous literature suggests that knowledge sharing intention is a key determinant of knowledge sharing behavior (Bock et al., 2005, p. 87; Lin, 2007a, p. 142).

Operationalization The indicators are adopted from Lin (2007a, p. 142) and adapted according to the research context (see Table 5.9). For the pre-implementation questionnaire, the conjunctive is used, e.g., the indicator "I will try to share my knowledge with other employees through organizational social media" has been rephrased in "Given the opportunity, I would try to share my knowledge with other employees through organizational social media".

Factor	Label	Indicator (PRE)	Indicator (POST)	Source
Knowledge sharing intention through enterprise social software	Int_1	Sobald die Möglichkeit besteht, würde ich mich stets bemühen, mein Wissen mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien zu teilen.	Ich werde mich stets bemühen, mein Wissen mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien zu teilen.	I will always make an effort to share knowledge with my colleagues (Lin, 2007a, p. 142, based on Davis, 1989, p. 988).
	Int_2	Sobald die Möglichkeit besteht, würde ich versuchen, mein Wissen mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien zu teilen.	Ich werde versuchen, mein Wissen mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien zu teilen.	I will try to share knowledge with my colleagues (Lin, 2007a, p. 142, based on Davis, 1989, p. 988).
	Int_3	Sobald die Möglichkeit besteht, würde ich mein Wissen in Zukunft mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien teilen.	Ich beabsichtige, mein Wissen in Zukunft mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien zu teilen.	I intend to share knowledge with my colleagues more frequently in the future (Lin, 2007a, p. 142, based on Davis, 1989, p. 988).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).				

Table 5.9. – Operationalization of knowledge sharing intention through enterprise social software (see Appendix C.9 for a translation of the German items).
Source: Own table.

Finally, Table 5.10 gives an overview of the formal definitions of the direct effects.

Construct	Definition
Effort expectancy	Effort expectancy is defined as the degree of ease associated with the use of enterprise social software (developed based on Venkatesh et al., 2003, p. 450).
Performance expectancy	Performance expectancy is defined as the degree to which employees believe that using enterprise social software will help them to attain gains in job performance (developed based on Venkatesh et al., 2003, p. 447).
Facilitating conditions	Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of enterprise social software (developed based on Venkatesh et al., 2003, p. 453).
Trust in technology	Trust in technology is defined as the degree to which employees trust the competence and security of enterprise social software (developed based on Teo and Men, 2008, p. 105).
Personal innovativeness	Personal innovativeness is defined as the willingness of an individual to try out any new information technology (Agarwal and Prasad, 1998, p. 206).
Social rewards for knowledge sharing	Social rewards for knowledge sharing are defined as the degree to which an employee believes that showing his or her expertise could enhance personal reputation, because he or she earns recognition, respect and a better image by peers and experts (developed based on Hsu and Lin, 2008, p. 68).
Economic rewards for knowledge sharing	Economic rewards for knowledge sharing are defined as the degree to which an employee believes that it is important to receive a bonus, payment, job security or career advancement, when showing his or her knowledge (developed based on Bock et al., 2005, p. 107).
Knowledge sharing attitude through enterprise social software	Knowledge sharing attitude through enterprise social software is defined as employee's positive or negative feelings about knowledge sharing through enterprise social software (developed based on Fishbein and Ajzen, 1975, p. 216).
Knowledge sharing intention through enterprise social software	Knowledge sharing intention through enterprise social software is defined as the degree to which employees have formulated conscious plans to perform or not perform future knowledge sharing behavior through enterprise social software (developed based on Warshaw and Davis, 1985, p. 214).

Table 5.10. – Direct construct definitions.
Source: Own table.

5.3. Moderation effects

Prior knowledge management literature rarely considers personal factors, organizational factors and demographic factors as moderators of knowledge sharing behavior. At least some researchers focus on one moderation effect at a time (e.g., Chai et al., 2012; Lee et al., 2005).

Therefore, this thesis adopts an *exploratory approach* in order to identify relevant personal (see Section 5.3.1), organizational (see Section 5.3.2) and demographic moderation effects (see Section 5.3.3) and to make the high number of moderated relationships manageable.

5.3.1. Personal factors

In this section, moderation hypotheses are deduced based on a theoretical discussion with regard to the personal factors of interpersonal trust (see Section 5.3.1.1), self-efficacy (see Section 5.3.1.2), altruism (see Section 5.3.1.3) and reciprocity (see Section 5.3.1.4).

5.3.1.1. Interpersonal trust

According to Chai et al. (2012, p. 312), the multidimensional aspect of trust has to be recognized, which, besides trust in technology, relates to interpersonal trust. Interpersonal trust is explained by the social exchange theory (Chai et al., 2012, p. 312) and is defined as:

> [...] the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other party will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party (Mayer et al., 1995, p. 712).

Hence, interpersonal trust is the belief in the good interest and intentions, skills and a high degree of reliance that employees behave in a responsible manner (Mishra, 1996, p. 5; Putnam, 1993, p. 3). Prior literature indicates that knowledge sharing behavior is encouraged, when employees believe in the skills and competences of other employees and are thus convinced that they can rely on the know-how of their colleagues (Ardichvili et al., 2006, p. 99). Most of the quantitative research focuses on the direct relationship between interpersonal trust and knowledge sharing behavior. For example, Chai et al. (2012, p. 332) report a positive relationship between interpersonal trust and behavior. Chang and Chuang (2011, p. 16) differentiate between the quality and quantity of shared knowledge and find that interpersonal trust has a positive effect on the quality of shared knowledge but not the quantity of shared knowledge. However, quantitative research rarely considers interpersonal trust as a moderator of the relationship between technological factors and knowledge sharing. Therefore, the following hypotheses are established:

H9aa-H9ae: Interpersonal trust (a) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *attitude* through enterprise social software.

H10aa-H10ae: Interpersonal trust (a) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Beierlein et al. (2012, p. 25) and Jarvenpaa and Leidner (1999, p. 813) (see Table 5.11). For the pre-implementation questionnaire and the post-implementation questionnaire, the same indicators are used, since they do not directly refer to the acceptance and use of enterprise social software.

Factor	Label	Indicator (PRE & POST)	Source
Interpersonal trust	Trust_1	Ich bin davon überzeugt, dass die meisten Menschen gute Absichten haben.	I am convinced that most people have good intentions (Beierlein et al., 2012, p. 25).
	Trust_2	Im Allgemeinen kann man den Menschen vertrauen.	In general, people can be trusted (Beierlein et al., 2012, p. 25).
	Trust_3	Ich kann mich auf andere verlassen.	I can rely on the knowledge of my colleagues (Jarvenpaa and Leidner, 1999, p. 813).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).			

Table 5.11. – Operationalization of interpersonal trust (see Appendix C.10 for a translation of the German items).
Source: Own table.

5.3.1.2. Self-efficacy

The concept of self-efficacy is linked to social exchange theory (Chiu et al., 2006, p. 1872; Cho et al., 2010, p. 1200) and is defined as "a person's judgment of his or her capability to organize and execute the actions required to attain designated types of performances" (Bandura, 1986, p. 391). Prior research finds that employees are more willing to share their knowledge when they are convinced that they possess knowledge which is relevant to others and useful for solving problems (Gottschalg and Zollo, 2007, p. 308). Most of the quantitative research focuses on the direct relationship between self-efficacy and knowledge sharing behavior. For example, some researchers show that higher self-efficacy is linked to higher levels of knowledge sharing attitude

(Huang et al., 2013, p. 150; Huang et al., 2013, p. 133), knowledge sharing intention (Cho et al., 2010, p. 1206; Jeon et al., 2011, p. 256) and knowledge sharing behavior (Chen and Hung, 2010, p. 232; Taylor and Todd, 1995b, p. 163; Lin, 2007b, p. 324; Kankanhalli et al., 2005b, p. 132), whereas others find self-efficacy to be a non-significant predictor of knowledge sharing intention (Tamjidyamcholo et al., 2013, p. 229). However, quantitative research rarely considers self-efficacy as a moderator of the relationship between technological factors and knowledge sharing. In order to address this research gap, it is postulated:

> H9ba-H9be: Self-efficacy (b) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *attitude* through enterprise social software.

> H10ba-H10be: Self-efficacy (b) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Beierlein et al. (2012, p. 23) and Romppel et al. (2013, p. 5) (see Table 5.12). For the pre-implementation questionnaire and the post-implementation questionnaire, the same indicators are used, since they do not directly refer to the acceptance and use of enterprise social software.

Factor	Label	Indicator (PRE & POST)	Source
Self-efficacy	Selfe_1	In schwierigen Situationen kann ich mich auf meine Fähigkeiten verlassen.	I can rely on my own abilities in difficult situations (Beierlein et al., 2012, p. 23).
	Selfe_2	Die meisten Probleme kann ich aus eigener Kraft gut meistern.	I am able to solve most problems on my own (Beierlein et al., 2012, p. 23).
	Selfe_3	In der Regel kann ich anstrengende und komplizierte Aufgaben gut lösen.	I can usually solve even challenging and complex tasks well (Beierlein et al., 2012, p. 23).
	Selfe_4	Die Lösung schwieriger Probleme gelingt mir immer, wenn ich mich darum bemühe	I can always manage to solve difficult problems if I try hard enough (Romppel et al., 2013, p. 5).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).			

Table 5.12. – Operationalization of self-efficacy (see Appendix C.11 for a translation of the German items).
Source: Own table.

5.3.1.3. Altruism

The concept of altruism can be linked to social exchange theory and is defined as “a behavior that is performed without expecting any future reward and is carried out mainly to benefit others” (Zimbardo, 1988, p. 434). Consequently, altruism can be regarded as a pro-social behavior (Zimbardo, 1988, p. 434; Hsu and Lin, 2008, p. 66; Gottschalg and Zollo, 2007, p. 306; Organ, 1988, p. 27). Prior literature suggests that employees are intrinsically motivated to share their knowledge, because they perceive being part of intellectual discussions and solving problems as either challenging or pleasurable (Kankanhalli et al., 2005a, p. 116; Wasko and Faraj, 2005, p. 40; Stocker and Tochtermann, 2012, p. 40). Most of the quantitative research focuses on direct relationships between altruism and knowledge sharing behavior. For instance, some researchers find a positive relationship between altruism and knowledge sharing attitude (Huang et al., 2013, p. 150; Jeon et al., 2011, p. 256; Cho et al., 2010, p. 1207; Huang et al., 2013, p. 133). In addition, a positive relationship between altruism and knowledge sharing behavior is postulated by some researchers (Kankanhalli et al., 2005a, p. 132; Lin, 2007b, p. 324; Chang and Chuang, 2011, p. 15; Yu et al., 2010, p. 39). However, quantitative research rarely considers altruism as a moderator of the relationship between technological factors and knowledge sharing. Therefore, it is assumed:

> H9ca-H9ce: Altruism (c) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *attitude* through enterprise social software.

> H10ca-H10ce: Altruism (c) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Kim and Kankanhalli (2009, p. 50) (see Table 5.13). The same indicators are used for the pre-implementation questionnaire and the post-implementation questionnaire, since they do not directly refer to the acceptance and use of enterprise social software.

5.3.1.4. Reciprocity

According to social exchange theory, employees expect mutual reciprocity (Blau, 1964, p. 4; Wasko and Faraj, 2005, p. 169). Blau (1964, p. 4) defines reciprocity as “actions that are contingent on rewarding reactions from others and that cease when these expected reactions are not forthcoming”. Moreover, Berger and Rauhut (2015, p.

Factor	Label	Indicator (PRE & POST)	Source
Altruism	Altr_1	Ich gehe auf die Bedürfnisse anderer ein.	I anticipate the needs of others (Kim and Kankanhalli, 2009, p. 50).
	Altr_2	Ich habe für jeden ein gutes Wort.	I have a good word for everyone (Kim and Kankanhalli, 2009, p. 50).
	Altr_3	Ich sorge mich um andere.	I am concerned about others (Kim and Kankanhalli, 2009, p. 50).
	Altr_4	Ich gebe anderen das Gefühl, willkommen zu sein.	I make people feel welcome (Kim and Kankanhalli, 2009, p. 50).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).			

Table 5.13. – Operationalization of altruism (see Appendix C.12 for a translation of the German items).
Source: Own table.

4) argue that different kind of goods can be exchanged, such as material goods or recognition, which are subjectively comparable in value. Prior literature suggests that employees have a rather positive attitude toward knowledge sharing, because they consider knowledge sharing to be valuable and worthwhile (Cho et al., 2010, p. 1206). In addition, employees expect others to contribute in response to their own provided content (Davenport and Prusak, 1998, p. 79). Furthermore, researchers highlight that contributions demand time and effort, which employees are willing to spend, if others reciprocate (Cho et al., 2010, p. 1198). Most of the quantitative research focuses on the direct relationship between reciprocity and knowledge sharing behavior. For example, some researchers provide empirical evidence showing a positive relationship between reciprocity and knowledge sharing attitude (Jeon et al., 2011, p. 256), whereas others find reciprocity to be a non-significant predictor of knowledge sharing attitude (Liao et al., 2013, p. 900; Cho et al., 2010, p. 1207). Furthermore, Chai et al. (2012, p. 332), Tamjidyamcholo et al. (2013, p. 229) and Cho et al. (2010, p. 1207) find support that reciprocity has a positive impact on knowledge sharing intention, whereas Chen and Hung (2010, p. 233) provide empirical evidence showing that reciprocity is a non-significant predictor of knowledge sharing intention. Finally, some researchers also report that reciprocity and knowledge sharing behavior are positively related to each other (Chang and Chuang, 2011, p. 15). However, quantitative research rarely considers reciprocity as a moderator of the relationship between technological factors and knowledge sharing. Therefore, it is expected:

> H9da-H9de: Reciprocity (d) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *attitude* through enterprise social software.

> H10da-H10de: Reciprocity (d) moderates the positive relationship between

the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Caliendo et al. (2012, p. 406) (see Table 5.14). For the pre-implementation questionnaire and the post-implementation questionnaire, the same indicators are used, since they do not directly refer to the acceptance and use of enterprise social software.

Factor	Label	Indicator (PRE & POST)	Source
Reciprocity	Rec_1r	Wenn mich jemand beleidigt, werde ich mich ihm/ihr gegenüber auch beleidigend verhalten.	If somebody offends me, I will offend him/her back (Caliendo et al., 2012, p. 406).
	Rec_2r	Wenn mir schweres Unrecht zuteil wird, werde ich mich um jeden Preis bei der nächsten Gelegenheit dafür rächen.	If I suffer a serious wrong, I will take revenge as soon as possible, no matter what the cost (Caliendo et al., 2012, p. 406).
	Rec_3r	Wenn mich jemand in eine schwierige Lage bringt, werde ich das Gleiche mit ihm/ihr machen.	If somebody puts me in a difficult position, I will do the same to him/her (Caliendo et al., 2012, p. 406).

Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).

Table 5.14. – Operationalization of reciprocity (r=reverse coded item) (see Appendix C.13 for a translation of the German items).
Source: Own table.

5.3.2. Organizational factors

In this section, hypotheses are deduced from literature and qualitative interviews with regard to the organizational factors of management support (see Section 5.3.2.1), knowledge sharing norms (see Section 5.3.2.2), organizational identification (see Section 5.3.2.3) and monitoring (see Section 5.3.2.4).

5.3.2.1. Management support

The concept of management support is linked to social exchange theory (Blau, 1964, p. 67) and is defined as the extent to which "supervisors explicitly encourage their subordinates" (Schillewaert et al., 2005, p. 327). In the context of this thesis, management support is regarded as the degree to which supervisors explicitly encourage their subordinates to share their knowledge (Schillewaert et al., 2005, p. 327). Prior literature suggests that management support is a key predictor of knowledge sharing in organizations (Connelly and Kelloway, 2003, p. 294). Most of the quantitative research focuses on the direct relationships between management support and knowledge sharing behavior. For example, some researchers find a positive relationship between management support and knowledge sharing behavior (Lin, 2007b, p. 324; Zboralski, 2006, p. 245). However, quantitative research rarely considers management support as a moderator of the relationship between technological factors and knowledge sharing. Therefore, it is expected:

> H9ea-H9ee: Management support (e) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *attitude* through enterprise social software.

> H10ea-H10ee: Management support (e) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Zboralski (2006, p. 225) and Lin (2007b, p. 331) (see Table 5.15). The same indicators are used for the pre-implementation questionnaire and the post-implementation questionnaire, since they do not directly refer to the acceptance and use of enterprise social software.

Factor	Label	Indicator (PRE & POST)	Source
Management support	Ms_1	Das Management ist sich der Wichtigkeit der Wissensteilung im Unternehmen bewusst.	Das Management ist sich der Wichtigkeit der Arbeit der Community bewusst (Zboralski, 2006, p. 225).
	Ms_2	Das Management ermutigt die Mitarbeiter dazu, ihr Wissen im Unternehmen zu teilen.	Top managers always support and encourage employees to share their knowledge with colleagues (Lin, 2007b, p. 331).
	Ms_3	Das Management unterstützt die Wissensteilung durch die Bereitstellung von Ressourcen (z.B. technische Ausstattung, personelle Unterstützung, Zeit) im Unternehmen.	Das Management unterstützt die Arbeit der Community durch die Bereitstellung von Ressourcen (Zboralski, 2006, p. 225).
	Ms_4	Das Management äußert sich positiv über die Wissensteilung im Unternehmen.	Das Management äußert sich gegenüber anderen positiv über die Aktivitäten der Community (Zboralski, 2006, p. 225).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).			

Table 5.15. – Operationalization of management support (see Appendix C.14 for a translation of the German items).
Source: Own table.

5.3.2.2. Knowledge sharing norms

In line with social capital theory, norms are defined as:

> [...] standards against which the person can evaluate the appropriateness of behavior, [...] providing order and meaning to what otherwise might be seen as an ambiguous, uncertain, or perhaps threatening situation (Raven and Rubin, 1976, p. 314).

Therefore, norms are a key component of social relationships and are the basis for interaction processes (Schäfers, 1995, p. 83; Putnam, 1993, p. 2), which generally depend on individuals behaving according to rules (Schäfers, 1995, p. 26). Kankanhalli et al. (2005b, p. 117) state, based on the works of Starbuck (1992, p. 727), Goodman and Darr (1998, p. 430), Jarvenpaa and Staples (2000, p. 132) and Leonard-Barton (1995, p. 24), that the climate for knowledge sharing can be enhanced by norms of teamwork, collaboration and sharing, willingness to value and respond to diversity, openness to conflicting views and tolerance for failure. In the context of this research, knowledge sharing norms are defined as "the prevalence of norms that are intended to facilitate knowledge sharing in the organization" (Kankanhalli et al., 2005b, p. 123). Prior literature suggests that norms with respect to knowledge sharing can help overcome perceived costs, such as time and effort required to codify and input knowledge into knowledge repositories (Cabrera and Cabrera, 2005, p. 728; Borgatti and Cross, 2003, p. 441; Gagné, 2009, p. 574). Quantitative research shows that knowledge behavior is moderated by knowledge sharing norms (Kankanhalli et al., 2005b, p. 132). However, quantitative research rarely considers knowledge sharing norms as a moderator of the relationship between technological factors and knowledge sharing. Thus, it is assumed:

> H9fa-H9fe: Knowledge sharing norms (f) moderate the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *attitude* through enterprise social software.

> H10fa-H10fe: Knowledge sharing norms (f) moderate the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Kankanhalli et al. (2005b, p. 143) (see Table 5.16). For the pre-implementation questionnaire and the post-implementation questionnaire, the same indicators are used, since they do not directly refer to the acceptance and use of enterprise social software.

Factor	Label	Indicator (PRE & POST)	Source
Knowledge sharing norms	Ksn_1	Zusammenarbeit hat eine hohe Bedeutung in meinem Unternehmen.	There is a norm of cooperation in my organization (Kankanhalli et al., 2005b, p. 143).
	Ksn_2	Aus Fehlern zu lernen hat eine hohe Bedeutung in meinem Unternehmen.	There is a norm of tolerance of mistakes in my organization (Kankanhalli et al., 2005b, p. 143).
	Ksn_3	Die Vielfältigkeit der Mitarbeiter (Teamzugehörigkeit, Wertvorstellungen, persönliche Erfahrungen, individuelle Fähigkeiten) hat eine hohe Bedeutung in meinem Unternehmen.	There is a willingness to value and respond to diversity in my organization (Kankanhalli et al., 2005b, p. 143).
	Ksn_4	Offenheit gegenüber gegensätzlichen Ansichten hat eine hohe Bedeutung in meinem Unternehmen.	There is a norm of openness to conflicting views in my organization (Kankanhalli et al., 2005b, p. 143).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).			

Table 5.16. – Operationalization of knowledge sharing norms (see Appendix C.15 for a translation of the German items).
Source: Own table.

5.3.2.3. Organizational identification

The concept of organizational identification is linked to social exchange theory and is defined as "the perception of similarity of values, membership, and loyalty with the organization" (Patchen, 1970, p. 159). Moreover, Spelsiek (2005, p. 89) states that, the more employees identify with an organization, the more they agree with organizational goals. Prior literature finds that organizational identification influences knowledge sharing behavior (Wenger, 1998, p. 6). Most of the quantitative research focuses on the direct relationship between organizational identification and knowledge sharing behavior. For instance, some researchers find a positive relationship between organizational identification and knowledge sharing behavior (Kankanhalli et al., 2005b, p. 132; Chang and Chuang, 2011, p. 15), whereas Cho et al. (2010, p. 1207) provide empirical evidence that organizational identification is a non-significant predictor of knowledge sharing attitude. However, quantitative research rarely considers organizational identification as a moderator of the relationship between technological factors and knowledge sharing. Therefore, it is postulated:

> H9ga-H9ge: Organizational identification (g) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *attitude* through enterprise social software.

> H10ga-H10ge: Organizational identification (g) moderates the positive relationship between the technological factors (effort expectancy (a), perfor-

mance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Meyer et al. (1993, p. 544) and Kankanhalli et al. (2005b, p. 143) (see Table 5.17). For the pre-implementation questionnaire and the post-implementation questionnaire, the same indicators are used, since they do not directly refer to the acceptance and use of enterprise social software.

Factor	Label	Indicator (PRE & POST)	Source
Organizational identification	Ident_1	Ich habe ein starkes Zugehörigkeitsgefühl zu meinem Unternehmen.	I do not feel a strong sense of belonging to my organization (Meyer et al., 1993, p. 544).
	Ident_2	Ich fühle mich, wie ein Teil der Familie in meinem Unternehmen.	I do not feel like part of the family at my organization (Meyer et al., 1993, p. 544).
	Ident_3	Mein Unternehmen hat eine große persönliche Bedeutung für mich.	This organization has a great deal of personal meaning for me (Meyer et al., 1993, p. 544).
	Ident_4	Ich bin froh für mein Unternehmen zu arbeiten.	I am glad I chose to work for this organization rather than another company (Kankanhalli et al., 2005b, p. 143).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).			

Table 5.17. – Operationalization of organizational identification (see Appendix C.16 for a translation of the German items).
Source: Own table.

5.3.2.4. Monitoring

Monitoring has been identified through the qualitative interviews and its concept is linked to control theory (Klein, 1989, p. 151). The factor monitoring is defined as "keeping things on track" (Merchant, 1985, p. 1), which is "the final function in the management process" (Merchant, 1985, p. 2).[2] In this thesis, monitoring relates to electronic surveillance, i.e., data are collected by management (Lyon, 2013, Preface and Acknowledgements) to see whether employees are performing activities they expect their employees to perform (Kohli et al., 1998, p. 264). Prior literature indicates that contributions made in technology devices are stored, which enables organizations to quickly oversee the actions of their employees through the use of analytic tools (Leonardi et al., 2013, p. 12). The interviews revealed that employees fear being controlled, even though such surveillance activities are denied by management. In

[2] For a detailed discussion concerning controllability, see Sushil and Stohr (2014, p. 178).

addition, researchers assume that employees tend to choose other communication forms in order to preserve their anonymity and autonomy, which would impede the success of enterprise social software and especially the potential benefit of third-party learning, based on knowledge contributions made in enterprise social software (Leonardi et al., 2013, p. 12). Most of the quantitative research focuses on the relationship between monitoring and job performance and job satisfaction (Jaworski et al., 1993, p. 57; Ouchi and Maguire, 1975, p. 560). However, quantitative research rarely considers monitoring with regard to knowledge sharing and how monitoring might moderate the relationship between technological factors and knowledge sharing. Therefore, it is postulated:

> H9ha-H9he: Monitoring (h) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *attitude* through enterprise social software.

> H10ha-H10he: Monitoring (h) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *intention* through enterprise social software.

Operationalization The indicators are adopted from Kohli et al. (1998, p. 272) and adapted to the research context (see Table 5.18). For the pre-implementation questionnaire, the conjunctive is used, e.g., the indicator “I assume that management evaluates the use of organizational social media” has been rephrased into “I assume that management would evaluate the use of organizational social media”.

Factor	Label	Indicator (PRE)	Indicator (POST)	Source
Monitoring	Moni_1	Ich vermute, dass das Management die Nutzung unternehmenseigener sozialer Medien analysieren würde.	Ich vermute, dass das Management die Nutzung unternehmenseigener sozialer Medien analysiert.	Self-developed item based on Kohli et al. (1998, p. 272).
	Moni_2	Ich vermute, dass das Management die Nutzung unternehmenseigener sozialer Medien auswerten würde.	Ich vermute, dass das Management die Nutzung unternehmenseigener sozialer Medien auswertet.	My manager evaluates my sales activities (Kohli et al., 1998, p. 272).
	Moni_3	Ich vermute, dass das Management die Nutzung unternehmenseigener sozialer Medien kontrollieren würde.	Ich vermute, dass das Management die Nutzung unternehmenseigener sozialer Medien kontrolliert.	Self-developed item based on Kohli et al. (1998, p. 272).

Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).

Table 5.18. – Operationalization of monitoring (see Appendix C.17 for a translation of the German items).
Source: Own table.

5.3.3. Demographic factors

In this section, moderation hypotheses are deduced from literature with regard to the demographic factors of gender (see Section 5.3.3.1), experience (see Section 5.3.3.2) and age (see Section 5.3.3.3).

5.3.3.1. Gender

The unified theory of acceptance and use explicitly considers that gender moderates the relationship between socio-technological factors and system use (Venkatesh et al., 2003, p. 447). Previous literature suggests that performance expectancy is more salient for men, while effort expectancy is more salient for women (Venkatesh and Morris, 2000, p. 468). In addition, quantitative research finds that gender affects knowledge-sharing practices (Chai et al., 2012, p. 332). This thesis is interested in analyzing how gender moderates the relationship between technological factors and knowledge sharing. Therefore, it is expected:

> H9ia-H9ie: Gender (i) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *attitude* through enterprise social software.

H10ia-H10ie: Gender (i) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *intention* through enterprise social software.

5.3.3.2. Experience

The unified theory of acceptance and use explicitly assumes that experience moderates the relationship between socio-technological factors and system use (Venkatesh et al., 2003, p. 447). Prior literature finds that attitude is more important with increasing experience (Karahanna et al., 1999, p. 188). In addition, some researchers assume performance expectancy and attitude toward behavior are more salient with increasing experience (Marler et al., 2009, p. 336; Taylor and Todd, 1995a, p. 165). Moreover, Thompson et al. (1994, p. 140) provide empirical evidence that facilitating conditions are more salient with less experience. This thesis is interested in investigating how experience moderates the relationship between technological factors and knowledge sharing. Therefore, it is assumed:

H9ja-H9je: Experience (j) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *attitude* through enterprise social software.

H10ja-H10je: Experience (j) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *intention* through enterprise social software.

5.3.3.3. Age

Traditional theories of knowledge management rarely consider that individuals of different generations have grown up with different technologies and content (Phang et al., 2006, p. 555), whereas the unified theory of acceptance and use explicitly assumes that age moderates the relationship between socio-technological factors and system use (Venkatesh et al., 2003, p. 447). This thesis expects that people of different ages react differently toward enterprise social software (Phang et al., 2006, p. 555). Therefore, this thesis takes a more differentiated view, compared to former knowledge management literature, by analyzing how age moderates the relationship between technological factors and knowledge sharing. Accordingly, it is hypothesized:

H9ka-H9ke: Age (k) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *attitude* through enterprise social software.

H10ka-H10ke: Age (k) moderates the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *intention* through enterprise social software.

Operationalization of the demographic variables Gender is coded as a dummy variable (0=woman)/1=man), which is also consistent with recent research (Venkatesh and Morris, 2000, p. 197; Venkatesh et al., 2003, p. 439), age is operationalized via a continuous variable, which is consistent with previous research (Venkatesh and Morris, 2000, p. 197; Venkatesh et al., 2003, p. 439) and experience is coded as a variable that takes ordinal values of 0 (daily), 1 (weekly), 2 (monthly), 3 (quarterly), 4 (half yearly) and 5 (never) to capture increasing levels of employees experience with social media, which is consistent with previous research (Venkatesh and Davis, 2000, p. 197; Venkatesh et al., 2003, p. 439) (see Table 5.19).

Factor	Indicator (PRE & POST)
Age	16 - 25 years 26 - 30 years 31 - 35 years 36 - 40 years 41 - 45 years 46 - 50 years 51 - 55 years 56 years and older
Experience (blogs, wikis and social networks)	Daily Weekly Monthly Quarterly Half yearly Never
Gender	Woman Man

Table 5.19. – Operationalization of demographic factors.
Source: Own table.

Table 5.20 gives an overview of formal definitions of the moderating effects.

Construct	Definition
Management support	Management support is defined as the degree to which supervisors explicitly encourage their subordinates to share their knowledge (based on Schillewaert et al., 2005, p. 327).
Knowledge sharing norms	Knowledge sharing norms are defined as the prevalence of norms that are intended to facilitate knowledge sharing in the organization (Kankanhalli et al., 2005b, p. 123).
Organizational identification	Organizational identification is defined as the perception of similarity of values, membership, and loyalty with the organization (Patchen, 1970, p. 159).
Monitoring	Monitoring is defined as electronic surveillance through enterprise social software, which refers to data that are collected by the organization to see whether employees are performing activities they expect their employees to perform (based on Lyon, 2013, Preface and Acknowledgements; Kohli et al., 1998, p. 264).
Self-efficacy	Self-efficacy is defined as a person's judgment of his or her capability to organize and execute the actions required in order to attain designated types of performances (Bandura, 1986, p. 391).
Altruism	Altruism is defined as a behavior that is performed without expecting any future reward and is carried out mainly to benefit others (Zimbardo, 1988, p. 434).
Reciprocity	Reciprocity refers to actions that are contingent on rewarding reactions from others and that cease when these expected reactions are not forthcoming (Blau, 1964, p. 4).
Interpersonal trust	Interpersonal trust is defined as the willingness of a party to be vulnerable to the actions of another party, based on the expectation that the other party will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party (Mayer et al., 1995, p. 712).

Table 5.20. – Moderator construct definitions.
Source: Own table.

5.4. Research model

The identified factors from the literature review, interview analyses and case study analyses are summarized into an integrative research model, which incorporates constructs of socio-psychological theories (see Figure 5.1).

The positive and direct relationship between *effort expectancy* and knowledge sharing attitude through enterprise social software **(H1a)** and knowledge sharing intention through enterprise social software **(H1b)** is based on the prediction that employees, who perceive enterprise social software as easy-to-use are more likely to have a positive attitude towards enterprise social software. Moreover, it is expected that the ease-of-use also increases the likelihood that enterprise social software is used in the future. Accordingly, it is expected that, the higher employees rate the ease-of-use, the more they value enterprise social software and the more they will use this tool to share knowledge with each other.

Hypotheses **H2a** and **H2b** assume that *performance expectancy* has a positive and direct impact on knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software. This is based on the assumption that employees, who are convinced that enterprise social software helps them increase their performance, are not only more likely to have a favorable attitudinal disposition towards enterprise social software, but also have a higher tendency to use enterprise social software in the future. So, employees, who perceive enterprise social software as a tool that facilitates them to complete their daily tasks faster than before, will be more likely to use it.

The positive and direct relationship between *facilitating conditions* and knowledge sharing attitude through enterprise social software **(H3a)** and knowledge sharing intention through enterprise social software **(H3b)** is grounded on the assumption that resources of support enhance employees' positive attitudinal formation concerning enterprise social software. Moreover, it is expected that support mechanisms reduce the barriers of using enterprise social software and lead to an increased future use.

Hypotheses **H4a** and **H4b** predict that *trust in technology* has a positive and direct effect on knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software. It is assumed that privacy and security issues are of great importance for enterprise social software success. The privacy and security lacks of open social media tools, such as Facebook, serve as a negative example, which has increased employees' sensitivity towards confidentiality, security and issues regarding user rights. That is why it is expected that employees form a positive attitude towards enterprise social software, when they perceive that privacy and security issues regarding enterprise social software are sufficiently dealt with in the organization. Moreover, it is expected that employees, who trust that enterprise social software is a safe tool, through which knowledge can be shared, are also more likely to use it for knowledge sharing.

The positive and direct relationship between *personal innovativeness* and knowledge sharing attitude through enterprise social software **(H5a)** and knowledge sharing intention through enterprise social software **(H5b)** is based on the expectation that innovative employees are more likely to have a positive attitude towards enterprise social software and are also more willing to use enterprise social software in the future. Innovative employees are expected to try out the software and be the first to experience its usefulness. The identification of innovative employees might then be an effective measure for organizations to promote the adoption of enterprise social software.

Hypotheses **H6a** and **H6b** assume that *social rewards for knowledge sharing* have a positive and direct impact on knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software. Hence, it is expected that people share their knowledge, because they expect to earn recognition for their contributions. Since enterprise social software is assumed to offer ways of rewarding employees for their contributions, it is expected that the expectation of social rewards for knowledge sharing not only increases employees' attitudinal formation towards enterprise social software, but also increases its use.

The positive and direct relationship between *economic rewards for knowledge sharing* and knowledge sharing attitude through enterprise social software **(H7a)** and knowledge sharing intention through enterprise social software **(H7b)** is based on the assumption that employees expect to be financially rewarded for their knowledge contributions. Economic rewards for knowledge sharing are especially important with regard to enterprise social software, since, compared to face-to-face knowledge sharing, electronic knowledge contributions involve costs in terms of time and effort required for codifying knowledge. Accordingly, it is expected that employees form a positive attitude towards enterprise social software and are motivated to use enterprise social software in future when economic rewards are available.

According to the technology acceptance model, a positive and direct relationship between attitude and intention is expected. Therefore, it is assumed that employees, who have a positive *knowledge sharing attitude through enterprise social software*, are also more willing to use enterprise social software to share their knowledge with each other **(H8)**.

An **exploratory approach** is pursued in order to identify relevant personal, organizational and demographic moderation effects and to make the high number of moderated relationships manageable. Accordingly, it is expected that *personal factors* (interpersonal trust (a), self efficacy (b), altruism (c) and reciprocity (d)) moderate the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and knowledge sharing *attitude* through enterprise social software **(H9aa to H9de)** and knowledge sharing *intention* through enterprise social software **(H10aa to H10de)**.

In addition, it is assumed that *organizational factors* (management support (e), knowledge sharing norms (f), organizational identification (g) and monitoring[3] (h)) moderate the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and both knowledge sharing *attitude* through enterprise social software **(H9ea to H9he)** and knowledge sharing *intention* through enterprise social software **(H10ea to H10he)**.

Furthermore, it is predicted that *demographic factors* (gender (i), experience (j) and age (k)) moderate the positive relationship between the technological factors (effort expectancy (a), performance expectancy (b), facilitating conditions (c), trust in technology (d) and personal innovativeness (e)) and both knowledge sharing *attitude* through enterprise social software **(H9ia to H9ke)** and knowledge sharing *intention* through enterprise social software **(H10ia to H10ke)**.

[3] Monitoring is assumed to weaken the positive relationship between technological factors and knowledge sharing attitude through enterprise social software (H9ha to H9he) and knowledge sharing intention through enterprise social software.

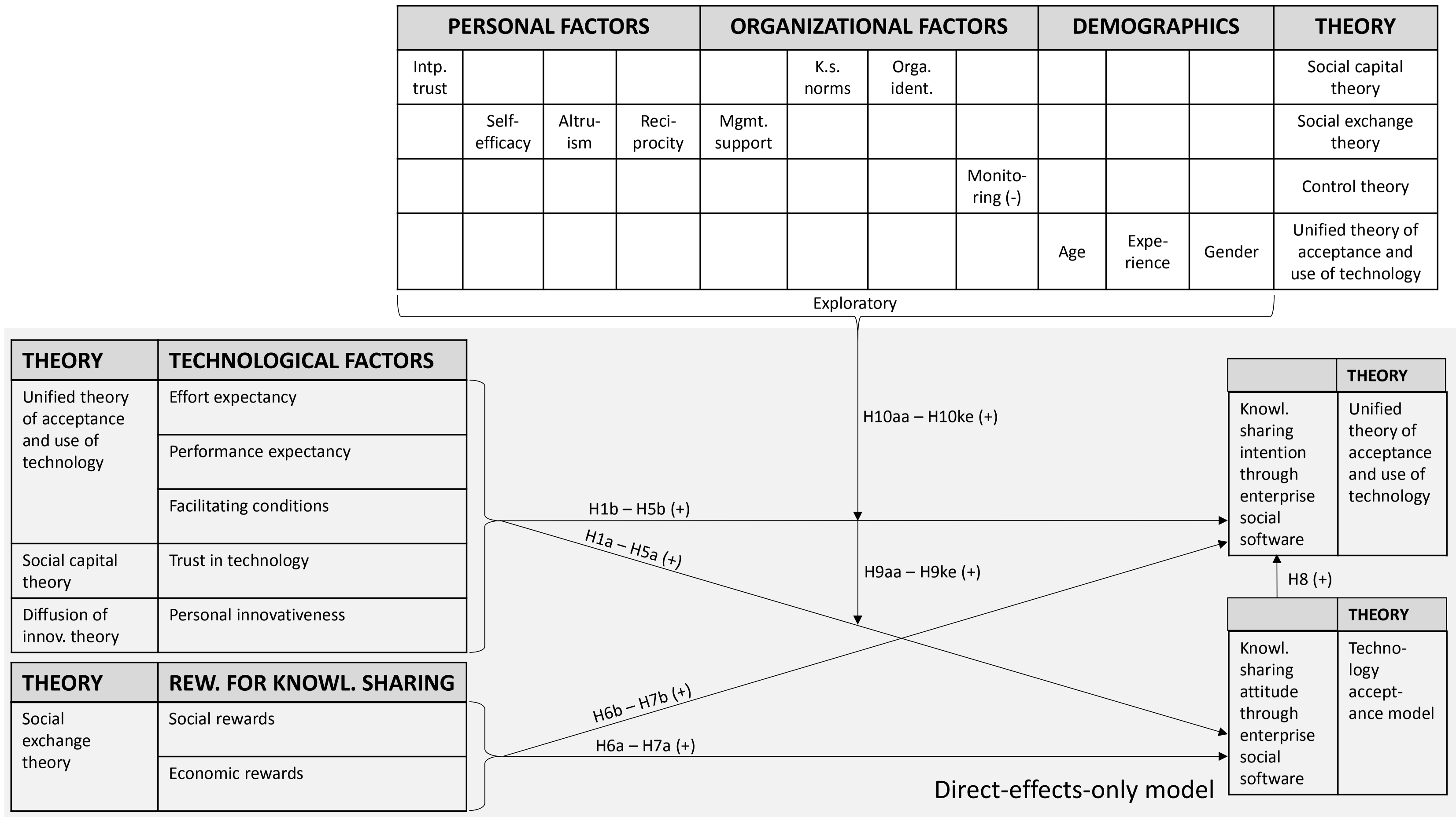

Figure 5.1. – Theoretical model.
Source: Own figure.

6. Quantitative analysis

In social research, the causal analysis is one of the most widely used analytical methods (Homburg, 1992, p. 499). In comparison to multiple regression analysis, the causal analysis provides several advantages (Homburg and Krohmer, 2006, p. 391). First, the causal analysis draws conclusions about the relationships of underlying latent variables with the help of parameter estimates (Homburg, 1989, p. 500). Hence, measurement errors are considered (Homburg, 1989, p. 20), so that the risk of measuring highly distorted model parameters is minimized (Bentler, 1983, p. 13). Moreover, it allows for investigating moderation effects (Homburg, 1992, p. 500).

In Section 6.1 the methodological principles of the causal analysis are explained. In Section 6.2 the quantitative data collection is described. Finally, the results of the quantitative analysis are summarized in Section 6.3.

6.1. Methodological bases for causal analysis

In Section 6.1.1, covariance-based and variance-based methods are described and compared with each other. In Section 6.1.2, the model specification is explained. Afterwards, the parameter estimation is discussed (see Section 6.1.3). Subsequently, it is explained how the quality of measurement models can be verified on the basis of reliability and validity (see Section 6.1.4). Therefore, quality criteria in terms of first-generation and second-generation procedures are outlined in Section 6.1.5. Finally, complex relationships of the causal analysis are discussed in Section 6.1.6.

6.1.1. Covariance-based methods vs. variance-based methods

A causal model is built for an empirical verification of the research model. Causal models can be divided into *covariance-based* and *variance-based* methods, which can be differentiated based on their requirements (e.g., distribution assumptions, sample size) (Hildebrandt, 2004, p. 545).

Variance-based methods try to explain the maximum variance of the dependent dimensions (Herrmann et al., 2006, p. 37). This can be done by using partial least squares (PLS) (Herrmann et al., 2006, p. 37), which was developed by Wold and is based on the principal components analysis and the canonical correlation analysis (Wold, 1980, p. 47). The algorithm of the parameter estimation is limited to individual part models and requires the knowledge of remaining model parameters (Fornell and Cha, 1994, p. 62). Due to the lack of distributional assumptions and soft assumptions concerning the properties of the indicators, PLS is also known as a soft modeling approach (Bookstein, 1982, p. 349; Reinartz et al., 2009, p. 336). PLS is an iterative process, in which a part of the parameters is assumed to be known and kept constant, while the other part is estimated (Herrmann et al., 2006, p. 37). The entire set of parameters is broken down into units, and least squares estimators are determined with regard to different parameters (Fornell and Cha, 1994, p. 62). The variance of the error terms of the measurement model and structural model are minimized, and the variance of the dependent variables is maximized as well as the variance of the measurement models (Betzin and Henseler, 2005, p. 49-69). Moreover, the significance of path coefficients is tested by bootstrapping in PLS (Hayes, 2009, p. 411-413). An example of variance-based software solutions is SmartPLS (**Smart** **P**artial **L**east **S**quares).

In covariance-based methods, the aim of the parameter estimation is to minimize the discrepancy between the theoretical covariance matrix and the empirical covariance matrix of the random sample (Homburg and Baumgartner, 1995, p. 1093; Herrmann et al., 2006, p. 37). Hence, the determination of the estimate for the model parameter is based on a minimization of the discrepancy function (Homburg and Baumgartner, 1995, p. 1093). If the theoretical model adequately reflects the empirical covariances, the model cannot be falsified (Homburg and Baumgartner, 1995, p. 1093). Covariance-based software solutions include, for example, LISREL (**LI**near **S**tructural **REL**ations), EQS (**EQ**uations based **S**tructural Program) and AMOS (**A**nalysis of **MO**ment **S**tructures).

Covariance-based methods have both advantages and disadvantages over variance-based methods (Herrmann et al., 2006, p. 39-44; Panten, 2005, p. 226), which are outlined in the following (see Figure 6.1). Covariance-based methods consider all the information of the covariance matrix, whereas variance-based methods only use parts of the covariances (Reinartz et al., 2009, p. 333). Variance-based methods lead to inaccurate estimates due to the fact that there is less information in the covariance matrix for the estimation of parameters (Reinartz et al., 2009, p. 333). However, variance-based methods have better predictive power than covariance-based methods (Reinartz et al., 2009, p. 340). An advantage of PLS is that even small sample sizes can be measured, because PLS is based on the estimation of individual regression equations (Reinartz et al., 2009, p. 341). In covariance-based estimates, small sample sizes can be problematic, since they can lead to nonsensical results (MacCallum, 1986, p. 116). In addition, excessive fit indices result in misspecified models and false assumptions based on these misspecified models (Hu and Bentler, 1998, p. 427). Especially for small sample sizes with less than hundred cases, the adequacy of fit indices to assess the global quality is limited because of their lack of asymptotic properties (Hu and Bentler, 1998, p. 429). In covariance-based methods, the maximum likelihood algorithm is mostly used, which requires a multivariate normal distribution of data (Hu and Bentler, 1998, p. 424). In PLS, it is not a prerequisite that the data are normally distributed, because ordinary least squares estimates are used for individual part models in order to determine the parameters (Fornell and Bookstein, 1982, p.

Criteria	PLS	LISREL
Type of analysis	Least-square-analysis	Covariance-structured analysis
Principles of estimation and distributional assumption	Iterative and non-iterative least squares estimation (no distributional assumption = soft modeling): Minimization of residual variances of the measurement and structural model	Maximum likelihood estimation (generally multivariate normal distribution of the data = hard modeling): Minimization of the gap between the theoretical model and empirical covariance matrix
Characteristics of parameter estimates	Estimates are consistent-at-large	Consistency of estimates
Size of the sample	At least the fivefold to tenfold of cases of the number of predictors of the largest regression equation	At least the fivefold to tenfold of cases of the total number of indicators
Relationships in the measurement model	Standard: reflective and formative relationships	Standard: reflective relationships
Scale	No limitations	At least interval scale
Application	Explorative	Confirmative
Model assessment	Heuristic	Statistical fit indices
Software	PLSGraph 3.0, SmartPLS, LV-PLS 1.8	LISREL, AMOS, EQS

Table 6.1. – Covariance-based methods and variance-based methods in comparison. Source: Panten (2005, p. 226).

443). In PLS, the significance of path coefficients is assessed by bootstrapping, i.e., the significance of the estimated path coefficient is determined approximately, which is less reliable (Reinartz et al., 2009, p. 340). Therefore, it is inferior to the estimation of model parameters in covariance-based estimates, which are based on the maximum likelihood algorithm with normally distributed data (Reinartz et al., 2009, p. 338). In PLS, the values of the construct are the result of linear combinations of indicators, which are subject to measurement errors (Reinartz et al., 2009, p. 335). Therefore, the values of the construct include some measurement errors of the indicators (Reinartz et al., 2009, p. 335). This leads to the inconsistency of values of constructs and associated parameter estimates (Fornell and Cha, 1994, p. 66). Therefore, PLS overestimates the correlations between indicator and construct, while the relationships between the constructs are underestimated due to the described inconsistency (Dijkstra, 1983, p. 86). However, the predictive quality of the PLS estimation is still good, insofar that the overestimation of the measurement model and the underestimation of the structural model offset each other (Areskoug, 1982, p. 106), so that the indicator correlations are consistent again (Fornell and Cha, 1994, p. 67). Since there is no substantial difference between the estimates of variance-based methods and covariance-based methods, the estimates of both methods are co-consistent (Wold, 1980, p. 52). In contrast to covariance-based methods, PLS has the advantage that it leads to a conservative estimate due to the underestimation of the structural parameters (Dijkstra, 1983, p. 86). Construct values calculated in PLS are more suitable for predictions, because its statistical power is larger than it is the case using covariance-based methods (Reinartz et al., 2009, p. 332). In covariance-based methods, all equations are estimated simultaneously through the best possible replication of the covariance matrix (Reinartz et al., 2009, p. 333). Therefore, the global model fit can be described by an approximation of the covariance matrix (Reinartz et al., 2009, p. 333). In contrast, the parameters of a PLS estimation are not estimated simultaneously, so that the fit indices for assessing the quality of the overall model are missing (Weiber and Mühlhaus, 2010, p. 66). In line with the factor analysis, covariance-based methods assume a reflective specification of the constructs, whereas PLS estimation is especially adequate in order to measure formative measurement models (Reinartz et al., 2009, p. 333).

Compared to covariance-based methods, PLS is less adequate for the detection of real structural correlations within a population, because of the less accurate estimates. Consequently, in this thesis, a covariance-based method will be used because (1) it is more adequate for the detection of real structural correlations within a population due to more accurate estimates, (2) model fit indices can be measured and (3) it is adequate for a large data set.

6.1.2. Model specification

A structural equation model is generally visualized in form of a path model (see Figure 6.1) (Backhaus et al., 2011, p. 519). A full causal model consists at least of three sub-models, i.e., a structural model, a measurement model for the exogenous and a measurement model for the endogenous variable (Backhaus et al., 2011, p. 519). The *structural model* is illustrated by the linear Equation (6.1) and specifies the relationships between the latent variables (Jöreskog and Sörbom, 1982, p. 404).

$$\eta = B\eta + \Gamma\xi + \zeta \qquad \text{(structural model)} \qquad (6.1)$$

$$y = \Lambda_y\eta + \epsilon \qquad \text{(endogenous measurement model)} \qquad (6.2)$$

$$x = \Lambda_x\xi + \delta \qquad \text{(exogenous measurement model)} \qquad (6.3)$$

η stands for the vector of the construct values of the latent endogenous variables, which is a combination of the independent latent variables with their error terms

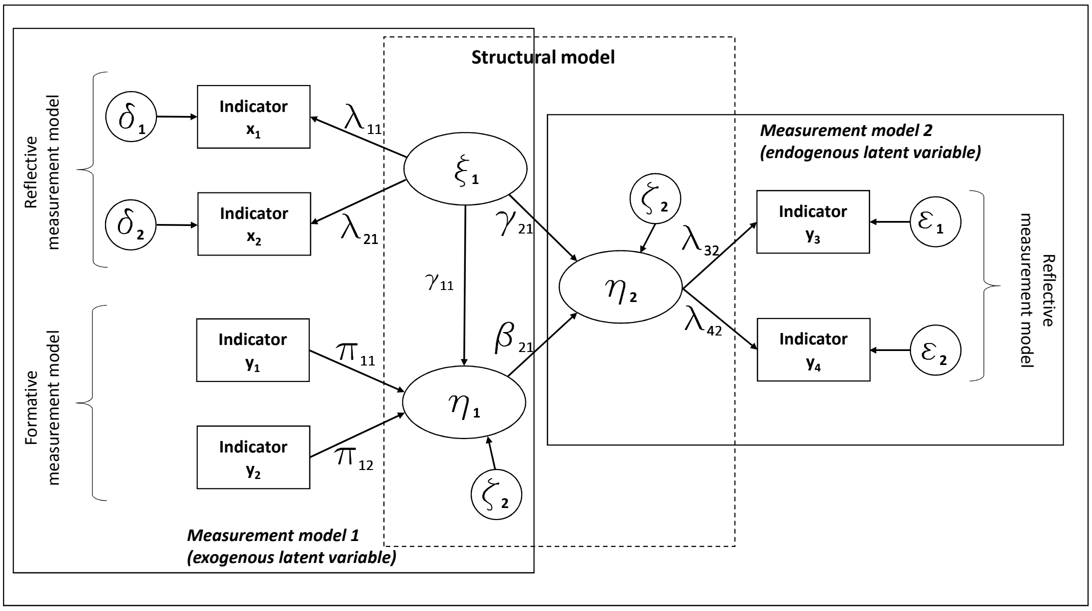

Figure 6.1. – An example of a structural equation model.
Source: Based on Götz and Liehr-Gobbers (2004, p. 716).

(Jöreskog and Sörbom, 1982, p. 404). ξ stands for the latent exogenous variables (Jöreskog and Sörbom, 1982, p. 405). Endogenous variables are influenced by other variables in the model, whereas exogenous variables are not (Jöreskog and Sörbom, 1982, p. 405). B stands for the coefficient matrix, which illustrates the effects between the latent endogenous variables (Jöreskog and Sörbom, 1982, p. 405). The coefficient matrix Γ represents the effects between the latent exogenous and endogenous variables (Jöreskog and Sörbom, 1982, p. 405). The vector ζ refers to the error terms of the structural model and encompasses the effects of variables, which are not captured in the model (Jöreskog and Sörbom, 1982, p. 405). That means that ζ stands for the residuals of endogenous constructs of the structural model (Backhaus et al., 2011, p. 520; Götz and Liehr-Gobbers, 2004, p. 717).

Both *measurement models* identify the respective relationships between latent variables and its indicators (see Equations (6.2) and (6.3)) (Jöreskog and Sörbom, 1982, p. 405). Vector y stands for the indicators of the latent endogenous variable and vector x refers to the indicators of the latent exogenous variable (Jöreskog and Sörbom, 1982, p. 405). The factor loading matrices are illustrated by the coefficient matrices Λ_y and Λ_x (Jöreskog and Sörbom, 1982, p. 405). Vectors ϵ and δ correspond to measurement errors of the measurement model (Jöreskog and Sörbom, 1982, p. 405).

Measurement models can be *formative* and *reflective* (see Figure 6.2) (Hunt, 1991, p. 386; Hahn, 2002, p. 94; Götz and Liehr-Gobbers, 2004, p. 716-719; Henseler, 2005, p. 70). Indicators, which cause their hypothetical constructs, are known as reflective relationships, whereas formative relationships refer to hypothetical constructs, which are a function of their indicators (Freeze and Raschke, 2007, p. 148; Bollen and Lennox, 1991, p. 306). When analyzing reflective indicators, measurement errors are considered (Homburg and Giering, 1996, p. 6). In order to measure formative constructs, measurement errors are not considered (Homburg and Giering, 1998, p. 116). That is why some researchers have already warned about the dangers of using formative indicators (Homburg and Giering, 1998, p. 116). Accordingly, this study uses exclusively reflective measurement models. Even if all variables are conceptualized as reflective, though, according to Jarvis et al. (2003, p. 216), their nature might be questioned.

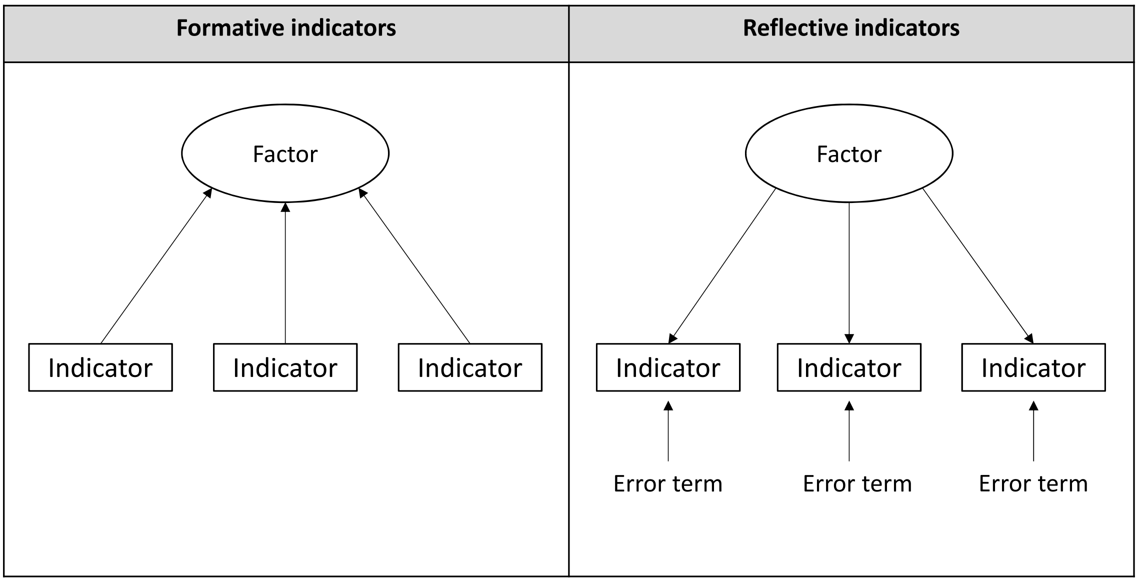

Figure 6.2. – Comparison of formative and reflective indicators.
Source: Homburg and Giering (1998, p. 116).

The question of *identification* must be considered, when a structural model is specified (Bagozzi and Baumgartner, 1994, p. 390). Similar to the measurement model, the empirical covariance matrix must have enough information in order to clearly estimate the parameters (Bagozzi and Baumgartner, 1994, p. 390). Degenerated estimators, such as negative error variances, represent evidence for unidentified models (Bollen, 1989b, p. 326). In addition, the identification of a structural model can be examined based on certain rules (Kenny et al., 1998, p. 255). A necessary condition in order to identify the structural model is represented by Equation (6.4) (Kenny et al., 1998, p. 255).

$$k(k-1)/2 \geq \sum(a, b, c, d) \tag{6.4}$$

k refers to the number of latent constructs of the structural equation model, a stands for the number of path coefficients, b refers to the number of correlations between all exogenous variables and c describes the number of correlations between the measurement error terms and an exogenous variable, whereas d denotes the correlations between the measurement error terms (Kenny et al., 1998, p. 255). In almost every specified model, c is zero and in many models d is zero (Kenny et al., 1998, p. 255). Moreover, a is defined by the formulated hypothesis and b should be up to a maximum, i.e., all exogenous variables should correlate with each other (Kenny et al., 1998, p. 255). The sufficient condition requires that not more than one of the criteria below is met between every pair of the constructs X and Y, only then is the structural equation model identified (Kenny et al., 1998, p. 225).

1. X causes Y directly
2. Y causes X directly
3. X and Y have correlated measurement error terms or (if X or Y are exogenous variables) are correlated with the measurement error terms of each other variable
4. X and Y are correlated exogenous variables

Afterwards, the two-step rule is applied, which implies that the structural model and the measurement model are identified, when considered separately (Bollen, 1989b, p. 328). Hence, the structural model must meet the necessary and sufficient condition (Bollen, 1989b, p. 328). In addition, the multi-factorial measurement model is identified, when each of the latent variables is measured with at least three indicators and the measurement error terms are not correlated with each other (Kenny, 2011, p. 1).

6.1.3. Parameter estimation

A parameter estimation is conducted after the model has been identified. Hence, the parameter matrices of the **structural model** (B and Γ) and of the **measurement model** (Λ_y, Λ_x) are estimated (Homburg and Krohmer, 2006, p. 397). Moreover, the variances and covariances of the exogenous latent variables (φ) as well as those of the error variables are calculated (Homburg and Krohmer, 2006, p. 397). If the conditions are appropriate, the covariance matrix $\sum$ of the observed variables x and y are expressed by eight parameter matrices (Homburg, 1989, p. 153). The last four parameter matrices refer to the covariance matrices of the vectors ξ, ζ, ϵ, δ (Homburg, 1989, p. 153), as Equation (6.5) indicates:

$$\sum = \sum(B, \Gamma, \Lambda_y, \Lambda_x, \Phi, \Psi, \Theta_\epsilon, \Theta_\delta) \tag{6.5}$$

$\sum$: Model-theoretical covariance matrix
B: Direct effects of the endogenous latent variables among each other
Γ: Direct effects of the exogenous to the endogenous latent variables
Λ_y: Loading matrix of the endogenous measurement model
Λ_x: Loading matrix of the exogenous measurement model
Φ: Covariance matrix of the ξ variables
ξ: Exogenous latent variables
Ψ: Covariance matrix of the ζ variables
ζ: Error variables of the structural equation model
Θ_ϵ: Covariance matrix of the ϵ variables
ϵ: Error variables of the endogenous measurement model
Θ_δ: Covariance matrix of the δ variables
δ: Error variables of the exogenous measurement model

The aim of the parameter estimation is to estimate the elements of the parameter matrices $B, \Gamma, \Lambda_y, \Lambda_x, \Phi, \Psi, \Theta_\epsilon, \Theta_\delta$, so that the resulting covariance matrix $\sum$ is similar to the covariance matrix S, which is based on empirical data (Homburg, 1989, p. 153). The discrepancy function F(S,$\sum$) is built, which captures the differences between the two covariance matrices (Homburg, 1989, p. 170). As part of the parameter estimation the discrepancy function is minimized by using the maximum likelihood method (Homburg and Baumgartner, 1995, p. 1102).

6.1.4. Reliability and validity

The quality of measurement models can be verified on the basis of reliability and validity (Homburg and Giering, 1996, p. 6; Götz and Liehr-Gobbers, 2004, p. 727). The relationship between reliability and validity can be explained by Formula (6.6) (Churchill, 1979, p. 65):

$$x_o = x_t + x_r + x_s \tag{6.6}$$

x_o stands for the value of a reflective construct measurement (Churchill, 1979, p. 65). The function consists of the current value x_t, the random error x_r and the systematic error x_s (Churchill, 1979, p. 65).

The *reliability* describes the extent to which a measuring procedure yields the same results on repeated trials (Herrmann and Homburg, 2000, p. 23). A high reliability is present, when the measurement is free from random errors and a repeated measurement leads to the same results (Peter and Churchill, 1986, p. 4). In addition, reliability describes whether the measurement really captures the characteristics of a construct (Hildebrandt, 1984, p. 41). The reliability coefficients in turn explain the degree to which the measurement of the indicators fit (Backhaus et al., 2011, p. 526). The lower the measurement errors of the variables, the more reliable the measurements of the constructs are (Peter, 1979, p. 7). In order to evaluate the measurement error, the use of several indicators is recommended (Steenkamp and Baumgartner, 2000, p. 198). However, some authors argue that the use of a single indicator for measuring a construct is also sufficient (Bergkvist and Rossiter, 2007, p. 183).

In addition, the measurement model must be verified on the basis of *validity*. Validity is the degree to which a measurement procedure indeed measures the correlations (Bagozzi and Phillips, 1982, p. 468). A high validity is given when the measurement is not only free from random errors, but is also characterized by the absence of systematic errors (Churchill, 1979, p. 65; Homburg and Giering, 1996, p. 7; Peter and Churchill, 1986, p. 4). Consequently, reliability is a necessary, but not sufficient prerequisite for validity (Churchill, 1979, p. 65; Peter, 1979, p. 6; Hildebrandt, 1984, p. 42). On the basis of structural equation models, it is not possible to distinguish between random errors and systematic errors on a statistical level (Mooi and Sarstedt, 2011, p. 35). Therefore, only an aggregated measurement error is reported (Little et al., 2002, p. 156).

Approaches towards verifying the reliability and validity are outlined in the following. Three models are available for examining the reliability (Peter, 1979, p. 8). The investigation of the test-retest reliability and parallel-test-reliability are very time-consuming procedures (Bühner, 2011, p. 61). Therefore, the internal consistency reliability is used, which has become a standard in social research (Bühner, 2011, p. 60-61). In this procedure, the correlations among the indicators of the underlying construct are analyzed (Steenkamp and Baumgartner, 1998, p. 78).

Validity measurement can be divided into: content validity, convergent validity, discriminant validity and nomological validity (Bagozzi, 1980, p. 114). The content-semantic correspondence of the indicators between a measurement model and the theoretical construct is described as *content validity* (Homburg and Giering, 1996, p. 7; Götz and Liehr-Gobbers, 2004, p. 727). A measurement model has a high validity, if it covers all substantive aspects of the construct (Bohrnstedt, 1970, p. 92; Hildebrandt, 1984, p. 42; Balderjahn, 2003, p. 131). The content validity can be measured by qualitative (Parasuraman et al., 1988, p. 28) and quantitative methods (Homburg, 2000, p. 82). In this study, content validity is verified by a qualitative analysis through a precise definition of the constructs and a quantitative analysis by performing an exploratory factor analysis (Krafft et al., 2005, p. 73).

Convergent validity refers to the degree to which several measurements of the same construct agree with each other (Bagozzi and Phillips, 1982, p. 468). A high convergent validity is defined as "the degree to which two or more attempts to measure the same concept are in agreement" (Bagozzi and Phillips, 1982, p. 468) and given if the indicators highly correlate with each other (Peter, 1981, p. 136). Therefore, there is a close connection between the internal-consistency reliability and convergent validity (Peter and Churchill, 1986, p. 9). In this study, convergent validity is measured by using the confirmatory factor analysis (Jöreskog, 1969, p. 185).

Discriminant validity is "the degree to which measures of distinct concepts differ"

(Bagozzi and Phillips, 1982, p. 469). Discriminant validity is given if the correlations of the indicators of a construct are higher with each other than with those of another construct (Bagozzi and Phillips, 1982, p. 469; Bagozzi, 1980, p. 114, 129; Bagozzi and Phillips, 1982, p. 468; Churchill, 1979, p. 70; Peter, 1981, p. 136; Bagozzi et al., 1991, p. 425). In this study, discriminant validity is measured by using the Fornell-Larcker criterion (Fornell and Larcker, 1981, p. 46). According to this criterion, discriminant validity is given if the average variance extracted (AVE) is larger than the squared correlations amongst the constructs (Fornell and Larcker, 1981, p. 46).

Nomological validity describes the degree of agreement between the theoretically derived correlations between two constructs and the results gained from empirical studies (Bagozzi, 1979, p. 24; Bagozzi, 1980, p. 114; Peter, 1981, p. 137; Peter and Churchill, 1986, p. 2). Accordingly, the nomological validity refers to specific causal relationships of the structural model (Fritz, 1995, p. 138). In addition, it measures to what extent the dependent variables are explained by the independent variables (Fritz, 1995, p. 138). A verification requires that the postulated relationships have been derived from a theoretical framework (Ruekert and Churchill, 1984, p. 231). In this study, the assumed relationships have been derived from the literature review.

6.1.5. Quality criteria

The reliability and validity can be measured through different quality criteria (Herrmann et al., 2006, p. 36; Panten and Thies, 2006, p. 314). It can be distinguished between first-generation and second-generation procedures (Herrmann et al., 2006, p. 36; Panten and Thies, 2006, p. 314). First-order methods have three main weaknesses (Gerbing and Anderson, 1988, p. 189). First, a differentiated assessment on the indicator level (e.g., the estimation of measurement errors) is not possible (Homburg, 2000, p. 87). Second, the methods are subject to very restrictive assumptions, for instance the restricting values of the validity measurement are not supported by inference of statistical rules (Gerbing and Anderson, 1988, p. 189). Thus, it is assumed that all indicators have the same reliability, when Cronbach's alpha is measured (Gerbing and Anderson, 1988, p. 190). Third, the assessment of validity is only made on the basis of rules of thumb rather than through inferential statistical tests (Gerbing and Anderson, 1988, p. 189). Therefore, second-order methods have been developed with better performance (Homburg and Giering, 1996, p. 9), which are based on the confirmatory factor analysis (Jöreskog, 1969, p. 185). The combined use of the methods has become standard in research (Homburg and Giering, 1996, p. 8).

Accordingly, first-generation procedures are outlined in Section 6.1.5.1 and second-generation procedures are discussed in Section 6.1.5.2.

6.1.5.1. First-generation procedures

The **exploratory factor analysis** examines a group of indicators with regard to their underlying structure (Bohrnstedt, 1970, p. 92; Backhaus et al., 2011, p. 330). Prior to the analysis, no assumptions are to be made concerning the assignment of indicators to factors (Anderson and Gerbing, 1991, p. 189). The factor analysis allows first statements regarding the discriminant and convergent validity (Homburg and Giering, 1996, p. 8). Discriminant and convergent validity are given, if all indicators have been clearly assigned to a factor, have values above or equal 0.6, the eigen values are greater than one, all factors are extracted and the Kaiser criterion has been met (Hair et al., 1998, p. 112; Peter, 1999, p. 179; Backhaus et al., 2011, p. 359). The eigen value of a factor is derived from the sum of the squared factor loadings of all its indicators (Backhaus et al., 2011, p. 359).

Quality criteria	Requirements
KMO and Bartlett's test	$\geq$ 0.5
Factor loadings	$\geq$ 0.6
Explained variance	$\geq$ 50%
Factor correlations	$\leq$ 0.7
VIF	$\leq$ 10
Cronbach's alpha	$\geq$ 0.7
Kurtosis	-2.5 - 2.5

Table 6.2. – First-generation quality criteria.
Source: Based on Fritz (1995, p. 140); Homburg and Giering (1996, p. 8); Hair et al. (1998, p. 244) and Backhaus et al. (2011, p. 362).

The **Kaiser-Meyer-Olkin** (KMO) criterion compares the strength of the observed correlation coefficients to the strength of the partial correlation coefficients (Kaiser, 1974). According to Kaiser (1974, p. 35), results in the 0.90s are marvelous, in the 0.80s are meritorious, in the 0.70s are middling, in the 0.60s are mediocre, in the 0.50s are miserable, and below 0.50 are unacceptable. The **Bartlett's test** of sphericity (Bartlett, 1937), on the one hand, tests the correlations among the items and, on the other hand, the hypothesis that the correlation matrix is an identity matrix (Bartlett, 1937, p. 99; Gaskin, 2012d). A **factor loading** is described by the correlations between a factor and its corresponding indicators (Backhaus et al., 2011, p. 334). Their values range between 0 and 1 (Backhaus et al., 2011, p. 528). Hence, factor loadings should be generally equal or greater than 0.60 (Hair et al., 1998, p. 112) and on average greater than 0.70 for each factor (Gaskin, 2012d), because this indicates that the shared variance between the construct and its indicator is greater than the error variance (Hair et al., 1998, p. 112; Backhaus et al., 2011, p. 362). Moreover, the factors should account together for at least **50% of the variance in the data** (Backhaus et al., 2011, p. 362). To test for discriminant validity, the factor correlation matrix is examined. **Correlations between factors** under the threshold of 0.7 indicate discriminant validity (Nunnally and Bernstein, 1994, p. 245). In order to measure the proportion of variance of an indicator that can be explained by other indicators, the **variance inflation factor** (VIF) is used, which indicates the degree of multicollinearity and should be generally equal or lower than 10 (Gujarati, 2003, p. 362). The internal validity is assessed by using **Cronbach's alpha** (Cronbach, 1951). First, the mean of all correlations is measured, which is a result of dividing the indicators of a factor in any possible group of two (Carmines and Zeller, 1979, p. 45; Homburg and Giering, 1996, p. 8). Cronbach's alpha can have values between minus infinity and 1, but only positive values can be interpreted in a meaningful way (Knapp, 1991, p. 459). High positive values indicate a high reliability (Cortina, 1993, p. 99). Values equal to and above 0.7 have an acceptable reliability (Nunnally and Bernstein, 1994, p. 265; Homburg and Giering, 1996, p. 8). Finally, normal distribution is assumed by many statistical procedures, including IBM SPSS AMOS and ANOVA (Weiber and Mühlhaus, 2010, p. 246). There are two tests used for measuring for normality: the skewness and kurtosis of a distribution. However, skewness is less meaningful, since the items are measured on a five point likert scale and are therefore better captured through **kurtosis** (Clason and Dormody, 1994, p. 34; Gaskin, 2012c). For a normal distribution, the ratio (z-value) for kurtosis should typically lie between –2.5 and 2.5 (Hair et al., 1998, p. 244). Negative values indicate too many cases in the tails of the distribution, while positive values indicate too few cases in the tails (Garson, 2012, p. 19-20). The first-generation quality criteria are summarized in Table 6.2.

6.1.5.2. Second-generation procedures

Second-order methods have been developed with better performance (Homburg and Giering, 1996, p. 9), which are based on the **confirmatory factor analysis** (Jöreskog, 1969, p. 185). From a vast number of quality criteria, some of them have become a standard in social research (Bollen and Long, 1993, p. 6). It can be distinguished between global and local fit indices (Homburg and Baumgartner, 1998, p. 351). Global fit indices (e.g., χ^2-test, RMSEA, CFI, TLI) assess the reproduction of the empirical data through the measurement model, whereas local indices (e.g., indicator reliability, construct reliability, AVE, Fornell-Larcker criterion) assess the measurement quality of individual factors or indicators (Preacher et al., 2008, p. 18). In the following, various global fit measures are described, which include inferential tests as well as descriptive and incremental fit measures.

Hence, global fit indices are explained in Section 6.1.5.2.1 and local fit indices are outlined in Section 6.1.5.2.2.

6.1.5.2.1. Global fit indices

The chi-squared test (χ^2-test) is an inferential test of the model (Homburg, 2000, p.

84; Weiber and Mühlhaus, 2010, p. 160). It tests the null hypothesis that the specified measurement model correctly reproduces the empirical data (Homburg and Giering, 1996, p. 10; Byrne, 2010, p. 75). Its meaningfulness is generally questioned (Kline, 2005, p. 157; Byrne, 2010, p. 76-77), since the assumption of an absolutely accurate model is not practicable in empirical research (Browne and Cudeck, 1992, p. 240; Byrne, 2010, p. 76). Due to the χ^2-test, models, which differ only slightly from the empirical data, are rejected with a high probability (Browne and Cudeck, 1992, p. 240; Jöreskog, 1993, p. 309). This is especially true for large samples (Browne and Cudeck, 1992, p. 240; Jöreskog, 1993, p. 309; Byrne, 2010, p. 76). Therefore, the χ^2-test is not used as an inferential test in this thesis, but as a descriptive goodness-of-fit measure (Jöreskog and Sörbom, 1996, p. 122). In order to consider the complexity of the model, the **χ^2-value is set in proportion to the model's degrees of freedom** (Jöreskog and Sörbom, 1996, p. 122;). For the quotient χ^2/df, values below 3 are required (Homburg, 2000, p. 84). In Equation (6.7) the quotient χ^2/df is illustrated (Homburg and Giering, 1998, p. 123):

$$\chi^2 = (n-1) * F\left(S, \hat{\Sigma}\right) \text{ mit } df = \frac{1}{2} q\,(q+1) - r \tag{6.7}$$

χ^2: Chi square value
n: Description of the sample size
S: Empirical covariance matrix
$\sum$: Model-theoretical covariance matrix
F: Discrepancy function
df: Degrees of freedom
q: Number of indicator variables
r: Number of parameters which have to be estimated

With the help of the **root mean squared error of approximation** (RMSEA), an inferential test can be conducted (Preacher and Hayes, 2008a, p. 18). In contrast to the χ^2-test, the RMSEA tests the discrepancy of a model (Preacher and Hayes, 2008a, p. 18; Weiber and Mühlhaus, 2010, p. 161). Therefore, the error of fit between the empirical and reproduced variance-covariance matrix is measured and set in relation to the degrees of freedom (Bagozzi and Yi, 2012, p. 28). The advantage of the RMSEA is that it considers the complexity of the model (Hu and Bentler, 1999, p. 3; Kline, 2005, p. 137). RMSEA values below 0.05 indicate a good model fit and values up to 0.08 indicate an acceptable model fit (Browne and Cudeck, 1993, p. 144). If the RMSEA is above 0.10, the model should be rejected (Fritz, 1995, p.

140). Equation (6.8) illustrates the calculation for RMSEA (Weiber and Mühlhaus, 2010, p. 162).

$$RMSEA = \sqrt{\max\left(\frac{\chi^2 - df}{df(n-1)}\right)} \tag{6.8}$$

χ^2: Chi square value
df: Degrees of freedom
n: Description of the sample size

The **comparative fit index** (CFI) is an incremental fit measurement, which measures the quality of a model by comparing it with the basic model, which assumes the independence of all indicators (Bentler, 1990, p. 241). Hence, the CFI measures the improvement in the goodness of fit in the transition from the basic model to the measurement model (Homburg and Baumgartner, 1998, p. 357). The CFI considers the degrees of freedom. Moreover, the CFI is a further development of the normed fit index (NFI), but compared to the NFI, it also considers the sample size (Bagozzi and Yi, 2012, p. 29). Therefore a bias due to small sample sizes is avoided (Bagozzi and Yi, 2012, p. 29). The CFI can have values between 0 and 1 (Byrne, 2010, p. 78). Values equal or greater than 0.95 refer to a good model fit (Hu and Bentler, 1999, p. 27). In addition, the CFI demonstrates good results in simulation studies (Homburg and Klarmann, 2006, p. 736). Equation (6.9) illustrates the calculation for CFI (Weiber and Mühlhaus, 2010, p. 170).

$$CFI = 1 - \frac{\max\{\chi_r^2 - df_r, 0\}}{\max\{\chi_b^2 - df_b, \chi_r^2 - df_r, 0\}} \tag{6.9}$$

χ_b^2: Chi square value of the basis model
χ_r^2: Chi square value of the estimated model
df_b: Degrees of freedom of the basis model
df_r: Degrees of freedom of the estimated model

The **tucker lewis index** (TLI) of Bentler and Bonett (1980) and Tucker and Lewis (1973) is also known as a non-normed fit index (NNFI). It also belongs to the incremental quality measures (Tucker and Lewis, 1973, p. 1-10; Marcoulides and Hershberger, 1997, p. 246; Bollen, 1989a, p. 273;). In contrast to the NFI and CFI, the TLI considers the number of parameters of the model (Marcoulides and Hershberger, 1997, p. 246; Marsh et al., 1996, p. 315; Byrne, 2010, p. 79). Furthermore, the TLI is not standardized on a 0 to 1 interval and can therefore take values above 1 (Bagozzi and Yi, 2012, p. 28). TLI values above 0.9 are considered as satisfactory and values above 0.95 as good (Homburg and Baumgartner, 1998, p. 357). In addition, the TLI shows good results in simulation studies (Homburg and Klarmann, 2006, p. 736). Equation (6.10) illustrates the calculation for TLI (Weiber and Mühlhaus, 2010, p. 170; Bollen, 1989b, p. 273).

$$TLI = \frac{\left(\frac{\chi_b^2}{df_b}\right) - \left(\frac{\chi_r^2}{df_r}\right)}{(\chi_b^2/df_b) - 1} \tag{6.10}$$

χ_b^2: Chi square value of the basis model
χ_r^2: Chi square value of the estimated model
df_b: Degrees of freedom of the basis model
df_r: Degrees of freedom of the estimated model

6.1.5.2.2. Local fit indices

Through local fit measures, such as the factor reliability and the AVE, the reliability and convergent validity of individual indicators and factors are assessed (Homburg, 2000, p. 81). These criteria are determined through the use of univariate confirmatory factor analyses for each construct (Jöreskog, 1969, p. 185). The **indicator reliability** indicates the portion of variance of an indicator, which is explained by its factor (Balderjahn, 1986, p. 117). It can have values between 0 and 1 (Balderjahn, 1986, p. 117). According to Balderjahn (1986, p. 117), values should not be below 0.1, whereas Bagozzi and Baumgartner (1994, p. 402) and Homburg and Rudolph (1998, p. 253) require values equal to and above 0.4. Equation (6.11) refers to the indicator reliability (Homburg and Baumgartner, 1995, p. 170).

$$rel(x_i) = \frac{\lambda_{ij}^2 \varphi_{jj}}{\lambda_{ij}^2 \varphi_{jj} + \theta_{ii}} \tag{6.11}$$

λ_{ij}: Loadings of the indicator i of a latent variable j
φ_j: Variance of a latent variable j
θ_i: Estimated variance of the related measurement error of the indicator i
j: Running index of all reflective measurement models of latent constructs j

The **factor reliability** specifies how well a factor is measured through its associated indicators, and is an index used for measuring convergent validity (Bagozzi and Baumgartner, 1994, p. 402; Homburg and Giering, 1996, p. 10). It can have values between 0 and 1 (Homburg and Baumgartner, 1995, p. 170). In addition, high values indicate a large fit (Homburg and Baumgartner, 1995, p. 170). The value of the factor reliability should be at least 0.6 (Fornell and Larcker, 1981, p.

46; Homburg and Baumgartner, 1995, p. 170). Equation (6.12) explains the factor reliability (Fornell and Larcker, 1981, p. 45).

$$rel(\xi_j) = \frac{(\sum_{i=1} \lambda_{ij})^2 \varphi_{jj}}{(\sum_{i=1}^{k} \lambda_{ij})^2 \varphi_{jj} + \sum_{i=1}^{k} \theta_{ii}} \tag{6.12}$$

λ_{ij}: Loadings of indicators i of a latent variable j
φ_j: Variance of a latent variable j
θ_i: Estimated variance of the related measurement error of the indicator i
j: Running index of all reflective measurement models of latent constructs j
k: Number of indicators of a construct

The **AVE** gives evidence on how well a factor can be measured through its indicators and is also an index designed for measuring convergent validity (Fritz, 1995, p. 133). It can assume values between 0 and 1 and should not be below 0.5 in order to explain at least 50% of the variance of all indicators (Bagozzi and Yi, 1988, p. 88; Fornell and Larcker, 1981, p. 46). Equation (6.13) is taken from Fornell and Larcker (1981, p. 46).

$$DEV(\xi_j) = \frac{\sum_{i=1}^{k} \lambda_{ij}^2 \varphi_{jj}}{\sum_{i=1}^{k} \lambda_{ij}^2 \varphi_{jj} + \sum_{i=1}^{k} \theta_{ii}} \tag{6.13}$$

λ_{ij}: Loadings of indicators i of a latent variable j
φ_j: Variance of a latent variable j
θ_i: Estimated variance of the related measurement error of the indicator i
j: Running index of all reflective measurement models of latent constructs j
k: Number of indicators of a construct

The discriminant validity can be assessed by using the χ^2-difference test (Jöreskog, 1977, p. 273) and the Fornell-Larcker criterion (Fornell and Larcker, 1981, p. 46). The **Fornell-Larcker criterion** is used in this study, because it is more difficult to meet. In order to calculate the Fornell-Larcker criterion, a multi-factorial analysis with all constructs of the measurement model is conducted (Fornell and Larcker, 1981, p. 46). The AVE of a construct has to be higher than every squared correlation of a factor with all other factors of the measurement model; only then is discriminant validity given, which means that a factor explains more variance of the indicators associated to it than to other indicators (Fornell and Larcker, 1981, p. 46).

The **squared multiple correlations** (R^2) are determined for the latent endogenous variables η_i, which indicate how much variance is explained through all variables (Homburg, 1992, p. 505). The value of the squared multiple correlation can be between 0 and 1 (Homburg, 1992, p. 505). Small values indicate that further constructs influence the latent endogenous variable η_i, which have not been specified in the model (Homburg, 1992, p. 505). According to literature, a threshold of 0.2 is recommended for the squared multiple correlations (Homburg and Baumgartner, 1998, p. 363).

In order to test the hypotheses, the **standardized path coefficients** of the structural model and their *p-values* are analyzed (Johnson and Lebreton, 2004, p. 243). The standardized effects indicate the strength and direction of the relationship between the latent variables (Johnson and Lebreton, 2004, p. 243). The statistical significance is evaluated by the p-value (Johnson and Lebreton, 2004, p. 244). However, the use of standardized path coefficients is criticized by some researchers (Richards, 1982, p. 201; Greenland et al., 1986, p. 203; Greenland et al., 1991, p. 387; Criqui, 1991, p. 393; Newman and Browner, 1991, p. 383; Luskin, 1991, p. 1032). The second-generation quality criteria are summarized in Table 6.3.

Quality criteria	Requirements
Global fit indices	
χ^2-value/df	≤ 3
RMSEA	≤ 0.05
CFI	≥ 0.95
TLI	≥ 0.95
Local fit indices	
Indicator reliability	≥ 0.4
Factor reliability	≥ 0.6
AVE	≥ 0.5
Fornell-Larcker criterion	AVE $>$ r^2
R^2	≥ 0.2
Standardized path coefficients	should be significant at $p \leq 0.05$

Table 6.3. – Second-generation quality criteria.
Source: Based on Browne and Cudeck (1993, p. 144); Fritz (1995, p. 140); Homburg (2000, p. 84); Homburg and Baumgartner (1998, p. 357) and Hu and Bentler (1999, p. 27).

6.1.6. Complex relationships

In the following, mediation effects (see Section 6.1.6.1) and moderation effects (see Section 6.1.6.2) are outlined.

6.1.6.1. Mediation effects

Generally, structural equation models assume linear relationships between constructs. However, there might be constructs that have an influence on a dependent construct through another independent construct (see Figure 6.3) (Eggert et al., 2005, p. 101). Consequently, an indirect effect is given, if a relationship between a variable X and another variable Y is mediated by a third variable M (Eggert et al., 2005, p. 101). It can be distinguished between two different types of mediation. A *full mediation* is given, when X has an indirect effect on M to Y, while, at the same time, no direct influence of X on Y can be observed (Eggert et al., 2005, p. 105; James and Brett, 1984, p. 307; Homburg and Klarmann, 2006, p. 730). A *partial mediation* is given, when a direct and an indirect effect can be observed (Eggert et al., 2005, p. 105; James and Brett, 1984, p. 316). Two prerequisites must be met, before a mediation can be determined by using causal analysis (Klarmann, 2008, p. 62). First, the individual variables X, M and Y of the causal chain must have discriminant validity, which should be tested by the Fornell-Larcker criterion (Klarmann, 2008, p. 62). Second, the path coefficients should be significantly different from zero (Klarmann, 2008, p. 62). The significance of the total effect is measured by using the bootstrap approach

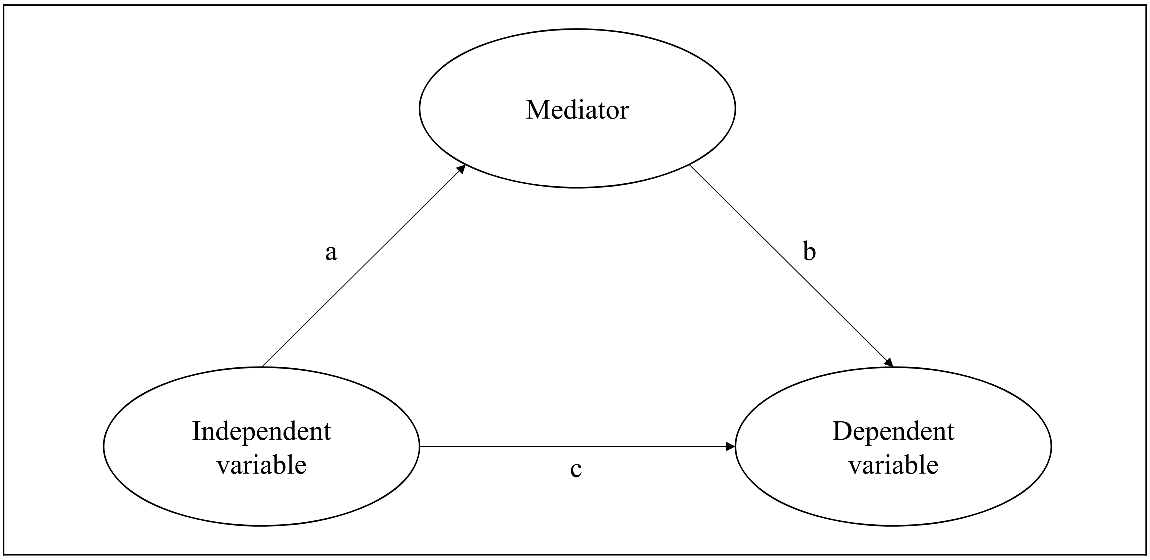

Figure 6.3. – Direct and indirect effects.
Source: Based on Baron and Kenny (1986, p. 1176).

(Preacher and Hayes, 2004, p. 717; Preacher and Hayes, 2008b, p. 13). With this procedure, specific confidence intervals are established to reject the null hypothesis that the indirect effect is zero, for instance with a 95% level of significance (Preacher and Hayes, 2008a, p. 884).

6.1.6.2. Moderation effects

If the *strength* or the *direction* of a *relationship* between two variables X and Y depends on a third variable Z, a moderation effect is given (see Figure 6.4) (Baron and Kenny, 1986, p. 1174). Baron and Kenny (1986, p. 1174) define a moderator as:

> [...] a qualitative (e.g. sex, race, class) or quantitative (e.g. level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable.

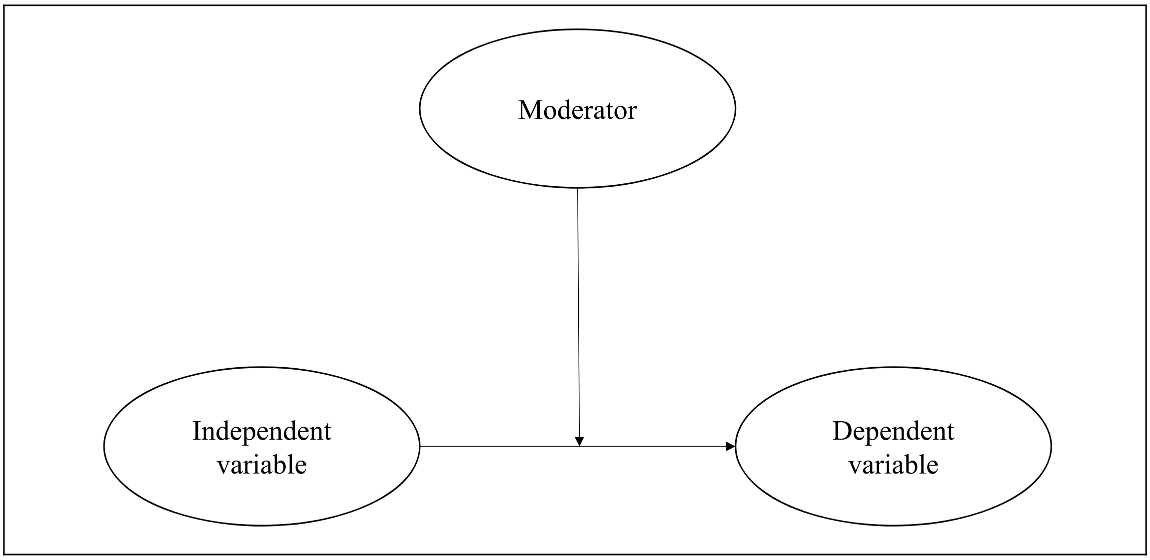

Figure 6.4. – Moderation effect.
Source: Eggert et al. (2005, p. 104).

A moderation effect can be positive and negative (see Figure 6.5). A positive moderation effect is given, when, at a high level of the moderator variable Z, the influence of the independent variable X on the dependent variable Y is stronger (Homburg and Krohmer, 2006, p. 385). A negative moderation effect is given, when the influence is reduced (Homburg and Krohmer, 2006, p. 385).

Moreover, it can be distinguished between a *purely moderated effect* and a *quasi moderation* (Sharma et al., 1981, p. 292). A purely moderation occurs, when the moderator Z only has an effect on the strength and direction of the relationship between X and Y (Sharma et al., 1981, p. 292). A quasi moderation is given, when the moderator also has a direct effect on the dependent variable Y (Sharma et al., 1981, p. 292). In the past, the independence of the moderator was often required, because otherwise it was mathematically not possible to determine, which variable was the moderator (Sharma et al., 1981, p. 294). This condition often cannot be met in research practice, so that, nowadays in both cases, one speaks of a moderated effect

(Homburg and Krohmer, 2006, p. 385). In case of a quasi moderation, it must be conceptually defined which variable is the moderator (Sharma et al., 1981, p. 292).

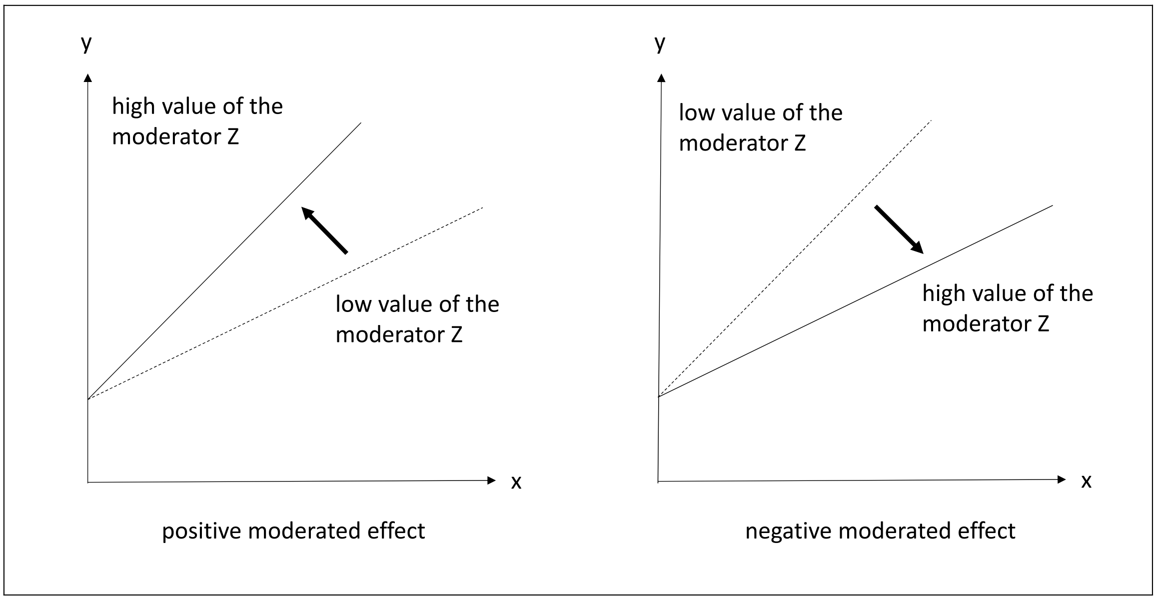

Figure 6.5. – Positive and negative moderated effects.
Source: Homburg and Krohmer (2006, p. 385).

The modeling of moderators can be done by a multi-group analysis or through interaction terms. From a conceptual perspective, interaction terms should be built, when the moderators are metric or quasi-metric (continuous variables) (Irwin and McClelland, 2001, p. 105), whereas, when the moderators are discrete, nominal (categorical variables) multi-group analysis is recommended (Chin, 2000, p. 1). Some researchers argue that during the grouping of multi-group analysis, information remains unused, so that the statistical power is reduced (Irwin and McClelland, 2001, p. 105). Moreover, in a multi-group analysis, the probability increases that an artefactual moderation effect is found, which refers to a type-one statistical inference error (MacCallum et al., 2002, p. 29), whereas the results of interaction moderations are very resilient, i.e., the risk of a type-one statistical inference error is low (Klarmann, 2008, p. 87). Nevertheless, multi-group analysis is often used in order to detect moderator effects, which is justified with the better interpretability of the results (MacCallum et al., 2002, p. 33).

In order to identify the moderation effects via **multi-group analysis**, the data set is divided into two equally sized data subsets according to the moderators (Jaccard et al., 1990, p. 49). If the variable is a continuous one, a median-split is conducted, which results in two groups: one group with a high parameter value and one group with a low parameter value (Jaccard et al., 1990, p. 49). Subsequently, the model specification is carried out simultaneously for both data sets.

In order to measure **interaction effects**, three paths are examined: path a between the independent and dependent variable, path b between the moderator variable and dependent variable and path c between the interaction variable and dependent variable (see Figure 6.6) (Eggert et al., 2005, p. 107).

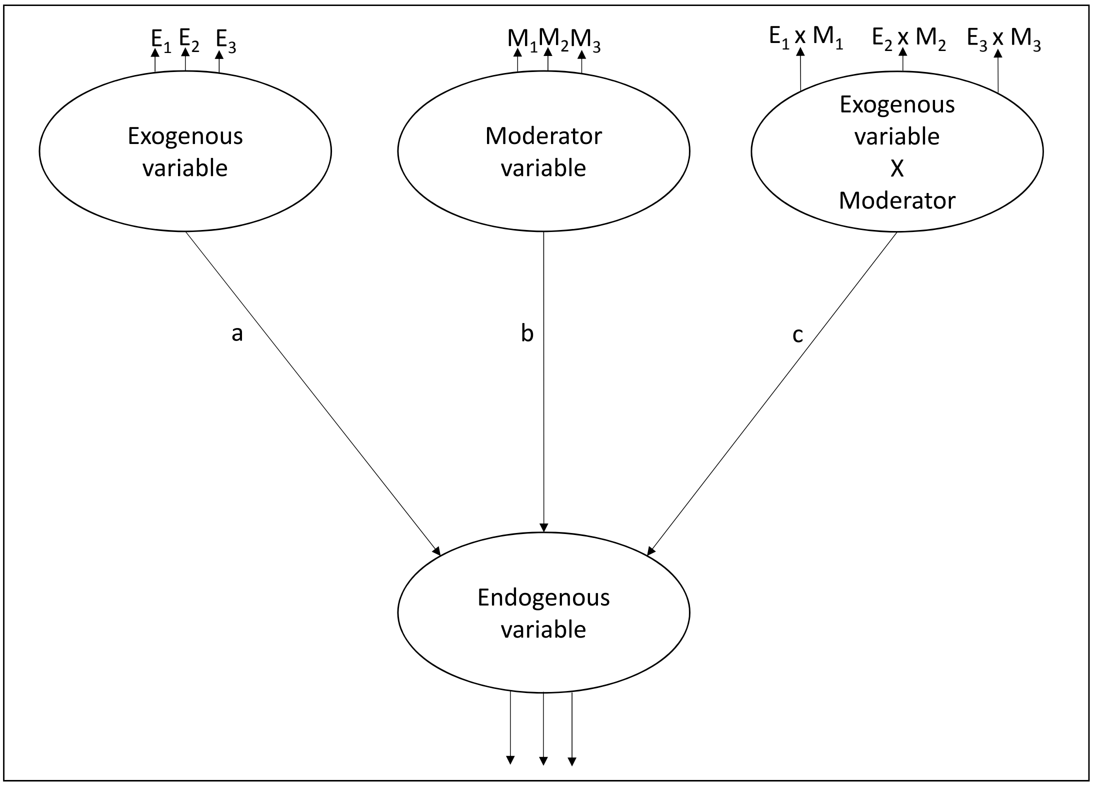

Figure 6.6. – Interaction moderation.
Source: Based on Eggert et al. (2005, p. 107).

The moderation effect can be supported, if the relationship between the interaction variable and dependent variable (path c) is significant (Smith and Sasaki, 1979, p. 35-56; Aiken and West, 1991, p. 40-48). The path coefficients of path a and b are irrelevant for the significance of the interaction term (Smith and Sasaki, 1979, p. 35-56; Aiken and West, 1991, p. 40-48). For reflective constructs, the indicators of the independent variables and the moderation variable first have to be standardized (Smith and Sasaki, 1979, p. 35-56; Aiken and West, 1991, p. 40-48). Therefore, a mean of zero and a variance of one is assumed (Smith and Sasaki, 1979, p. 35-56; Aiken and West, 1991, p. 40-48). Otherwise, an issue of multicollinearity could arise (Smith and Sasaki, 1979, p. 35-56; Aiken and West, 1991, p. 40-48). In addition, the standardization facilitates the interpretation of the path coefficients (Smith and Sasaki, 1979, p. 35-56; Aiken and West, 1991, p. 40-48). Finally, the indicators of the interaction variable are computed by multiplying the indicators of the independent variables and the moderator variable pairwise with each other (Götz and Liehr-Gobbers, 2004, p. 725). Instead of using all product indicators as recommended by Kenny and Judd (1984, p. 204), only a subset of the product indicators are used (e.g., E_1*M_1, E_2*M_2, E_3*M_3). This approach goes back to Jaccard and Wan (1996), which, according to Ping (2003, p. 8) "relieves much of the tedium in specifying the full set of Kenny and Judd indicators and [...] is less likely to produce convergence and model-to-data fit problems". However, this technique has been criticized by some authors (Ping, 2003, p. 8).[1]

6.2. Data collection

In the following, the survey administration procedure is outlined (see Section 6.2.1). In Section 6.2.2, the survey response rate and representativeness is described. After pointing out the descriptive statistics in Section 6.2.3, the survey instrument is explained in Section 6.2.4.

6.2.1. Survey administration procedure

The aim of this thesis is to derive non-industry specific and, therefore, generalizable statements according to employees' willingness to share knowledge through enterprise social software at the pre-implementation stage and at the post-implementation stage. Consequently, a cross-section analysis is applied. In this thesis, German employees are questioned, whose workplace is equipped with a computer. According to the Federal Statistical Office, 61% of German employees work with a computer at their workplace (Statistisches Bundesamt, 2014). Unfortunately, there is no further information available that characterizes these employees in greater detail (e.g., age, gender, education, etc.).

In order to provide sufficient statistical power for multivariate tests, a large sample size is necessary (Cole, 1987, p. 585). Hence, a sample ought to be selected that contains a large number of subjects. To identify organizations that are planning on introducing enterprise social software (pre-implementation stage) and those that have already implemented enterprise social software (post-implementation stage), press releases have been searched for. The search yielded several organizations, which have been contacted via e-mail. Organizations using enterprise social software are mainly in the initial or intermediate stages of enterprise social software implementation and are likely to benefit from the recommendations on how to enhance employees' willingness to share knowledge through enterprise social software. Finally, two organizations

[1] In order to support the results, a summarized scale score for the interaction effects has also been investigated, which showed similar results (Podsakoff et al., 2003, p. 202), thus enhancing the validity of the results. Compared to the approach described above, the summarized scale score is the less conservative method in order to detect interaction effects, since measurement errors are not considered.

positively responded to the request for participation. Employees of both organizations have been interviewed at the pre-implementation stage (the organizations are explained in Section 4.1.5 and 4.1.6). At the time when the questionnaire survey was conducted, organization A had already implemented enterprise social software, whereas organization B was still planning on introducing enterprise social software.

In order to minimize the likelihood that the findings are idiosyncratic to these two organizational types, the sample is supplemented by a second sample, that is intended to represent a broad spectrum of organizational types. The data of the second sample were collected through an online survey distributed via social networks (Facebook and Xing), alumni networks and mailing lists.

Based on the total sample (all data sets), it was intended to derive generalizable statements. Data have been collected from organization A, organization B as well as from social networks, alumni networks and mailing lists between April 2014 and November 2014.

The contact person in each organization was enlisted to identify the pool of survey participants and to distribute an e-mail containing the online survey link. The e-mails included some encouraging words and the information that the results of the survey are advantageous to the organization. Moreover, the e-mail and the landing page of the online survey informed employees that all collected data would be handled anonymously and with the utmost confidentiality.

The general online survey was distributed via social networks, alumni networks and mailing lists. The online survey link was sent and posted with some encouraging words and the information that all data provided are treated as confidential. The general online survey consisted of two versions. A filter question led the participant either to version A (organization uses enterprise social software (post-implementation stage)) or version B (organization does not use enterprise social software (pre-implementation stage)). Since all questions of the online surveys were mandatory, there are no missing values or incomplete responses.

In order to investigate employees' willingness to share knowledge at the pre-implementation stage and at the post-implementation stage, the three data sets ((1)

	Post-implementation stage	**Pre-implementation stage**
Organization A	210	n/a
Organization B	n/a	590
Social networks/ Alumni networks/ Mailing lists	230	238
#	440	828

Table 6.4. – Split of the data sets (pre-implementation stage and post-implementation stage).
Source: Own table.

a data set of 210 respondents from organization A, (2) a data set of 590 respondents from organization B and (3) a data set of 468 respondents from the general online survey) have been combined and split according to the different stages of implementation ((1) one data set of 828 respondents for the pre-implementation stage and (2) one data set of 440 respondents for the post-implementation stage) (see Table 6.4). Data analysis was carried out simultaneously for the two models.

6.2.2. Survey response and representativeness

A summary of the response rate is presented in Table 6.5. Out of 1,200 employees in organization A, who received the online survey link, 210 responses were obtained, providing an overall response rate of 17.5%. Out of 3,750 employees in organization B, 590 responses were obtained, resulting in an overall response rate of 15.73%. No case had to be removed from the data sets since all questions were mandatory.

	Organization A	Organization B	Social networks/ Alumni networks/ Mailing lists
Number of e-mails sent	1200	3750	n/a
Responses	210	590	468
Response rate (%)	17.5	15.73	n/a

Table 6.5. – Response rate.
Source: Own table.

Covariance-based analysis methods require that the sample is representative for the population. According to results of the Federal Statistical Office, 61% of German employees work with a computer at their workplace (Statistisches Bundesamt, 2014). Since the statistic does not provide further information about this population (e.g., age, gender, education, etc.), descriptive statistics as well as the Mann-Whitney-U test and Wilcoxon signed-rank test are used in order to assess the representativeness of the sample and to demonstrate that the respondents are not a biased sample, but in fact are representative of the population (Mann and Whitney, 1947). First, the **descriptive statistics** of the sample were calculated in order to make comparisons against any known population characteristics and to assess its generalizability. On average, respondents reported 36.12 years of age and 7.5 years average tenure within the company. Moreover, 27.1% of the sample was female. Some of these findings coincide with the findings of prior research, e.g., the results support existing data that men are better represented than women in technical sectors, such as information technology (IT) and telecommunications, automotive, engineering and construction and electronics (Schoper, 2014, p. 10).

Second, **non-response bias** is a potential limitation of the representativeness, especially when responses are collected only from a subset of the overall population

(Podsakoff et al., 2003, p. 889). Hence, external validity might be reduced through employees who did not participate in the online survey (Urbach et al., 2010, p. 191). In order to assess a non-response bias, the groups of early respondents and late respondents are compared with each other by using the nonparametric Mann-Whitney-U test (Mann and Whitney, 1947) and the Wilcoxon signed-rank test (Wilcoxon, 1945; Rogelberg and Stanton, 2007, p. 195). This procedure assumes that employees, who participated at a later stage in the online survey are similar to non-respondents (employees, who did not participate in the online survey). Both tests reveal that no significant differences exist between early respondents and late respondents (see Table 6.6), which indicates that a non-response bias does not exist (Rogelberg and Stanton, 2007, p. 199).

6.2.3. Descriptive statistics

The following tables (Tables 6.7, 6.8 and 6.9) report individual demographics and job-related characteristics of the respondents.

Table 6.7 is outlined first, which refers to the respondents' profiles. In both implementation stages, the majority of respondents were males (73.3% at the pre-implementation stage, 72% at the post-implementation stage) and between 31 and 35 years (21.4% at the pre-implementation stage, 20.2% at the post-implementation

	Organization A*		**Organization B**	**General online survey**
Period of data collection	11.09.2014-06.10.2014 (3.5 weeks)	15.10.2014-10.11.2014 (3.5 weeks)	02.04.2014-25.04.2014 (3 weeks)	18.07.2014-25.08.2014 (5 weeks)
# of respondents	118	92	590	468
# of early respondents	92 (11.09.2014-18.09.1014)	77 (15.10.2014-22.10.2014)	484 (02.04.2014-09.04.2014)	336 (18.07.2014-01.08.2014)
# of late respondents	26 (19.09.2014-06.10.2014)	15 (23.10.2014-10.11.2014)	106 (10.04.2014-25.04.2014)	132 (02.08.2014-22.08.2014)
Mann-Whitney-U test and Wilcoxon signed-rank test	.599 (n.s.)	.579 (n.s.)	.180 (n.s.)	.667 (n.s.)

Table 6.6. – Comparison of late and early respondents (*since one work council of organization A agreed to an earlier date to the request for participation than the second one, data has been collected at two different times at organization A).
Source: Own table.

stage). The results support existing data that men are better represented than women in technical sectors, such as information technology (IT) and telecommunications, automotive, engineering and construction and electronics (Schoper, 2014, p. 10). The majority of respondents of the pre-implementation stage had a Diploma's degree (44.8%), while the majority of respondents of the post-implementation stage had a College degree (34.8%). However, a large percentage of respondents of the post-implementation stage also had a Diploma's degree (28.2%). Most of the respondents have worked in their current organization for more than five years (23.7% at the pre-implementation stage, 16.8% at the post-implementation stage). In both companies, a small percentage of upper management representatives participated in the survey (5.6% at the pre-implementation stage, 2.7% at the post-implementation stage), whereas most of the participants were employees without any management responsibility (64.3% at the pre-implementation stage, 71.8% at the post-implementation stage).

Table 6.8 refers to the respondents' work environment and is explained in the following. Relatively large proportions of respondents of the pre-implementation stage worked in the automotive industry (44.1%), while a comparatively large percentage of respondents of the post-implementation stage were employed in the information (IT) and telecommunication industry (57.3%). Even though these results can be traced back to the business cooperations with organization A and organization B, the large percentage of the information (IT) and telecommunication industry and automotive industry still adequately represents the general population, since especially employees employed in the information (IT) and telecommunication industry and automotive industry use computers during their working time (Statistisches Bundesamt, 2014). Concerning the size of the companies, respondents were asked to make statements towards the size of the entire group. In both implementation stages, the respondents were employed in organizations with 5,000 or more employees (65% at the pre-implementation stage, 67.5% at the post-implementation stage). Relatively large proportions of respondents of the pre-implementation stage worked in research & development (28.5%), while a comparatively large percentage of respondents of the post-implementation stage were employed in information technology (33.2%).

Table 6.9 is explained in the following, which refers to the respondents' social media experiences. At both implementation stages, the majority of respondents have never used private blogs (65.1% at the pre-implementation stage, 55.7% at the post-implementation stage), have used private wikis on a weekly basis (such as Wikipedia) (49.6 % at the pre-implementation stage, 45.7% at the post-implementation stage) and have used social networks on a daily basis (36.8% at the pre-implementation stage, 50.2% at the post-implementation stage). In addition, at both implementation stages the percentage of respondents, who have never used social networks is relatively high (28.9% at the pre-implementation stage, 23.6% at the post-implementation stage). In general, these results are also supported by the ARD/ZDF online study, which shows the same tendency that blogs are used the least among the German population (van

Eimeren and Frees, 2014, p. 388). Even though the results of the ARD/ZDF online study and the results of this thesis cannot be directly compared (e.g., in the ARD/ZDF online study, German online users from the age of 14 were questioned, whereas the age range from 14 to 15 has not been questioned in this thesis), the results provide a good approximation (van Eimeren and Frees, 2014, p. 388). According to the ARD/ZDF online study, 41% of the respondents use Wikipedia on a weekly basis (in this research study, 48.3% respondents use wikis on a weekly basis), followed by 39%, who use social networks on a weekly basis (in this study, 17.5% respondents use social networks on a weekly basis) and 5% who use blogs on a weekly basis in 2014 (in this study, 12% respondents use blogs on a weekly basis) (van Eimeren and Frees, 2014, p. 388).

Variable	Items	All data (frequency and percentage)	Pre-implementation stage (frequency and percentage)	Post-implementation stage (frequency and percentage)
Gender	Female	344 (27.1%)	221 (26.7%)	123 (28.0%)
	Male	924 (72.9%)	607 (73.3%)	317 (72.0%)
Age	16 - 25 years	99 (7.8%)	42 (5.1%)	57 (13.0%)
	26 - 30 years	201 (15.9%)	131 (15.8%)	70 (15.9%)
	31 - 35 years	266 (21.0%)	177 (21.4%)	89 (20.2%)
	36 - 40 years	198 (15.6%)	149 (18.0%)	49 (11.1%)
	41 - 45 years	159 (12.5%)	120 (14.5%)	39 (8.9%)
	46 - 50 years	147 (11.6%)	88 (10.6%)	59 (13.4%)
	51 - 55 years	131 (10.3%)	81 (9.8%)	50 (11.4%)
	56 years and older	67 (5.3%)	40 (4.8%)	27 (6.1%)
Education	High school or below	150 (11.8%)	106 (12.8%	44 (10%)
	College	321 (25.3%)	168 (20.3%)	153 (34.8%)
	Bachelor	120 (9.5%)	64 (7.7%)	56 (12.7%)
	Diploma	495 (39.0%)	371 (44.8%)	124 (28.2%)
	Master	116 (9.1%)	75 (9.1%)	41 (9.3%)
	PhD and above	64 (5.0%)	44 (5.3%)	20 (4.5%)
Length of working for the organization	up to 1 year	88 (6.9%)	51 (6.2%)	37 (8.4%)
	more than 1 year	164 (12.9%)	104 (12.6%)	60 (13.6%)
	more than 3 years	151 (11.9%)	93 (11.2%)	58 (13.2%)
	more than 5 years	270 (21.3%)	196 (23.7%)	74 (16.8%)
	more than 10 years	244 (19.2%)	182 (22.0%)	62 (14.1%)
	more than 15 years	122 (9.6%)	71 (8.6%)	51 (11.6%)
	more than 20 years	70 (5.5%)	50 (6.0%)	20 (4.5%)
	more than 25 years	86 (6.8%)	51 (6.2%)	35 (8.0%)
	more than 30 years	36 (2.8%)	13 (1.6%)	23 (5.2%)
	35 years and more	35 (2.8%)	17 (2.1%)	18 (4.1%)
Position	Employee	848 (66.9%)	532 (64.3%)	316 (71.8%)
	Lower management	201 (15.9%)	139 (16.8%)	62 (14.1%)
	Middle management	159 (12.5%)	111 (13.4%)	48 (10.9%)
	Upper management	58 (4.6%)	46 (5.6%)	12 (2.7%)

Table 6.7. – Profile of respondents.
Source: Own table.

Variable	Items	All data (frequency and percentage)	Pre-implementation stage (frequency and percentage)	Post-implementation stage (frequency and percentage)
Industry	Education	26 (2.1%)	13 (1.6%)	13 (3.0%)
	Consulting	29 (2.3%)	14 (1.7%)	15 (3.4%)
	Banking/Insurance	30 (2.4%)	17 (2.1%)	13 (3.0%)
	Public sector	32 (2.5%)	23 (2.8%)	9 (2.0%)
	Building	33 (2.6%)	15 (1.8%)	18 (4.1%)
	Manufacturing	39 (3.1%)	30 (3.6%)	9 (2.0%)
	Service industry	68 (5.4%)	38 (4.6%)	30 (6.8%)
	Engineering/Construction	82 (6.5%)	74 (8.9%)	8 (1.8%)
	Electronics	146 (11.5%)	138 (16.7%)	8 (1.8%)
	Information technology (IT)/ Telecom.	271 (21.4%)	19 (2.3%)	252 (57.3%)
	Automotive	380 (30.0%)	365 (44.1%)	15 (3.4%)
	Others	132 (10.2%)	82 (9.8%)	50 (11.4%)
Number of employees	1 - 10	52 (4.1%)	45 (5.4%)	7 (1.6%)
	11 - 50	73 (5.8%)	56 (6.8%)	17 (3.9%)
	51 - 250	102 (8.0%)	69 (8.3%)	33 (7.5%)
	251 - 500	43 (3.4%)	22 (2.7%)	21 (4.8%)
	501 - 1000	78 (6.2%)	57 (6.9%)	21 (4.8%)
	1001 - 4999	85 (6.7%)	41 (5.0%)	44 (10.0%)
	5000 and more	835 (65.9%)	538 (65.0%)	297 (67.5%)
Department	Finance	24 (1.9%)	7 (0.8%)	17 (3.9%)
	Production	35 (2.8%)	17 (2.1%)	18 (4.1%)
	Planning	41 (3.2%)	37 (4.5%)	4 (0.9%)
	Human resources	45 (3.5%)	31 (3.7%)	14 (3.2%)
	Marketing	49 (3.9%)	31 (3.7%)	18 (4.1%)
	Purchasing	53 (4.2%)	47 (5.7%)	6 (1.4%)
	Sales	61 (4.8%)	48 (5.8%)	13 (3.0%)
	Technical office	63 (5.0%)	43 (5.2%)	20 (4.5%)
	Customer service	77 (6.1%)	30 (3.6%)	47 (10.7%)
	Quality management	115 (9.1%)	108 (13.0%)	7 (1.6%)
	Project management	138 (10.9%)	96 (11.6%)	42 (9.5%)
	Information technology	176 (13.9%)	30 (3.6%)	146 (33.2%)
	Research & Development	263 (20.7%)	236 (28.5%)	27 (6.1%)
	Others	128 (10.0%)	67 (8.2%)	61 (13.8%)

Table 6.8. – Work environment of respondents.
Source: Own table

Variable	Items	All data (frequency and percentage)	Pre-implementation stage (frequency and percentage)	Post-implementation stage (frequency and percentage)
Use of blogs	Daily	88 (6.9%)	38 (4.6%)	50 (11.4%)
	Weekly	152 (12.0%)	89 (10.7%)	63 (14.3%)
	Monthly	103 (8.1%)	63 (7.6%)	40 (9.1%)
	Quarterly	63 (5.0%)	45 (5.4%)	18 (4.1%)
	Half yearly	78 (6.2%)	54 (6.5%)	24 (5.5%)
	Never	784 (61.8%)	539 (65.1%)	245 (55.7%)
Use of wikis	Daily	240 (18.9%)	137 (16.5%)	103 (23.4%)
	Weekly	612 (48.3%)	411 (49.6%)	201 (45.7%)
	Monthly	221 (17.4%)	152 (18.4%)	69 (15.7%)
	Quarterly	58 (4.6%)	36 (4.3%)	22 (5.0%)
	Half yearly	29 (2.3%)	20 (2.4%)	9 (2.0%)
	Never	108 (8.5%)	72 (8.7%)	36 (8.2%)
Use of social networks	Daily	526 (41.5%)	305 (36.8%)	221 (50.2%)
	Weekly	222 (17.5%)	149 (18.0%)	73 (16.6%)
	Monthly	98 (7.7%)	69 (8.3%)	29 (6.6%)
	Quarterly	44 (3.5%)	33 (4.0%)	11 (2.5%)
	Half yearly	35 (2.8%)	33 (4.0%)	2 (0.5%)
	Never	343 (27.1%)	239 (28.9%)	104 (23.6%)

Table 6.9. – Social software experience profile of respondents.
Source: Own table.

Overall, the distribution of respondents for each of the demographic categories indicate that the respondents are fairly representative of the general population in the context of this thesis.

6.2.4. Survey instrument

In the following, the structure of the questionnaire and online survey (see Section 6.2.4.1) as well as the operationalization of the constructs and pre-tests are described (see Section 6.2.4.2).

6.2.4.1. Structure of the questionnaire and online survey

The questionnaire is divided into ten logical parts. It begins with an encouraging introduction that emphasizes confidentiality issues and instructs the respondents on how to complete the questionnaire, while the second part refers to personal factors. In order to ensure that all respondents have the same understanding of the term knowledge, the third part informs the participants about the differentiation between signs, data, information and knowledge. In line with this differentiation, questions in the online survey, that are assigned to the knowledge receiver, should actually refer to information (e.g., “How often do you receive information...”), whereas questions, that are assigned to the knowledge sender, should refer to knowledge (e.g., “How often do you share knowledge...?”) (Hopf, 2009, p. 8). Within this thesis, all questions used for the questionnaire refer to knowledge, since such inconsistencies are difficult for the respondents to follow (Hopf, 2009, p. 8). The fourth part refers to organizational factors. Although this thesis does not focus on specific enterprise social software tools, the most common enterprise social software tools, which are blogs, wikis and social networks (Ali-Hassan and Nevo, 2009, p. 3), are defined in the fifth part in order to ensure that all respondents have the same basic understanding of these social software tools, which some respondents may have never seen or used before. Accordingly, definitions and screenshots of these tools are shown to the respondents before questions concerning enterprise social software are asked. The sixth part refers to technological factors. The process of knowledge sharing involves two actions: transmission (sending or presenting knowledge to a potential recipient or medium) and absorption by that person or group (Davenport and Prusak, 1998, p. 101). Therefore, items concerning the technological factors, for instance, implicitly depict that knowledge is absorbed by employees in order to increase productivity (e.g., “Using organizational social media increases my productivity.”). The seventh part is related to the respondents’ acceptance and intended use of enterprise social software for knowledge sharing, whereas the eighth part asks for the respondents’ experiences made with private social software. Finally, the ninth part refers to demographics and the tenth part concludes by thanking the respondents for their support.

In order to distribute the questionnaire, the online survey software EFS Survey (Enterprise Feedback Suite 10.0 by Unipark/Globalpark) is used, a well-established survey tool, which is widely used in academics. The online survey resembles the format of a paper questionnaire. The content is limited to one page, where possible, to prevent respondents from having to scroll down. All questions are mandatory, so that the respondents are forced to answer all questions before moving on to the next set of questions. Moreover, a progress bar is implemented into the online survey, so that the respondents know at which stage they are in the completion progress (Dillman et al., 1999, p. 745). In addition, at certain points through the survey, further instructions are provided before the corresponding questions appear.

6.2.4.2. Operationalization of the constructs and pre-tests

As outlined in Section 5, existing scales for measuring the latent variables were used and modified to fit this specific research context. According to researchers, this should enhance the measurement instrument validity from the very beginning (Kankanhalli, 2002, p. 68). Since the questionnaire was distributed in Germany, the original English items were translated into German. In a first step, the original English items were translated into German with the support of three research assistants and adapted to the research context. In a second step, the quality of the translation was evaluated by an English native speaker. All items were measured using a five-point Likert-type scale (ranging from 1=strongly agree to 5=strongly disagree) (Likert, 1932) and were conceptualized as reflective, though, according to Jarvis et al. (2003, p. 216), their nature might be questioned. It is recommended that data collection should begin with an appropriate pre-test of the content (Churchill, 1995, p. 440). Therefore, the questionnaire was first pre-tested with five research assistants to ensure that the content and wording were clear and concise. Afterwards, a heterogeneous group of five employees examined the revised questionnaire for meaningfulness, relevance and clarity in a separate face-to-face meeting with the author. Based on these pre-tests, item wordings were further refined.

6.3. Results of the quantitative analysis

To test the hypotheses, structural equation modeling (SEM) is employed. SEM involves a two-step approach (Jöreskog and Sörbom, 1996, p. 1). In the first step, the instrument validation is examined, based on the measurement model with the help of first-generation quality criteria (see Section 6.3.1) and second-generation quality criteria (see Section 6.3.2). In the second step, the structural model is evaluated (see Section 6.3.3).

6.3.1. First-generation quality criteria

First, the measurement model is assessed by first-generation quality criteria for all data (sample size of 1,286 respondents). For the evaluation, SPSS 21 (IBM Corporation, 2012) is used. With the help of an exploratory factor analysis, the latent variables, which explain the patterns of correlations within the data set, are extracted by a fixed number of seventeen constructs (five technological factors, two factors for rewards of knowledge sharing, four personal factors, four organizational factors, one attitudinal factor and one intentional factor) (Gefen and Straub, 2005, p. 91; Hair et al., 1998, p. 99). An extraction without fixing the number of constructs reveals that knowledge sharing norms and management support load on the same factor, while fixing the number of constructs leads to a clean pattern matrix. However, the constructs of management support and knowledge sharing norms are kept under scrutiny, and the AVE and Fornell-Larcker criterion of the confirmatory factor analysis will finally help confirming the constructs' discriminant validity. The exploratory factor analysis is conducted by means of a maximum likelihood procedure[2] with promax rotation on the collected data. In comparison to varimax, promax assumes that the factors correlate

[2]When using IBM SPSS AMOS for measuring the structural equation model, which is based on the maximum likelihood procedure, researchers recommend using this procedure for the exploratory factor analysis as well (Christ and Schlüter, 2012, p. 36).

across each other and are therefore not independent from each other (Kline, 2013, p. 186). In this thesis, the KMO and Bartlett's test measures a value of 0.887 with a significance of 0.00, which indicates that the matrix is not an identity matrix, i.e., the factors do relate to one another enough to conduct a significant exploratory factor analysis (Merkle et al., 1998, p. 210; Shrestha and Kazama, 2007, p. 466). According to Kaiser (1974), a value of 0.887 is nearly a marvelous result. The seventeen factors account together for 68.26% of the variance in the data and reflects a value above the recommended threshold of 50% as recommended by Backhaus et al. (2011, p. 362). Statements according to convergent validity can be made by using factor loadings (Cole, 1987, p. 584). According to Field (2000, p. 440), sufficient or significant factor loadings depend on the sample size of the dataset. Factor loadings should be generally greater than 0.60 (Hair et al., 1998, p. 112) and on average greater than 0.70 for each factor (Gaskin, 2012d). Tables 6.10 and 6.11 indicate that all factor loadings meet these requirements. According to discriminant validity, variables should relate more strongly to their own factor than to others (Chin, 1998, p. 321). Appendix C.20 shows that the correlation matrix displays that no correlations between factors are higher than 0.7, which indicates discriminant validity of the data. Then, the VIF is calculated for each technological factor and rewards for knowledge sharing (since they are measured as direct effects) to assess the degree of multicollinearity (see Appendix C.19). The largest VIF value is 1.844, which is significantly below the recommended threshold of 10 for critical multicollinearity (Gujarati, 2003, p. 362), indicating no multicollinearity issues within the data. Reliability is tested by using Cronbach's alpha (Cronbach, 1951, p. 331), which examines the consistency of the item-level errors of a single variable (Cronbach, 1951, p. 314). The statistics show that all constructs meet the requirements in terms of Cronbach's alpha (≥ 0.7), as recommended by Nunnally and Bernstein (1994, p. 265) and Homburg and Giering (1996, p. 8) (see Tables 6.10 and 6.11). According to literature, the ratio (z-value) for kurtosis should typically lie between –2.5 and 2.5 for a normal distribution (Hair et al., 1998, p. 244). Finally, the kurtosis statistics show no values below –2.5 or above 2.5, therefore the data indicates a normal distribution.

Overall, the quality of the measurement model can be described as good by the criteria of the first generation.

Factor	Label	Factor loading	Indicator reliability	Factor reliability	Cronbach's alpha	AVE
Threshold value		≥ 0.6	≥ 0.4	≥ 0.6	≥ 0.7	≥ 0.5
Effort expectancy	Ee_1	0.918	0.885	0.951	0.951	0.867
	Ee_2	0.873	0.815			
	Ee_3	0.970	0.898			
Performance expectancy	Pe_1	0.904	0.866	0.958	0.957	0.849
	Pe_2	0.956	0.864			
	Pe_3	0.943	0.851			
	Pe_4	0.820	0.816			
Facilitating conditions	Cond_1	0.680	0.553	0.855	0.849	0.663
	Cond_2	0.971	0.791			
	Cond_3	0.761	0.647			
Trust in technology	TrustT_1	0.850	0.743	0.917	0.916	0.786
	TrustT_2	0.884	0.772			
	TrustT_3	0.921	0.842			
Personal innovativeness	Innov_1	0.808	0.692	0.886	0.885	0.721
	Innov_2	0.877	0.752			
	Innov_3	0.867	0.719			
Social rewards	SocRew_1	0.622	0.489	0.843	0.832	0.645
	SocRew_2	0.954	0.823			
	SocRew_3	0.796	0.623			
Economic rewards	EcoRew_1	0.597	0.384	0.817	0.809	0.603
	EcoRew_2	0.865	0.712			
	EcoRew_3	0.837	0.712			
Attitude	Att_1	0.868	0.866	0.957	0.957	0.881
	Att_2	0.921	0.911			
	Att_3	0.853	0.865			
Intention	Int_1	0.922	0.825	0.951	0.950	0.865
	Int_2	0.880	0.880			
	Int_3	0.926	0.891			

Table 6.10. – Quality criteria of direct effects.
Source: Own table.

Factor	Label	Factor loading	Indicator reliability	Factor reliability	Cronbach's alpha	AVE
Threshold value		≥ 0.6	≥ 0.4	≥ 0.6	≥ 0.7	≥ 0.5
Interpersonal trust	Trust_1	0.716	0.478	0.722	0.714	0.468
	Trust_2	0.771	0.602			
	Trust_3	0.541	0.323			
Altruismus	Altr_1	0.781	0.609	0.808	0.804	0.515
	Altr_2	0.629	0.414			
	Altr_3	0.713	0.456			
	Altr_4	0.722	0.580			
Self-efficacy	Self_1	0.641	0.452	0.799	0.794	0.501
	Self_2	0.699	0.466			
	Self_3	0.848	0.656			
	Self_4	0.621	0.429			
Reciprocity	Rec_1r	0.614	0.396	0.816	0.805	0.600
	Rec_2r	0.807	0.666			
	Rec_3r	0.881	0.738			
Management support	Ms_1	0.699	0.545	0.832	0.829	0.554
	Ms_2	0.918	0.672			
	Ms_3	0.654	0.532			
	Ms_4	0.649	0.470			
Knowledge sharing norms	Ksn_1	0.672	0.500	0.829	0.825	0.550
	Ksn_2	0.777	0.528			
	Ksn_3	0.843	0.665			
	Ksn_4	0.608	0.506			
Identification	Ident_1	0.879	0.785	0.912	0.911	0.722
	Ident_2	0.853	0.744			
	Ident_3	0.875	0.694			
	Ident_4	0.778	0.665			
Monitoring	Moni_1	0.907	0.839	0.910	0.907	0.772
	Moni_2	0.941	0.855			
	Moni_3	0.780	0.624			

Table 6.11. – Quality criteria of moderators.
Source: Own table.

6.3.2. Second-generation quality criteria

The measurement model is assessed by second-generation quality criteria using IBM SPSS AMOS 21, and the parameter estimation is performed by using the maximum likelihood procedure. The same sample is used for both the exploratory factor analysis and the confirmatory factor analysis. In order to determine the factor structure of the dataset, the confirmatory factor analysis is run with all seventeen constructs. First, composite reliability is assessed in order to confirm the reliability of the factors. All factors show values above the threshold of 0.6, as required and recommended by Homburg and Baumgartner (1995, p. 170). Second, AVE is measured in order to assess the convergent validity (Bagozzi and Phillips, 1982, p. 468). As Tables 6.10 and 6.11 indicate, all but one AVE are well above the threshold of 0.5, as recommended by Fornell and Larcker (1981, p. 45), thus indicating convergent validity. Even though the AVE of the construct interpersonal trust shows a value that is below the threshold of 0.5, the construct is kept, since the value of 0.468 is just slightly under the threshold. Moreover, Bollen and Long (1993, p. 6) state that the given minimum values are not absolutely binding and that an overall picture of the quality measures should rather be the aim. Consequently, a model or construct should not be rejected due to a threshold that has not been met (Bollen and Long, 1993, p. 6). Therefore, the construct is kept and will be tested as an interaction moderation in Section 6.3.3.3. The Fornell-Larcker criterion is used as a measure for discriminant validity (Fornell and Larcker, 1981, p. 45). In case all square roots of the AVE are greater than the inter-construct correlations, the Fornell-Larcker criterion is met (Fornell and Larcker, 1981, p. 45). Appendix C.21 indicates that all AVE are greater than the inter-construct correlations, which implies that discriminant validity is given. The indicator reliability is assessed by the factor loadings of the indicators on the latent variable (Hulland, 1999, p. 198). According to literature, a threshold of 0.40 is recommended for the indicator reliability (Hulland, 1999, p. 198). Although the indicators EcoRew_1 (0.384) (see Table 6.10), Trust_3 (0.323) (see Table 6.11), Rec_1r (0.396) (see Table 6.11) reflect a value below the recommended threshold, they are retained due to the overall validity of each single factor. Tables 6.10 and 6.11 indicate that all other indicators reflect values above the suggested threshold, so that an appropriate level of indicator reliability is confirmed.

According to Podsakoff et al. (2003, p. 881), common method bias may represent a potential concern, since all data have been collected through an online survey. Due to the single common method, systematic response bias might be a problem that either inflates or deflates responses (Podsakoff et al., 2003, p. 879; Gaskin, 2012b). Therefore, a procedure comparable to the Harman's single-factor test is conducted, by using confirmatory factor analysis (Podsakoff et al., 2003, p. 889). Accordingly, a common latent factor is built to estimate the amount of common method variance in the indicator variables (Podsakoff et al., 2003, p. 889). Afterwards, the standardized regression weights from this model are compared with the standardized regression weights of the model without the common latent factor (Gaskin, 2012b). The differences are lower than 0.20, consequently, no substantial common method bias is represented in the sample (Podsakoff et al., 2003, p. 889; Gaskin, 2012b).

Configural and metric invariance is tested to validate that the factor structure and loadings are sufficiently equivalent across groups (MacKenzie et al., 2011, p. 325). This is of special interest, since this study explores employees' willingness to share knowledge through enterprise social software across two groups: the pre-implementation stage and the post-implementation stage. Configural invariance is confirmed, since a good model fit is achieved, when both groups are tested together (see Table 6.12). To test for metric invariance, a multigroup moderation test is conducted using critical ratios for differences. According to Byrne et al. (1989, p. 458), Steenkamp and Baumgartner (1998, p. 81) and Reise et al. (1993, p. 561), partial metric equivalence across groups is sufficient. MacKenzie et al. (2011, p. 325) offer a more specific explanation by arguing that "full metric invariance is not necessary for further tests of invariance and substantive analyses to be meaningful, provided that at least one item (other than the one fixed at unity to define the scale of each latent construct) is metrically invariant". Recently, an increasing number of researchers have followed these recommendations (e.g., Armentano et al., 2014, p. 5; Wang et al., 2014, p. 233). Accordingly, the regression weights for the factors of each implementation stage and the critical ratios for differences are computed in AMOS. From these critical ratios, p-values are calculated to examine the significance of the differences. With the help of a calculation table provided by professor James Gaskin, a table is produced which shows which indicators differ from each other (Gaskin, 2012e). To this end, it is examined whether there is at least one indicator for each factor that is not significantly different between groups. The results are summarized in Appendix C.22. Since at least one item is metrically invariant, it can be concluded that partial invariance is given.[3]

	CMIN/DF	CFI	NFI	TLI	RMSEA
Direct-effects-only model					
Dataset: all data	2.108	0.988	0.978	0.986	0.030
Dataset split into multi-groups:					
Group 1=pre-implementation stage					
Group 2=post-implementation stage	1.841	0.982	0.961	0.978	0.026

Table 6.12. – Fit statistics for the **measurement models** (confirmatory factor analysis).
Source: Own table.

[3]Configural and metric invariance is also tested between all single samples (organization A, organization B and the general online survey). All tests indicate that partial invariance is given, since at least one item is metrically invariant between organization A and organization B, organization A and the general online survey, as well as organization B and the general online survey.

In summary, the measurement model demonstrates high reliability, convergent validity, discriminant validity and partial invariance.

6.3.3. Validation of hypotheses

The direct-effects-only model consists of the direct effects of the technological factors and rewards for knowledge sharing on knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software, which are outlined in Section 6.3.3.1. In addition, the research model implicitly depicts that the seven predictors (effort expectancy, performance expectancy, facilitating conditions, trust in technology, personal innovativeness, social rewards for knowledge sharing and economic rewards for knowledge sharing) are fully mediated[4] by knowledge sharing attitude through enterprise social software. These mediation effects are discussed in Section 6.3.3.2, followed by an explorative approach to test for moderators, which is described in Section 6.3.3.3. Finally, the full model, i.e., with direct effects and moderation effects, is described and tested in Section 6.3.3.4.

6.3.3.1. Direct-effects-only model

The consistency of the measurement model has been confirmed. The next step consists of testing the conceptual model, as depicted in Figure 5.1. Therefore, the basic model is investigated first; hence, the direct effects (technological factors and rewards for knowledge sharing factors) on knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software are measured. For the structural model, the observed normed χ^2/df is 2.108 (χ^2 = 661.82; df = 314) (see Table 6.13). The CFI is 0.988, TLI is 0.986, and RMSEA is 0.030. The results show an excellent degree of overall model fit and support the overall validity of the structural model.[5]

	CMIN/DF	CFI	NFI	TLI	RMSEA
Direct-effects-only model					
Dataset: all data	2.108	0.988	0.978	0.986	0.030
Dataset split into multi-groups:					
Group 1=pre-implementation stage					
Group 2=post-implementation stage	1.841	0.982	0.961	0.978	0.026

Table 6.13. – Fit statistics for the **structural models**.
Source: Own table.

[4] Although this thesis does not specifically theorize about full or partial mediation.

[5] The fit statistics for the measurement model and the structural model indicate the same results. This can be explained by the fact that, for the structural model, only the relationships towards the variables "attitude" and "intention" have been changed.

In a next step, the data set is split into two groups: the pre-implementation stage and the post-implementation stage. The two samples (pre-implementation stage and post-implementation stage) are estimated as separate groups, albeit simultaneously. This procedure is recommended by Arbuckle (2005, p. 159), who states that less accurate parameter estimates are provided, when two separate single-group analyses are conducted. When both groups are tested together, the observed normed χ^2/df is 1.841 ($\chi^2 = 1156.03$; df = 628). The CFI is 0.982, TLI is 0.978, and RMSEA is 0.026.

Finally, this model is tested against two alternative models. In the **alternative model 1**, all structural paths and measurement weights are constrained to equal each other across the pre-implementation stage and post-implementation stage. This alternative model tests the null hypothesis that the two samples do not differ significantly from each other and therefore should be combined (Marler et al., 2009, p. 344). The constrained model is nested within the hypothesized unconstrained full model, so that a chi-square difference test is used to compare the models with each other (Homburg, 2000, p. 84 Marler et al., 2009, p. 344). For the alternative model 1, the observed normed χ^2/df is 1.894 ($\chi^2 = 1253.90$; df = 662). The CFI is 0.980, TLI is 0.977, and RMSEA is 0.027. Table 6.14 indicates that the alternative model 1 has a chi-square that is significantly greater than the hypothesized model ($\triangle\ \chi^2 = 97.70$, $p < .05$). This constrained model (null model) has a significantly poorer fit; consequently, the null hypothesis, that the parameter estimates for the pre-implementation stage and the post-implementation stage are not significantly different, is rejected. These results provide support for the hypothesized theoretical model in which structural relationships vary significantly between the pre-implementation stage and the post-implementation stage.

	χ^2	**df**	$\triangle\chi^2$	$\triangle$ **df**	**CFI**	**NFI**	**TLI**	**RMSEA**
Direct-effects-only model								
Dataset split into multi-groups:								
Group 1=pre-implementation stage								
Group 2=post-implementation stage	1156.03	628			0.982	0.961	0.978	0.026
Alternative model 1 (constrained)								
Dataset split into multi-groups:								
Group 1=pre-implementation stage								
Group 2=post-implementation stage	1253.90	662	97.70	34	0.980	0.958	0.977	0.027
Alternative model 2								
(EE$\Rightarrow$ PE, EE $\not\Rightarrow$ INT)								
Dataset split into multi-groups:								
Group 1=pre-implementation stage								
Group 2=post-implementation stage	1332.17	640	176.14	12	0.976	0.955	0.972	0.029

Table 6.14. – Fit statistics for the direct-effects-only model and the alternative models. Source: Own table.

The **alternative model 2** tests the relationship between effort expectancy and performance expectancy, as recommended by the technology acceptance model. In addition, the path between effort expectancy and knowledge sharing intention through enterprise social software has been deleted, which is also in line with the technology acceptance model. As Table 6.14 indicates, the alternative model 2 has a significantly poorer fit, which again shows that the alternative null model can be rejected ($\triangle\ \chi^2 = 176.14$, $p < .05$).

6.3.3.2. Mediation

Although this thesis focuses on the overall model test and does not specifically theorize about full or partial mediation, the model implicitly depicts that the seven predictors are fully mediated by knowledge sharing attitude through enterprise social software. To test for mediations, the *indirect effects* of “effort expectancy”, “performance expectancy”, “facilitating conditions”, “trust in technology”, “personal innovativeness”, “social rewards for knowledge sharing” and “economic rewards for knowledge sharing” on knowledge sharing intention through enterprise social software are measured for the pre-implementation stage and the post-implementation stage, as outlined in Section 6.1.6.1. Accordingly, the *direct* and *indirect effects* are tested and the significance of the *total effect* is measured, using the bootstrap approach (Preacher and Hayes, 2004, p. 717; Preacher and Hayes, 2008b, p. 13).

First, the mediation test for the pre-implementation model is outlined (see Section 6.3.3.2.1). Subsequently, the mediation test for the post-implementation model is explained (see Section 6.3.3.2.2).

6.3.3.2.1. Pre-implementation stage

Table 6.15 indicates that no mediation effects are found for “effort expectancy”, “social rewards for knowledge sharing” and “economic rewards for knowledge sharing”.

The *indirect effects* of “facilitating conditions” and “personal innovativeness” on knowledge sharing intention through enterprise social software are significant. Together with the non-significant *direct effect*s of “facilitating conditions” and “personal innovativeness” on knowledge sharing intention through enterprise social software, this result establishes knowledge sharing attitude through enterprise social software as a **perfect mediator**. Accordingly, knowledge sharing attitude through enterprise social software positively and fully mediates the positive relationship between “facilitating conditions” on knowledge sharing intention through enterprise social software and between “personal innovativeness” and knowledge sharing intention through enterprise social software.

The *indirect effects* of “performance expectancy” and “trust in technology” on knowledge sharing intention through enterprise social software are significant. Together with the significant *direct effects* of “performance expectancy” and “trust in technology” on knowledge sharing intention through enterprise social software, this result establishes knowledge sharing attitude through enterprise social software as a **partial mediator**. Accordingly, knowledge sharing attitude through enterprise social software positively and partially mediates the positive relationship between "performance expectancy" on knowledge sharing intention through enterprise social software and between "trust in technology" and knowledge sharing intention through enterprise social software.

Relationship	Direct effects without mediator	Indirect effects with mediator	Indirect effects
EE ATT INT	EE INT (0.052, n.s.)	EE INT (0.023, n.s.)	n.s. (no mediation)
PE ATT INT	PE INT (0.463, ***)	PE INT (0.193, ***)	s. (partial mediation)
COND ATT INT	COND INT (0.070, 0.028*)	COND INT (0.004, n.s.)	s. (full mediation)
TRUSTT ATT INT	TRUSTT INT (0.177, ***)	TRUSTT INT (0.129, ***)	s. (partial mediation)
INNOV ATT INT	INNOV INT (0.082, 0.010**)	INNOV INT (0.052, n.s.)	s. (full mediation)
SOC ATT INT	SOC INT (0.055, n.s.)	SOC INT (0.029, n.s.)	n.s. (no mediation)
ECO ATT INT	ECO INT (0.033, n.s.)	ECO INT (0.026, n.s.)	n.s. (no mediation)

Table 6.15. – Mediator analysis at the pre-implementation stage.
Source: Own table.

6.3.3.2.2. Post-implementation stage

Table 6.16 indicates that no mediation effects are found for "effort expectancy", "facilitating conditions", "personal innovativeness" and "economic rewards for knowledge sharing".

The *indirect effects* of "trust in technology" and "social rewards for knowledge sharing" on knowledge sharing intention through enterprise social software are significant. Together with the non-significant *direct effects* of "trust in technology" and "social rewards for knowledge sharing" on knowledge sharing intention through enterprise social software, this result establishes knowledge sharing attitude through enterprise social software as a **perfect mediator**. Accordingly, knowledge sharing attitude through enterprise social software positively and fully mediates the relationship between "trust in technology" on knowledge sharing intention through enterprise social software and between "social rewards for knowledge sharing" and knowledge sharing intention through enterprise social software.

The *indirect effect* of "performance expectancy" on knowledge sharing intention through enterprise social software is significant. Together with the significant *direct effect* of "performance expectancy" on knowledge sharing intention through enterprise social software, this result establishes knowledge sharing attitude through enterprise social software as a **partial mediator**. Accordingly, knowledge sharing attitude through enterprise social software positively and partially mediates the positive relationship between "performance expectancy" on knowledge sharing intention through enterprise social software.

Relationship	Direct effects without mediator	Indirect effects with mediator	Indirect effects
EE ATT INT	EE INT (-0.112, 0.034*)	EE INT (-0.134, 0.005**)	n.s. (no mediation)
PE ATT INT	PE INT (0.518, ***)	PE INT (0.261, ***)	s. (partial mediation)
COND ATT INT	COND INT (0.107, 0.015*)	COND INT (0.101, 0.011*)	n.s. (no mediation)
TRUSTT ATT INT	TRUSTT INT (0.200, ***)	TRUSTT INT (0.089, n.s.)	s. (full mediation)
INNOV ATT INT	INNOV INT (0.195, ***)	INNOV INT (0.194, ***)	n.s. (no mediation)
SOC ATT INT	SOC INT (0.080, 0.049*)	SOC INT (0.015, n.s.)	s. (full mediation)
ECO ATT INT	ECO INT (0.011, n.s.)	ECO INT (0.036, n.s.)	n.s. (no mediation)

Table 6.16. – Mediator analysis at the post-implementation stage.
Source: Own table.

6.3.3.3. Exploratory approach of moderation effects

To test for moderators regarding personal, organizational and demographic factors, an explorative approach is followed. Therefore, each personal, organizational and demographic factor is considered in combination with each technological factor on knowledge sharing *attitude* through enterprise social software and knowledge sharing *intention* through enterprise social software in order to examine whether a moderating effect is likely or not. However, only those moderators have been further analyzed,

	Technological factors									
	EE (a)		PE (b)		COND (c)		TRUSTT (d)		INNOV (e)	
Personal factors										
Interaction moderators										
TRUST (a)	H9aa	x	H9ab	x	H9ac	x	H9ad	x	H9ae	x
SELFE (b)	H9ba	x	H9bb	x	H9bc	✓	H9bd	x	H9be	x
ALT (c)	H9ca	x	H9cb	x	H9cc	x	H9cd	x	H9ce	x
RECI (d)	H9da	x	H9db	x	H9dc	x	H9dd	x	H9de	x
Organizational factors										
Interaction moderators										
MS (e)	H9ea	x	H9eb	✓	H9ec	x	H9ed	x	H9ee	x
KSN (f)	H9fa	x	H9fb	x	H9fc	x	H9fd	x	H9fe	x
IDENT (g)	H9ga	x	H9gb	x	H9gc	x	H9gd	x	H9ge	x
MONI (h)	H9ha	x	H9hb	x	H9hc	x	H9hd	x	H9he	x
Demographics										
Multi-group analysis										
GENDER (i)	H9ia	x	H9ib	x	H9ic	x	H9id	x	H9ie	x
EXP (j)	H9ja	x	H9jb	x	H9jc	x	H9jd	x	H9je	x
AGE (k)	H9ka	x	H9kb	✓	H9kc	x	H9kd	x	H9ke	x

Table 6.17. – Identification of moderators on knowledge sharing **attitude** through enterprise social software.
Source: Own table.

which show significant effects, when considered simultaneously in the model (Arbuckle, 2005, p. 159). According to Arbuckle (2005, p. 159), testing individual moderation effects in isolation will not allow for assessing their meaning in the presence of other direct and moderating effects. Therefore, all direct and interaction effects are computed simultaneously, so that their effect can be seen in the context of the total model. Moreover, only those moderators are further considered, which are significant in at least one stage, since this research is interested in exploring whether employees' willingness of knowledge sharing through enterprise social software at a pre-implementation stage differs from the post-implementation stage (see Research Question 4 in Section 1.3).

From a conceptual perspective, interaction terms should be built, when the moderators are metric or quasi-metric (continuous variables) (Irwin and McClelland, 2001, p. 105), whereas, when the moderators are discrete, nominal (categorical variables) multi-group analysis is recommended (Chin, 2000, p. 1). Hence, personal factors and organizational factors are tested by interaction moderation analysis, whereas demographic factors are analyzed by using multi-group moderation analysis. As Tables 6.17 and 6.18 indicate, three interaction variables and six multi-group moderations have been revealed.

	Technological factors				
	EE (a)	PE (b)	COND (c)	TRUSTT (d)	INNOV (e)
Personal factors					
Interaction moderators					
TRUST (a)	H10aa **x**	H10ab **x**	H10ac **x**	H10ad **x**	H10ae **x**
SELFE (b)	H10ba **x**	H10bb **x**	H10bc **x**	H10bd **x**	H10be **x**
ALT (c)	H10ca **x**	H10cb **x**	H10cc **x**	H10cd **x**	H10ce **x**
RECI (d)	H10da **x**	H10db **x**	H10dc **x**	H10dd **x**	H10de **x**
Organizational factors					
Interaction moderators					
MS (e)	H10ea **x**	H10eb **x**	H10ec **x**	H10ed **x**	H10ee **x**
KSN (f)	H10fa **x**	H10fb **x**	H10fc ✓	H10fd **x**	H10fe **x**
IDENT (g)	H10ga **x**	H10gb **x**	H10gc **x**	H10gd **x**	H10ge **x**
MONI (h)	H10ha **x**	H10hb **x**	H10hc **x**	H10hd **x**	H10he **x**
Demographics					
Multi-group analysis					
GENDER (i)	H10ia **x**	H10ib **x**	H10ic **x**	H10id **x**	H10ie **x**
EXP (j)	H10ja ✓	H10jb ✓	H10jc **x**	H10jd **x**	H10je **x**
AGE (k)	H10ka **x**	H10kb ✓	H10kc ✓	H10kd ✓	H10ke **x**

Table 6.18. – Identification of moderators on knowledge sharing **intention** through enterprise social software.
Source: Own table.

The associated hypotheses for the interaction effects are briefly summarized in Table 6.19.

Interaction effects	
H9bc	Self-efficacy positively moderates the positive relationship between facilitating conditions and knowledge sharing attitude through enterprise social software.
H9eb	Management support positively moderates the positive relationship between performance expectancy and knowledge sharing attitude through enterprise social software.
H10fc	Knowledge sharing norms positively moderate the positive relationship between facilitating conditions and knowledge sharing intention through enterprise social software.
Multi-group effects	
H9kb	Age moderates the relationship between performance expectancy and knowledge sharing attitude through enterprise social software, such that for age $\geq$41, the positive effect is stronger than for age $\leq$40.
H10ja	Experience moderates the relationship between effort expectancy and knowledge sharing intention through enterprise social software, such that for those with little experience, the positive effect is stronger than for those with considerable experience.
H10jb	Experience moderates the relationship between performance expectancy and knowledge sharing intention through enterprise social software, such that for those with little experience, the positive effect is stronger than for those with considerable experience.
H10kb	Age moderates the relationship between performance expectancy and knowledge sharing intention through enterprise social software, such that for age $\leq$40, the positive effect is stronger than for age $\geq$41.
H10kc	Age moderates the relationship between between facilitating conditions and knowledge sharing intention through enterprise social software, such that for age $\geq$41, the positive effect is stronger than for age $\leq$40.
H10kd	Age moderates the relationship between trust in technology and knowledge sharing intention through enterprise social software, such that for age $\geq$41, the positive effect is stronger than for age $\leq$40.

Table 6.19. – Moderation hypotheses supported by the exploratory approach.
Source: Own table.

In the following, the identified interaction moderations are described (see Section 6.3.3.3.1), before the findings concerning the multi-group moderations are outlined (see Section 6.3.3.3.2).

6.3.3.3.1. Interaction moderations

Interaction moderations have only been found at the post-implementation stage. Through the exploratory approach, **management support** has been identified as an interaction term. Table 6.20 exhibits that the R^2 increases from 0.556 to 0.569 when the interaction term "Management support * Performance expectancy" is employed in the model. In addition, Figure 6.7 indicates that "management support" positively moderates the positive relationship between "performance expectancy" and "knowledge sharing attitude through enterprise social software".

R^2-change of attitude		
R^2 without moderator	**R^2 with moderator**	**R^2 with moderator and interaction**
0.556	0.557	0.569

Interaction moderator: Management support * Performance expectancy
Independent variable: Performance expectancy
Moderator: Management support
Dependent variable: Attitude

Table 6.20. – Interaction effect at the **post-implementation stage**: Management support * Performance expectancy.
Source: Own table.

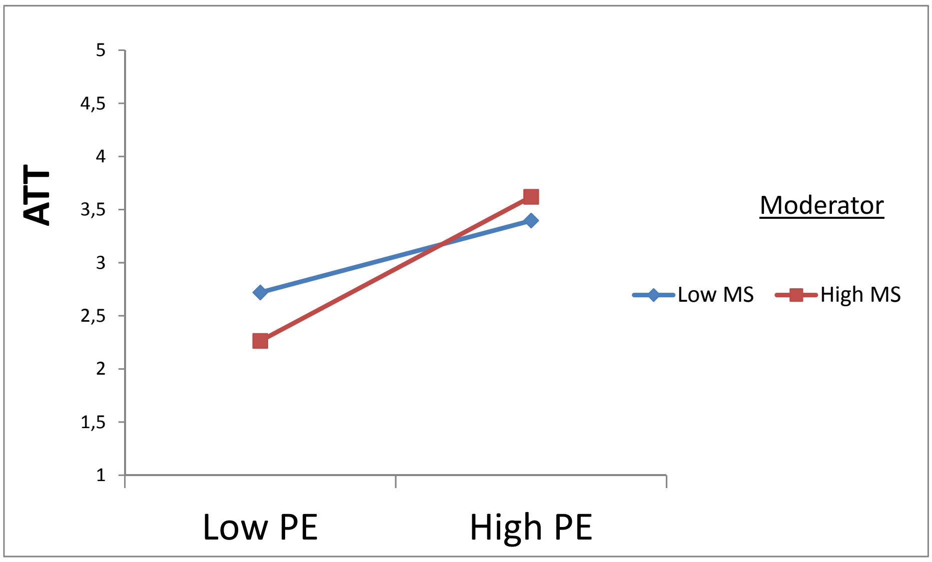

Figure 6.7. – Interaction effect of management support (MS) on the relationship between performance expectancy (PE) and attitude (ATT) at the post-implementation stage.
Source: Own figure based on Gaskin (2012a).

Due to the explorative approach, **self-efficacy** has been revealed as a second interaction term. Table 6.21 indicates that the R^2 increases from 0.556 to 0.574 according to the interaction term "Self-efficacy * Facilitating conditions". In addition, Figure 6.8 shows that "self-efficacy" positively moderates the positive relationship between "facilitating conditions" and "knowledge sharing attitude through enterprise social software".

R^2-change of attitude		
R^2 without moderator	**R^2 with moderator**	**R^2 with moderator and interaction**
0.556	0.557	0.574
Interaction moderator: Self-efficacy * Facilitating conditions *Independent variable:* Facilitating conditions *Moderator:* Self-efficacy *Dependent variable:* Attitude		

Table 6.21. – Interaction effect at the **post-implementation stage**: Self-efficacy * Facilitating conditions.
Source: Own table.

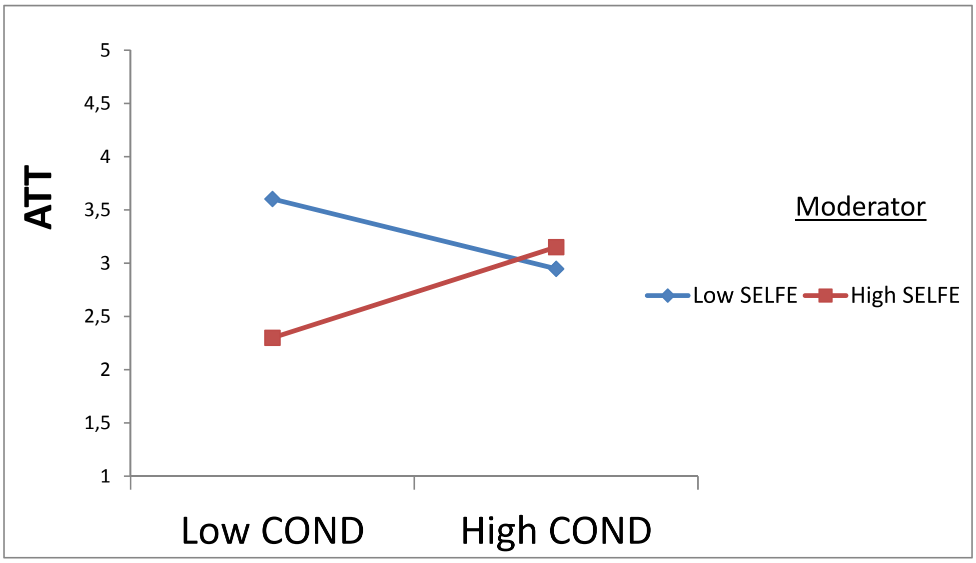

Figure 6.8. – Interaction effect of self-efficacy (SELFE) on the relationship between facilitating conditions (COND) and attitude (ATT) at the post-implementation stage.
Source: Own figure based on Gaskin (2012a).

Finally, the factor **knowledge sharing norms** has been revealed as a third interaction term through the exploratory approach. With regard to Table 6.22, the R^2 increases from 0.596 to 0.611 according to the interaction term "Knowledge sharing norms * Facilitating conditions". Furthermore, Figure 6.9 indicates that "knowledge sharing norms" positively moderate the positive relationship between "facilitating conditions" and "knowledge sharing intention through enterprise social software".

R^2-change of intention		
R^2 without moderator	**R^2 with moderator**	**R^2 with moderator and interaction**
0.596	0.599	0.611

Interaction moderator: Knowledge sharing norms * Facilitating conditions
Independent variable: Facilitating conditions
Moderator: Knowledge sharing norms
Dependent variable: Intention

Table 6.22. – Interaction effect at the **post-implementation stage**: Knowledge sharing norms * Facilitating conditions.
Source: Own table.

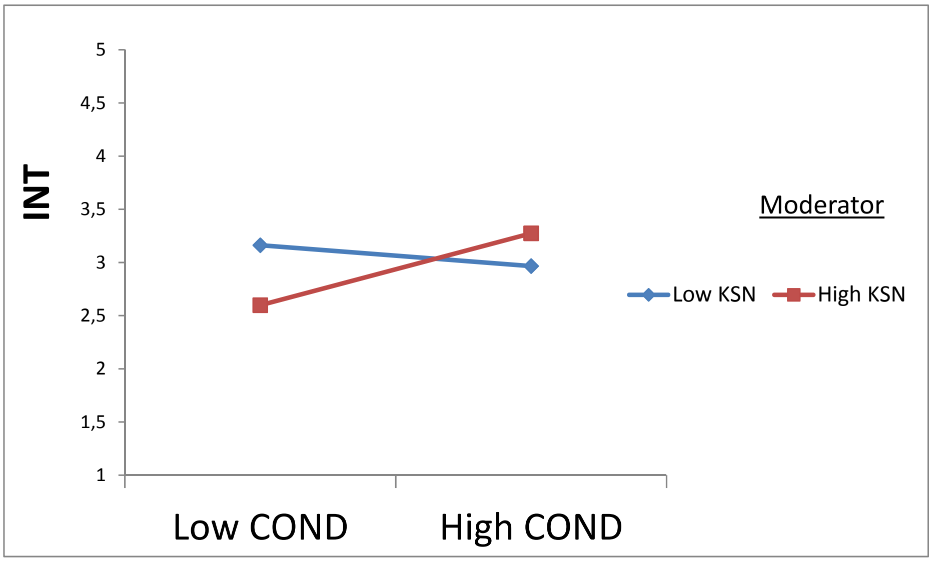

Figure 6.9. – Interaction effect of knowledge sharing norms (KSN) on the relationship between facilitating conditions (COND) and intention (INT) at the post-implementation stage.
Source: Own figure based on Gaskin (2012a).

6.3.3.3.2. Multi-group moderations

Multi-group moderations have been found at the pre-implementation stage and at the post-implementation stage. If the variable is continuous, a median-split is conducted, which results in two groups: one group with a high parameter value and one group with a low parameter value (see Table 6.23) (Jaccard et al., 1990, p. 49). Hence, the group with low experiences refers to employees, who have so far only gained little or no experience with social software in their private environment, whereas high experiences refer to employees, who often use public social software, such as wikis or social networks (see Table 6.9 for a description of the use intensity of different public social software tools).[6] A median-split is also conducted for age, resulting in two age groups: employees aged ≤40 and employees aged ≥41. Moreover, the dichotomous moderator variable gender is splitted into two groups: "males" and "females".

	Age		**Experience**		**Gender**	
	≤40	≥41	low	high	males	females
All data	764	504	615	653	924	344
Pre-implementation stage	499	329	436	392	607	221
Post-implementation stage	265	175	179	261	317	123

Table 6.23. – Description of groups for multi-group analysis.

Recently, an increasing number of researchers have used the critical ratios for differences in regression weights in order to detect multi-group moderators (e.g., Armentano et al., 2014, p. 5; Wang et al., 2014, p. 233). From these critical ratios, p-values are calculated to examine the significance of the differences. According to this technique, z-scores are produced for all regression paths in the model across groups, which indicate whether the paths significantly differ from each other. In the following, this technique is used in order to identify multi-group moderations at the pre-implementation stage and at the post-implementation stage.

Pre-implementation stage Table 6.24 indicates that **"age"** moderates the relationship between "performance expectancy" and "knowledge sharing attitude through enterprise social software" at the pre-implementation stage, such that for age ≥41, the (significant) positive effect is stronger than for age ≤40 (positive and significant).

[6] As shown in Table 6.9, the answers in the questionnaires indicate that public blogs are used less, compared to public wikis and public social networks. Accordingly, the median for the data sets (one data set for the experiences made with blogs, the experiences made with wikis and for the experiences made with social networks, respectively) is different for blogs (median=3) than for wikis and social networks (median=2). Therefore, only the data sets for experiences with wikis and social networks are combined and serve as a basis for employees' experiences made with public social software. The median split has been conducted for this combined data set (wikis and social networks).

			Age ≤40		Age ≥41		
			Estimate	**P**	**Estimate**	**P**	**z-score**
attitude	<—	**PE**	0.473	0.000	**0.626**	0.000	**2.329****
attitude	<—	COND	0.180	0.000	0.135	0.013	-0.646
attitude	<—	INNOV	0.096	0.004	0.007	0.879	-1.604
attitude	<—	TRUSTT	0.096	0.006	0.069	0.085	-0.510
attitude	<—	EE	0.076	0.093	0.048	0.385	-0.391
intention	<—	**PE**	**0.256**	0.000	0.083	0.231	**-2.075****
intention	<—	COND	0.018	0.682	-0.006	0.918	-0.326
intention	<—	**TRUSTT**	0.067	0.043	**0.170**	0.000	**1.838***
intention	<—	EE	0.040	0.346	-0.014	0.825	-0.715
intention	<—	INNOV	0.020	0.510	0.110	0.026	1.569

Legend: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Table 6.24. – Multi-group analysis for age at the pre-implementation stage (only part of the table is displayed since this thesis is interested in which factors moderate the relationship between the technological factors and attitude/intention).
Source: Own table.

Moreover, **"age"** moderates the relationship between "performance expectancy" and "knowledge sharing intention through enterprise social software", such that for age ≤40, the (significant) positive effect is stronger than for age ≥41 (positive and non-significant).

In addition, **"age"** moderates the relationship between "trust in technology" and "knowledge sharing intention through enterprise social software", such that for age ≥41, the (significant) positive effect is stronger than for age ≤40 (positive and significant).

Post-implementation stage Table 6.25 indicates that **"age"** moderates the relationship between between "facilitating conditions" and "knowledge sharing intention through enterprise social software" at the post-implementation stage, such that for age ≥41, the (significant) positive effect is stronger than for age ≤40 (positive and non-significant).

Moreover, **"experience"** moderates the relationship between "performance expectancy" and "knowledge sharing intention through enterprise social software", such that for those with little experience, the (significant) positive effect is stronger than for those with considerable experience (significant and positive) (see Table 6.26).

In addition, **"experience"** moderates the relationship between "effort expectancy" and "knowledge sharing intention through enterprise social software", such that for those with little experience, the (significant) negative effect[7] is stronger than for those with considerable experience (negative and non-significant).

[7] The effect is negative due to a suppressor effect which is explained in Section 7.1.1.

			Age ≤40		Age ≥41		
			Estimate	**P**	**Estimate**	**P**	**z-score**
attitude	<—	PE	0.467	0.000	0,643	0.000	1.041
attitude	<—	COND	0.015	0.796	0,098	0.273	0.785
attitude	<—	INNOV	-0.032	0.472	0,113	0.187	1.502
attitude	<—	TRUSTT	0.210	0.000	0,247	0.013	0.318
attitude	<—	EE	0.066	0.254	-0.074	0.523	-1.083
intention	<—	PE	0.258	0,000	0.266	0.003	0.073
intention	<—	**COND**	0.050	0.374	**0.293**	0.000	**2.366****
intention	<—	TRUSTT	0.081	0,243	0.179	0.032	0.896
intention	<—	EE	-0.165	0,014	-0.179	0.061	-0.122
intention	<—	INNOV	0.192	0,000	0.180	0.004	-0.157

Legend: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Table 6.25. – Multi-group analysis for age at the post-implementation stage (only part of the table is displayed since this thesis is interested in which factors moderate the relationship between the technological factors and attitude/intention).
Source: Own table.

			Little experience		Considerable experience		
			Estimate	**P**	**Estimate**	**P**	**z-score**
attitude	<—	PE	0.597	0.000	0.452	0.000	-1.303
attitude	<—	COND	0.105	0.298	0.020	0.701	-0.744
attitude	<—	INNOV	0.025	0.748	-0.018	0.704	-0.475
attitude	<—	TRUSTT	0.177	0.079	0.258	0.000	0.662
attitude	<—	EE	-0.016	0.865	0.050	0.414	0.596
intention	<—	**PE**	**0.447**	0.000	0.175	0.011	**-2.324****
intention	<—	COND	0.193	0.012	0.079	0.170	-1.194
intention	<—	TRUSTT	0.165	0.068	0.041	0.565	-1.075
intention	<—	**EE**	**-0.263**	0.000	-0.085	0.201	**1.725***
intention	<—	INNOV	0.182	0.007	0.199	0.000	0.199

Legend: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Table 6.26. – Multi-group analysis for experience at the post-implementation stage (only part of the table is displayed since this thesis is interested in which factors moderate the relationship between the technological factors and attitude/intention).
Source: Own table.

6.3.3.4. Full model with moderators

In the following, the full model, i.e., with direct effects and moderation effects, is outlined. First, the results of the hypothesis tests are described (see Section 6.3.3.4.1). Afterwards, the strength of standardized path coefficients for each implementation stage is outlined (see Section 6.3.3.4.2). Next, a multi-group analysis for the pre-implementation stage and the post-implementation stage is conducted (see Section 6.3.3.4.3). Then, control variables are discussed (see Section 6.3.3.4.4). Finally, the relationship between knowledge sharing intention through enterprise social software and knowledge sharing behavior through enterprise social software is tested by using the data set of the post-implementation stage (see Section 6.3.3.4.5).

6.3.3.4.1. Hypothesis tests

Hypotheses **1a** and **1b** predict that effort expectancy will be positively related to *attitude* and *intention*. The standardized estimated direct effect of effort expectancy on knowledge sharing *attitude* through enterprise social software is positive, yet not significant at both the *pre-implementation stage* and the *post-implementation stage*. Thus, hypothesis 1a is not supported. The standardized estimated direct effect of effort expectancy on knowledge sharing *intention* through enterprise social software is positive, however not significant at the *pre-implementation stage*, while it is significant, but negative at the *post-implementation stage*. Since the negative path coefficient contradicts well-respected theories (e.g., unified theory of acceptance and use of technology), a negative suppressor effect is assumed. Darlington (1968, p. 163) describes a negative suppressor as a variable that has a positive correlation with the dependent variable, but negative beta weights in a regression equation. Sharpe and Roberts (1997, p. 48) support the argumentation of Darlington (1968) by saying that cases of suppression can be identified directly from the correlation matrix, which Ludlow and Klein (2014, p. 5) regard as an advantage, since the "necessary and sufficient condition is based directly on correlation coefficients". Since effort expectancy has a positive correlation with the dependent variable (intention) (0.388) (see Appendix C.20), but negative beta weights in a regression equation (-0.146) (see Figure 6.11), effort expectancy for knowledge sharing is revealed as a negative suppressor (Darlington, 1968, p. 163). Accordingly, the path coefficient is interpreted as if it were positive. So these results provide partial support for hypothesis 1b.

Hypotheses **2a** and **2b** examine the effects of performance expectancy on *attitude* and *intention*. Performance expectancy is significantly and positively related to knowledge sharing *attitude* through enterprise social software and knowledge sharing *intention* through enterprise social software at the *pre-implementation stage* and at the *post-implementation stage*, thus supporting hypotheses 2a and 2b.

Hypotheses **3a** and **3b** predict that facilitating conditions will be positively related to *attitude* and *intention*. Facilitating conditions and knowledge sharing *attitude* through enterprise social software are positively related at the *pre-implementation* *stage* and at the *post-implementation stage*, but the relationship is only significant at the *pre-implementation stage*. Thus, hypothesis 3a is partially supported. The standardized estimated direct effect of facilitating conditions on knowledge sharing *intention* through enterprise social software is positive, although the relationship is only significant at the *post-implementation stage*. Thus, hypothesis 3b is partially supported.

Hypotheses **4a** and **4b** assume that trust in technology will be positively related to *attitude* and *intention*. The standardized estimated direct effect of trust in technology on knowledge sharing *attitude* through enterprise social software is positive and significant at both the *pre-implementation* as well as the *post-implementation stage*. Thus, hypothesis 4a is supported. Trust in technology and knowledge sharing *intention* through enterprise social software are positively related at the *pre-implementation stage* and at the *post-implementation stage* but the relationship is only significant at the *pre-implementation stage*. Hence, hypothesis 4b is partially supported.

Hypotheses **5a** and **5b** examine the effect of personal innovativeness on *attitude* and *intention*. Personal innovativeness and knowledge sharing *attitude* through enterprise social software are positively related at the *pre-implementation stage* and at the *post-implementation stage*, but the relationship is only significant at the *pre-implementation stage*. Thus, hypothesis 5a is partially supported. The standardized estimated direct effect of personal innovativeness on knowledge sharing *intention* through enterprise social software is positive, although the relationship is only significant at the *post-implementation stage*. Thus, hypothesis 5b is partially supported.

Hypotheses **6a** and **6b** predict that social rewards for knowledge sharing will be positively related to *attitude* and *intention*. The standardized estimated direct effect of social rewards for knowledge sharing on knowledge sharing *attitude* through enterprise social software is positive and significant at both stages. Thus, hypothesis 6a is supported. The standardized estimated direct effect of social rewards for knowledge sharing on knowledge sharing *intention* through enterprise social software is negative at the *pre-implementation stage* due to a suppressor effect[8] and positive at the *pre-implementation stage*, but non-significant in both the *pre-implementation stage* and the *post-implementation stage*. Thus, hypothesis 6b is not supported.

Hypotheses **7a** and **7b** examine the positive effect of economic rewards for knowledge sharing on *attitude* and *intention*. The standardized estimated direct effect of economic rewards for knowledge sharing on knowledge sharing *attitude* through enterprise social software is positive at the *pre-implementation stage* and negative at

[8]Since social rewards for knowledge sharing have a positive correlation with the dependent variable (intention) (0.220) (see Appendix C.20), but negative beta weights in a regression equation (-0.014) (see Figure 6.10), social rewards for knowledge sharing are revealed as a negative suppressor (Darlington, 1968, p. 163).

the *post-implementation stage* due to a suppressor effect[9], yet non-significant in both the *pre-implementation stage* and the *post-implementation stage*. Thus, hypothesis 7a is not supported. The standardized estimated direct effect of economic rewards for knowledge sharing on knowledge sharing *intention* through enterprise social software is positive and not significant at both the pre-implementation stage and the post-implementation stage. Thus, hypothesis 7b is not supported.

Hypothesis **8** examines the positive relationship between knowledge sharing *attitude* through enterprise social software and knowledge sharing *intention* through enterprise social software at the *pre-implementation stage* and at the *post-implementation stage*. The standardized estimated direct effect of knowledge sharing *attitude* through enterprise social software on knowledge sharing *intention* through enterprise social software is positive at both stages. Thus, hypothesis 8 is supported.

In order to test the moderator effects **9aa** to **9ke** and **10aa** to **10ke**, an explorative approach was followed in Section 6.3.3.3. Since this research is interested in examining whether employees' willingness of knowledge sharing through enterprise social software at the pre-implementation stage differs from the post-implementation stage (see Research Question 4 in Section 1.3), only those moderators have been further considered, which have been significant in at least one stage. Personal factors and organizational factors have been tested by interaction moderation analysis, whereas demographics have been analyzed by using multi-group moderation analysis. In addition, all direct and interaction terms have been employed simultaneously. Hence, three interaction variables **(H9bc, H9eb, H10fc)** and six multi-group moderations **(H9kb, H10ja, H10jb, H10kb, H10kc, H10kd)** have been revealed.

Hypothesis **H9bc** examines the effect of self-efficacy and facilitating conditions on knowledge sharing *attitude* through enterprise social software. The hypothesis predicts that self-efficacy will strengthen the positive relationship between facilitating conditions and knowledge sharing *attitude* through enterprise social software. This hypothesis is partially supported. There is a significant moderating influence at the *post-implementation stage*, but the effect is not significant at the *pre-implementation stage*.

Hypothesis **H9eb** explores the effect of management support and performance expectancy on knowledge sharing *attitude* through enterprise social software. The hypothesis predicts that management support will strengthen the positive relationship between performance expectancy and knowledge sharing *attitude* through enterprise social software. This hypothesis is partially supported. There is a significant moderating influence at the *post-implementation stage*, but the effect is not significant at the *pre-implementation stage*.

Hypothesis **H10fc** examines the effect of knowledge sharing norms and facilitating

[9]Since economic rewards for knowledge sharing have a positive correlation with the dependent variable (attitude) (0.096) (see Appendix C.20), but negative beta weights in a regression equation (-0.051) (see Figure 6.11), economic rewards for knowledge sharing are revealed as a negative suppressor (Darlington, 1968, p. 163).

conditions on knowledge sharing *intention* through enterprise social software. The hypothesis predicts that knowledge sharing norms will strengthen the positive relationship between facilitating conditions and knowledge sharing *intention* through enterprise social software. This hypothesis is partially supported. There is a significant moderating influence at the *post-implementation stage*, but the effect is not significant at the *pre-implementation stage*.

Hypothesis **H9kb** investigates the effect of age and performance expectancy on knowledge sharing *attitude* through enterprise social software. The hypothesis predicts that age moderates the relationship between performance expectancy on knowledge sharing *attitude* through enterprise social software, such that for age ≥41, the positive effect is stronger than for age ≤40. This hypothesis is partially supported. There is a significant moderating influence at the *pre-implementation stage*, but the effect is not significant at the *post-implementation stage*.

Hypothesis **H10ja** assumes the effect of experience and effort expectancy on knowledge sharing *intention* through enterprise social software. The hypothesis assumes that experience moderates the relationship between effort expectancy and knowledge sharing *intention* through enterprise social software, such that for those with little experience, the positive effect is stronger than for those with considerable experience. The result shows that, for those with little experience, the negative effect is stronger than for those with considerable experience. The negative effect results from a suppressor effect (see first lines of this section for an explanation of effort expectancy as a negative suppressor variable) and must therefore be interpreted as positive. This hypothesis is partially supported. There is a significant moderating influence at the *post-implementation stage*, but the effect is not significant at the *pre-implementation stage*.

Hypothesis **H10jb** explores the effect of experience and performance expectancy on knowledge sharing *intention* through enterprise social software. The hypothesis assumes that experience moderates the relationship between performance expectancy and knowledge sharing *intention* through enterprise social software, such that for those with little experience, the positive effect is stronger than for those with considerable experience. This hypothesis is partially supported, because there is a significant moderating influence at the *post-implementation stage*, but the effect is not significant at the *pre-implementation stage*.

Hypothesis **H10kb** investigates the effect of age and performance expectancy on knowledge sharing *intention* through enterprise social software. The hypothesis predicts that age moderates the relationship between performance expectancy and knowledge sharing *intention* through enterprise social software, such that for age ≤40, the positive effect is stronger than for age ≥41. This hypothesis is partially supported: there is a significant moderating influence at the *pre-implementation stag*e, but the effect is not significant at the *post-implementation stage*.

Hypothesis **H10kc** examines the effect of age and facilitating conditions on knowledge sharing *intention* through enterprise social software. The hypothesis assumes that age moderates the relationship between facilitating conditions and knowledge sharing *intention* through enterprise social software, such that for age ≥41, the positive effect is stronger than for age ≤40. This hypothesis is partially supported, since there is a significant moderating influence at the *post-implementation stage*, but the effect is not significant at the *pre-implementation stage*.

Hypothesis **H10kd** examines the effect of age and trust in technology on knowledge sharing *intention* through enterprise social software. The hypothesis predicts that age moderates the relationship between trust in technology and knowledge sharing *intention* through enterprise social software, such that for age ≥41, the positive effect is stronger than for age ≤40. This hypothesis is partially supported. There is a significant moderating influence at the *pre-implementation stage*, but the effect is not significant at the *post-implementation stage*. Table 6.27 summarizes the results of all hypothesis tests with regard to the pre-implementation stage and the post-implementation stage.

	Hypothesis tests	**PRE**	**POST**	**Results**
H1a	Effort expectancy→ Attitude	x	x	not supported
H1b	Effort expectancy→ Intention	x	✓	partially supported
H2a	Performance expectancy→ Attitude	✓	✓	supported
H2b	Performance expectancy→ Intention	✓	✓	supported
H3a	Facilitating conditions→ Attitude	✓	x	partially supported
H3b	Facilitating conditions→ Intention	x	✓	partially supported
H4a	Trust in technology→ Attitude	✓	✓	supported
H4b	Trust in technology→ Intention	✓	x	partially supported
H5a	Personal innovativeness→ Attitude	✓	x	partially supported
H5b	Personal innovativeness→ Intention	x	✓	partially supported
H6a	Social rewards→ Attitude	✓	✓	supported
H6b	Social rewards→ Intention	x	x	not supported
H7a	Economic rewards→ Attitude	x	x	not supported
H7b	Economic rewards→ Intention	x	x	not supported
H8	Attitude→ Intention	✓	✓	supported
H9bc	Facilitating conditions x Self-efficacy→ Attitude	x	✓	partially supported
H9eb	Performance expectancy x Management support → Attitude	x	✓	partially supported
H9kb	Performance expectancy x Age → Attitude	✓	x	partially supported
H10fc	Facilitating conditions x Knowledge sharing norms → Intention	x	✓	partially supported
H10ja	Effort expectancy x Experience → Intention	x	✓	partially supported
H10jb	Performance expectancy x Experience → Intention	x	✓	partially supported
H10kb	Performance expectancy x Age→ Intention	✓	x	partially supported
H10kc	Facilitating conditions x Age → Intention	x	✓	partially supported
H10kd	Trust in technology x Age → Intention	✓	x	partially supported

Table 6.27. – Results of the hypothesis test at the pre-implementation stage and at the post-implementation stage.
Source: Own table.

6.3.3.4.2. Standardized path coefficients

Standardized path coefficients indicate the relative strength of the path coefficients (Johnson and Lebreton, 2004, p. 243). Table 6.28 shows the relative strength of path coefficients at the pre-implementation stage. Performance expectancy (0.571) has the strongest relation to knowledge sharing attitude through enterprise social software. In addition, knowledge sharing attitude through enterprise social software (0.471) and performance expectancy (0.200) have a strong relation to knowledge sharing intention through enterprise social software. Furthermore, facilitating conditions (0.137) and trust in technology (0.103) have a moderate relation to knowledge sharing attitude through enterprise social software. In addition, trust in technology (0.123) has a moderate relation to knowledge sharing intention through enterprise social software. Finally, personal innovativeness (0.065) and social rewards for knowledge sharing (0.061) have a weak relation to knowledge sharing attitude through enterprise social software.

Path	Standardized path coefficients
Performance expectancy → Attitude	0.571
Attitude → Intention	0.471
Performance expectancy → Intention	0.200
Facilitating conditions → Attitude	0.137
Trust in technology → Intention	0.123
Trust in technology → Attitude	0.103
Personal innovativeness → Attitude	0.065
Social rewards for knowledge sharing → Attitude	0.061

Table 6.28. – Strength of path coefficients at the pre-implementation stage.
Source: Own table.

Table 6.29 illustrates the relative strength of the standardized path coefficients at the post-implementation stage. Performance expectancy (0.546) and trust in technology (0.231) have a strong relation to knowledge sharing attitude through enterprise social software. In addition, knowledge sharing attitude through enterprise social software (0.493) and performance expectancy (0.268) have a strong relation to knowledge sharing intention through enterprise social software. Furthermore, the interaction terms *self-efficacy * facilitating condition* (0.164) and *management support * performance expectancy* (0.128) as well as social rewards for knowledge sharing (0.136) have a moderate relation to knowledge sharing attitude through enterprise social software. Moreover, personal innovativeness (0.182), effort expectancy (-0.146), the interaction term *knowledge sharing norms * facilitating conditions* (0.132) and facilitating conditions (0.112) have a moderate relation to knowledge sharing intention through enterprise social software.

Path	Standardized path coefficients
Performance expectancy → Attitude	0.546
Attitude → Intention	0.493
Performance expectancy → Intention	0.268
Trust in technology → Attitude	0.231
Personal innovativeness → Intention	0.182
Facilitating conditions x Self-efficacy → Attitude	0.164
Effort expectancy → Intention	-0.146
Social rewards for knowledge sharing → Attitude	0.136
Facilitating conditions x Knowledge sharing norms → Intention	0.132
Performance expectancy x Management support → Attitude	0.128
Facilitating conditions → Intention	0.112

Table 6.29. – Strength of path coefficients at the post-implementation stage.
Source: Own table.

The standardized estimated path coefficients are visualized in Figures 6.10 and 6.11. The figures illustrate the hypothesized relationships between the independent and the dependent constructs. Significant path coefficients are depicted through bold lines and insignificant path coefficients through dash lines. Moreover, the coefficients of determination of each endogenous latent construct (R^2) are visualized in the figures.

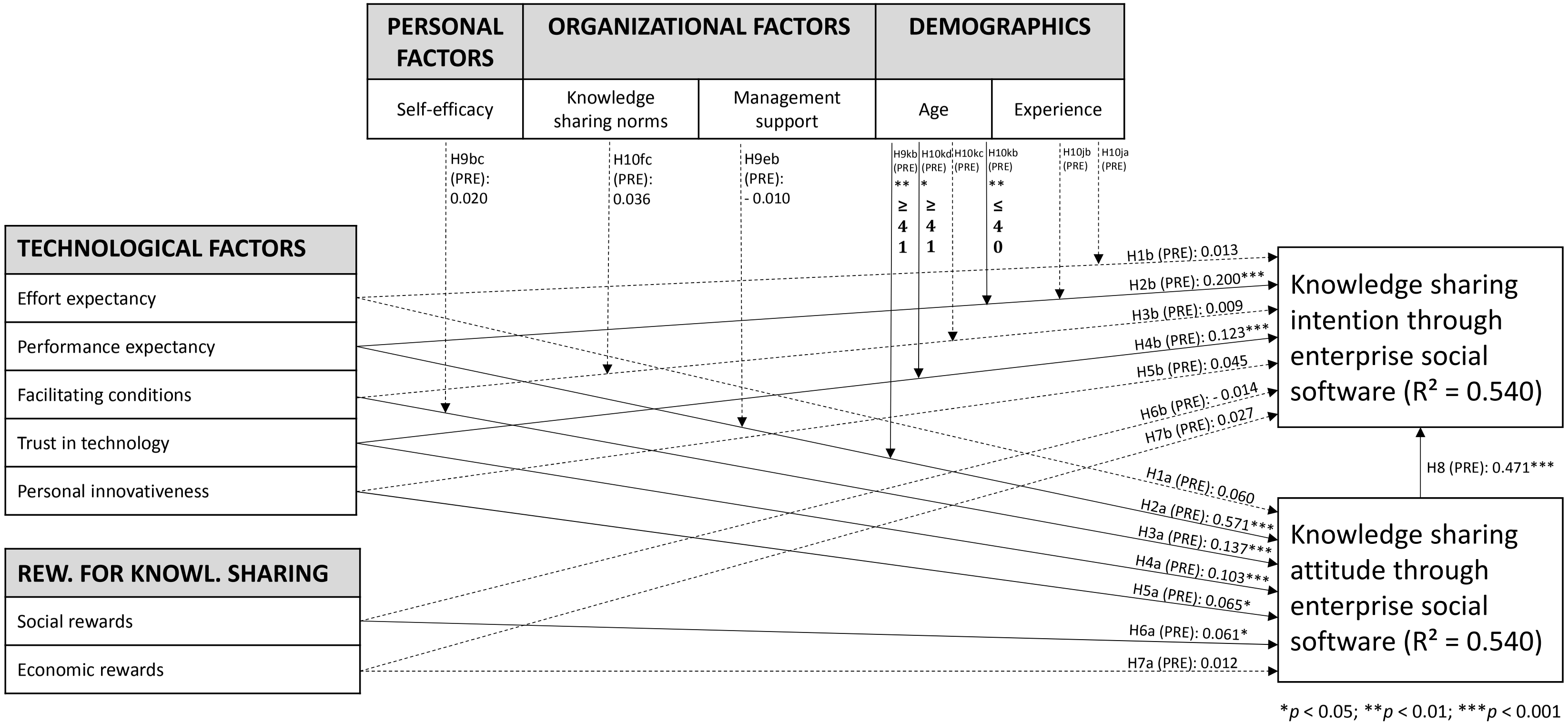

Figure 6.10. – Pre-implementation structural equation model results (significant path coefficients are depicted through bold lines and insignificant path coefficients through dash lines). Model fit (direct-effects-only model *with moderators*): CMIN/DF 1.870; CFI 0.954; TLI 0.948; RMSEA 0.026.
Source: Own figure.

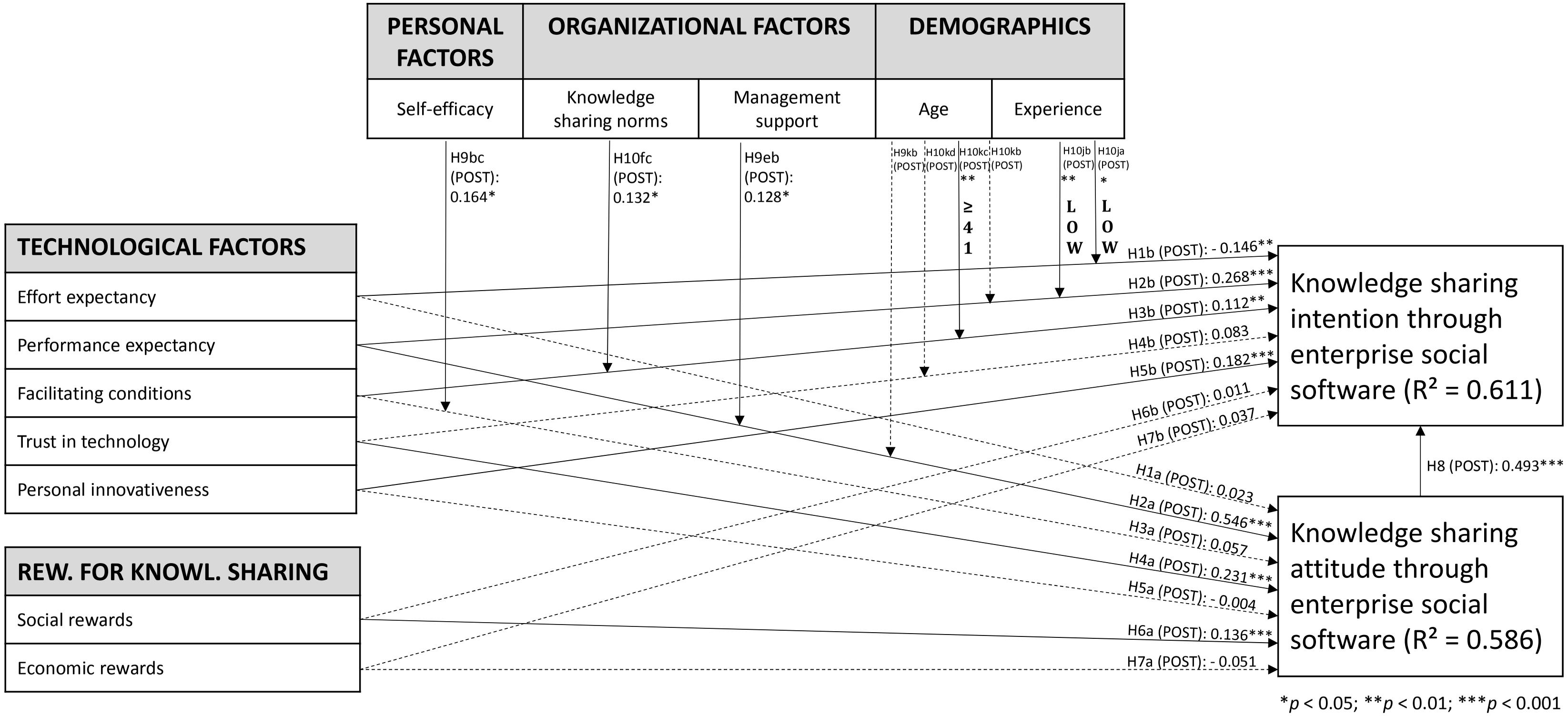

Figure 6.11. – Post-implementation structural equation model results (significant path coefficients are depicted through bold lines and insignificant path coefficients through dash lines). Model fit (direct-effects-only model *with moderators*): CMIN/DF 1.870; CFI 0.954; TLI 0.948; RMSEA 0.026.
Source: Own figure.

6.3.3.4.3. Multi-group analysis for the pre-implementation stage and the post-implementation stage

Even though the standardized estimated path coefficients and p-values have been measured for the pre-implementation stage and the post-implementation stage in the previous section, it is necessary to test whether the differences among groups are indeed significant (Armentano et al., 2014, p. 5). Therefore, the critical ratios for the differences in regression weights between both groups are calculated (Armentano et al., 2014, p. 5). From these critical ratios, p-values are computed in order to determine the significance of the differences (Armentano et al., 2014, p. 5). The results are summarized in Table 6.30.

In the following, the **differences between groups for the direct effects** are outlined. Hence, at the pre-implementation stage, the positive effect of "facilitating conditions" on knowledge sharing *attitude* through enterprise social software is stronger and significant, while the effect is not significant at the post-implementation stage. Moreover, the positive effect of "trust in technology" on knowledge sharing *attitude* through enterprise social software is significant at both stages, while the effect is stronger at the post-implementation stage. Furthermore, at the pre-implementation stage, the positive effect of "social rewards for knowledge sharing" on knowledge sharing *attitude* through enterprise social software is significant, while the effect is stronger and significant at the post-implementation stage. At the pre-implementation stage, the effect of "effort expectancy" on knowledge sharing *intention* through enterprise social software is positive but not significant, while the effect is negative[10] and significant at the post-implementation stage. Additionally, at the pre-implementation stage, the positive effect of "facilitating conditions" and "personal innovativeness" on knowledge sharing *intention* through enterprise social software is not significant, while the effect is stronger and significant at the post-implementation stage.

However, there is no significant difference among groups for the direct effects of "performance expectancy", "economic rewards for knowledge sharing", "personal innovativeness", "effort expectancy" on knowledge sharing *attitude* through enterprise social software and the effects of "performance expectancy", "trust in technology", "social rewards for knowledge sharing" and "economic rewards for knowledge sharing" on knowledge sharing *intention* through enterprise social software.

In the following, the **differences between groups for the moderation effects** are outlined. Hence, there is a significant difference among groups for the moderation effect of "management support" on the relationship between "performance expectancy" and knowledge sharing *attitude* through enterprise social software, insofar that the effect is stronger and significant at the post-implementation stage, while the effect is not significant at the pre-implementation stage. Moreover, there is a significant difference among groups for the moderation effect of "self-efficacy" on the relationship between "facilitating conditions" and knowledge sharing *attitude* through enterprise social soft-

[10]The effect is negative due to a suppressor effect which is explained in Section 7.1.1.

			Pre-implementation		Post-implementation		
			Estimate	**P**	**Estimate**	**P**	**z-score**
attitude	<—	Performance expectancy	0.535	0.000	0.507	0.000	-0.484
attitude	<—	Economic rewards	0.012	0.674	-0.056	0.196	-1.317
attitude	<—	**Facilitating conditions**	**0.164**	**0.000**	0.059	0.227	**-1.737***
attitude	<—	Personal innovativeness	0.057	0.030	-0.004	0.920	-1.267
attitude	<—	**Trust in technology**	**0.089**	**0.000**	**0.237**	**0.000**	**2.450****
attitude	<—	Effort expectancy	0.067	0.053	0.022	0.657	-0.729
attitude	<—	**Performance expectancy x Management support**	-0.014	0.781	**0.163**	**0.011**	**2.154****
attitude	<—	**Facilitating conditions x Self-efficacy**	0.027	0.518	**0.377**	**0.014**	**2.211****
attitude	<—	**Social rewards**	**0.069**	**0.046**	**0.179**	**0.000**	**1.742***
intention	<—	Performance expectancy	0.190	0.000	0.266	0.000	1.113
intention	<—	**Facilitating conditions**	0.011	0.760	**0.125**	**0.006**	**1.970****
intention	<—	Trust in technology	0.108	0.000	0.091	0.097	-0.274
intention	<—	**Effort expectancy**	0.015	0.663	**-0.153**	**0.002**	**-2.748*****
intention	<—	Social rewards	-0.017	0.650	0.016	0.776	0.485
intention	<—	Facilitating conditions x Knowledge sharing norms	0.060	0.277	0.216	0.021	1.441
intention	<—	**Personal innovativeness**	0.040	0.118	**0.198**	**0.000**	**3.420*****
intention	<—	Economic rewards	0.027	0.340	0.044	0.295	0.342
intention	<—	attitude	0.480	0.000	0.527	0.000	0.677

Legend: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Table 6.30. – Multi-group analysis for the pre-implementation stage and the post-implementation stage.
Source: Own table.

ware, insofar that the effect is stronger and significant at the post-implementation stage, while the effect is not significant at the pre-implementation stage.

However, there is no significant difference among groups for the moderation effect of "knowledge sharing norms" on the relationship between "facilitating conditions" and knowledge sharing *intention* through enterprise social software.

6.3.3.4.4. Control variables

In order to reduce the likelihood of alternative explanations, many cross-sectional research papers suggest to rule out competing arguments by adding control variables to their research models (Rindfleisch et al., 2008, p. 276). It is assumed that control variables may have separate but significant effects on the endogenous variable (Rindfleisch et al., 2008, p. 276). Prior research suggests that job tenure needs to be considered when examining employees' willingness to accept and use information and communication technologies (Abdinnour-Helm et al., 2003, p. 270). Therefore, the length of time an employee has been with the organization is added to the research model. The results indicate that job tenure has neither a significant impact on knowledge sharing attitude through enterprise social software (pre-implementation stage: standardized path coefficient=-0.017, p-value=0.512, post-implementation stage: standardized path coefficient=-0.021, p-value=0.532), nor on knowledge sharing intention through enterprise social software (pre-implementation stage: standardized path coefficient=0.031, p-value=0.228, post-implementation stage: standardized path coefficient=0.014, p-value=0.662).

6.3.3.4.5. Relationship between intention and behavior

In the literature, it is questioned whether intention leads to actual behavior. In order to contribute to this discussion, questions concerning actual behavior were also included in the questionnaire (see Table 6.31) (Matschke et al., 2014, p. 253). Accordingly, the post-implementation model was extended by the construct "actual behavior" and tested again. The results indicate that knowledge sharing intention through enterprise social software has a positive and significant effect on knowledge sharing behavior through enterprise social software (standardized path coefficient=0.725, p-value=$\leq$ 0.001).[11]

[11] The construct "knowledge sharing behavior through enterprise social software" meets all quality criteria, i.e., the values are all above the required threshold with regard to factor loadings, indicator reliability, factor reliability, Cronbach's alpha, the AVE and the Fornell-Larcker criterion.

Factor	Label	Indicator (POST)	Source
Knowledge sharing behavior through enterprise social software	Beh_1	Ich teile mein Wissen regelmäßig mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien.	I regularly use electronic knowledge repositories to contribute my knowledge in my work (Kankanhalli et al., 2005b, p. 185).
	Beh_2	Ich teile mein Wissen oft mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien.	I frequently participate in knowledge sharing activities in this online community (Hsu et al., 2007, p. 163).
	Beh_3	Ich verbringe viel Zeit damit Wissen mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien zu teilen.	I usually spend a lot of time conducting knowledge-sharing activities in this virtual community (Hsu et al., 2007, p. 163).
	Beh_4	Ich teile Wissen aus meinen Berufserfahrungen mit anderen Mitarbeitern mittels unternehmenseigener sozialer Medien.	Employees in my company share know-how from work experience with each other (Lin and Lee, 2004, p. 124).
Legend: Measuring of indicators on a scale from 1 to 5 (1 = strongly agree, 5 = strongly disagree).			

Table 6.31. – Operationalization of knowledge sharing behavior through enterprise social software (see Appendix C.18 for a translation of the German items).
Source: Own table.

7. Discussion of results

In this chapter, the results of the quantitative analysis are discussed.

Hence, the direct effects of the technological factors and rewards for knowledge sharing as well as the relationship between attitude and intention are pointed out in Section 7.1, whereas, in Section 7.2, the moderation effects of the personal factors, organizational factors and demographic factors are discussed.

7.1. Direct effects

The direct effects of the technological factors are outlined at first. Accordingly, the results are discussed concerning effort expectancy (see Section 7.1.1), performance expectancy (see Section 7.1.2), facilitating conditions (see Section 7.1.3), trust in technology (see Section 7.1.4) and personal innovativeness (see Section 7.1.5). Subsequently, the direct effects of rewards for knowledge sharing are presented. Hence, in Section 7.1.6, social rewards for knowledge sharing are outlined and in Section 7.1.7 economic rewards for knowledge sharing are discussed. Finally, the relationship between knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software is discussed in Section 7.1.8.

7.1.1. Effort expectancy

Consistent with much of the previous literature, the results indicate that effort expectancy and performance expectancy play different roles across time (Marler et al., 2009, p. 351). The direct effect of effort expectancy on employees' knowledge sharing *attitude* through enterprise social software at the *pre-implementation stage and post-implementation stage* is positive, yet non-significant, whereas the direct effect of effort expectancy on employees' knowledge sharing *intention* through enterprise social software at the *post-implementation stage* is significant, but negative due to a suppressor effect (see Section 6.3.3.4 for an explanation) (Darlington, 1968, p. 163). Accordingly, the path coefficient is interpreted as if it were positive. A possible explanation for the non-significant paths at the *pre-implementation stage* is that potential tradeoffs in the level of effort required to use enterprise social software are less clear before implementation. In contrast, at the *post-implementation stage*, tradeoffs in the level of effort required to use enterprise social software become clearer. For a similar argumentation see Bughin and Manyika (2007, p. 256) and Iriberri and Leroy (2009, p. 20). This may explain why effort expectancy could not be verified as a direct predictor of *attitude* and *intention* at the *pre-implementation stage*, whereas at the *post-implementation stage*, effort expectancy becomes a direct predictor of *intention*. However, it should not be concluded that effort expectancy has no significance on *attitude* at the *post-implementation stage*, as the effects of effort expectancy on *attitude* may exist, yet may be masked by other variables (Marler et al., 2009, p. 352).

7.1.2. Performance expectancy

The results indicate that knowledge sharing *attitude* through enterprise social software positively and partially mediates the relationship between performance expectancy and knowledge sharing *intention* through enterprise social software at the *pre-implementation stage* and at the *post-implementation stage*. This means that a part of the relationship between performance expectancy and knowledge sharing *intention* through enterprise social software depends on knowledge sharing *attitude* through enterprise social software. Besides the indirect effect, performance expectancy also has a positive and direct effect on knowledge sharing *intention* through enterprise social software at both stages. These findings suggest that clearly highlighting the specific benefits associated with enterprise social software is crucial for the success of enterprise social software. Methods for emphasizing the usefulness of enterprise social software will directly enhance knowledge sharing *intention* through enterprise social software. For a similar line of reasoning see Grossmann et al. (2009, p. 565).

7.1.3. Facilitating conditions

Facilitating conditions have an indirect effect on knowledge sharing *intention* through enterprise social software at the *pre-implementation stage*, which is positively and fully mediated by knowledge sharing *attitude* through enterprise social software. Accordingly, facilitating conditions for knowledge sharing contribute to knowledge sharing *intention* through enterprise social software exclusively through their positive effect on knowledge sharing *attitude* through enterprise social software. From an expectancy perspective, the positive effects of facilitating conditions on knowledge sharing *attitude* through enterprise social software arise from the assumption that, when employees do not believe that sufficient resources, such as training and help desks, exist, they may be less motivated to intend on using enterprise social software. For a similar argumentation see also Ritscher and Bächle (2008, p. 17), Granitzer and Tochtermann (2009, p. 72) and Koch and Richter (2009, p. 119). At the *post-implementation stage*, a positive and significant direct effect of facilitating conditions on knowledge sharing *intention* is examined, which is not mediated by knowledge sharing *attitude* through enterprise social software. This result suggests that, at the *post-implementation stage*, individuals have gained experience with enterprise social software and have learned what resources are in fact available (Thompson et al., 1991, p. 140). Therefore, they might have found multiple avenues for help and support throughout the organization, thereby removing impediments to sustained usage (Venkatesh et al., 2003, p. 454; Marler et al., 2009, p. 353), which directly motivates the employees to use enterprise social software in the future.

7.1.4. Trust in technology

The relationship between trust in technology and knowledge sharing *intention* through enterprise social software at the *pre-implementation stage* is positively and partially mediated through knowledge sharing *attitude* through enterprise social software. A part of the relationship between trust in technology and knowledge sharing *intention* through enterprise social software depends on knowledge sharing *attitude* through enterprise social software. This finding suggests that building trust in technology is necessary for a successful implementation of enterprise social software, i.e., methods to build trust will directly enhance knowledge sharing *intention* through enterprise social software. In comparison, trust in technology has an indirect effect on knowledge sharing *intention* through enterprise social software at the *post-implementation stage*, which is fully mediated by knowledge sharing *attitude* through enterprise social software. Accordingly, trust in technology contributes to knowledge sharing *intention* through enterprise social software exclusively through its positive effect on knowledge sharing *attitude* through enterprise social software. The positive effect of trust in technology on knowledge sharing *attitude* through enterprise social software may arise when employees have the feeling that privacy and security issues concerning enterprise social software are sufficiently dealt with in their organization. For a similar argumentation see Steinhüser and Räth (2010, p. 15) and Iriberri and Leroy (2009, p. 20).

However, there is no significant difference among groups for the effect of trust in technology on knowledge sharing *intention* through enterprise social software (see Table 6.30). A significant statement according a significant difference between groups is statistically based on the standard error (Koschack, 2008, p. 259). The statistic gives an indication of whether the differences between groups is not random but is statistically significant under consideration of measurement inaccuracy (standard error) (Koschack, 2008, p. 259). In this case, the dispersion of the values might be a reason that no group difference could be found.

7.1.5. Personal innovativeness

Personal innovativeness has an indirect effect on knowledge sharing *intention* through enterprise social software at the *pre-implementation stage*, which is fully mediated by knowledge sharing *attitude* through enterprise social software. Accordingly, personal innovativeness contributes to knowledge sharing *intention* through enterprise social software exclusively through its positive effect on knowledge sharing *attitude* through enterprise social software. The positive indirect effect implies that innovative employees are more likely to be favorable toward enterprise social software, which in turn positively affects their intentions towards using enterprise social software in the future. At the *post-implementation stage*, personal innovativeness has a negative, yet insignificant impact on knowledge sharing *attitude* through enterprise social software. Since personal innovativeness has a positive correlation with the dependent variable (attitude) (0.172) (see Appendix C.20), but negative beta weights in a regression equation (-0.004) (see Figure 6.11), personal innovativeness for knowledge sharing is revealed as a negative suppressor (Darlington, 1968, p. 163). In addition, personal innovativeness has a positive and significant impact on knowledge sharing *intention* through enterprise social software. This finding indicates that innovative employees are more willing to use enterprise social software for knowledge sharing. For a similar argumentation see Ritscher and Bächle (2008, p. 18).

However, there is no significant difference among groups for the effect of personal innovativeness on knowledge sharing attitude through enterprise social software (see Table 6.30). As explained in Section 7.1.4, the dispersion of the values might be a reason that no group difference could be found.

7.1.6. Social rewards for knowledge sharing

At the *pre-implementation stage*, a significant effect of social rewards for knowledge sharing on *attitude* is found. Hence, no significant effect of social rewards for knowledge sharing on *intention* is found, which may be due to the fact that the meaning of enterprise social software in the sense of receiving social recognition might be less clear, when enterprise social software has not yet been implemented (Ijaz et al., 2014, p. 2562). Social rewards for knowledge sharing have a negative, but non-significant effect on knowledge sharing *intention* through enterprise social software at the *pre-implementation stage*. Since social rewards for knowledge sharing have a positive correlation with the dependent variable (intention) (0.220) (see Appendix C.20), but negative beta weights in a regression equation (-0.014) (see Figure 6.10), social rewards for knowledge sharing are revealed as a negative suppressor (Darlington, 1968, p. 163). One explanation for the non-significant effect of social rewards for knowledge sharing on knowledge sharing *intention* through enterprise social software at the *pre-implementation stage* is that employees, who strive for recognition by their colleagues may believe that there are better ways to share their knowledge than through enterprise social software (e.g., face-to-face knowledge sharing) (O'Dell and Grayson, 1998, p. 62). In comparison, social rewards for knowledge sharing have an indirect effect on knowledge sharing *intention* through enterprise social software at the *post-implementation stage*, which is fully mediated by knowledge sharing *attitude* through enterprise social software. Accordingly, social rewards for knowledge sharing contribute to knowledge sharing *intention* through enterprise social software exclusively through their positive effect on knowledge sharing *attitude* through enterprise social software. The positive effect of social rewards for knowledge sharing on knowledge sharing *attitude* through enterprise social software may arise from learning effects. Employees learn that knowledge sharing can enhance their reputation or status in the organization. For a similar argumentation see Iriberri and Leroy (2009, p. 22), Granitzer and Tochtermann (2009, p. 72) and Alarifi and Sedera (2013, p. 6).

7.1.7. Economic rewards for knowledge sharing

At the *pre-implementation stage*, the effect of economic rewards for knowledge sharing on *attitude* and *intention* are positive, however non-significant. The effect of economic rewards for knowledge sharing on knowledge sharing *attitude* through enterprise social software is negative and non-significant at the *post-implementation stage*. Since economic rewards for knowledge sharing have a positive correlation with the dependent variable (attitude) (0.096) (see Appendix C.20), but negative beta weights in a regression equation (-0.051) (see Figure 6.11), economic rewards for knowledge sharing are revealed as a negative suppressor (Darlington, 1968, p. 163). In addition, the impact of economic rewards for knowledge sharing on knowledge sharing *intention* through enterprise social software is positive and non-significant at the *post-implementation stage*. It is assumed that economic rewards have a positive impact on knowledge sharing through enterprise social software, since employees have to give up their knowledge position, when they share their valuable knowledge with others. However, no significance has been found for this assumption. One explanation is that most employees do not see a reason for being paid when engaging in knowledge sharing activities through enterprise social software. This assumption is in line with the findings of Bughin (2008, p. 257).

7.1.8. Attitude and intention

In line with the technology acceptance model, knowledge sharing *attitude* through enterprise social software has a positive and significant impact on knowledge sharing *intention* through enterprise social software. The large contribution of knowledge sharing *attitude* through enterprise social software on knowledge sharing *intention* through enterprise social software at the *pre-implementation stage* (standardized path coefficient 0.471) and the *post-implementation stage* (standardized path coefficient 0.493) suggests that employees with favorable attitudinal disposition are more likely to engage in knowledge sharing through enterprise social software. Considering previous literature, these issues support that the relationship between attitude and intention will be stronger for users than for potential adopters (Karahanna et al., 1999, p. 197).

In addition, this study explains a variance in knowledge sharing *attitude* through enterprise social software of 54% at the *pre-implementation stage* and 58.6% at the *post-implementation stage*. Furthermore, the predictors explain about 54% of the variance in knowledge sharing *intention* through enterprise social software at the *pre-implementation stage* and 61.1% at the *post-implementation stage*.

7.2. Moderation effects

Three interaction variables and six multi-group moderations have been revealed. No significant moderation effects have been found for the personal variables: altruism, reciprocity and interpersonal trust. In addition, no significant moderation effects have been found for the organizational variables: organizational identification and monitoring. The moderating effect may have been masked by stronger moderating variables with which they are correlated (see Appendix C.20). Therefore, it cannot be concluded that these variables are non-relevant factors, when regarding knowledge sharing through enterprise social software, and should therefore be considered in greater detail in future research.

In Section 7.2.1, the moderation effect of self-efficacy is discussed, which is the only factor that has been revealed as a personal moderator. In Section 7.2.2, the organizational moderation effects of knowledge sharing norms and management support are presented. Finally, the demographic moderation effects of age and experience are outlined in Section 7.2.3.

7.2.1. Personal factors

The results show that **self-efficacy** positively moderates the positive relationship between facilitating conditions and knowledge sharing *attitude* through enterprise social software at the *post-implementation stage*. It is interesting to note that facilitating conditions become a significant predictor of attitude through enterprise social software at the *post-implementation stage*, only under conditions of high self-efficacy. Facilitating conditions are thus positively and significantly associated with a greater degree of knowledge sharing *attitude* through enterprise social software, but only among those employees that display high levels of self-efficacy. Based on Bandura's (1997) suggestion that employees with high levels of self-efficacy feel comfortable when confronted with challenging tasks, in contrast to employees with low self-efficacy levels, it is assumed that the latter type of employee regards facilitating conditions as a demand, rather than a resource. Although facilitating conditions are generally viewed as a positive feature, employees with low levels of self-efficacy might find facilitating conditions, such as trainings stressful (Bandura, 1997, p. 106). At the pre-implementation stage, no significance has been found suggesting that self-efficacy moderates the relationship between facilitating conditions and knowledge sharing *attitude* through enterprise social software.

7.2.2. Organizational factors

In the following the moderation effects of knowledge sharing norms (see Section 7.2.2.1) and management support are outlined (see Section 7.2.2.2).

7.2.2.1. Knowledge sharing norms

The results show that knowledge sharing norms positively moderate the positive relationship between facilitating conditions and knowledge sharing *intention* through enterprise social software at the *post-implementation stage*. Consequently, when an organization fosters an environment, where employees feel their values and goals are strongly considered, facilitating conditions are likely to enhance the normative pressure on employees to use enterprise social software. For a similar argumentation see Ritscher and Bächle (2008, p. 18) and Steinhüser and Räth (2010, p. 15). At the *pre-implementation stage*, no significance for knowledge sharing norms moderating the relationship between facilitating conditions and knowledge sharing *intention* through enterprise social software has been found.

However, Table 6.30 shows that there is no significant difference among groups for the moderation effect of knowledge sharing norms on the relationship between facilitating conditions and knowledge sharing intention through enterprise social software. As explained in Section 7.1.4, the dispersion of the values might be a reason that no group difference could be found.

7.2.2.2. Management support

The results indicate that management support positively moderates the positive relationship between performance expectancy and knowledge sharing *attitude* through enterprise social software at the *post-implementation stage*. Consequently, when managers foster a knowledge sharing culture, where employees feel that knowledge sharing is strongly considered, performance expectancy is likely to increase. For a similar argumentation see Wang and Fesenmaier (2004, p. 719), Granitzer and Tochtermann (2009, p. 72) and Alarifi and Sedera (2013, p. 6). At the *pre-implementation stage*, no significance for management support moderating the relationship between performance expectancy and knowledge sharing *attitude* through enterprise social software has been found. These findings suggest that management support may actually be more effective just after implementation of enterprise social software than just before (Marler et al., 2009, p. 351). Moreover, these results open up future steps of research concerning the timing of management support initiatives in introducing enterprise social software (Marler et al., 2009, p. 351).

7.2.3. Demographic factors

In the following the moderation effects of age (see Section 7.2.3.1) and experience (see Section 7.2.3.2) are discussed.

7.2.3.1. Age

The results indicate that age moderates the positive relationship between **performance expectancy** and knowledge sharing *attitude* through enterprise social software and knowledge sharing *intention* through enterprise social software at the *pre-implementation stage*.

The results show that especially employees aged ≥41 are more likely to form a positive knowledge sharing **attitude** through enterprise social software, since they expect enterprise social software to have a positive impact on their productivity at work. However, it is possible that they are reserved concerning their future use of enterprise social software, since they may rather rely on proven technologies for knowledge sharing.

In comparison, employees aged ≤41 are more likely to form a positive knowledge sharing **intention** through enterprise social software, which is in line with the unified theory of acceptance and use of technology (Venkatesh et al., 2003, p. 450). It is suggested that employees aged ≤41 rather tend to try out enterprise social software, since they have already gained other experiences with social media. To sum up, the inhibitions of use seem to be lower for ≤41 than ≥41. For a similar argumentation see Phang et al. (2006, p. 6) and Mitzner et al. (2010, p. 5). At the *post-implementation stage*, no significance for age moderating the relationship between performance expectancy and knowledge sharing *attitude* through enterprise social software and between performance expectancy and knowledge sharing *intention* through enterprise social software has been found.

The results indicate that age moderates the positive relationship between **facilitating conditions** and knowledge sharing *intention* through enterprise social software at the *post-implementation stage*. Especially employees aged ≥41 attach more importance to receiving help and assistance as a means for familiarizing themselves with enterprise social software (Morris and Venkatesh, 2000, p. 398). For a similar argumentation see Mitzner et al. (2010, p. 11) and Venkatesh et al. (2012, p. 168). At the *pre-implementation stage*, no significance for age moderating the relationship between facilitating conditions and knowledge sharing *intention* through enterprise social software has been found.

Furthermore, the results indicate that age moderates the positive relationship between **trust in technology** and knowledge sharing *intention* through enterprise social software at the *pre-implementation stage*. Employees aged ≥41 have a greater focus on privacy and security issues, because they are possibly more sensitive to potential threats associated with the use of enterprise social software. They may fear the misfortune of running into a situation, where their enterprise social software activity could impact their reputation and would therefore affect their career and success opportunities (e.g., when posting false information or too much information). Employees aged ≥41 might think twice before sharing knowledge, because they understand that once information is online, there will be a digital record of it somewhere permanently

(Mitzner et al., 2010, p.11). Accordingly, the more employees aged ≥41 feel safe with privacy settings adjusted to enterprise social software, the more likely it is that they use enterprise social software in the future. These data are consistent with the assumptions of Mitzner et al. (2010, p.11). At the *post-implementation stage*, no significance for age moderating the relationship between trust in technology and knowledge sharing *intention* through enterprise social software has been found.

7.2.3.2. Experience

The results indicate that experience moderates the positive relationship between **performance expectancy** and knowledge sharing *intention* through enterprise social software at the *post-implementation stage*. The results indicate that performance expectancy plays a major role for less-experienced employees. Accordingly, organizations have to show how enterprise social software can help their employees increase their productivity at work. Therefore, a significant influence of performance expectancy on knowledge sharing intention through enterprise social software is revealed, while the effect is expected to decrease with the duration of use. At the *pre-implementation stage*, no significance for experience moderating the relationship between performance expectancy and knowledge sharing *intention* through enterprise social software has been found.

Furthermore, experience moderates the positive relationship between **effort expectancy** and knowledge sharing *intention* through enterprise social software at the *post-implementation stage*. This result indicates that less-experienced employees place a higher importance on the ease-of-use than experienced employees. Therefore, a significant influence of effort expectancy on knowledge sharing intention through enterprise social software is revealed, while the effect is expected to decrease with the duration of use. For a similar finding, see Soederberg Miller and Bell (2012, p. 525). At the *pre-implementation stage*, no significance for experience moderating the relationship between effort expectancy and knowledge sharing *intention* through enterprise social software has been found.

Factors identified at each analysis stage are outlined in Table 7.1.

		Conceptual analysis	Qualitative analysis		Quantitative analysis	
Category	**Factors**	**Literature Review**	**Interview analysis** (pre-implementation)	**Meta-analysis of qualitative case studies** (post-implementation)	**Questionnaire** (pre-implementation)	**Questionnaire** (post-implementation)
Technological factors	Performance expectancy	✓	✓	✓	✓	✓
	Effort expectancy	✓	✓	✓	×	✓
	Trust in technology	×	✓	×	✓	✓
	Facilitating conditions	✓	✓	✓	✓	✓
	Personal innovativeness	×	✓	×	✓	✓
Rewards for knowledge sharing	Social rewards	✓	✓	×	✓	✓
	Economic rewards	✓	✓	×	×	×
Personal factors	Interpersonal trust	✓	✓	×	×	×
	Reciprocity	✓	✓	×	×	×
	Altruism	✓	✓	×	×	×
	Self-efficacy	✓	✓	×	×	✓
Organizational factors	Management support	✓	✓	✓	×	✓
	Knowledge sharing norms	✓	✓	✓	×	✓
	Organizational identification	✓	✓	×	×	×
	Monitoring	×	✓	×	×	×
Demographic factors	Gender	✓	×	×	×	×
	Experience	✓	✓	×	×	✓
	Age	✓	✓	×	✓	✓

Table 7.1. – Factors identified at each analysis stage.
Source: Own table.

8. Conclusion

An understanding of which factors cause employees to hold certain beliefs about knowledge sharing through enterprise social software is of value, not only to researchers interested in explicating the paths through which employees' willingness to share knowledge through enterprise social software is manifested (see Section 8.1), but also to practitioners responsible for the implementation of enterprise social software (see Section 8.2). This thesis ends by highlighting the limitations and directions for future research (see Section 8.3).

8.1. Implications for research

Understanding employees' willingness to share knowledge through enterprise social software is a research priority in today's knowledge-based economy and society (Leonardi et al., 2013, p. 2) to which this thesis makes several contributions: **First**, this research provides evidence for a model that explains employees' willingness to share knowledge through enterprise social software. Although the aforementioned antecedent variables are not new to knowledge sharing literature (Kankanhalli et al., 2005b, p. 119; Bock et al., 2005, p. 92), this study is the first to present the factors which primarily drive employees' *attitudes towards sharing knowledge through enterprise social software* and employees' *intentions towards sharing knowledge through enterprise social software*. Thus, this thesis contributes towards structuring a new research stream and theory development by testing a research model, which is based on different theoretical approaches (unified theory of acceptance and use of technology, technology acceptance model, diffusion of innovations theory, social capital theory, social exchange theory and control theory). **Second**, this thesis offers a comprehensive overview of an interdisciplinary state of research according to the fields of Enterprise 2.0 and knowledge management. Furthermore, the potential of enterprise social software is outlined and compared to traditional knowledge management systems. **Third**, the findings contribute to the quantitative examination of the TOM model by investigating technological, organizational and personal factors. As a **fourth** contribution, this thesis uses a multi-method approach by first performing a literature review, followed by qualitative analyses (interview analysis and meta-analysis of case studies) and a quantitative study (survey method) in order to provide more profound results (Al-Alawi et al., 2007, p. 25). **Fifth**, this thesis answers the research questions suggested in Section 1.3. Hence, the results indicate that from a range of factors (seventeen constructs), which are identified through a multi-method approach, some factors (ten constructs) are proven to be significantly influential with regard to knowledge sharing through enterprise social software. The results indicate that factors, such as *"effort expectancy", "facilitating conditions", "trust in technology", "personal innovativeness", "social rewards for knowledge sharing"* as well as moderation factors, such as *"self-efficacy", "norms of knowledge sharing", "management support", "age", "experience with public social software"* influence employees' willingness to share knowledge through enterprise social software (see **Research Question 1**).

Hence, this thesis partly provides support for the conceptual framework that is adapted from several theories and is extended with the help of qualitative interviews through which three additional factors are uncovered (personal innovativeness, monitoring and trust in technology) (see Figure 5.1). The quantitative results show that *social exchange theory* ("self-efficacy", "social rewards for knowledge sharing"), *social capital theory* ("knowledge sharing norms", "management support", "trust in technology"), *diffusion of innovations theory* ("personal innovativeness"), *technology acceptance model* ("knowledge sharing attitude through enterprise social software"), *unified theory of acceptance and use of technology* ("effort expectancy", "performance expectancy", "facilitating conditions", "knowledge sharing intention through enterprise social software", "age", "experience with public social media") are proven to be suitable as a theoretical foundation of knowledge sharing through enterprise social software (see **Research Question 2**).

Another crucial management question refers to the ongoing debate regarding appropriate incentive systems. In order to contribute to this debate, the relationship between rewards for knowledge sharing and employees' willingness to share knowledge through enterprise social software has been investigated. The results show that *social rewards for knowledge sharing* have a positive and significant relationship with employees' willingness to share knowledge through enterprise social software, whereas a significant relationship between *economic rewards for knowledge sharing* and employees' willingness to share knowledge through enterprise social software is not found (see **Research Question 3**).

In addition, the results of the qualitative analyses and the quantitative analysis provide empirical evidence that employees' willingness to share knowledge through enterprise social software at a pre-implementation stage differs from the post-implementation stage. By distinguishing between the implementation stages, implications can be deduced that help organizations better understand the dynamics of employees' adoption decisions (Marler et al., 2009, p. 328). It is demonstrated that some factors proved to be positive and significant predictors for knowledge sharing through enterprise social software at both implementation stages, such as *"performance expectancy", "facilitating conditions", "trust in technology", "personal innovativeness" and "social rewards for knowledge sharing"*. In addition, *moderation effects* are investigated at both implementation stages. A moderator is a variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable. Hence, moderation factors are revealed at the **pre-implementation stage**, indicating that employees assess *performance expectancy* as well as *trusting issues* of enterprise social software for knowledge sharing differently according to their *age*. At the **post-implementation stage**, further moderation effects are revealed. Hence, *facilitating conditions* (e.g., training) with regard to the use of enterprise social software for knowledge sharing are assessed differently depending on *age*. In addition, *facilitating conditions* are moderated by an employee's *self-efficacy* as well as *knowledge sharing norms*. Furthermore, employees' *experience with social software* moderates the *performance expectancy* and *effort expectancy* of enterprise social software for knowledge sharing. The results also show that *performance expectancy* is substantially influenced by *management support* (see **Research Question 4**).

Finally, the results show that, at both the pre-implementation stage and the post-implementation stage, *performance expectancy* has the strongest relation to knowledge sharing attitude through enterprise social software and knowledge sharing intention through enterprise social software (see **Research Question 5**).

In summary, the results of this thesis present a range of factors, which significantly influence the acceptance and use of enterprise social software for knowledge sharing, and therefore constitute a major contribution to theory and practice.

8.2. Implications for practice

From a managerial perspective, this study has identified several factors essential to successful knowledge sharing through enterprise social software. When companies learn which factors have an impact on knowledge sharing through enterprise social software, they can take appropriate actions to strengthen employees' willingness to share their knowledge. This will not only prevent companies from spending money on ineffective measures, but also save costs by taking tailor-made solutions into account. Such an understanding can help organizations maximize their return on investments in enterprise social software. The results indicate which technological, personal and organizational factors have an influence on employees' willingness to share knowledge through enterprise social software. The findings are based on a comprehensive literature review, in-depth interviews, a meta-analysis of qualitative case studies and surveys, and should help develop organizational strategies that encourage and foster knowledge sharing through enterprise social software. In the following, managerial implications are given with regard to the identified factors.

The results show that some factors have a positive and significant effect on knowledge sharing activities at both the pre-implementation stage and the post-implementation stage, such as "performance expectancy", "facilitating conditions", "trust in technology", "personal innovativeness" and "social rewards for knowledge sharing", whereas "effort expectancy" has a positive and significant effect at the post-implementation stage. These relationships are outlined in the following.

Knowledge sharing through enterprise social software is highly dependent on employees' perception of how the new system can help them complete their tasks successfully, which refers to its **performance expectancy**. Therefore, it is advisable to integrate enterprise social software into employees' daily work processes (Koch and Richter, 2009, p. 8). In order to motivate employees to work on their tasks via the software, soft enforcement measures may prove helpful, e.g., mapping existing procedures or lessons learned exclusively through enterprise social software (Koch and Richter, 2009, p. 8). The results demonstrate that **performance expectancy** is influenced by **"age"** at the pre-implementation stage and by **"management support"** and **"experience"** at the post-implementation stage. The results indicate that especially employees *aged* ≥41 are more likely to form a positive knowledge sharing attitude through enterprise social software at the pre-implementation stage, since they expect enterprise social software to have a positive impact on their productivity at work. However, it is possible that they are reserved concerning their future usage of enterprise social software, since they may rather rely on proven technologies for knowledge sharing. In comparison, employees aged ≤41 are more likely to form a positive knowledge sharing intention through enterprise social software at the pre-implementation stage. It is suggested that employees aged ≤41 rather tend to try out enterprise social software, since they have already gained their experiences with social media. With regard to *management support*, it is recommended that managers and team leaders highlight the benefits of enterprise social software especially at the post-implementation stage, so that employees are able to understand which possible job performance enhancements can be reached through enterprise social software (Marler et al., 2009, p. 354; Riege, 2007, p. 58). Therefore, it is assumed that, on the one hand, once employees perceive high usefulness of enterprise social software, they will develop positive knowledge sharing attitudes through enterprise social software and will consequently share their knowledge, which is the key to reaping the benefits of enterprise social software (Marler et al., 2009, p. 354). On the other hand, if an organization fails to point out the added value of enterprise social software, it may experience difficulties in encouraging employees to use enterprise social software in the future, since employees may doubt the usefulness of enterprise social software with regard to dealing with their daily work (Ritscher and Bächle, 2008, p. 8). Moreover, the results indicate that performance expectancy plays a major role for *less-experienced* employees at the post-implementation stage. Accordingly, organizations have to show how enterprise social software can help their employees increase their productivity at work.

The results show that resources used for employee support have a positive effect on knowledge sharing through enterprise social software. Consequently, it is assumed that it is easier for organizations that offer **facilitating conditions** to increase their employees' willingness to share knowledge through enterprise social software. The provision of training schemes is one means that allows employees to become familiar with the new tool (Riege, 2007, p. 62). Training measures are especially suitable in order to reduce employees' fears of change (Riege, 2007, p. 62). The results concerning the the pre-implementation stage show that it is advisable to hold seminars or training sessions even before enterprise social software has been implemented so that employees can form realistic expectations about the software (Ginzberg, 1981, p. 476; Abdinnour-Helm et al., 2003, p. 271). Moreover, it is recommended to train managers and team leaders as well, so that they can lead the way (Riege, 2007, p. 63). In addition, peer-to-peer mentoring and coaching programs can increase the acceptance of knowledge sharing through enterprise social software (Ritscher and Bächle, 2008, p. 17). To this end, employees who are already familiar with enterprise social software could advise and guide employees with less experience (Riege, 2007, p. 55). Furthermore, companies can prevent a misleading use of enterprise social software by establishing rules of behavior (Iriberri and Leroy, 2009, p. 19). Such guidelines would provide an orientation regarding what kind of information is valuable for the company (Ardichvili et al., 2003, p. 74). Hence, it is recommended that these policies include knowledge sharing norms and standards for sharing knowledge through enterprise social software (Cabrera and Cabrera, 2002, p. 699). Integrating guidelines helps enterprise social software become a sustainable knowledge management solution (Ritscher and Bächle, 2008, p. 21). Technical support can help reduce employees' reluctance to share knowledge through enterprise social software (Riege, 2007, p. 52). By providing training opportunities, the company establishes an organizational culture that fosters knowledge sharing activities (De Long and Fahey, 2000, p. 117; Riege, 2007, p. 52). The results indicate that **facilitating conditions are influenced by "self-efficacy", "knowledge sharing norms" and "age"** at the post-implementation stage. *Self-efficacy* has been shown to be a factor in enhancing the effect of facilitating conditions on knowledge sharing attitude through enterprise social software at the post-implementation stage. With a high level of self-efficacy, it is assumed that employees respond to facilitating conditions, utilizing enterprise social software to a greater extent in future and leading to an increased return on investment in the technology (Marler et al., 2009, p. 328). In addition, the results suggest that when *knowledge sharing norms* are strong, the need for facilitating conditions is strengthened. Therefore, increasing teamwork and collaboration norms have a positive effect on the relationship between facilitating conditions and knowledge sharing through enterprise social software (Ritscher and Bächle, 2008, p. 33). With regard to *age* differences, it is recommended to offer additional training for employees aged $\geq$41, since these employees may have difficulties adopting to the new way of sharing knowledge and are potentially afraid of the complexity of enterprise social software (Riege, 2007, p. 56).

The findings uncover employees' concerns with regard to security and privacy aspects associated with enterprise social software, hence: **trust in technology**. Organizations are obliged to implement technologies, such as enterprise social software, in compliance with current data protection guidelines (Iriberri and Leroy, 2009, p. 20). To improve employees' perceptions that their data will be treated confidentially, security and user rights concepts are recommended (Koch and Thönnißen, 2011, p. 10). Consequently, it may be reasonable to involve employee representatives and the responsible chief privacy officer at a very early stage, when installing a new system to ensure an understanding of given mechanisms within the whole organization (Koch and Bentele, 2011, p. 18). Rules must be followed very carefully at any time; if trust is lost, it is very difficult to restore (Stieglitz, 2011, p. 12). In addition, a certification through an independent provider can strengthen trust into installed mechanisms (Steinhüser and Gerz, 2011, p. 10). To secure confidentiality aspects, companies have to implement authorization structures within the enterprise social software (Steinhüser and Gerz, 2011, p. 11). The user must be able to control any self-produced content as well as personal information (Iriberri and Leroy, 2009, p. 20). Control of information includes being able to delete any self-produced content and to decide who is able (and not able) to see content (Bukvova and Kalb, 2010, p. 8). If legal limits are hurt, the source of content needs to be identifiable and the user must know that he or she will be held accountable for misuse of enterprise social software tools (Richter et al., 2011, p. 16). Consequently, it is assumed that it is easier for organizations that are sensitive to privacy and security issues, to increase employees' willingness to share knowledge through enterprise social software. On the contrary, if an organization fails to establish trust in enterprise social software, it may have difficulties in encouraging employees to use enterprise social software in the future, because they may doubt that enterprise social software sufficiently considers privacy and security issues (Teo et al., 2008, p. 123). The results indicate that **trust in technology is moderated by "age"** at the pre-implementation stage. Especially employees aged $\geq$41 are sensitive to privacy and security issues at the pre-implementation stage. Accordingly, it is recommended to involve these age group at a very early stage when implementing enterprise social software to ensure an understanding of privacy and security issues.

Prior literature indicates that organizations, which identified innovative employees, were more successful in implementing new technologies (Agarwal and Prasad, 1998, p. 204). Therefore, it is assumed that organizations, that are aware of employees' **personal innovativeness**, are more likely to increase employees' willingness to share knowledge through enterprise social software (Steinhüser and Räth, 2010, p. 8; Cervellieri et al., 2011, p. 12). Especially, when they are able to identify innovative employees and are successful in encouraging them to act as ambassadors for enterprise social software. These employees can serve as key change agents and opinion leaders in order to facilitate further diffusion of enterprise social software (Rogers, 2003, p. 242, 279). Moreover, successful acquisitions of innovators may help to achieve a critical mass for enterprise social software and thereby foster its acceptance (Mörl et al., 2011, p. 10). In addition, such ambassadors can help less innovative employees overcome technological barriers (Iriberri and Leroy, 2009, p. 21). Furthermore, they can provide useful feedback to the organization about their enterprise social software experience by highlighting deficiencies or suggesting improvements (Iriberri and Leroy, 2009, p.

21). Hence, identifying opinion leaders can be an effective way to promote adoption (Agarwal and Prasad, 1998, p. 205).

At the post-implementation stage, the use of enterprise social software is influenced by the extent to which employees perceive the software to be free of effort, which refers to **effort expectancy** (Venkatesh et al., 2003, p. 450). Therefore, usability issues should be taken seriously by management. Accordingly, efforts to secure a structured use of enterprise social software, e.g., by using patterns, may be a valuable step in increasing acceptance and use of knowledge sharing through enterprise social software (O'Dell and Grayson, 1998, p. 97; Pinho et al., 2012, p. 225). Templates can be a strategic and operational move for companies, since they help beginners adjust faster to the new software, thus increasing user-friendliness and user-efficiency (Cervellieri et al., 2011, p. 12). The results also demonstrate that **effort expectancy is influenced by "experience"**. According to differences in experience, training for employees with low experience are recommendable (Stieglitz, 2011, p. 12).

At the pre-implementation stage and at the post-implementation stage, **social rewards for knowledge sharing** influence employees' willingness to share knowledge through enterprise social software. Companies can intensify knowledge sharing behavior by recognizing knowledge contributors (Stieglitz, 2011, p. 15). For instance, a competition regarding the "best article of the week" could be introduced or superiors could praise the contributions directly via phone (Riege, 2007, p. 54). Furthermore, an overview of the top articles on enterprise social software can be given, showing how often they have been clicked through (Müller and Stocker, 2012, p. 16). Levels of reputation can be enhanced through a rating system, which is integrated into the enterprise social software (Mörl et al., 2011, p. 7; Steinhüser and Gerz, 2011, p. 9). Another measure is allowing employees to show their appreciation of an outstanding or helpful article by enabling a like-function (e.g. thumbs up, similar to Facebook) (Riege, 2007, p. 56). Consequently, it is assumed that it is easier for organizations that are sensitive to rewarding the contributions of their employees to increase employees' willingness to share knowledge through enterprise social software.

8.3. Limitations and directions for future research

The results of this thesis must be interpreted in the context of its limitations. **First**, the study was conducted in Germany. Therefore, caution must be exercised when generalizing results to other countries, since the results may vary in different countries due to cultural differences (Kankanhalli et al., 2005b, p. 135). **Second**, actual use of the enterprise social software was not measured by objective numbers (e.g., log records) but on basis of self-reported behavior. On the one hand, knowledge management literature and technology acceptance theories have consistently revealed a significant relationship between intentions and behaviors (Ajzen, 1991, p. 205; Madden et al., 1992, p. 8; Venkatesh et al., 2003, p. 468). On the other hand, a research stream exists that states that subjective intentions concerning one's behavior are not necessarily identical with actual behavior (Matschke et al., 2014, p. 556). Even, if this thesis provides evidence that intentions lead to behavior on basis of self-reported answers, including an objective measure of user behavior would enhance the validity of the results (Marler et al., 2009, p. 355). **Third**, all constructs used in this thesis were self-reported. When the data correlate with self-report intention, common method variance could be the result (Podsakoff and Organ, 1986, p. 531). The common method variance was minimized by following the procedures by Podsakoff et al. (2003, p. 889). However, it remains a potential limitation of this research that the data may still contain some common method biases. **Fourth**, the results of this research may be limited, since factors are likely to vary for different forms of knowledge management systems (Kankanhalli, 2002, p. 11), potentially causing employees to be biased in their opinions regarding the usefulness of enterprise social software (Szajna, 1996, p. 90). **Fifth**, employees included in the pre- and post-implementation survey were not all the same. However, assessment of the samples suggested that both samples were representative of the overall population and that the samples did not vary significantly on key variables, thus enhancing the confidence in the results. **Sixth**, a longitudinally designed study would allow for testing the internal validity, by measuring the directions of causality (Agarwal, 2000, p. 102). Accordingly, future research could employ a longitudinal design in order to assess the directions of causality with confidence. **Seventh**, no significant moderation effects have been found for the personal variables: altruism, reciprocity and interpersonal trust. In addition, no significant moderation effects have been found for the organizational variables: organizational identification and monitoring. The moderating effect may have been masked by stronger moderating variables. Therefore, it cannot be concluded that these variables are non-relevant factors, when regarding knowledge sharing through enterprise social software, and should therefore be considered in greater detail in future research. **Eighth**, the predictors explain about 54% of the variance in knowledge sharing intention through enterprise social software at the pre-implementation stage and 61.1% at the post-implementation stage. This suggests that additional factors may be of importance. Therefore, future research could include additional factors to improve the strength of the research model.

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Appendix A. Definitions

A.1. Definitions of knowledge

Source	Definitions	Origin
Platon (based on Fine, 2003, p. 5)	[...] knowledge as "justified true belief".	Philosophy
Kant (1781, p. 823)	Endlich heißt das sowohl subjektiv als objektiv zureichende Fürwahrhalten das Wissen.	Philosophy
Boulding (1956, p. 5-6)	Knowledge has an implication of validity, of truth. What I am talking about is what I believe to be true; my subjective knowledge. It is this image that largely governs my behavior.	Economic sciences
Bell (1976, p. 175)	An organized set of statements of facts or ideas, presenting a reasoned judgment or an experimental result, which is transmitted to others through some communication medium in some systematic form.	Sociology
Dretske (1981, p. 86)	Knowledge is identified with information-produced (or sustained) belief, but the information a person receives is relative to what he or she already knows about the possibilities at the source.	Philosophy
Drucker (1988, p. 46)	Information is data endowed with relevance and purpose. Converting data information thus requires knowledge. And knowledge, by definition, is specialized.	Economic sciences
Davis and Botkin (1994, p. 167)	[...] knowledge [...] [means] the application and productive use of information.	Economic sciences
Nonaka and Takeuchi (1995, p. 58-59)	[I]nformation is a flow of messages, while knowledge is created by that very flow of information, anchored in the beliefs and commitment of its holder. [...] Knowledge is essentially related to human action.	Knowledge management
Cranach (1995, p. 25)	Ich definiere Wissen als aufbewahrte Information, die einen Bezug zu wichtigen Strukturen, Prozessen und Funktionen ihres Trägersystems (in dessen Gedächtnis sie aufbewahrt wird) besitzt und bewertende Prozesse hervorruft (Wissen braucht immer ein System, das es trägt, in dessen Strukturen es verankert ist). [...] Dafür kommen nicht nur Individuen, sondern auch alle Arten von sozialen Systemen in Frage.	Sociology
Kerssens-van Drongelen et al. (1995, p. 2)	[...] knowledge is information internalized by means of research, study or experience, that has value for the organization.	Economic sciences
Hörz (1997, p. 972)	Wissen ist die Gesamtheit aller Gedankengebilde, die die objektive Realität mehr oder weniger richtig widerspiegeln und somit erfolgreiches Handeln ermöglichen.	Philosophy

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Source	Definitions	Origin
Fahey and Prusak (1998, p. 267)	Knowledge therefore must be viewed as originating' between the ears' of individuals. Taken literally, the need for a knower raises profound questions as to whether and how knowledge can exist outside the heads of individuals. Although knowledge can be represented in and often embedded in organizational processes, routines, and networks, and sometimes in document repositories, it cannot truly originate outside the heads of individuals. Nor is it ever complete outside of an individual.	Knowledge management
Davenport and Prusak (1998, p. 5)	Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provide a framework for evaluating and incorporating new experience and information. It originates and is applied in the mind of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices and norms.	Knowledge management
van der Spek and Spijkervet (1997, p. 13)	Knowledge is what enables people to assign meaning to data and thereby generate information.	Knowledge management
Nonaka and Konno (1998, p. 41)	Knowledge, however, is intangible, boundaryless, and dynamic, and if it is not used at a specific time in a specific place, it is of no value.	Knowledge management
Wendt (1998, p. 14)	Wissen wird intern in kognitiven Prozessen ausgemacht, indem immer schon vorhandenes Wissen mit den Informationen interagiert, diese unter Begriffe in eine schlüssige Form bringt und mit Vorstellungen verbindet, wobei neue Auffassungen entstehen und alte Auffassungen verändert werden.	Social sciences
von Krogh et al. (2000, p. 7)	Dynamic, relational, and based on human action; it depends on the situation and people involved rather than on absolute truth or hard facts.	Economic sciences
Alavi and Leidner (2001, p. 109)	We posit that information is converted into knowledge once it is processed in the minds of individuals and knowledge becomes information once it is articulated and presented in the form of text, graphics, words, or other symbolic forms.	Knowledge management
Burton-Jones (2001, p. 5)	Knowledge is defined as the cumulative stock of information and skills derived from use of information by the recipient. [...] Knowledge thus reflects the processing (thinking or cognition) by the brain of the "raw material" supplied in the form of information.	Information management
Schick (2002, p. 441)	Wissen ist ein kognitiv-mentales Phänomen. Es ist das Ergebnis von Denk- und Erkenntnisleistungen des menschlichen Gehirns. Wissen ist aber nicht nur durch Semantik (Inhalt, Repräsentation), sondern auch durch Syntaktik (Verknüpfung, systematischer Zusammenhang) und Pragmatik (situativer Kontext, Zweck, Träger) bestimmt, deren Faktoren miteinander in Wechselwirkung stehen.	Communication science
Maier et al. (2005, p. 19)	Knowledge comprises all cognitive expectancies that an individual or organizational actor uses to interpret situations and to generate activities, behavior and solutions no matter whether these expectancies are rational or used intentionally. Cognitive expectancies are observations that have been meanfully organized, accumulated and embedded in a context through experience, communication, or inference.	Knowledge management

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Source	Definitions	Origin
Probst et al. (2012, p. 23)	Wissen bezeichnet die Gesamtheit der Kenntnisse und Fähigkeiten, die Individuen zur Lösung von Problemen einsetzen. Dies umfasst sowohl theoretische Erkenntnisse als auch praktische Alltagsregeln und Handlungsanweisungen. Wissen stützt sich auf Daten und Informationen, ist im Gegensatz zu diesen jedoch immer an Personen gebunden. Es wird von Individuen konstruiert und repräsentiert deren Erwartungen über Ursache-Wirkungs-Zusammenhänge.	Economic sciences

Table A.1. – Definitions of knowledge.
Source: Based on Amelingmeyer (2004, p. 41-42).

A.2. Definitions of knowledge management

Source	Definition
Huysman and de Wit (2004)	Knowledge management is about the support of knowledge sharing.
Laudon and Laudon (1999)	KM is the process of systematically and actively managing and leveraging the stores of knowledge in an organization.
Beijerse (1999)	KM is achieving organizational goals through the strategy-driven motivation and facilitation of knowledge workers to develop, enhance and use their capability to interpret data and information (by using available sources of information, experience, skills, culture, character, personality, feelings, etc.) through a process of giving meaning to these data and information.
Beckman (1999)	KM is the formalization of and access to experience, knowledge and expertise to create new capabilities, enable superior performance, encourage innovation, and enhance customer value.
Snowden (1998)	KM can be defined as the identification, optimization and active management of intellectual assets, either in the form of explicit knowledge held in artefacts or as tacit knowledge possessed by individuals or communities.
Davenport et al. (1998)	[...] attempt to do something useful with knowledge, to accomplish organizational objectives through the structuring of people, technology and knowledge content.
Wiig (1998)	KM is the systematic, explicit and deliberate building, renewal and application of knowledge to maximize an enterprise's knowledge-related effectiveness and returns on its knowledge assets and to renew them constantly.
Malhotra (1998)	KM caters to the critical issues of organizational adaptation, survival and competence in face of increasingly discontinuous environmental change. Essentially it embodies organizational processes that seek synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings.
O'Dell (1997)	KM applies systematic approaches to find, understand and use knowledge to create value.
Frappaulo and Toms (1997)	KM is a tool set for the automation of deductive or inherent relationships between information objects, users and processes.
van der Spek and Spijkervet (1997)	KM is the explicit control and management of knowledge within an organization aimed at achieving the company's objectives.
Bassi (1997)	KM is the process of creating, capturing and using knowledge to enhance organizational performance. KM is most frequently associated with two types of activities. One is to document and appropriate individuals' knowledge and then disseminate it through such venues as a company-wide database. KM also includes activities that facilitate human exchanges using such tools as groupware, email and the internet.
Hibbard (1997)	KM is the process of capturing a company's collective expertise wherever it resides - in databases, on paper, or in people's heads - and distributing it to wherever it can help to produce the biggest payoff.
Taylor (1997)	Powerful environmental forces are reshaping the world of the manager of the 21st century. These forces call for a fundamental shift in organization process and human resource strategy. This is Knowledge Management.
Quintas et al. (1997)	KM is the process of critically managing knowledge to meet existing needs, to identify and exploit existing and acquired knowledge assets and to develop new opportunities.
Brooking (1997)	KM is the activity which is concerned with strategy and tactics to manage human centred assets.
De Jarnet (1996)	KM is [...] knowledge creation, which is followed by knowledge interpretation, knowledge dissemination and use, and knowledge retention and refinement.
Petrash (1996)	KM is getting the right knowledge to the right people at the right time so that they can make the best decision.
Macintosh (1996)	KM involves the identification and analysis of available and required knowledge, and the subsequent planning and control of actions to develop knowledge assets so as to fulfill organizational objectives.

Table A.2. – Definitions of knowledge management.
Source: Hlupic et al. (2002, p. 93).

Appendix B. Interview analysis

Company A			
Factor	#Statements	#Interviewees	Percentage
Knowledge sharing norms	30	7	100,0%
Management support	30	7	100,0%
Performance expectancy	28	7	100,0%
Trust in technology	22	6	85,7%
Facilitating conditions	15	6	85,7%
Economic rewards for knowledge sharing	9	7	100,0%
Personal innovativeness	9	6	85,7%
Altruism	6	3	42,9%
Social rewards for knowledge sharing	6	5	71,4%
Effort expectancy	6	5	71,4%
Interpersonal trust	5	4	57,1%
Age	4	4	57,1%
Monitoring	4	3	42,9%
Experience	3	2	28,6%
Reciprocity	3	3	42,9%
Organizational identification	2	1	14,3%
Self-efficacy	2	2	28,6%

Table B.1. – Influencing factors in company A.
Source: Own table.

Company B			
Factor	**#Statements**	**#Interviewees**	**Percentage**
Performance expectancy			
	55	7	100,0%
Knowledge sharing norms			
	33	7	100,0%
Management support			
	31	7	100,0%
Trust in technology			
	17	5	71,4%
Effort expectancy			
	13	7	100,0%
Facilitating conditions			
	12	5	71,4%
Personal innovativeness			
	10	7	100,0%
Economic rewards for knowledge sharing			
	8	7	100,0%
Social rewards for knowledge sharing			
	7	7	100,0%
Age			
	4	4	57,1%
Experience			
	4	3	42,9%
Organizational identification			
	4	4	57,1%
Reciprocity			
	4	4	57,1%
Self-efficacy			
	4	4	57,1%
Interpersonal trust			
	4	4	57,1%
Altruism			
	3	3	42,9%
Monitoring			
	1	1	14,3%

Table B.2. – Influencing factors in company B.
Source: Own table.

	Summary: Company A and B			
	Factor	#Statements	#Interviewees	Percentage
1	Performance expectancy	83	14	100,0%
2	Knowledge sharing norms	63	14	100,0%
3	Management support	61	14	100,0%
4	Trust in technology	39	11	78,6%
5	Facilitating conditions	27	11	78,6%
6	Personal innovativeness	19	13	92,9%
7	Effort expectancy	19	12	85,7%
8	Economic rewards for knowledge sharing	17	14	100,0%
9	Social rewards for knowledge sharing	13	12	85,7%
10	Altruism	9	6	42,9%
11	Interpersonal trust	9	8	57,1%
12	Age	8	8	57,1%
13	Experience	7	5	35,7%
14	Reciprocity	7	7	50,0%
15	Organizational identification	6	5	35,7%
16	Self-efficacy	6	6	42,9%
17	Monitoring	5	4	28,6%

Table B.3. – Influencing factors in company A and B.
Source: Own table.

Summary				Company B				Company A			
	#Statements	#Interviewees	Percentage		#Statements	#Interviewees	Percentage		#Statements	#Interviewees	Percentage
Desperate search for information	25	11	78,6%	**Desperate search for information**	15	5	71,4%	**Desperate search for information**	10	6	85,7%
Poor usability	16	10	71,4%	**Poor usability**	12	7	100,0%	**Lack of networking**	9	6	85,7%
Lack of networking	15	10	71,4%	**Parallel systems**	10	5	71,4%	**Flood of E-Mails**	6	3	42,9%
Flood of E-Mails	13	7	50,0%	**Missing tools**	8	4	57,1%	**Poor usability**	4	3	42,9%
Parallel systems	11	6	42,9%	**Flood of E-Mails**	7	4	57,1%	**Missing tools**	1	1	14,3%
Missing tools	9	5	35,7%	**Lack of networking**	6	4	57,1%	**Parallel systems**	1	1	14,3%

Table B.4. – Problems of the companies current knowledge management systems.
Source: Own table.

Appendix C. Quantitative analysis

C.1. Translation of the German items

Factor	Label	Indicator (PRE)	Indicator (POST)
Effort expectancy	Ee_1	I think that organizational social media would be easy to use.	I find organizational social media easy to use.
	Ee_2	I think it would be easy to learn how to use organizational social media.	It is easy to learn how to use organizational social media.
	Ee_3	I think that it would be easy to become skillful in using organizational social media.	It is easy to become skillful in using organizational social media.

Table C.1. – Operationalization of effort expectancy (translated).
Source: Own table.

Factor	Label	Indicator (PRE)	Indicator (POST)
Performance expectancy	Pe_1	I think that using organizational social media would improve my performance in my job.	Using organizational social media improves my performance in my job.
	Pe_2	I think that using organizational social media in the organization would increase my productivity.	Using organizational social media increases my productivity.
	Pe_3	I think that using organizational social media would help me accomplish tasks more quickly.	Using organizational social media helps me accomplish tasks more quickly.
	Pe_4	I think that organizational social media would be useful in my job.	Using organizational social media is useful in my job.

Table C.2. – Operationalization of performance expectancy (translated).
Source: Own table.

Factor	Label	Indicator (PRE)	Indicator (POST)
Facilitating conditions	Cond_1	It would be important, that my organization provides guidance (e.g., code of conduct) on how to work with organizational social media.	My organization provides guidance (e.g., code of conduct) on how to work with organizational social media.
	Cond_2	It would be important, that my organization gives the necessary support (e.g., hand books, use cases) to work with organizational social media.	My organization gives the necessary support (e.g., hand books, use cases) to work with organizational social media.
	Cond_3	It would be important, that my organization gives the necessary assistance (e.g., help desk, contact person, ambassador, training) to work with organizational social media.	My organization gives the necessary assistance (e.g., help desk, contact person, ambassador, training) to work with organizational social media.

Table C.3. – Operationalization of facilitating conditions (translated).
Source: Own table.

Factor	Label	Indicator (PRE)	Indicator (POST)
Trust in technology	TrustT_1	Organizational social media has enough safeguards that would protect my personal data from misuse (Data protection).	Organizational social media has enough safeguards to protect my personal data from misuse (Data protection).
	TrustT_2	I feel confident that I would have control over my digital identity in organizational social media, i.e. I could add and oversee new data and regulate the access to it.	I have control over my digital identity in organizational social media, i.e. I can add and oversee new data and regulate the access to it.
	TrustT_3	In general, I feel confident that organizational social media would be a safe environment for business transactions.	In general, organizational social media is a safe environment for business transactions.

Table C.4. – Operationalization of trust in technology (translated).
Source: Own table.

Factor	Label	Indicator (PRE & POST)
Personal innovativeness	Innov_1	I like to experiment with new information technologies.
	Innov_2	In my private environment, I am usually the first who tries out new information technologies.
	Innov_3	I regularly inform myself about new technologies.

Table C.5. – Operationalization of personal innovativeness (translated).
Source: Own table.

Factor	Label	Indicator (PRE & POST)
Social rewards	SocRew_1	Sharing my knowledge in the organization improves my image.
	SocRew_2	Sharing my knowledge with other employees improves my reputation.
	SocRew_3	I am respected by other employees for my knowledge sharing.

Table C.6. – Operationalization of social rewards for knowledge sharing (translated).
Source: Own table.

Factor	Label	Indicator (PRE & POST)
Economic rewards	EcoRew_1	It is important that employees get more job security for their knowledge sharing.
	EcoRew_2	It is important that employees get a higher salary for their knowledge sharing.
	EcoRew_3	It is important that employees get a bonus for their knowledge sharing.

Table C.7. – Operationalization of economic rewards for knowledge sharing (translated).
Source: Own table.

Factor	Label	Indicator (PRE)	Indicator (POST)
Knowledge sharing attitude through enterprise social software	Att_1	I find that knowledge sharing with other employees through organizational social media would be good.	I find knowledge sharing with other employees through organizational social media good.
	Att_2	I find that knowledge sharing with other employees through organizational social media would be beneficial.	I find knowledge sharing with other employees through organizational social media beneficial.
	Att_3	I find that knowledge sharing with other employees through organizational social media would be wise.	I find knowledge sharing with other employees through organizational social media wise.

Table C.8. – Operationalization of knowledge sharing attitude through enterprise social software (translated).
Source: Own table.

Factor	Label	Indicator (PRE)	Indicator (POST)
Knowledge sharing intention through enterprise social software	Int_1	Given the opportunity, I would always make an effort to share my knowledge with other employees through organizational social media.	I will always make an effort to share my knowledge with other employees through organizational social media.
	Int_2	Given the opportunity, I would try to share my knowledge with other employees through organizational social media.	I will try to share my knowledge with other employees through organizational social media.
	Int_3	Given the opportunity, I would share my knowledge with other employees through organizational social media in the future.	I intend to share my knowledge with other employees through organizational social media in the future.

Table C.9. – Operationalization of knowledge sharing intention through enterprise social software (translated).
Source: Own table.

Factor	Label	Indicator (PRE & POST)
Interpersonal trust	Trust_1	I am convinced that most people have good intentions.
	Trust_2	In general, people can be trusted.
	Trust_3	I can rely on others.

Table C.10. – Operationalization of interpersonal trust (translated).
Source: Own table.

Factor	Label	Indicator (PRE & POST)
Self-efficacy	Selfe_1	I can rely on my own abilities in difficult situations.
	Selfe_2	I am able to solve most problems on my own.
	Selfe_3	I can usually solve even challenging and complex tasks well.
	Selfe_4	I can always manage to solve difficult problems if I try hard enough.

Table C.11. – Operationalization of self-efficacy (translated).
Source: Own table.

Factor	Label	Indicator (PRE & POST)
Altruism	Altr_1	I anticipate the needs of others.
	Altr_2	I have a good word for everyone.
	Altr_3	I am concerned about others.
	Altr_4	I make others feel welcome.

Table C.12. – Operationalization of altruism (translated).
Source: Own table.

Factor	Label	Indicator (PRE & POST)
Reciprocity	Rec_1r	If somebody offends me, I will offend him/her back.
	Rec_2r	If I suffer a serious wrong, I will take revenge as soon as possible, no matter what the cost.
	Rec_3r	If somebody puts me in a difficult position, I will do the same to him/her.

Table C.13. – Operationalization of reciprocity (r=reverse coded item) (translated).
Source: Own table.

Factor	Label	Indicator (PRE & POST)
Management support	Ms_1	Management is aware of the importance of knowledge sharing in the organization.
	Ms_2	Management encourages employees to share their knowledge in the organization.
	Ms_3	Management provides the necessary resources to enable employees to share knowledge (e.g., technical equipment, personnel support, time) in the organization.
	Ms_4	Management speaks out positively towards knowledge sharing in the organization.

Table C.14. – Operationalization of management support (translated).
Source: Own table.

Factor	Label	Indicator (PRE & POST)
Knowledge sharing norms	Ksn_1	Cooperation is of great importance in my organization.
	Ksn_2	Learning from mistakes is of great importance in my organization.
	Ksn_3	Employees' diversity (e.g., team membership, values, individual experiences, individual skills) is of great importance in my organization.
	Ksn_4	Openness to conflicting views is of great importance in my organization.

Table C.15. – Operationalization of knowledge sharing norms (translated).
Source: Own table.

Factor	Label	Indicator (PRE & POST)
Organizational identification	Ident_1	I feel a strong sense of belonging to my organization.
	Ident_2	I feel like being part of the family in my organization.
	Ident_3	My organization has a great personal meaning for me.
	Ident_4	I am glad to work for my organization.

Table C.16. – Operationalization of organizational identification (translated).
Source: Own table.

Factor	Label	Indicator (PRE)	Indicator (POST)
Monitoring	Moni_1	I assume that management would analyze the use of organizational social media.	I assume that management analyzes the use of organizational social media.
	Moni_2	I assume that management would evaluate the use of organizational social media.	I assume that management evaluates the use of organizational social media.
	Moni_3	I assume that management would control the use of organizational social media.	I assume that management controls the use of organizational social media.

Table C.17. – Operationalization of monitoring (translated).
Source: Own table.

Factor	Label	Indicator (POST)
Knowledge sharing behavior through enterprise social software	Beh_1	I regularly use organizational social media to share knowledge with other employees.
	Beh_2	I frequently share knowledge through organizational social media with other employees.
	Beh_3	I spend a lot of time conducting knowledge sharing with other employees through organizational social media.
	Beh_4	I share knowledge from my work experiences with other employees through organizational social media.

Table C.18. – Operationalization of knowledge sharing behavior through enterprise social software (translated).
Source: Own table.

C.2. Statistics

Dependent variable	Independent variable	VIF
Effort expectancy	Performance expectancy	1.495
	Facilitating conditions	1.264
	Trust in technology	1.339
	Personal innovativeness	1.088
	Social rewards	1.224
	Economic rewards	1.204
Performance expectancy	Effort expectancy	1.423
	Facilitating conditions	1.238
	Trust in technology	1.323
	Personal innovativeness	1.082
	Social rewards	1.220
	Economic rewards	1.204
Facilitating conditions	Effort expectancy	1.700
	Performance expectancy	1.748
	Trust in technology	1.382
	Personal innovativeness	1.087
	Social rewards	1.213
	Economic rewards	1.174
Trust in technology	Effort expectancy	1.693
	Performance expectancy	1.757
	Facilitating conditions	1.299
	Personal innovativeness	1.086
	Social rewards	1.200
	Economic rewards	1.204
Personal innovativeness	Effort expectancy	1.749
	Performance expectancy	1.826
	Facilitating conditions	1.299
	Trust in technology	1.381
	Social rewards	1.220
	Economic rewards	1.163
Social rewards	Effort expectancy	1.831
	Performance expectancy	1.749
	Facilitating conditions	1.289
	Trust in technology	1.356
	Personal innovativeness	1.085
	Economic rewards	1.063
Economic rewards	Effort expectancy	1.757
	Performance expectancy	1.844
	Facilitating conditions	1.274
	Trust in technology	1.390
	Personal innovativeness	1.057
	Social rewards	1.085

Table C.19. – Collinearity statistics.
Source: Own table.

	PE	IDENT	EE	TRUSTT	INT	MS	MONI	KSN	INNOV	ALT	COND	SELFE	SOC	ECO	ATT	REC	TRUST
PE	1.000	.266	.573	.426	.589	.068	.006	.170	.153	.085	.362	.040	.164	.134	.656	.011	.124
IDENT	.266	1.000	.275	.242	.277	.423	-.063	.538	.115	.160	.213	.123	.294	.012	.241	.112	.212
EE	.573	.275	1.000	.415	.388	.165	.019	.243	.154	.153	.351	.134	.172	.103	.451	.032	.114
TRUST	.426	.242	.415	1.000	.447	.221	-.068	.237	.148	.167	.248	.114	.203	.090	.441	.013	.175
INT	.589	.277	.388	.447	1.000	.183	.026	.254	.243	.197	.311	.094	.220	.133	.671	.079	.138
MS	.068	.423	.165	.221	.183	1.000	-.102	.551	-.029	.170	.143	.010	.311	-.018	.129	.085	.213
MONI	.006	-.063	.019	-.068	.026	-.102	1.000	-.082	.045	.058	.302	.013	-.083	.131	-.011	.046	-.034
KSN	.170	.538	.243	.237	.254	.551	-.082	1.000	.096	.198	.114	.081	.407	.045	.184	.131	.183
INNOV	.153	.115	.154	.148	.243	-.029	.045	.096	1.000	.115	.100	.288	.081	.024	.172	.066	.103
ALT	.085	.160	.153	.167	.197	.170	.058	.198	.115	1.000	.097	.311	.244	.191	.157	.247	.198
COND	.362	.213	.351	.248	.311	.143	.302	.114	.100	.097	1.000	.048	.090	.042	.327	.073	.078
SELFE	.040	.123	.134	.114	.094	.010	.013	.081	.288	.311	.048	1.000	.185	.025	.070	.030	.113
SOC	.164	.294	.172	.203	.220	.311	-.083	.407	.081	.244	.090	.185	1.000	.144	.247	.079	.256
ECO	.134	.012	.103	.090	.133	-.018	.131	.045	.024	.191	.042	.025	.144	1.000	.096	-.114	-.070
ATT	.656	.241	.451	.441	.671	.129	-.011	.184	.172	.157	.327	.070	.247	.096	1.000	.027	.138
REC	.011	.112	.032	.013	.079	.085	.046	.131	.066	.247	.073	.030	.079	-.114	.027	1.000	.280
TRUSTT	.124	.212	.114	.175	.138	.213	-.034	.183	.103	.198	.078	.113	.256	-.070	.138	.280	1.000

Table C.20. – Correlation matrix.
Source: Own table.

	REC	ATT	PE	IDENT	EE	MS	TRUSTT	MONI	KSN	INNOV	ALT	SELFE	COND	SOC	INT	ECO	TRUST
REC	0.774																
ATT	0.024	0.939															
PE	0.006	0.704	0.922														
IDENT	0.111	0.250	0.277	0.850													
EE	0.024	0.480	0.590	0.277	0.931												
MS	0.080	0.130	0.074	0.431	0.160	0.745											
TRUSTT	0.011	0.455	0.434	0.243	0.417	0.223	0.887										
MONI	0.051	-0.007	-0.002	-0.052	0.018	-0.090	-0.066	0.879									
KSN	0.133	0.191	0.184	0.554	0.243	0.569	0.240	-0.063	0.741								
INNOV	0.057	0.184	0.160	0.112	0.156	-0.039	0.152	0.048	0.096	0.849							
ALT	0.258	0.160	0.086	0.166	0.153	0.177	0.166	0.062	0.205	0.122	0.717						
SELFE	0.029	0.072	0.044	0.121	0.134	0.010	0.121	0.021	0.080	0.286	0.325	0.708					
COND	0.069	0.337	0.360	0.211	0.347	0.144	0.245	0.302	0.120	0.092	0.101	0.044	0.815				
SOC	0.070	0.238	0.163	0.280	0.164	0.297	0.210	-0.063	0.403	0.085	0.251	0.193	0.091	0.803			
INT	0.082	0.706	0.618	0.280	0.406	0.182	0.457	0.031	0.252	0.252	0.199	0.097	0.316	0.212	0.930		
ECO	-0.102	0.095	0.131	0.014	0.103	-0.020	0.091	0.120	0.029	0.029	0.187	0.029	0.030	0.140	0.121	0.776	
TRUST	0.272	0.144	0.130	0.222	0.116	0.214	0.187	-0.027	0.191	0.107	0.225	0.120	0.075	0.256	0.144	-0.068	0.684

Table C.21. – Fornell and Larcker's (1981) discriminant validity criterion.
Source: Own table.

			Pre-implementation		Post-implementation		
			Estimate	**P**	**Estimate**	**P**	**z-score**
Att_2	<—	ATT	1.028	0.000	1.035	0.000	0.230
Att_1	<—	ATT	0.992	0.000	1.005	0.000	0.404
Pe_3	<—	PE	0.975	0.000	1.022	0.000	1.325
Pe_1	<—	PE	0.957	0.000	1.011	0.000	1.574
Pe_4	<—	PE	0.952	0.000	1.019	0.000	1.74*
Ident_1	<—	IDENT	0.981	0.000	1.060	0.000	1.404
Ident_2	<—	IDENT	1.107	0.000	1.121	0.000	0.228
Ident_4	<—	IDENT	0.908	0.000	0.940	0.000	0.557
Ee_1	<—	EE	1.015	0.000	1.009	0.000	-0.174
Ee_2	<—	EE	0.847	0.000	0.976	0.000	3.924***
Ms_1	<—	MS	0.875	0.000	0.935	0.000	0.849
Ms_3	<—	MS	0.896	0.000	1.045	0.000	1.873*
Ms_4	<—	MS	0.781	0.000	1.029	0.000	3.176***
TrustT_2	<—	TRUSTT	1.000	0.000	0.849	0.000	-3.317***
TrustT_1	<—	TRUSTT	0.968	0.000	1.004	0.000	0.800
Moni_1	<—	MONI	0.969	0.000	0.980	0.000	0.277
Moni_3	<—	MONI	0.914	0.000	0.853	0.000	-1.231
Ksn_2	<—	KSN	0.929	0.000	1.098	0.000	2.018**
Ksn_1	<—	KSN	0.734	0.000	0.845	0.000	1.627
Ksn_4	<—	KSN	0.812	0.000	1.044	0.000	3.024***
Innov_3	<—	INNOV	0.979	0.000	0.964	0.000	-0.267
Innov_1	<—	INNOV	0.856	0.000	0.922	0.000	1.230
Altr_4	<—	ALT	1.115	0.000	0.970	0.000	-1.648
Altr_3	<—	ALT	0.943	0.000	0.822	0.000	-1.460
Altr_2	<—	ALT	1.045	0.000	0.929	0.000	-1.207
Selfe_2	<—	SELFE	0.899	0.000	0.833	0.000	-0.831
Selfe_4	<—	SELFE	0.930	0.000	0.881	0.000	-0.567
Selfe_1	<—	SELFE	0.833	0.000	0.752	0.000	-1.112
Cond_3	<—	COND	0.842	0.000	0.858	0.000	0.259
Cond_1	<—	COND	0.709	0.000	0.883	0.000	2.688***
SocRew_3	<—	SOCREW	0.814	0.000	0.879	0.000	1.148
SocRew_1	<—	SOCREW	0.835	0.000	0.829	0.000	-0.092
Int_1	<—	INT	1.040	0.000	0.990	0.000	-1.442
Int_2	<—	INT	1.024	0.000	0.957	0.000	-2.157**
EcoRew_3	<—	ECOREW	1.039	0.000	1.085	0.000	0.572
EcoRew_1	<—	ECOREW	0.666	0.000	0.792	0.000	1.868*
Rec_2_r	<—	REC	1.082	0.000	0.978	0.000	-1.305
Rec_1_r	<—	REC	0.892	0.000	0.734	0.000	-2.046**
Trust_1	<—	TRUST	0.894	0.000	0.871	0.000	-0.228
Trust_3	<—	TRUST	0.858	0.000	0.559	0.000	-3.368***

Legend: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Table C.22. – Invariance test for the pre-implementation stage and post-implementation stage.
Source: Own table.