Groupware Adoption:  
The Role of Groupware Potency and Social Influences

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in partial fulfilment of the requirements for the degree of

Master of Science
in Innovation Management

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Subject headings: Groupware, Technology adoption
Abstract

This thesis analyzes the role of groupware potency (i.e. the group confidence belief that a group can effectively work together using a groupware technology) and different types of social influences in the groupware adoption process. A conceptual model is proposed that investigates the impact of groupware potency and social influences on technology perceptions and feature usage behavior. Empirical evidence supports the notion that in addition to groupware potency, social influences from peer colleagues and customers play an important role in groupware adoption, while social influences that originate from supervisors or competitors do not have a significant impact on groupware adoption.
Preface

This master thesis is the result of my graduation project which I have conducted at Capgemini Netherlands. The graduation project is the concluding part of the master program ‘Innovation Management’ which I have followed at Eindhoven University of Technology (TU/e). Capgemini provided me with the opportunity to investigate the role of social influences and groupware potency in the groupware adoption process.

I would like to use this preface to thank all people who have helped me conducting this master thesis project, which has not always been easy, so every help I received was greatly appreciated. First of all, I would like to thank my supervisors of the TU/e and Capgemini Netherlands. Both Dr. de Jong and Prof. Nijssen have helped me tremendously by providing me with supportive criticism during the complete duration of the project. Dr. Jeroen Schepers of the TU/e was readily available to help me out on a very short notice for which I would like to thank him very much. Also, I would like to thank Freek Duppen and Koen Klokgieters of Capgemini Netherlands, for both giving me the opportunity to conduct my thesis at Capgemini and providing me with well appreciated feedback. Furthermore, I would like to thank my colleagues of the Business Innovation team at Capgemini for the warm welcome and the feedback I received when piloting my online survey instrument. Several fellow students have also provided me with supportive feedback regarding the online survey instrument, for which I am very grateful. Without the help of the 19 TeamRoom managers who provided me with a total of 400 potential participants for the online survey instrument, I would not have been able to empirically validate the conceptual model in this thesis: many thanks! Although he has been awarded an Apple iPod touch for his effort, a special thanks goes to Richard Langerak, who provided me a list with a total of 75 Capgemini employees who I could invite to participate in the online survey. Finally, I would like to thank my girlfriend Annemieke Timmerman for reviewing the final version of my master thesis.

Enjoy taking in the knowledge of this master thesis!

Jeroen Klooster
Utrecht, September 2008
Management summary

Groupware, which is a broad term for software that supports groups working together, has been widely implemented in many organizations. Groupware technologies provide great potential for streamlining business processes by facilitating knowledge management and virtual teams. While many organizations have implemented different types of groupware such as email, instant messaging, and team collaboration platforms, email is actually one of the very few examples that have been successfully adopted by the business community. Thus, while many organizations implement groupware technologies and make them available to their employees, this does not necessarily mean that these employees will embrace the technology and start using it right away. Many companies therefore struggle to reap the benefits of groupware technologies.

One of the companies that experiences this struggle is Capgemini. Capgemini has multiple incentives to research this process. First of all, Capgemini has a number of internal groupware applications that are not adopted successfully by its employees. Hence, this provides an opportunity for Capgemini to streamline their collaboration processes. Furthermore, Capgemini is a consulting company that helps companies improve their business processes. Many of these organizations have difficulties in reaping the benefits of groupware technologies, which provides an opportunity for Capgemini to assist their clients in guiding their groupware adoption process.

Hence, this thesis focuses on the groupware adoption process. As groupware technologies are a specific type of social software, the research presented here will take a number of social constructs into account in order to create a more comprehensive understanding of the drivers of groupware adoption. More specifically, this research will disentangle the concept of subjective norm, which has received considerable attention in previous research and refers to the degree to which users think that important others think they should use a certain technology. This research will divide these important others into separate categories, i.e. team peers, supervisors, competitor’s employees and customers. Thus, this research identifies four sources of social influence that are likely to play a role in the groupware adoption process: peer usage, supervisor influence, competitive pressure, and customer influence.

Furthermore, this thesis also considers groupware potency as a driver in the groupware adoption process. Groupware potency is defined as the perception shared by team members of their ability to work together using a groupware technology. This is a collective confidence belief that is expected to play an important role in groupware adoption. Thus, this thesis will focus on the following research question.

What is the role of groupware potency and social influences in the adoption behavior of groupware technologies?

In order to answer this question, several existing theories of technology adoption were considered first. Eventually, the technology acceptance model (TAM) was chosen as the
starting point for this research as it has been proven to be a robust theory across persons, settings and times in various empirical studies. Furthermore, TAM was developed to explain information technology acceptance and groupware technology is a more specific type of information technology, which makes TAM an appropriate theory for groupware. TAM theory argues that perceived usefulness and perceived ease of use are the key determinants of the usage behavior of information technology. Perceived usefulness refers to the degree to which a person believes that using a particular system would enhance his or her job performance, while perceived ease of use refers to the degree to which a person believes that using a particular system would be free from effort. An extension of the TAM model includes perceived enjoyment as a determinant of usage behavior as well. This research also will consider this construct as it is interesting to determine whether feelings of enjoyment also play a role in technology acceptance in a work setting.

After the selection of TAM as a starting point for the conceptual model, the model was extended with the concept of groupware potency and the four different types of social influences that are already mentioned before. Furthermore, in order to add to the already extensive literature on technology acceptance, a distinction between the usage of standard (frequently used) features and non-standard (less frequently used) features was conceptualized in the model.

In order to test the conceptual model, an online survey methodology was used for data collection. The survey scales were based on existing scales from previous research. The groupware technology that was the subject of this research was the variety of internal TeamRoom applications that are used within Capgemini to support teams working on projects. A total of 184 Capgemini employees filled out the survey, yielding a response rate of 46%. The software program SmartPLS was used to estimate the different relationships in the model. The research results are presented in an overview in Figure 1 on the next page.

The research results indicated that peer usage and customer influence were the main determinants of groupware potency. Groupware potency had a significant impact on all technology perceptions, i.e. perceived usefulness, perceived ease of use, and perceived enjoyment. Furthermore, perceived usefulness had a positive effect on standard usage, while perceived enjoyment had a positive effect on non-standard usage. Perceived ease of use was found to affect perceived usefulness and an perceived enjoyment, but did not showed any significant effect on standard or non-standard usage. The research results also showed that the social influence of supervisors and competitor’s employees do not play any important role in the groupware adoption process.

Additional data analysis beyond the relations in the conceptual model showed that peer usage also had a direct effect on standard usage, while customer influence had a significant impact on perceived usefulness, perceived ease of use, perceived enjoyment, and non-standard use. Groupware potency also had a direct impact on non-standard usage. Again, supervisor influence and competitive pressure did not show any significant relationships.
Figure 1: Overview of research results

*Significant relationship at p<0.01 level, also represented by bold arrow
The research contributes to the current body of literature in many ways. First of all, it introduces the concept of groupware potency, which allows this concept to be researched more frequently in future research in a broader range of groupware technologies. Furthermore, this thesis extends previous research into a broader groupware context by providing additional empirical evidence for the relationships between social influences and groupware potency. Also, the concept of subjective norm has been divided into four different kinds of social influences, namely peer usage, supervisor influence, competitive pressure, and customer influence. This research adds to the current body of literature by providing empirical evidence for the notion that these social influences play different roles in the groupware adoption process. Additionally, this thesis explores new consequences of groupware potency. The technology perceptions of perceived usefulness, perceived ease of use, and perceived enjoyment are all positively affected by groupware potency. Furthermore, empirical evidence is provided for supporting the impact of perceived ease of use on both perceived usefulness and perceived enjoyment in an organizational groupware context. Finally, this research identifies two distinctive sets of features in groupware technology, one standard set that is frequently used and one non-standard set that is less frequently used. Users who are more extrinsically motivated tend to use standard features, while intrinsic motivation causes users to use non-standard features.

For Capgemini, these findings yield some useful managerial implications. First of all, as peer usage and customer influence are important drivers in the groupware adoption process, employees should be made aware of these social influences so that groupware potency is increased, thereby generating positive perceptions of the groupware technology amongst Capgemini employees. Furthermore, in training programs and advertising, standard features should be emphasized as being useful, while non-standard features should be emphasized as being very enjoyable. Finally, Capgemini could translate the insights from this thesis into a service offering that allows Capgemini to guide the groupware adoption processes of client companies.
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Introduction

In many organizations, groupware technologies such as e-mail, bulletin boards and group support systems have become an important part of the business computing infrastructure (Chen & Lou, 2002; Dennis & Garfield, 2003). As its name indicates, groupware is a broad term for software and tools that are intended to improve group performance, which is achieved by enhancing communication and collaboration among group members. Traditional communication technologies such as telephony are considered to be groupware, but the term is commonly used to refer to a specific class of technologies that are based on modern computer networks (Van Slyke, Lou, & Day, 2002).

The constant pressure to create synergies in the resources under their control has led organizations to implement teams and knowledge management in order to increase value (Griffith, Sawyer, & Neale, 2003). In general, groupware can improve market share, revenue and profitability by streamlining the business process and facilitating better management of complex processes (Rugullies, Moore, Herrell, & Fossner, 2004). Collaborative efforts can be made much more effective and efficient if supported by groupware (De Vreede & Guerrero, 2006). Corporate executives recognize the potential of groupware technologies and have put considerable effort into implementing these technologies (Rugullies, Moore, Herrell, & Fossner, 2004). In spite of this considerable effort, organizations struggle to reap the benefits of groupware technologies (Bansler & Havn, 2006). Some groupware technologies are commonly accepted throughout a wide range of organizations, where email is obviously the best example. However, other groupware applications are far from being commonly accepted (De Vreede & Guerrero, 2006), while laboratory research and many field studies have shown the positive impact of these technologies on group productivity (Nunamaker, 1997).

The current body of literature has not yet considered the role of groupware potency (i.e. the shared belief that a team is capable of working together using groupware) in a groupware adoption context. This relatively new construct is likely to have quite an impact on the groupware adoption process, since shared confidence beliefs are likely to influence individual beliefs (Yoo, 1998), thereby influencing individual behavior. Furthermore, while social influences have been considered in a technology adoption context (see Schepers & Wetzels, 2007 for an overview), this thesis will consider a wider range of social influences in the groupware adoption process, since social influences seem especially important for social software like groupware. Thus, this thesis will focus on the role of groupware potency and social influences in groupware adoption.

One of the companies that struggle with the aforementioned issues of groupware adoption is Capgemini. Capgemini Netherlands therefore assigned me the grateful task of conducting a master thesis research on groupware adoption. For Capgemini as a consulting company, there is another incentive to conduct a research on groupware adoption. Many clients of Capgemini struggle with groupware adoption issues as well, which is an ample opportunity for Capgemini to take the insights from this thesis and translate them into a service offering for their clients. This introduction will now continue with a brief introduction to Capgemini Netherlands, followed by the research objective, research approach and the structure of this thesis.
1.1 Capgemini Netherlands

Capgemini Group is headquartered in Paris, France and operates in 36 countries, the Netherlands being one of them. Capgemini Group employs over 86,000 people in North America, Europe, and the Asia Pacific region. Management and support roles aside, Capgemini employees are grouped into four major disciplines, each of which is governed by its specific economic rules, and managed with its own profit. These four disciplines are consulting services, technology services, outsourcing services and local professional services.

Capgemini works together with clients to develop business strategies and technologies that are fine-tuned to the client’s specific needs. Capgemini Netherlands (hereafter: Capgemini) is the fourth biggest IT professional services vendor in the Netherlands. It has a market share of 7.3% in this € 8.9 billion market. Within the global Capgemini Group, the Dutch branch is the fourth biggest independent regional office, measured in revenues. Capgemini Group has global revenues of € 8.7 billion with a net profit of € 440 million (both 2007 figures).

1.2 Research questions

Taking the aforementioned expected importance of groupware potency and social influences in groupware adoption processes into account, this thesis will attempt to answer the following general research question:

What is the role of groupware potency and social influences in the adoption behavior of groupware technologies?

In order to answer this question, a literature review will be conducted in order to create a more comprehensive understanding of both groupware technology and technology adoption in general. Based on this literature review, the expected drivers of groupware adoption will be modeled in a conceptual model. An empirical analysis will be conducted to test this conceptual model in a Capgemini groupware context. The results of these findings will be discussed and then translated into managerial implications for Capgemini in order to give some practical guidelines for improving the adoption of groupware technologies. Hence, the following sub-questions are stated:

1. What exactly is groupware?
2. What are commonly accepted theories on technology adoption in literature?
3. What are the expected drivers of groupware adoption?
4. What can be concluded from the empirical analysis of the conceptual model of groupware adoption?
1.3 Thesis structure

This report logically follows the structure of the research questions stated in the previous paragraph. The structure of this thesis is shown in Figure 2. The next chapter will discuss groupware in order to come to a definition and provide insights into both its different types and its benefits. In literature, technology adoption is a topic that has received considerable attention. As this topic is very relevant for groupware adoption, the third chapter will focus on existing models of technology adoption. The fourth chapter elaborates on collective confidence beliefs, and more specifically: groupware potency. The conceptual model of groupware adoption will be presented in Chapter 5. Chapter 6 introduces the research methodology that will be used to empirically research the conceptual model. In chapters 7 and 8, the results of the empirical research will be presented. Finally, the last chapter will discuss the research results and provide an overview of the theoretical contributions, the managerial implications, the limitations of this study and some avenues for future research.

Figure 2: Thesis structure
2 Groupware

2.1 Definition

Groupware technologies have attracted attention from both researchers and practitioners, since these technologies offer potential for improving organizational effectiveness by reducing communication barriers, increasing productivity, and facilitating decision-making activities (Rebstock Williams & Wilson, 1997). The term groupware is somewhat ambiguous in literature, since multiple terms are discussed that seem to be interconnected as they all relate to technologies that support group work. The first term is obviously ‘groupware’ itself. Groupware is a generic term for computerized aids that support groups in their collaborative work (Wilson, 1991). It can involve hardware, software, services and group process support. Group support systems (GSS) is a term that is strongly interconnected with groupware. A GSS has the following characteristics (Rebstock Williams & Wilson, 1997): (1) it reduces communication barriers, (2) it may support different kind of group activities such as planning, problem solving and creative tasks, (3) it is a social technology, and (4) it is a combination of computer, decision, and communication technologies. Another term that is coined in the literature is ‘Collaboration Technology’, or ‘Collaborative Technology’. This term seems to be more restrictive than groupware, as collaboration technologies need to fulfill some minimum requirements. Majchrzak et al. (2000) note that collaboration technologies are virtual workplaces that, at a minimum, provides a repository for recording group process, information sharing (such as email and electronic whiteboards), metadata for the repository entries such as date and author, and easy access to the repository.

This paper will use the term that is most frequently used in the current body of literature: groupware. Additionally, groupware is a more generic term than group support systems and collaboration technologies. Based on the aforementioned terms and definitions, groupware will be defined as technologies that involve hardware, software, services and support which support the collaborative effort of groups by reducing communication barriers.

Bafoutsou and Mentzas (2002) describe two dimensions of groupware: time and place. These groupware dimensions are depicted in Figure 3, where time is represented on the horizontal axis and place is represented on the vertical axis. The time dimension indicates that users can work at the same time (synchronous) or at different times (asynchronous), while the place dimension indicates that users can work together in the same place or in different places. For example, email is an asynchronous groupware technology that allows users to work together on different locations. Video conferencing would be an example of a synchronous groupware technology that needs users to be connected at the same time.
Major vendors like Microsoft and IBM have introduced more comprehensive ‘collaboration platforms’ (Rugullies, Moore, Herrell, & Fossner, 2004), which are unified communication client-server architectures that support both synchronous and asynchronous communication through a variety of communication channels. The basic elements of these platforms are focused on messaging (e.g. email, calendaring, and contact management), team collaboration (e.g. file synchronization, ideas and notes in a wiki, and task management), and real-time collaboration and communication (e.g. presence awareness, instant messaging, and web, video and audio conferencing). These platforms provide functionality for structuring a team’s tasks, monitoring a team’s process, and manage and store the team’s information (Griffith, Sawyer, & Neale, 2003).

These platforms try to simplify and unify different kinds of communication channels by providing users with one identity, instead of a separate identity for every communication channel such as an email identity, phone identity and an instant messaging identity. In addition, these platforms provide one unified portal with access to different communication channels, so users will not have to switch from platform to platform in order to use a different communication channel. One global contact list allows a user to choose whether he wants to email, text, phone, or instant message a specific contact. Additionally, the user can plan a web or video conference, or assign a task to that person.

### 2.2 Benefits

Organizations have good reasons to implement groupware. Case studies all over the world have demonstrated that teams using groupware can reduce labor costs by 50% and the number of calendar days used for a project by 90% (Nunamaker, 1997). Groupware systems reduce minimize the inter-activity intervals and delays (Babar, Kitchenham, Zhu, Gorton, & Jeffery, 2006). Efficiency gains have been found to yield return-on-investment rates up to 42.6% for groupware technology investments (Post, 1992). This section will discuss the benefits of groupware technologies that explain how organizations can attain these advantageous performance improvements.

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**Figure 3: Groupware dimensions** (Bafoutsou & Mentzas, 2002)
2.2.1 Knowledge management

First of all, groupware can help organizations with knowledge management issues. Groupware facilitates the access, creation, processing, storage, retrieval, distribution, and analysis of information across positional, physical, and temporal boundaries (Majchrzak, Rice, Malhotra, King, & Ba, 2000). Especially for teams, knowledge creation and knowledge exchange are important facilitators of team effectiveness and creating team synergies. Groupware technologies often are able to store information on central repositories with easy access for group members (Artail, 2006). One particular example of these central repositories are organizational wikis. Like the popular website www.wikipedia.org, wikis are online encyclopedias. However, wikis in organizational contexts are not open for everybody, but are restricted to the members of an organization or a team. This limited openness might cause members to open up and share more secure information on a wiki.

Storing information is also helpful for decision-making (Hilmer & Dennis, 2000; Schepers, 2008). As more information is available, better informed decisions can be made. For example, when a service team is at a client’s office to resolve an issue with one of their company’s products, access to similar issues in a central repository through a mobile device can help them decide on the best approach to solve the problem. This reduces the time that is needed to solve the problem.

In addition, groupware technologies like social networking make users more interconnected, but also more aware of knowledge and expertise of other users within their social network. A social network does not have to be limited by organizational boundaries. Users will be able to localize expertise and knowledge within and outside of their organization, which would otherwise have been difficult to obtain (Lipnack & Stamps, 1997).

2.2.2 Team virtualization

Secondly, groupware technologies make team meetings more participative, more productive and more effective (Dennis & Garfield, 2003; Artail, 2006). Through parallelism, anonymity and meeting memory, groupware can create a more participative work environment (Dennis & Garfield, 2003). Parallelism means that groupware allows multiple users to generate input at the same time, so that they do not have to wait for others to speak up in the meeting (Nunamaker, 1997; Dennis & Garfield, 2003). This makes the users more productive, as they do not have to wait and they do not forget they what they wanted to contribute. Anonymity provides the user with the possibility to participate in a meeting while its identity is protected (DeSanctis & Poole, 1994). This causes some users to be less reluctant to participate in a meeting since they do not risk to be negatively evaluated. Meeting memory means that all contributions in a meeting are stored, allowing meeting data to be retrieved at a later point in time (Dennis & Garfield, 2003). Users will have the opportunity to read others’ contributions again, which mitigates the risk of overlooking information.

Another major benefit is that groupware users do not have to be collocated in order to work together (Benbunan-Fich, Hiltz, & Turoff, 2002; Griffith, Sawyer, & Neale, 2003; Fuller, Hardin, & Davison, 2006; Schepers, 2008). This enabled teams to be virtualized, allowing team member to be geographically dispersed while still being able to work together using shared repositories, discussion forums, instant messaging functions, and shared agendas (Schepers, 2008).
Certain business drivers are starting to change the nature of teams as well as the ways they accomplish work (Kayworth & Leidner, 2001; Montoya-Weiss, Massey, & Song, 2001). The popularity of interorganizational alliances is growing (De Man, 2004) and the tendency towards globalization (Kayworth & Leidner, 2001) have altered the nature of teams by expanding its organizational as well as its geographical boundaries. This adds to the difficulty of managing these teams, such as the coordination of tasks across time zones, physical boundaries and organizational context (Kayworth & Leidner, 2001). This emerging type of team structure is labeled a virtual team: “Virtual teams are composed of coworkers geographically and organizationally linked through telecommunications and information technologies attempting to achieve an organizational task” (Townsend, DeMarie, & Hendrickson, 1998, p. 17). Thus, virtual teams need groupware in order to work together since they practically never meet face-to-face. For teams that do meet face-to-face, groupware is not necessary but research has pointed out that groupware can facilitate major performance improvements (De Vreede & Guerrero, 2006).

These virtual teams are becoming increasingly prevalent in today’s organizations (Fuller, Hardin, & Davison, 2006). Fuller, Hardin and Davison expect this trend to continue for a variety of reasons, including increasing travel costs, increased organizational benefits from using the best talent regardless of location, and the greater availability of sophisticated groupware technologies. Groupware supports the creation and maintenance of team identity by the use of team rooms that decrease distorted communication (by capturing decisions in a shared database) while increasing team cohesiveness, inclusion, and common ground (Shachaf, 2008).

Groupware can change the way in which teams work, through its structural features and its spirit (Dennis & Garfield, 2003). Structural features are the components of the technology, its rules and resources and its capabilities (DeSanctis & Poole, 1994). For example, the anonymity of groupware can make people more comfortable in speaking up in team meetings, thereby making the team more productive. Spirit is the general intent of the structural features, which provides a normative frame for the behaviors that are appropriate in the context of the technology. These are different from more traditional ways of working. Groupware has therefore the ability to make people think differently (Hilmer & Dennis, 2000). Hilmer and Dennis have found that groupware may induce different patterns of communication and different use of cognitive resources. Therefore, using groupware technologies is not only a technological change, it is a social change as well (Rebstock Williams & Wilson, 1997, p. 912).

To fully exploit the potential of the benefits of groupware technologies, users have to actually use these technologies (Schepers, 2008). Therefore, the adoption of groupware technologies is a relevant issue for organizations. The following chapter will therefore focus on technology adoption.
3 Technology adoption

If members of organizations do not use information technologies, organizational performance is obviously not improved by the implementation of these technologies (Davis, Bagozzi, & Warshaw, 1989). For example, groupware technologies such as a discussion forum allows users to communicate asynchronously by posting messages. When two or more persons cannot meet face-to-face because of conflicting appointments or geographic dispersion, a discussion forum can be an effective communication channel. Users can contribute from any location at any point in time. However, if the user does not access the forum and, hence, does not read it or contribute to it, the potential benefits of the groupware technology are lost. Therefore, a groupware technology must be adopted by the intended end users in order to maximize the potential benefits. Since groupware technologies involve teamwork, the usage of groupware technologies is a social process. Thus, in order to be effective, all team members must appreciate its value (Jarvenpaa, Knoll, & Leidner, 1998).

Some groupware technologies have to compete with other or older technologies. Users use the communication medium that best suits their needs at a particular point in time (Bansler & Havn, 2006). When a user faces problems with a new technology or does not think it is reliable or easy enough to work with, the user might switch back to another communication medium. For example, if a user is on a discussion forum and wants to contribute an answer to a particular problem, he will not be happy if an error message is displayed that tells him that his message could not be posted due to a server connection problem. The user will frown and might decide to pick up the phone and call the contributor of the message he saw on the discussion forum. After sharing the solution on the phone, the answer will not be stored on the discussion forum and is therefore not of any help to other users who run into a similar problem. Thus, while groupware technologies might be considered superior to older communication media, these older media might still be preferred by users since they are more well-known and familiar (Bansler & Havn, 2006).

Thus, the adoption of groupware technologies is a precondition for reaping its benefits (Schepers, 2008). Therefore, in order to create a more comprehensive understanding of technology adoption, existing theories on user acceptance of technology will be covered in the following section.

3.1 Existing theory on user acceptance of technology

Not surprisingly, technology adoption has been a topic of academic research for decades. Therefore, literature on the adoption of new technologies is not scarce. Several models have been developed for explaining technology adoption. The following sections will discuss three of the most acknowledged models and theories in the field of technology acceptance.

3.1.1 Diffusion of innovations

Everett Rogers introduced his first book on the diffusion of innovations in 1962 (Dorf & Byers, 2008). This book describes the process of how innovations spread through a population. Within this theory, innovations can be products, processes or ideas that are perceived as new by potential adopters. People have different perceptions of an innovation’s advantages and its risks, which led Rogers to classify potential adopters into different
categories. Figure 4 presents these categories, where the area of a certain category represents its proportion of the total population. Innovators are the first few to adopt a new innovation as they want to be on the cutting edge of new technology and enjoy mastering the quirks of new innovations (Mohr, Sengupta, & Slater, 2005). Early adopters are next and bring considerable more money to the table than the innovators, while the early majority makes the bulk of innovation purchases (Mohr, Sengupta, & Slater, 2005). The late majority is more pessimistic about new innovations and their price sensitivity causes them adopt new innovations later, while laggards are the last ones to adopt a new innovation (Mohr, Sengupta, & Slater, 2005).

Figure 4: Different categories of innovation adopters (Dorf & Byers, 2008)

Rogers argues that the adoption of innovations depends on individual perceptions of five characteristics of innovations, which are relative advantage, compatibility, trialability, complexity, and observability (Dorf & Byers, 2008). Relative advantage refers to the extent to which an innovation is perceived by its potential user(s) as being better than its predecessor. Compatibility refers to the extent to which a new technology is perceived as being consistent with the existing values, needs, and past experiences of potential adopters. A new technology which is more compatible is less uncertain for the potential adopter and fits more closely with the adopter’s situation. Trialability refers to the extent to which a new technology can be experienced or used before actually adopting the innovation. New products which can be tried are generally adopted more rapidly than products that cannot be tried. Complexity refers to the extent to which a new technology is perceived as being difficult to use for their potential adopters. The complexity of a new technology is negatively related to its rate of adoption. Observability refers to the extent to which the results of a new technology are observable to potential users of the innovation. This factor is positively related to the adoption rate of an innovative product or service.

3.1.2 Technology Acceptance Model

The technology acceptance model (TAM) is based on the theory of reasoned action (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980) and was designed to understand the causal chain
linking external variables to user acceptance and actual use of information technology in a workplace. The model is depicted in Figure 5.

**Figure 5: The Technology Acceptance Model (Venkatesh, 1999)**

The TAM model revolves around the concepts of perceived usefulness and perceived ease of use. Both concepts are user’s beliefs about the technology (Davis, Bagozzi, & Warshaw, 1989). Davis (1989) defines perceived usefulness as the degree to which a person believes that using a particular system would enhance his or her job performance, which is somewhat similar to the concept of relative advantage of the theory of diffusion of innovations. He defines perceived ease of use as the degree to which a person believes that using a particular system would be free from effort. This concept relates inversely to the concept of complexity of the diffusion of innovations theory. Attitude toward using a technology, which refers to the degree to which a user has a favorable or unfavorable evaluation or appraisal of the behavior in question (Ajzen, 1991), was included in the original TAM model (Davis, Bagozzi, & Warshaw, 1989). However, this construct was later dropped from the TAM model since it did not fully mediate the effect of individual perceptions on behavioral intentions to use (Venkatesh, 1999; Venkatesh & Davis, 2000; Yi & Hwang, 2003). In a work environment, the partial mediation of the effect of perceived usefulness on behavioral intention by attitude toward using a technology can be the result of people intending to perform a certain behavior while they do not have a favorable attitude towards this behavior (Venkatesh, 1999). Perceived ease of use has a direct effect on perceived usefulness but not vice versa (Davis, 1993). Thus, if two systems are identical in terms of functionality, the one which is more easy to use will be perceived to be more useful. Thus, making a system easier to use, holding all else constant, makes it more useful. However, the opposite does not hold as making a system more useful, holding all else constant, does not make it more easy to use. Furthermore, if technology already has numerous features, added functionality might even have a negative impact on perceived ease of use (Rust, Thompson, & Hamilton, 2006).
3.1.3 Unified theory of acceptance and use of technology

Academics have argued that there is some overlap between different models of technology acceptance in literature. In an attempt to create a unified view from competing models, Venkatesh et al. (2003) have proposed the unified theory of acceptance and use of technology (UTAUT). This model proposes that performance expectancy, effort expectancy, social influence, and facilitating conditions either directly or indirectly influence technology usage. They provided empirical evidence that the UTAUT model outperforms the other models of technology acceptance and adoption in terms of explaining the variance in usage intention.

Figure 6: Unified theory of acceptance and use of technology (Venkatesh, Morris, Davis, & Davis, 2003)

In this model, Venkatesh et al. (2003) define three constructs that have a direct effect on behavioral intentions: (1) performance expectancy, (2) effort expectancy, and (3) social influence. Performance expectancy refers to the degree to which a user believes that using the technology will enhance the user’s job performance. This construct relates to the concept of relative advantage of the diffusion of innovations theory and perceived usefulness of the TAM model. Performance expectancy is found to be the strongest predictor of behavioral intentions, which is in line with findings on the concept of relative advantage (Tornatzky & Klein, 1982). Effort expectancy refers to the degree to which expect the technology to be easy to use. The concepts of complexity (diffusion of innovations) and perceived ease of use (TAM) clearly relate to this construct. Social influence refers to the degree to which a user thinks that other users think that the user should use a new technology. Facilitating conditions refers to the degree that a user thinks that there is an organizational and technical
infrastructure in place to support the new technology. This relates to the construct of compatibility of the theory on the diffusion of innovations. Since prior research indicated that performance expectancy and effort expectancy fully mediate the relation between facilitating conditions and behavioral intentions, Venkatesh et al. (2003) argue that this construct does not have an effect on behavioral intentions. However, facilitating conditions do have a direct influence on actual usage, since technology without sufficient infrastructure cannot be used (Ajzen, 1991). With gender, age, experience, and voluntariness, the model has four variables that moderate the different relationships.

3.2 Model selection

The previous sections have discussed several theories of user acceptance. One of these studies will be selected as a starting point for this research on groupware adoption. This section will focus on this model selection.

The UTAUT model has shown the most explanatory power in comparison with other models (Venkatesh, Morris, Davis, & Davis, 2003). However, this high score is only achieved when the key relationships are moderated by four different variables (Van Raaij & Schepers, 2008). Furthermore, the key constructs of social influence and facilitating conditions include a wide variety of items (Van Raaij & Schepers, 2008). The concept of social influence incorporates subjective norm, social factors and image. This concept thus combines the user’s perception of whether important others think they should use the technology (Ajzen, 1991), the perception of other users being supportive to use the technology (Thompson, Higgins, & Howell, 1991), and the perception of whether using the technology will enhance one’s social status (Moore & Benbasat, 1991). It is difficult to understand how these different items are integrated in the same latent construct (Van Raaij & Schepers, 2008). Since groupware technologies have such a strong social component which makes social influence an important construct (Schepers, 2008), this research will not use UTAUT as the starting point for explaining groupware adoption.

Of the two remaining models, the more traditional technology acceptance model (TAM) has received the most attention in adoption research (Van Raaij & Schepers, 2008). TAM is tailored for user acceptance in information systems in the workplace (Davis, Bagozzi, & Warshaw, 1989; Davis & Venkatesh, 1996; Schepers & Wetzels, 2007), while the diffusions of innovations theory is focused on explaining a much wider range of products, processes and ideas (Dorf & Byers, 2008). Additionally, the diffusions of innovations theory explains the diffusion of an innovation throughout a population rather than individual user acceptance. Furthermore, TAM has been found to be a robust theory across persons, settings and times in various empirical studies (Straub, Keil, & Brenner, 1997). Since groupware technologies are a more specific type of information technologies and TAM has been proven to be a robust model, TAM seems a very suitable starting point for explaining groupware adoption.

Since Capgemini wants to research the adoption of an existing groupware implementation, it is not needed to examine behavioral intentions as actual usage can be measured directly (Van Raaij & Schepers, 2008). For technology that is already implemented for a longer period of time, the relationship between perceptions of technology and actual usage is not mediated by behavioral intentions, in contrast with technologies that have been implied
quite recently (Yoo, 1998). Therefore, the concept of behavioral intentions to use will not be considered in this research, leaving a direct link between technology perceptions and actual technology use in the original TAM model. This original model has been extended in previous research. The two most well-known extensions will be discussed in the following section.

3.3 TAM extensions

3.3.1 Perceived enjoyment

Users do not only use information technology because of its usefulness. Perceived enjoyment is considered to play an essential role as well (Teo, Lim, & Lai, 1999; Van der Heijden, 2004). For hedonic systems, perceived enjoyment is even found to be the main predictor variable of system adoption (Van der Heijden, 2004). The term hedonic is derived from hedonism, which is defined as the doctrine that every activity is motivated by the desire for pleasure and the avoidance of pain (Hewstone & Stroebe, 2001). On the other hand, perceived usefulness is argued to be the main determinant of system adoption in utilitarian systems (Van der Heijden, 2004). Utilitarianism denotes the doctrine that expected usefulness is the determining condition of an individual's behavior (Hewstone & Stroebe, 2001). In literature, the perception of usefulness has been identified as a form of extrinsic motivation, while perception of enjoyment have been identified as a form of intrinsic motivation (Teo, Lim, & Lai, 1999). Extrinsic motivation emphasizes performing a certain behavior in order to achieve a goal, while intrinsic motivation refers to the pleasure derived from a specific activity (Venkatesh, 1999). Perceived enjoyment has been found to affect behavioral intentions in an organizational context (Davis, Bagozzi, & Warshaw, 1992). It is therefore likely that perceived enjoyment is important in a groupware setting as well.

3.3.2 Social influence

The TAM model has been validated in a study on groupware technology by Yoo (1998). Since the basic concepts of perceived usefulness and perceived ease of use are individualistic perceptions, the original TAM model fails to consider social influences on intention to use groupware (Taylor & Todd, 1995; Yoo, 1998). The lack of social influence is not an uncommon criticism on the TAM model, and many researchers have answered the call to incorporate social influences, which has been done by including the concept of subjective norm in the TAM model (Venkatesh & Davis, 2000). Subjective norm is defined as a "person’s perception that most people who are important to him think he should or should not perform the behavior in question" (Venkatesh & Davis, 2000, p. 187). Subjective norm has been frequently researched in a TAM setting, which has led Schepers and Wetzels (2007) to conduct a meta-analysis on this subject. They found significant support for the relationship between subjective norm and both perceived usefulness and behavioral intentions. However, in a study that left behavioral intentions out of the model, no support for the impact of subjective norm on actual usage was found (Van Raaij & Schepers, 2008).

As mentioned before, this research does not consider behavioral intentions, which does not mean that social influences will be left out as well. As groupware is software to support groups working together in order to achieve common goals, social team factors are likely to be very relevant. Furthermore, Kelly and Jones (2001) argue that social contacts are very
important for the successful implementation of groupware technologies. Users are likely to share their experiences and new beliefs with other people, which will have an effect on the beliefs of these people and indirectly on their actual usage of the system (Yoo, 1998). Thus, groupware usage can change over time as group beliefs affect individual beliefs. Therefore, both social influences and collective beliefs will be taken into account in this research. The next chapter will elaborate further on collective beliefs.
Collective beliefs

This chapter will elaborate on collective beliefs in order to create a more comprehensive understanding of this topic. The concepts of group potency and collective efficacy have been used by researchers to describe a team’s belief in their ability to perform (Fuller, Hardin, & Davison, 2006). While these concepts have been incorrectly used interchangeably, these two concepts are similar but not identical (Fuller, Hardin, & Davison, 2006; Schepers, De Jong, De Ruyter, & Wetzels, Forthcoming). Group potency refers to the collective belief of a team that it can be effective, independent of the task at hand (Gibson, 1999; De Jong, De Ruyter, & Wetzels, 2005), while collective efficacy refers to the collective belief of a team that it can be effective given a specific task (De Jong, De Ruyter, & Wetzels, 2005). Having made this distinction, the research model presented here will only incorporate potency beliefs since groupware technologies are often used to accomplish a wide range of tasks. Collective beliefs seem more relevant for groupware technologies than for individual computer technologies such as word processing software since groupware technologies are developed to help groups achieve common goals, which makes group confidence more prevalent.

Schepers et al. (Forthcoming, p. 1) have introduced the concept of GDSS potency, which is defined as “the perception shared by team members of their joint ability to make decisions across a wide range of service tasks using GDSS technology”. GDSS is an abbreviation of group decision support system, which is a specific type of groupware technology. This construct is referred to as a ‘potency’ since it encompasses a wide range of tasks. Schepers et al. (Forthcoming) have researched antecedents and consequences of this construct in a service team context. GDSS effectiveness, role-prescribed service performance and service innovation support where considered as consequences of GDSS potency. However, technology perception constructs have not been considered as consequences of GDSS potency. As collective beliefs are likely to have an effect on individual beliefs (Yoo, 1998), it seems logical to research technology perceptions as additional consequences of groupware potency. In addition, Schepers et al. also researched social influences as antecedents of GDSS potency. This research could contribute to the current body of literature by trying to replicate these antecedent relationships of GDSS potency in another groupware context, thereby making the theory apply to a broader context. In order to do so, the concept of GDSS potency is replaced by a broader concept called groupware potency. Groupware potency will have a definition similar to GDSS potency and is defined as the perception shared by team members of their ability to work together using a groupware technology. The model depicted in Figure 7 shows a simple representation of the research model. The next chapter will delve into the different relationships in this conceptual model.

Figure 7: Simple research model
5 Hypothesis development

As depicted in Figure 5, TAM predicts external variables to affect both PU and PEOU (Davis, Bagozzi, & Warshaw, 1989). However, these external variables have received much less attention (Venkatesh & Davis, 2000). These factors might be different for groupware technologies in comparison with other technologies, as groupware technologies have a strong social component (Schepers, 2008). Therefore, this chapter will focus on the development of a research model that incorporates social variables.

The model depicted in Figure 7 incorporates three different parts that make up the base model for the hypothesis development. The first two parts, social influences and collective beliefs, are based on the work of Schepers et al. (Forthcoming). These collective beliefs seem important as Yoo (1998) argues that collective beliefs influence individual beliefs. The third and final box in the model represents TAM constructs. The following sections will discuss how the relations between and within these parts are hypothesized.

5.1 Consequences of social influences

Social influences are likely to play a role in groupware adoption. The concept of subjective norm has received considerable attention in previous research on technology adoption. While subjective norm refers to the degree to which important others think a person should or should not use a system, this research tries to divide these ‘important others’ in more specific categories. In this research, ‘important others’ are divided into peer colleagues, supervisors, competitor’s employees, and customers. As mentioned before, Schepers et al. (Forthcoming) have examined the impact of these four separate social influences on a more specific type of groupware potency. They further divide these four influences into two types of social influences, namely vicarious experience and verbal persuasion. Vicarious experience allows people to judge their own capabilities when observing others performing a task, while verbal persuasion causes people to come to a belief through suggestion from someone else. Schepers et al. identify peer usage and competitive pressure as sources of vicarious experiences, and supervisor influence and customer influence as sources of verbal persuasion. Therefore, the following sections will focus on these concepts.

5.1.1 Peer usage

Peer usage refers to the degree to which other team peers use the groupware technology. As additional users add additional value to a technology (Katz & Shapiro, 1985; Basu, Mazumdar, & Raj, 2003), this will be especially the case for social software like groupware technologies. Since groupware is a broad term for tools that support groups working together, it is very important for team members that their peers use the groupware technology as well. Peer usage therefore is very likely to build confidence beliefs amongst team peers that they actually can make effective use of the groupware technology. Additionally, when peers contribute to a groupware technology such as a discussion forum, this can build confidence amongst team members as they get a better understanding of peer expertise (Schepers, De Jong, De Ruyter, & Wetzels, Forthcoming). Therefore, peer usage is hypothesized to have a positive effect on groupware potency.

Hypothesis 1. Peer usage has a significant positive effect on groupware potency.
5.1.2 Supervisor influence

Supervisor influence refers to the degree to which a supervisor actually believes that his/her team can effectively use the groupware technology. Since supervisors guide their team and are thereby likely to influence collective confidence beliefs, the type of leadership can be very important (Howell & Shea, 2006). For example, when supervisors make clear they have high expectations of groupware technologies, team members will feel more confident that they can actually make effective use of the groupware technology. An optimistic vision of the supervisor will thereby strengthen the collective team identity. Therefore, as the supervisor encourages the idea of the team members working together using the groupware technology, groupware potency perceptions of team members will increase. Hence, the following hypothesis is stated.

Hypothesis 2. Supervisor influence has a significant positive effect on groupware potency.

5.1.3 Competitive pressure

Competitive pressure refers to the degree to which employees observe their competitors use a certain type of groupware technology. Robertson and Gatignon (1986) argue that a competitive environment can influence technology adoption. Observing competitors using a groupware technology can influence collective confidence beliefs (Schepers, De Jong, De Ruyter, & Wetzels, Forthcoming), as this observation can cause team members to feel they can effectively use these technologies since the competition is capable of doing so as well. For example, if members from an organization observe that members from another organization use a certain discussion forum, they think their team must also be capable of collectively using such a technology. Hence, it is expected that external vicarious experience, or competitive pressure, has a positive effect on groupware potency.

Hypothesis 3. Competitive pressure has a significant positive effect on groupware potency.

5.1.4 Customer influence

Customer influence refers to the degree to which the customers express their positive attitude towards a groupware technology. When teams work at the outer boundaries of the company and communicate frequently with customers, which is often the case in organizations that work on technology implementation or consultancy projects such as Capgemini, customers might also influence collective confidence beliefs about groupware technologies (Schepers, De Jong, De Ruyter, & Wetzels, Forthcoming). For example, when team members receive positive feedback from their customers regarding the groupware technology, team members will feel confident they can effectively use this technology to increase customer satisfaction. Therefore, it is expected that external verbal persuasion, or customer influence, has a positive effect on groupware potency.

Hypothesis 4. Customer influence has a significant positive effect on groupware potency.
5.2 Consequences of groupware potency

As mentioned before, groupware potency is defined as the perception shared by team members of their ability to work together using a groupware technology. Collective beliefs seem more relevant for groupware technologies than for individual computer technologies. Furthermore, collective beliefs influence individual beliefs (Yoo, 1998). Thus, when team members have confidence in the team’s ability to work together using groupware technologies, this is likely to positively influence their individual perceptions of the groupware technology.

For example, groupware potency causes team members to consider the groupware technology to be more useful since they think all team members are capable of contributing to the system. When more contributions are made to the system, the system is more useful for team members as they have access to timely information they need to perform in their job. Thus, groupware potency causes team members to perceive groupware technologies as more useful. Hence, the following hypothesis is stated.

Hypothesis 5. **Groupware potency has a significant positive effect on perceived usefulness.**

Moreover, groupware potency also affects the individual perception of ease of use. For example, when team members feel confident that the team is capable of working together using the groupware technology, which implies that other team members are capable of interacting with the system, the individual will feel capable of interacting with the system as well. In addition, confidence beliefs have a positive effect on the time people think they need to learn how to use a new system (Venkatesh, 2000). Hence, groupware potency is expected to have a positive effect on perceived ease of use.

Hypothesis 6. **Groupware potency has a significant positive effect on perceived ease of use.**

Furthermore, the feeling of being collectively able to effectively use the groupware technology is obviously a positive feeling towards the groupware process. Positive feelings cause people to be able to enjoy using the groupware technology. Thus, the feeling that all team members can collectively make effective use of the groupware technology makes the technology more enjoyable for an individual user. Hence, groupware potency is hypothesized to have a positive effect on perceived enjoyment.

Hypothesis 7. **Groupware potency has a significant positive effect on perceived enjoyment.**

5.3 Consequences of perceptions of ease of use

Since prior TAM research has shown that perceived ease of use is a significant determinant of both perceived usefulness and perceived enjoyment in an internet usage context (Teo, Lim, & Lai, 1999), this research attempts to contribute to the current body of literature by examining whether these relations also exist in a groupware context. As mentioned before in Section 3.1.2, perceived ease of use is likely to influence perceived usefulness since ease of use allows users to use the groupware application more efficiently, thereby improving job performance. In addition, perceived ease of use is also expected to have an impact on
perceived enjoyment as a user-friendly system causes much less frustration than an overly complex system. Hence, the following hypotheses are stated.

Hypothesis 8. Perceived ease of use has a significant positive effect on perceived usefulness.

Hypothesis 9. Perceived ease of use has a significant positive effect on perceived enjoyment.

5.4 Consequences of technology perceptions

The relations between perceptions of technology and behavioral intentions to use and actual usage have been supported repeatedly in the current body of TAM literature (Venkatesh, Morris, Davis, & Davis, 2003). However, in order to contribute to traditional TAM literature, this research will introduce a distinction between different sets of groupware features. This distinction is based on the assumption that different sets of groupware features actually exist. This assumption is based on the fact that features have different characteristics. Not surprisingly, previous research has found that some features are more frequently used than others (Li, Gupta, Sanocki, He, & Rui, 2000). This research will examine whether this distinction also exists within a groupware context. For reasons of readability, frequently used feature usage will be labeled standard usage since these features are used more often in standard everyday use. Similarly, the usage of less frequently used features will be labeled non-standard usage. It is expected that the different perceptions of groupware technology do not have similar influences on the usage of different sets of features.

When team members perceive the groupware technology to improve their job performance (i.e. perceived usefulness), this is likely to have a positive effect on both standard and non-standard usage since all features are actually developed to improve job performance. However, it is expected that the effect on standard usage is stronger since the fact that these features are used more frequently probably implies that they have the greatest impact on increasing job performance. Nonetheless, both effects are expected to be significantly positive, which leads to the following hypotheses.

Hypothesis 10. Perceived usefulness has a significant positive effect on standard usage.

Hypothesis 11. Perceived usefulness has a significant positive effect on non-standard usage.

Perceptions of ease of use have been recognized as drivers of system usage by previous research (Teo, Lim, & Lai, 1999). Therefore, perceived ease of use is expected to have a positive impact on the usage of a variety of features, including both standard and non-standard features, since increased usability enhances the appeal of using a certain feature. In order to test this statement, the following hypotheses are stated.

Hypothesis 12. Perceived ease of use has a significant positive effect on standard usage.

Hypothesis 13. Perceived ease of use has a significant positive effect on non-standard usage.
Perceived enjoyment is also expected to have a positive effect on both standard and non-standard usage. When a certain system is fun to use and causes feelings of enjoyment, a user is likely to use the system more frequently. However, it is expected that the effect on non-standard usage is stronger since these non-standard features go beyond the standard everyday use, thereby attracting more attention from users who actually enjoy using the system. Nonetheless, both standard usage and non-standard usage are expected to be positively affected by perceived enjoyment, which leads to the following hypotheses.

Hypothesis 14. *Perceived enjoyment has a significant positive effect on standard usage.*

Hypothesis 15. *Perceived enjoyment has a significant positive effect on non-standard usage.*

Now that all relationships in this groupware adoption model have been hypothesized, a research methodology needs to be developed in order to test the research model depicted in Figure 8. The following chapter will discuss this research methodology.
Figure 8: Research model
6 Research methodology

To test the research model depicted in Figure 8, a research methodology was developed. Since a quantitative method is used most often to test theory (Shah & Corley, 2006), the approach taken to empirically test the hypotheses was a field study using a survey methodology for data collection. However, an appropriate type of groupware technology, that would be the subject of this research, had to be selected first.

6.1 Target application selection

Within Capgemini, several groupware applications are implemented, which can all be considered as the technological context of this research. Two applications have been introduced to encourage the organization-wide distribution of knowledge. However, these applications focus on the organization while the research model focuses on teams, which are considerably smaller units than organizations as a whole. Therefore, these two applications are not considered appropriate for this research.

Capgemini has also implemented specialized software that is intended to facilitate better management of team processes. These software applications are called TeamRooms. As these TeamRoom applications focus on the team process, they are considered very appropriate for conducting this research. Therefore, the target application of this research is the TeamRoom application.

TeamRoom applications are web-based project environments for collaboration and document sharing. TeamRoom applications are based on Microsoft Sharepoint technology. These TeamRooms provide document libraries and several lists of contacts, events, hyperlinks and announcements. The content in these environments is created, uploaded and edited by users that have been granted permission to do so. All team members are granted access to the TeamRoom of their team so they can all share team-specific information. Appendix 1 shows two screenshots of a typical TeamRoom application within Capgemini.

6.2 Measurement instrument

Since TeamRoom applications are web-based, it was considered appropriate to conduct an online survey. Internet surveys are cheap since no paper, envelopes or postage stamps are needed to invite potential respondents (Dillman, 1999). In addition, internet surveys allow faster turnaround times. After a participant has filled out the online survey, he/she does not need to post it since the results are immediately stored in a database. It is important that the target population has access to the survey and is able to participate in the survey (Dillman, 1999). This concern is mitigated by the fact that laptops with internet access have been provided to Capgemini employees to support them in their work. It can therefore be assumed that all the potential participants have considerable experience using the internet, which makes an online survey an adequate tool for data collection.

6.2.1 Measurement scales

All latent constructs in the research model were measured using multi-item scales. For all latent constructs except for feature usage, respondents were asked to indicate their
(dis)agreement with a set of statements using a seven-point Likert scale which ranged from “Strongly disagree” to “Strongly agree”. Groupware potency was measured using four scales based on previous research by Fuller et al. (2006) and Schepers et al. (Forthcoming). The wording of the items was altered to fit this specific research setting. Peer usage, supervisor influence, competitive pressure and customer influence were adapted from Schepers et al. (Forthcoming). Again, the wording were tailored to fit this specific TeamRoom setting. The traditional TAM constructs perceived usefulness and perceived ease of use were adopted from Venkatesh and Davis (2000). The items to measure perceived enjoyment were based on previous research from Igbaria et al. (1995), Teo et al. (1999) and Agarwal and Karahanna (2000). In order to measure feature usage, a set of 17 features was identified in collaboration with several colleagues at Capgemini. On a seven-point Likert scale ranging from “Not at all” to “To a great extent”, participants had to indicate to which extent they use a certain feature. This scale was adopted from previous research by Teo et al. (1999), which used this scale to measure the extent to which participants used internet to perform a set of tasks. Since a feature is actually a very specific task, this scale was considered appropriate to measure feature usage.

6.2.2 Measurement implementation

After the scales were selected, the questionnaire was set up using the online survey software of SurveyMonkey.com. This software allows the survey designer to alter the look and feel of the online survey. This survey was altered to match the corporate look and feel of other Capgemini websites, so Capgemini employees would recognize the professional style and feel comfortable filling out the survey. In addition, the survey was split up in several pages with a progress bar on every page so participants would feel they were making progress towards the end of the survey, instead of being presented a rather long list of questions. Figure 9 shows a screenshot of the online survey, while Appendix 2 gives a more elaborate overview of the online survey instrument as a whole.

6.2.3 Pilot

The online survey was pre-tested by 12 supervisors, colleagues and fellow students. Overall response was quite positive, especially regarding the look and feel of the survey. Some items were rephrased to make the questions more understandable. In addition, some items were positioned elsewhere in the survey to create a more logically flowing survey. After all the remarks of the reviewers were considered and applied where necessary, the online survey was ready to be sent out.
6.3 Target population selection

Globally, the Capgemini TeamRoom support office have set up several thousand TeamRoom applications to support teams working together. This is an adequate pool of potential respondents for this research. However, many of these TeamRooms are still supported but not used anymore. Since we are measuring actual usage, abandoned TeamRoom applications are not relevant for this research since TeamRoom members do not actually use these TeamRooms anymore. Furthermore, some of these TeamRooms are used to support groups that have a shared interest in a particular field of expertise, such as innovation management or asset management. These TeamRooms are typically not used very often since teams do not actually use these TeamRooms to support them towards the end or goal of a project, but rather use them as an archive for interesting documents on the topic of interest. TeamRooms for shared interests are not considered relevant for this research as they do not actually support teams working together towards a common goal.

Thus, a preselection had to be conducted to filter out the irrelevant TeamRooms. Since the remaining pool of TeamRooms was still expected to be rather large after the preselection, time constraints made this research focus on the TeamRooms managed from the Netherlands office of Capgemini. Thus, the target population of this research consists of all Dutch Capgemini employees that use a TeamRoom application for a project that is still in progress.
Not surprisingly, such a list of Capgemini employees was not readily available and it would take an considerable amount of effort from the TeamRoom support office to produce such a list. Therefore, an alternative approach was taken. After retrieving a list from the TeamRoom support office with 2050 TeamRooms and their managers, one of the vice presidents of Capgemini made a selection of the TeamRooms that were most likely to be used for running projects in the Netherlands. This selection left 424 TeamRoom applications. Using the corporate directory, it was determined which of these TeamRooms indeed had a Dutch manager, which left 79 TeamRoom managers.

In order to determine whether these TeamRooms were relevant for this research, these 79 TeamRoom managers needed to be contacted to determine whether their TeamRoom was still used for a running project. If so, they needed to provide a list of TeamRoom users since that information was not readily available for the researcher. Of these 79 managers, 17 could not be contacted since they did not respond either through voicemail or email within the timeframe that was set for this empirical study. 43 TeamRoom managers indicated that their TeamRooms were not in use, while 19 TeamRoom managers indicated that their TeamRooms were actively supporting a running project and that they were willing to cooperate. These 19 TeamRoom managers eventually provided exactly 400 names of Capgemini employees.

6.4 Incentives

To improve the response rate, invitation emails were sent out on behalf of the TeamRoom managers so their team members would be more willing to cooperate since they received an email from a well-known colleague. In another attempt to increase the response rate, the email invitation was personalized by using the first name of the potential respondent in the introduction, while the name of their TeamRoom was also presented in the email. See Appendix 3 for an example of such a personalized email invitation. A couple of days after the initial email invitation, the potential respondents who did not yet participate were sent another email to remind them of this online survey.

In order to further improve the response rate of the survey, Capgemini provided two Apple iPod touches. An Apple iPod touch is a recently introduced touch-controlled music player, as shown in Figure 10. One of these gadgets was raffled amongst the participants who completely filled out the survey. Raffling an incentive amongst the participants is an approach that has been used extensively in previous research to motivate potential respondents to fill out the survey. In addition to the cooperation of potential respondents, the cooperation of TeamRoom managers was critical as well, since the TeamRoom managers needed to provide lists of TeamRoom users. Therefore, the other iPod touch was promised to the TeamRoom manager who managed to persuade the most TeamRoom users to completely fill out the survey. Again, this was considered to be a good motivation for TeamRoom managers which ensured considerable cooperation of these managers as well. This approach was taken in order to increase both the sample size (by providing an incentive for TeamRoom managers) and the response rate (by providing an incentive for participants). In all correspondence, an image of the Apple iPod touch was presented to remind Capgemini employees they were eligible to win an Apple iPod touch if they were willing to cooperate.
6.5 Sample characteristics

Eventually, 212 Capgemini employees started filling out the survey of which 184 completed the survey, yielding a response rate of 46.0 percent. These 184 respondents came from a total of 59 different teams, of which 33 teams had two or more respondents in the total sample. 151 respondents were male (83%) and 32 respondents were female (17%), while one respondent did not indicate his/her gender. Figure 11 depicts the distribution of gender within the sample. This distribution is similar to the distribution of gender within Capgemini. The actual distribution of demographic variables within Capgemini is confidential, so unfortunately, no data regarding the actual gender distribution can be presented here.

Figure 11: Gender distribution

The respondents were 23 to 62 years old. As expected when sampling from a workforce, the majority of the sample was between 20 and 50 years old, as can be seen in Figure 12. This represents the actual age distribution of Capgemini quite well. Again, no confidential
information regarding actual age distribution can be presented here, but it should be noted that the age group between 20 and 29 represents a slightly larger percentage in the sample than in the actual distribution, while the age groups over 40 represent a slightly smaller percentage in the sample than in the actual distribution. This is most probably due to the fact that older employees work less frequently in projects since they hold higher positions in the company hierarchy where job responsibilities are more focused on sales than on projects.

**Figure 12: Age distribution**

Additionally, the survey also included a question that asked the respondent to indicate his/her highest level of education. The distribution of level of education of the sample is depicted in Figure 13. Most respondents are educated at the university level, while another large group is educated at the vocational university level. This is quite representative for the actual distribution of educational level within Capgemini, since Capgemini currently has the policy that vocational university is the minimum level of education for new employees.

**Figure 13: Distribution of level of education**
7 Exploring feature sets

Before interpreting the data with regard to the relationships in the research model, it needs to be examined whether the expected distinction between different sets of feature usage items exist in the data. Therefore, an exploratory factor analysis is conducted, taking only feature usage items into account. Exploratory factor analysis is an appropriate method since this method can be conducted without knowing how many factors actually exist or which variables belong to which constructs (Hair, Black, Babin, Anderson, & Tatham, 2006).

7.1 Results of exploratory factor analysis

The method used was a principal components factor analysis with the VARIMAX orthogonal rotation technique. The factor analysis is conducted using the statistical software package SPSS, version 16.0.1. First, the data set must be checked to determine the appropriateness of factor analysis. This was examined using Bartlett’s test of sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy (MSA). Bartlett’s test of sphericity was significant which means that there exist at least some significant correlations between some of the variables (Hair, Black, Babin, Anderson, & Tatham, 2006). The MSA measure was .843, which also implies that factor analysis is appropriate (Hair, Black, Babin, Anderson, & Tatham, 2006). The number of factors were extracted using the latent root criterion. This implies that factors are extracted if their eigenvalue (which represents the amount of variance accounted for by a factor) is greater than one (Hair, Black, Babin, Anderson, & Tatham, 2006). To ensure practical significance, Hair et al. (2006) suggest that items should have factor loadings that exceed .70, since this indicates a well-defined structure. Additionally, items that have multiple significant factor loadings cause difficulty, since factors should be distinct and represent separate constructs. Hence, items had to meet the following criteria to remain in the factor analysis: Items should have a factor loading above .70, while it has no other loadings above .30. These criteria caused seven items to be deleted from the factor analysis. Table 1 shows the remaining items that represented two factors. On factor consist of two items that actually represent document management features (i.e. uploading and downloading documents), while the other factor consists of items that represent features that facilitate announcements, task management, discussion forums and event management.

Table 1 also shows the mean value for each of these items. The difference in the mean values between the one feature set and the other is rather large considering the fact that these items were measured using a seven-point Likert scale. Thus, as expected, there is indeed a difference between a feature set that is more frequently used and set that is a less frequently used. Therefore, these different sets will be used as separate factors in the data analysis discussed in Chapter 8. As mentioned before, the usage of frequently used features will be referred to as standard usage, while the usage less frequently used features will be referred to as non-standard usage.
Table 1: Factor loadings and mean values for feature usage items

<table>
<thead>
<tr>
<th>Measurement item</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Download files</td>
<td>.822</td>
<td></td>
<td>5.58</td>
</tr>
<tr>
<td>Upload files</td>
<td>.859</td>
<td></td>
<td>5.36</td>
</tr>
<tr>
<td>Read announcements</td>
<td></td>
<td>.783</td>
<td>3.05</td>
</tr>
<tr>
<td>Make announcements</td>
<td></td>
<td>.847</td>
<td>2.47</td>
</tr>
<tr>
<td>View team tasks</td>
<td></td>
<td>.855</td>
<td>2.37</td>
</tr>
<tr>
<td>Create or update team tasks</td>
<td></td>
<td>.855</td>
<td>2.16</td>
</tr>
<tr>
<td>Read discussion forum</td>
<td></td>
<td>.796</td>
<td>2.24</td>
</tr>
<tr>
<td>Contribute to discussion forum</td>
<td></td>
<td>.845</td>
<td>2.11</td>
</tr>
<tr>
<td>Use calendar to find upcoming events</td>
<td></td>
<td>.819</td>
<td>2.42</td>
</tr>
<tr>
<td>Create or update upcoming events in calendar</td>
<td></td>
<td>.827</td>
<td>2.12</td>
</tr>
</tbody>
</table>
8 Data analysis and results

Although the items used in this research have been used and validated in prior research (except for standard and non-standard usage), it still remains important to check for the validity of the measurement instrument in order to be able to produce valid research results. The software package SmartPLS (version 2.0.M3) was used to assess the validity of the measurement model as well as to estimate the relationships in the research model. SmartPLS uses the variance-based partial least squares (PLS) methodology, which is not as widely known as other structural equation modeling techniques that are covariance-based, such as LISREL (Chin, 1998). PLS allows researchers to simultaneously examine theory and measures (Hulland, 1999). More importantly, this research uses this methodology since it is recommended for smaller data samples. Minimum recommendations for sample sizes for PLS range from 30 to 100 while minimum recommendations for LISREL start at 200 (Stan & Saporta, 2005). Since the sample size of this study is 184, a PLS approach to structural equation modeling is considered appropriate.

8.1 Reliability and validity of measurement model

Before attempting to draw conclusions about the construct relationships, researchers first need to ensure that the measurement model is valid and reliable (Fornell & Larcker, 1981; Hair, Black, Babin, Anderson, & Tatham, 2006). To do so, Hulland (1999) suggests to look at (1) individual item reliabilities, (2) convergent validity of the measures associated with individual constructs and (3) discriminant validity.

8.1.1 Item reliability

Individual item reliability is examined by looking at the item loadings on their respective construct (Hulland, 1999). Many researchers use the item loading threshold of 0.70, which implies that items that score above this threshold have more shared variance with their construct than error variance (Hulland, 1999; Hair, Black, Babin, Anderson, & Tatham, 2006). One of the items that measured perceived enjoyment had a score of 0.54 and was therefore omitted from the measurement model. This was an inverted scale. Participants might have come to expect that they had to score consecutive items in a similar fashion, which is most probably the cause of its lower loading. Table 2 shows all remaining measurement items and their respective factor loadings. All remaining items scored significantly on their respective constructs, which provides evidence for item reliability.

Table 2: Construct items with reliability and validity information

<table>
<thead>
<tr>
<th>Construct / Item</th>
<th>Factor Loading</th>
<th>Composite Reliability</th>
<th>Average Variance Extracted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groupware potency</td>
<td>0.90</td>
<td>0.94</td>
<td>0.80</td>
</tr>
<tr>
<td>Our team has confidence in its ability to cooperate using the TeamRoom application.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using the TeamRoom application, my team is capable of working together.</td>
<td>0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Statement</td>
<td>Score</td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td><strong>Peer usage</strong></td>
<td>The majority of the colleagues in my team use the TeamRoom application.</td>
<td>0.92</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In my team, the TeamRoom application is heavily employed by everyone.</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A lot of my colleagues rely on the TeamRoom application.</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td><strong>Supervisor influence</strong></td>
<td>My immediate supervisor explicitly supports my using of the TeamRoom application.</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td></td>
<td>My immediate supervisor truly believes in the benefits of the TeamRoom application.</td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I am continuously encouraged by my immediate supervisor to use the TeamRoom application in my job.</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td><strong>Competitive pressure</strong></td>
<td>Our competitors' employees extensively use an application similar to the TeamRoom application.</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Our competitors' employees rely on an application similar to the TeamRoom application in dealing with their customers.</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Competing companies use an application similar to the TeamRoom application.</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td><strong>Customer influence</strong></td>
<td>My customers show great interest when I use the TeamRoom application.</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Many of my customers like it when I rely upon the TeamRoom application.</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The fact that I use the TeamRoom application is very appealing to my customers.</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td><strong>Perceived usefulness</strong></td>
<td>Using the TeamRoom application improves my performance in my job.</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Using the TeamRoom application in my job increases my productivity.</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Using the TeamRoom application enhances my effectiveness in my job.</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I find the TeamRoom application to be useful in my job.</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td><strong>Perceived ease of use</strong></td>
<td>My interaction with the TeamRoom application is clear and understandable.</td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interacting with the TeamRoom application does not require a lot of my mental effort.</td>
<td>0.88</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I find the TeamRoom application to be easy to use.</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I find it easy to get the TeamRoom application to do what I want it to do.</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td><strong>Perceived enjoyment</strong></td>
<td>Using the TeamRoom application is fun.</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Using the TeamRoom application is pleasurable.</td>
<td>0.97</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I enjoy using the TeamRoom application.</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td><strong>Standard usage</strong></td>
<td>Download files.</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upload files.</td>
<td>0.82</td>
<td></td>
</tr>
</tbody>
</table>
**Non-standard usage**

<table>
<thead>
<tr>
<th>Activity</th>
<th>0.94</th>
<th>0.68</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read announcements</td>
<td>0.79</td>
<td></td>
</tr>
<tr>
<td>Make announcements</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>View team tasks</td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td>Create or update team tasks</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>Read discussion forum</td>
<td>0.79</td>
<td></td>
</tr>
<tr>
<td>Contribute to discussion forum</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>Use calendar to find upcoming events</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>Create or update upcoming events in calendar.</td>
<td>0.82</td>
<td></td>
</tr>
</tbody>
</table>

### 8.1.2 Convergent validity

Items that measure the same construct should share a high proportion of variance, known as convergent validity (Hair, Black, Babin, Anderson, & Tatham, 2006). Composite reliability is a measure of convergent validity and is presented for each construct in column 3 of Table 2. All measures of composite reliability exceed .80, which suggests that the construct items all consistently represent their respective construct (Hair, Black, Babin, Anderson, & Tatham, 2006). Additionally, the average variance extracted (AVE) was also measured for each factor (last column in Table 2). AVE is also a measure of convergent validity, for which constructs need to score .50 or higher in order to imply convergent validity (Hair, Black, Babin, Anderson, & Tatham, 2006). In addition to the measures of composite reliability, all construct measures of AVE exceed .50, which provides more evidence for convergent validity.

### 8.1.3 Discriminant validity

Discriminant validity is the extent to which measures of a construct truly differ from measures from another construct (Hulland, 1999; Hair, Black, Babin, Anderson, & Tatham, 2006). A criterion for discriminant validity in a PLS context is that constructs should share more variance with its measures than with other constructs (Hulland, 1999). Therefore, Fornell and Larcker’s test (1981) is used to determine discriminant validity, which is depicted in Table 3. For each construct, this test compares the square root of the AVE to the correlations with other constructs in the model. Discriminant validity is present if the square root AVE is higher than the correlations with other constructs. As can be seen in Table 3, this is the case for this measurement model. Therefore, evidence of discriminant validity has been provided.
Table 3: Construct correlations with square root AVE on diagonal

<table>
<thead>
<tr>
<th></th>
<th>GP</th>
<th>PEER</th>
<th>SI</th>
<th>CP</th>
<th>CI</th>
<th>PU</th>
<th>PEOU</th>
<th>ENJ</th>
<th>SU</th>
<th>NSU</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP</td>
<td>0.892</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEER</td>
<td>0.685</td>
<td>0.943</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td>0.503</td>
<td>0.622</td>
<td>0.901</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CP</td>
<td>0.140</td>
<td>0.154</td>
<td>0.290</td>
<td>0.936</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CI</td>
<td>0.542</td>
<td>0.440</td>
<td>0.374</td>
<td>0.281</td>
<td>0.947</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU</td>
<td>0.671</td>
<td>0.515</td>
<td>0.444</td>
<td>0.251</td>
<td>0.616</td>
<td>0.942</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEOU</td>
<td>0.562</td>
<td>0.424</td>
<td>0.340</td>
<td>0.092</td>
<td>0.413</td>
<td>0.586</td>
<td>0.874</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PE</td>
<td>0.611</td>
<td>0.400</td>
<td>0.363</td>
<td>0.159</td>
<td>0.493</td>
<td>0.635</td>
<td>0.645</td>
<td>0.963</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SU</td>
<td>0.318</td>
<td>0.399</td>
<td>0.325</td>
<td>0.193</td>
<td>0.352</td>
<td>0.380</td>
<td>0.249</td>
<td>0.241</td>
<td>0.863</td>
<td></td>
</tr>
<tr>
<td>NSU</td>
<td>0.449</td>
<td>0.251</td>
<td>0.213</td>
<td>0.093</td>
<td>0.401</td>
<td>0.401</td>
<td>0.341</td>
<td>0.518</td>
<td>0.169</td>
<td>0.823</td>
</tr>
</tbody>
</table>

GP = Groupware potency, PEER = Peer usage, SI = Supervisor influence, CP = Competitive pressure, CI = Customer influence, PU = Perceived usefulness, PEOU = Perceived ease of use, ENJ = Perceived enjoyment, SU = Standard usage, NSU = Non-standard usage

8.2 Hypotheses testing

After assessing the reliability and validity of the measurement model, the hypotheses were ready for testing. This was done by examining the path coefficients and significance of the estimated relationships between constructs. The bootstrap algorithm of SmartPLS is the recommended method for testing significance of path coefficients in PLS research (Goodhue, Lewis, & Thompson, 2007). The bootstrap algorithm was calculated using 184 cases and 1000 samples. The results are displayed in Table 4. As can be seen in Table 4, most hypotheses have been supported in this research. The effects of peer usage and customer influence on groupware potency (H1 and H4) were supported, while the effects of supervisor influence and competitive pressure on groupware potency (H2 and H3) were not supported. Furthermore, all hypothesized relations between groupware potency and the different technology perceptions were supported (H5, H6, and H7). Also, perceived ease of use proved to significantly affect perceived usefulness (H8) and perceived enjoyment (H9). However, some hypotheses regarding the relation between technology perceptions and standard and non-standard usage have not been supported by this research (H11, H12, H13,
and H14). Nonetheless, perceived usefulness did have a significant effect on standard usage (H10), while the research also showed support for the effect of perceived enjoyment on non-standard usage (H15). The interpretations of these results will be discussed more profoundly in the final chapter.

Table 4: Results of PLS analysis

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Independent variable</th>
<th>Dependent variable</th>
<th>Result</th>
<th>Supported*</th>
<th>T-statistic</th>
<th>Path coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Peer usage</td>
<td>Groupware potency</td>
<td></td>
<td>Supported*</td>
<td>6.141</td>
<td>0.503</td>
</tr>
<tr>
<td>H2</td>
<td>Supervisor influence</td>
<td>Groupware potency</td>
<td></td>
<td>Not supported</td>
<td>1.302</td>
<td>0.092</td>
</tr>
<tr>
<td>H3</td>
<td>Competitive pressure</td>
<td>Groupware potency</td>
<td></td>
<td>Not supported</td>
<td>0.810</td>
<td>-0.049</td>
</tr>
<tr>
<td>H4</td>
<td>Customer influence</td>
<td>Groupware potency</td>
<td></td>
<td>Supported*</td>
<td>4.453</td>
<td>0.300</td>
</tr>
<tr>
<td>H5</td>
<td>Groupware potency</td>
<td>Perceived usefulness</td>
<td></td>
<td>Supported*</td>
<td>7.365</td>
<td>0.499</td>
</tr>
<tr>
<td>H6</td>
<td>Groupware potency</td>
<td>Perceived enjoyment</td>
<td></td>
<td>Supported*</td>
<td>10.785</td>
<td>0.562</td>
</tr>
<tr>
<td>H7</td>
<td>Groupware potency</td>
<td>Perceived ease of use</td>
<td></td>
<td>Supported*</td>
<td>5.058</td>
<td>0.363</td>
</tr>
<tr>
<td>H8</td>
<td>Perceived ease of use</td>
<td>Perceived usefulness</td>
<td></td>
<td>Supported*</td>
<td>4.376</td>
<td>0.305</td>
</tr>
<tr>
<td>H9</td>
<td>Perceived usefulness</td>
<td>Standard usage</td>
<td></td>
<td>Supported*</td>
<td>6.394</td>
<td>0.441</td>
</tr>
<tr>
<td>H10</td>
<td>Groupware potency</td>
<td>Perceived ease of use</td>
<td></td>
<td>Not supported</td>
<td>3.543</td>
<td>0.365</td>
</tr>
<tr>
<td>H11</td>
<td>Perceived ease of use</td>
<td>Perceived usefulness</td>
<td></td>
<td>Not supported</td>
<td>1.601</td>
<td>0.305</td>
</tr>
<tr>
<td>H12</td>
<td>Perceived usefulness</td>
<td>Non-standard usage</td>
<td></td>
<td>Not supported</td>
<td>0.448</td>
<td>0.455</td>
</tr>
<tr>
<td>H13</td>
<td>Perceived ease of use</td>
<td>Non-standard usage</td>
<td></td>
<td>Not supported</td>
<td>0.350</td>
<td>0.455</td>
</tr>
<tr>
<td>H14</td>
<td>Perceived enjoyment</td>
<td>Non-standard usage</td>
<td></td>
<td>Not supported</td>
<td>0.218</td>
<td>0.455</td>
</tr>
<tr>
<td>H15</td>
<td>Perceived enjoyment</td>
<td>Non-standard usage</td>
<td></td>
<td>Supported*</td>
<td>5.423</td>
<td>0.455</td>
</tr>
</tbody>
</table>

* p<0.01 (t-statistic cut-off value = 2.33)
8.3 Explanatory power

The research model was also examined in terms of explanatory power. Covariance-based techniques compare the predicted model with the actual data, and seek to reproduce the actual covariance matrix as closely as possible (Hulland, 1999). Therefore, several statistical measures are available to test the goodness-of-fit of these models. However, PLS has no such measures for assessing the goodness-of-fit of the model since PLS attempts to maximize the explained variance (Hulland, 1999). Since this research was not interpreted using a covariance-based technique for structural equation modeling, no goodness-of-fit statistics are available. Hulland (1999) therefore argues that researchers should report the $R^2$ values of the endogenous variables, which represents the proportion of explained variance of the constructs that have predictor variables in the model. Therefore, these $R^2$ values are presented in Table 5. Almost 55 percent of the variance in groupware potency is explained by its predictor variables. Groupware potency and perceived ease of use explain 51 percent of the variance in both perceived usefulness and perceived enjoyment. For perceived ease of use, that had only one predictor variable in the model, groupware potency still explains 31 percent of its variance. Finally, perceptions of technology predicted 15 percent of the variance in standard usage and 28 percent of the variance in non-standard usage.

Table 5: $R^2$ values of endogenous constructs

<table>
<thead>
<tr>
<th>Endogenous construct</th>
<th>$R^2$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groupware potency</td>
<td>0.547</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>0.514</td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>0.316</td>
</tr>
<tr>
<td>Perceived enjoyment</td>
<td>0.506</td>
</tr>
<tr>
<td>Standard usage</td>
<td>0.146</td>
</tr>
<tr>
<td>Non-standard usage</td>
<td>0.278</td>
</tr>
</tbody>
</table>

8.4 Overview of research results

In order to present a more comprehensive overview of the research results, the research model is presented with all the relevant statistical measures. This visual overview of the research results is presented in Figure 14.
Figure 14: Overview of research results

**Social Influences**
- Peer Usage
- Supervisor Influence
- Competitive Pressure
- Customer Influence

**Collective Beliefs**
- Groupware Potency \( R^2 = 0.547 \)
  - \( 0.503^* \)
  - \( 0.092 \)
  - \( -0.049 \)
  - \( 0.300^* \)

**Technology Perceptions**
- Perceived Usefulness \( R^2 = 0.514 \)
  - \( 0.499^* \)
- Perceived Ease of Use \( R^2 = 0.316 \)
  - \( 0.363^* \)
- Perceived Enjoyment \( R^2 = 0.506 \)
  - \( 0.365^* \)
  - \( 0.127 \)
  - \( 0.049 \)
  - \( -0.027 \)
  - \( -0.022 \)
  - \( 0.455^* \)

**Feature Usage**
- Standard Usage \( R^2 = 0.146 \)
- Non-standard Usage \( R^2 = 0.278 \)

* = significant relationship at \( p < 0.01 \) level, also represented by bold arrow
8.5 Alternative models

Now the research model has been tested, it is interesting to look beyond this model. Since the empirical data is already available, the direct relations between the building blocks of the research model (i.e. “Social influences”, “Collective beliefs”, “Technology perceptions”, and “Feature usage”) can also be considered to determine whether the data reveals additional interesting observations. As a number of direct relationships have already been examined in the original research model, this section will focus on the direct relations between social influences and technology perceptions, between social influences and feature usage, and between collective beliefs and feature usage.

8.5.1 Relationships between social influences and technology perceptions

The relation between social influences and groupware potency has been found to be significant for both peer usage and customer influence. Furthermore, empirical evidence has been provided for the relation between groupware potency and technology perceptions. Thus, social influences and technology perceptions are indirectly linked through groupware potency. As we already have the data, it might yield interesting results if the direct relations between social influences and technology perceptions are added to the original model.

Table 6: Results for relations between social influences and technology perceptions

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Independent variable</th>
<th>Dependent variable</th>
<th>Path coefficient</th>
<th>T-statistic</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer usage</td>
<td>Perceived usefulness</td>
<td>0.011</td>
<td>0.122</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Peer usage</td>
<td>Perceived ease of use</td>
<td>0.027</td>
<td>0.260</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Peer usage</td>
<td>Perceived enjoyment</td>
<td>0.115</td>
<td>1.532</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Supervisor influence</td>
<td>Perceived usefulness</td>
<td>0.057</td>
<td>0.920</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Supervisor influence</td>
<td>Perceived ease of use</td>
<td>0.060</td>
<td>0.804</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Supervisor influence</td>
<td>Perceived enjoyment</td>
<td>0.052</td>
<td>0.757</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Competitive pressure</td>
<td>Perceived usefulness</td>
<td>0.083</td>
<td>1.516</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Competitive pressure</td>
<td>Perceived ease of use</td>
<td>-0.034</td>
<td>0.451</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Competitive pressure</td>
<td>Perceived enjoyment</td>
<td>0.031</td>
<td>0.611</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Customer influence</td>
<td>Perceived usefulness</td>
<td>0.287</td>
<td>4.443</td>
<td>Supported**</td>
<td></td>
</tr>
<tr>
<td>Customer influence</td>
<td>Perceived ease of use</td>
<td>0.152</td>
<td>1.962</td>
<td>Supported*</td>
<td></td>
</tr>
<tr>
<td>Customer influence</td>
<td>Perceived enjoyment</td>
<td>0.161</td>
<td>2.517</td>
<td>Supported**</td>
<td></td>
</tr>
</tbody>
</table>

*: p<0.05 (t-statistic cut-off value = 1.96)
**: p<0.01 (t-statistic cut-off value = 2.33)

The PLS approach that was used for the original model was used to examine these relationships as well. Table 6 depicts the results of this PLS analysis. These results are more clearly visualized in the model in Figure 15. The results indicate that only customer influence has a positive impact on technology perceptions, it even has significant effects on all perceptions of technology that are used in this research. Peer usage, supervisor influence and competitive pressure showed no significant direct impact on technology perceptions.
Thus, while customer influence has both a direct and an indirect effect on technology perceptions, peer usage has only an indirect effect and supervisor influence and competitive pressure have no effect at all. Furthermore, by adding these additional relations to the model, the explained variance ($R^2$) of perceived usefulness increased considerably more than the explained variance of both perceived ease of use and perceived enjoyment.

**Figure 15: Overview of results regarding social influences and technology perceptions**

![Diagram showing relationships between social influences and technology perceptions with arrows and coefficients]

8.5.2 Relationships between social influences and feature usage

While the direct impact of social influences on technology perceptions remains limited to customer influence only, social influences might also have a direct impact on feature usage. Therefore, these relations are also added to the model in order to investigate whether this addition yields interesting findings. Thus, eight relations between social influences and feature usage were analyzed using PLS, yielding the results shown in Table 7.
Table 7: Results for relations between social influences and feature usage

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Independent variable</th>
<th>Dependent variable</th>
<th>Path coefficient</th>
<th>T-statistic</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer usage</td>
<td>Standard usage</td>
<td>0.260</td>
<td>2.160</td>
<td>Supported*</td>
<td></td>
</tr>
<tr>
<td>Peer usage</td>
<td>Non-standard usage</td>
<td>-0.100</td>
<td>1.090</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Supervisor influence</td>
<td>Standard usage</td>
<td>0.062</td>
<td>0.698</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Supervisor influence</td>
<td>Non-standard usage</td>
<td>-0.019</td>
<td>0.259</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Competitive pressure</td>
<td>Standard usage</td>
<td>0.063</td>
<td>0.869</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Competitive pressure</td>
<td>Non-standard usage</td>
<td>-0.019</td>
<td>0.282</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Customer influence</td>
<td>Standard usage</td>
<td>0.093</td>
<td>1.441</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Customer influence</td>
<td>Non-standard usage</td>
<td>0.168</td>
<td>2.026</td>
<td>Supported*</td>
<td></td>
</tr>
</tbody>
</table>

*: p<0.05 (t-statistic cut-off value = 1.96)

Figure 16 shows a visual representation of these results. Supervisor influence and competitive pressure do not have a significant impact on both standard and non-standard usage. However, peer usage does have a significant effect on standard usage, while it does not significantly affect non-standard usage. For customer influence, this is exactly the other way around. The addition of these relationships to the original model cause increased explained variance for both standard and non-standard usage. However, the increase in explained variance for standard usage is considerably higher than for non-standard usage.

Figure 16: Overview of results regarding social influences and feature usage

* = significant relationship at p<0.05 level, also represented by bold arrow
8.5.3 Relationships between social influences and technology perceptions

Finally, one more addition is made to the model. While social influences have now been directly linked to all the different building blocks of the research model, collective beliefs (or more specifically: groupware potency) can still be directly linked to feature usage. As before, the SmartPLS software is used to add these relationships to the model. Table 8 depicts the results of this PLS analysis.

Table 8: Results for relations between collective beliefs and feature usage

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Independent variable</th>
<th>Dependent variable</th>
<th>Path coefficient</th>
<th>T-statistic</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groupware potency</td>
<td>Standard usage</td>
<td>0.126</td>
<td>1.267</td>
<td>Not supported</td>
<td></td>
</tr>
<tr>
<td>Groupware potency</td>
<td>Non-standard usage</td>
<td>0.213</td>
<td>2.130</td>
<td>Supported*</td>
<td></td>
</tr>
</tbody>
</table>

*: p<0.05 (t-statistic cut-off value = 1.96)

These relationships are also presented in a visual model (see Figure 17). Groupware potency does not have a direct impact on standard usage. However, it does indirectly affect standard usage through perceived usefulness. Furthermore, groupware potency has a direct positive impact on non-standard usage, in addition to its indirect positive impact through perceived enjoyment. However, the addition of the direct relation between groupware potency and standard usage only cause the explained variance of standard usage to increase marginally. For non-standard usage, the explained variance increases by 2 percentage points, which is a considerable higher increase than for standard usage. The following chapter will now discuss the findings of both the original research model as well as the findings related to these alternative models.

Figure 17: Overview of results regarding groupware potency and feature usage

*=significant relationship at p<0.05 level, also represented by bold arrow
9 Conclusion

Now the research results have been presented in an overview in Figure 14 and additional relations have been investigated in Section 8.5, this chapter will discuss these findings and summarize the contributions of this research to the current body of literature. Furthermore, the value of these findings will be translated into managerial implications for Capgemini. Finally, this thesis will end with acknowledged limitations of this research and suggestions for future research.

9.1 Discussion of the findings

First of all, the interpretation of the findings regarding the consequences of the different constructs in the research model will be discussed. In line with Chapter 5, the consequences of social influences will be discussed first, after which the consequences of groupware potency receive considerable attention. The discussion of the findings will end with the consequences of technology perceptions.

9.1.1 Consequences of social influences

Looking more closely at the research results regarding the impact of social influences on groupware potency, it can be concluded that the research results support not all hypotheses. While peer usage (H1) and customer influence (H4) are significant determinants of groupware potency, supervisor influence (H2) and competitive pressure (H3) were not found to be significant antecedents of groupware potency. These results replicate the earlier findings of Schepers et al. (Forthcoming) in a GDSS context. Schepers et al. found exactly the same results regarding social influences on groupware potency. Therefore, this study provided additional support for these findings by researching another type of groupware, thereby extending the validity of these findings into a broader groupware context.

Thus, an internal source of vicarious experience, i.e. peer usage, has a positive impact on the collective confidence belief to effectively use groupware technology. Peer usage is important since TeamRoom users need their coworkers to use the TeamRoom as well since these are the people they need to cooperate with. If fellow colleagues do not participate in the digital creation process that a TeamRoom facilitates, the group confidence belief in working together using the TeamRoom diminishes. When a team member notices that other team members contribute to the groupware process, their perceptions of the collective confidence beliefs to use the groupware application improve significantly. Customer influence, an external source of verbal persuasion, has also been identified as a significant determinant of groupware potency. Thus, when groupware users get positive feedback from their customers regarding their use of groupware technology, this significantly improves the collective confidence to work together using the groupware technology. The positive effect of peer usage is however more significant than the positive effect of customer influence. This might be caused by the fact that peer usage is more visible than customer influence for team members.

However, supervisor influence, which was identified as a source of internal verbal persuasion, did not have a significant impact on groupware potency. Thus, when a supervisor tries to get his subordinates to work together using a groupware technology, this
has no impact on his team’s confidence that they indeed can effectively work together using this groupware technology. Supervisor persuasion might be perceived as being unpleasantly pressurizing and not as being very motivational (Schepers, De Jong, De Ruyter, & Wetzels, Forthcoming). Thus, while a supervisor might like a groupware application, this does not necessarily mean that subordinates share their supervisor’s enthusiasm. Furthermore, competitive pressure also did not have a significant relationship with groupware potency. This does not necessarily mean that Capgemini employees are insensitive to the behavior of their competitors, but the usage of similar groupware technologies by competitors does not influence the collective confidence to use groupware. Team members within Capgemini might also be very unaware of the usage of groupware technologies by competitors, since this is not particularly visible to them.

Furthermore, customer influence also has a direct effect on perceived usefulness, perceived ease of use and perceived enjoyment. Thus, when a customer indicates his approval of a groupware technology, team members will find the groupware technology more useful, more easy to use, and more enjoyable. With regard to usefulness, this makes sense since employees might perceive the groupware technology as useful since their usage of the groupware technology increases the likelihood of satisfying the customer. Also, when customers value the groupware technology, this causes team members to enjoy the technology more as they enjoy pleasing the customer. However, the relation between customer influence and perceived ease of use is harder to explain. Although far-fetched, customer influence might cause team members to become enthusiastic about the groupware technology. This positive feeling of enthusiasm causes users to feel less frustrated when they actually use the system as using the system supports the greater common goal of satisfying the customer.

The impact of social influences on feature usage has also been analyzed. Supervisor influence and competitive pressure show no effect on standard or non-standard use. Thus, in this research setting, both these social influences have no effect in the groupware adoption process. Again, supervisor influence might be considered as a negative pressure, while users might simply be unaware of the competitor’s behavior regarding groupware usage behavior. However, an interesting finding was that peer usage only has a positive effect on standard usage, while customer influence only has a positive impact on non-standard usage. If one considers the fact that standard features are the features that are used most frequently, it is likely that peer team members use these features more frequently as well. Therefore, when team members observe their peers using the groupware technology, they probably see them using these standard features. Since people often copy the behavior of others, peer usage cause individuals to use these standard groupware features as well. Furthermore, customer influence positively affects non-standard usage. The willingness to please customers makes their opinion important for Capgemini employees. If customers value the groupware technology, team members are willing to go the extra mile for their customers and use additional less frequently used features to show they actually make extensive use of the groupware technology.

### 9.1.2 Consequences of groupware potency

As hypothesized, groupware potency has a significant effect on perceived usefulness (H5), perceived ease of use (H6) and perceived enjoyment (H7). This finding extends the currently
small body of literature on groupware potency by providing empirical support for additional consequences of groupware potency. From this observation, it can be concluded that group beliefs have a significant effect on individual beliefs.

Thus, if team members feel collectively confident about the groupware technology, this enhances the perceived value of the groupware technology in terms of usefulness since they really feel their team is collectively capable of effectively adding useful contributions to the groupware system, which makes the system more useful. Additionally, groupware confidence beliefs also positively affect perceptions of ease of use. Higher perceptions of groupware potency cause team members to feel they all have the skill to understand how to operate the groupware, which causes individual perceptions of ease of use to increase as well. Furthermore, individual perceptions of enjoyment also increase as groupware potency increases, since the feeling of collective confidence generates a positive feeling for individual users. These positive feelings allow team members to enjoy the groupware technology.

The effect of groupware potency on perceived ease of use has been found to be relatively more important than the effect on perceived usefulness and perceived enjoyment, but this is due to the fact that perceived ease of use only has one predictor variable. Perceived usefulness and perceived enjoyment both have two predictor variables, which are likely to predict some amount of shared variance since groupware potency also indirectly influences both perceived usefulness and perceived enjoyment through perceived ease of use.

Furthermore, the direct impact of groupware potency on feature usage has also been investigated. This led to the interesting observation that groupware potency is a significant driver of non-standard usage, while the effect on standard usage proved to be insignificant. This is somewhat surprising since if collective confidence beliefs would influence usage behavior directly, you would expect this to be true for both standard and non-standard usage. However, this is not the case. Groupware potency might cause more impact on non-standard usage since collective confidence beliefs might imply that the probability that a team member’s contribution to non-standard features, such as the creation of an announcement, is actually viewed by other team members. However, for standard features, confidence beliefs are less important as these features are already used far more frequently and no additional confidence is needed.

9.1.3 Consequences of perceptions of technology

Perceived ease of use has been found to have a significant positive effect on both perceived usefulness (H8) and perceived enjoyment (H9). The relationship between perceived ease of use and perceived enjoyment has not been researched in an organizational groupware context before. This research thereby replicates previous findings of Teo et al. (1999), but extends the applicability of these findings into a groupware context. Thus, if a groupware technology is easy to use, perceptions of usefulness will be higher as complexity undermines the effectiveness of the groupware technology. Groupware technology becomes also more enjoyable when it is easy to use since this lowers the level of user frustration.

The research findings show that perceived usefulness has a significant impact on standard usage (H10). In addition, perceived enjoyment has a significant impact on non-standard usage (H15). These findings add to the rather large body of literature on technology
acceptance (Venkatesh, Morris, Davis, & Davis, 2003) by making a distinction between standard usage and non-standard usage.

However, while two of the hypotheses were supported, the other four hypotheses relating perceptions of technology to feature usage were not. Thus, perceived ease of use does not play a significant direct role in feature usage, whether they are standard features (H12) or not (H13). Previous literature has suggested that perceived ease of use only has an indirect effect on behavioral intentions through both perceived usefulness and perceived enjoyment (Venkatesh, 1999). Other research has found that perceived ease of use only has a rather relatively small effect on behavioral intentions to use (Davis, Bagozzi, & Warshaw, 1989) or no effect on actual usage (Agarwal & Prasad, 1997; Van Raaij & Schepers, 2008). When a technology is already in use, the impact of ease of use is less salient (Davis, Bagozzi, & Warshaw, 1989; Venkatesh, Morris, Davis, & Davis, 2003). Since TeamRoom applications have already been implemented at Capgemini for some time, it might not be very surprising that perceived ease of use does not show significant direct influence on actual feature usage.

However, an interesting result is found when the effects of perceived usefulness and perceived enjoyment on feature usage are examined. While perceived usefulness has a significant impact on the usage of standard features (H10), it had no significant impact on the usage of non-standard features (H11). For perceived enjoyment, it is exactly the other way around, i.e. H14 is not supported, while H15 is. In this respect, it is important to recall the difference between extrinsic motivation and intrinsic motivation. Extrinsic motivation refers to the fact that a certain behavior is performed for the sake of the outcome of this behavior, while intrinsic motivation refers to the fact that a certain behavior is performed for the sake of the activity itself (Teo, Lim, & Lai, 1999; Lee, Cheung, & Chen, 2005). Perceived usefulness has been identified by many researchers as a form of extrinsic motivation (Lee, Cheung, & Chen, 2005) since it causes people to use a system for its positive impact on job performance. On the other hand, perceived enjoyment is regarded as an example of intrinsic motivation (Lee, Cheung, & Chen, 2005) since it causes people to perform usage behavior simply because they enjoy performing this behavior. Taking this distinction into consideration, it seems logical that extrinsic motivation positively affects standard usage as these features are likely to have the largest impact on job performance as they are used more frequently than non-standard features. On the other hand, users who are intrinsically motivated are willing to go the extra mile as they enjoy putting additional effort in making the technology work for the team, i.e. they simply have fun using additional, non-standard features of groupware technology. It is however strange that extrinsic motivation and intrinsic motivation do not influence both standard and non-standard features. While it seems unlikely, it might be the case that standard features are not affected by intrinsic motivation since these features are perceived as being a necessary evil for getting the job done. While the usefulness of non-standard features might be less useful than standard features, it is still rather surprising that extrinsic motivation does not have an effect on non-standard usage since it can be safely assumed that these features are developed to increase job performance as well.

9.2 Theoretical contributions

This research has contributed to the current body literature in more ways than one. First of all, this research has introduced the concept of groupware potency, which has been defined
as the perception shared by team members of their ability to work together using a groupware technology. While this construct is similar to the construct of GDSS potency (Schepers, De Jong, De Ruyter, & Wetzels, Forthcoming), the introduction of this concept allows to research groupware potency in a broader context than GDSS systems alone and apply the results of such research on multiple types of groupware technologies.

This research has used the concept of groupware potency to replicate the results of Schepers et al. (Forthcoming) into a broader groupware context. Similar to the findings in the GDSS research of Schepers et al., this research has shown that peer usage and customer influence are social influence factors that are significant determinants of groupware potency, while supervisor influence and competitive pressure do not have a significant relationship with groupware potency. Thus, the findings presented in this research validate the findings of Schepers et al..

Subjective norm, which refers to the degree to which important others value a certain technology, has received considerable attention in technology acceptance literature (Schepers & Wetzels, 2007). This research disentangles the concept of subjective norm into four different kinds of social influence, i.e. peer usage, supervisor influence, competitive pressure, and customer influence. While supervisor influence and competitive pressure have not been found to be drivers of any constructs in this research model, peer usage and customer influence have been proved to play a considerable role in the groupware adoption process. Customer influence has been identified as a driver of groupware potency, perceived usefulness, perceived ease of use, perceived enjoyment, and non-standard usage. On the other hand, peer usage drives groupware potency and standard usage. Thus, this research contributes to the current theory by providing empirical evidence for the notion that different social influences play different roles in the groupware adoption process.

Furthermore, this research has explored new consequences of groupware potency by linking this construct to technology perception constructs drawn from the technology acceptance literature. The findings of this research imply that groupware potency is indeed a significant predictor of perceived usefulness, perceived ease of use, and perceived enjoyment, which have been identified as important drivers of technology usage behavior in a number of previously published articles (Teo, Lim, & Lai, 1999; Venkatesh, Morris, Davis, & Davis, 2003). Additionally, empirical evidence also provides support for non-standard usage as a consequence of groupware potency.

In addition, this research has provided additional support for the notion that perceived ease of use does not only predict perceived usefulness, but perceived enjoyment as well. While this finding has been supported in previous research such as Teo et al. (1999), this research contributes to the current body of literature by providing empirical support for this relationship in an organizational groupware context. Thus, perceived enjoyment plays a role in technology adoption processes in work environments as well.

Finally, this research identified two distinctive sets of features within the TeamRoom groupware technology, where one set of features is used far more frequently than the other. Thus, this research contributed to theory by making the distinction between standard and non-standard usage. Furthermore, these distinctive sets of features are driven by different determinants. Standard usage is driven by extrinsic motivation since users use these features to gain the expected improvements in job performance, while non-standard usage is
driven by intrinsic motivation since users use these features for the sheer joy they get out of it.

9.3 Managerial implications

In companies like Capgemini where employees are responsible for seizing their own job opportunities, it is important for employees to maintain their personal network both within and outside of the company. Thus, peers and customers are important social contacts for Capgemini employees. Subsequently, peer usage and customer influence have been found to be relatively important in the groupware adoption process. On the other hand, supervisor influence and competitive pressure have not been found to significantly affect constructs in the groupware adoption process. Therefore, Capgemini should not invest resources in making employees aware of the fact that certain groupware is used by competing companies. While supervisor influence has not been proved to play a significant role in building collective confidence belief regarding groupware technology, it probably would not do any harm if supervisors would still support the use of groupware technologies such as TeamRooms. It should however be noted that it is not advisable to invest resources in making supervisors enthusiastic about groupware technologies. However, customer influence and peer usage do have a significant impact on groupware potency. Capgemini employees should therefore be made aware that colleagues and customers value the TeamRoom application, so they get the confidence that they can work together using a TeamRoom.

Thus, to improve groupware potency, Capgemini should set up awareness programs in which peer usage and customer influence are emphasized. For example, TeamRoom users could be sent a periodic update via email with the recent changes and updates in the TeamRoom so users know their peers have been using the TeamRoom. The keyword here is periodic, since it would become rather annoying when users constantly receive TeamRoom updates whenever an item within the TeamRoom is updated. This approach will positively affect the group confidence belief that the team is capable of working together using the TeamRoom, which will indirectly influence the actual use of the TeamRoom applications through technology perceptions. Additionally, being aware that peers use the groupware technology will also directly affect the team member’s usage behavior of standard features, as this relationship has been supported by empirical evidence in this research.

Customer influence should also be emphasized in awareness programs, since it does not only indirectly affects usage through groupware potency and technology perceptions, it also is a determinant of non-standard feature usage. In order to create the awareness that the customer values the TeamRoom applications, Capgemini should interview relevant customers and distribute interesting quotes from these interviews to TeamRoom users. This would raise awareness amongst the TeamRoom users that customers acknowledge the value of working together using a TeamRoom. This leads to an increased feeling of groupware potency, since users perceive the TeamRoom to be an application they can use to work together and effectively satisfy the customer.

Since extrinsic motivation and intrinsic motivation are related to the usage of different feature sets, Capgemini should take these differences into account when setting up training programs and advertisements that are intended to increase the usage of groupware
technology. Standard features that are frequently used, such as downloading documents, should be emphasized as being useful, while non-standard features that are less frequently used, such as making announcements, should be emphasized as being fun and enjoyable. Whether it is subconsciously or consciously, this will cause groupware users to know which features have the greatest impact on job performance which should extrinsically motivate them to use these standard features. On the other hand, groupware users also know which features make the groupware system more enjoyable, which should intrinsically motivate them to use non-standard features. Using this approach, both perceived usefulness and perceived enjoyment receive the focus they need to trigger team members to use the different features of the groupware system.

For Capgemini, these results can also be used for helping client companies in their struggle to implement groupware. Groupware adoption is a problem in many organizations (De Vreede & Guerrero, 2006). Therefore, as a consulting company, Capgemini could use these research results to create a service offering they can sell to client companies. For example, a quick scanning tool could be developed to measure relevant variables in order to create a quick overview of the current situation. With this approach, the quick scan will provide insights into which features are frequently used (standard) and which are not (non-standard). When this distinction is clear, it quickly becomes clear which features should be communicated as being very useful and which features should be communicated as being very enjoyable. In addition, Capgemini should use the aforementioned practice of making team members aware of peer usage and customer influence into this service offering as well.

In an attempt to gain additional information regarding the TeamRoom applications of Capgemini, participants of the online survey were also asked if they had any additional comments regarding their TeamRoom application. Several topics were mentioned by the participants who chose to leave a comment.

A common comment was a criticism on the actual performance of the TeamRoom itself. Files sometimes take a long time to upload or download. When this happens, it is likely to have a negative effect on technology perceptions. Thus, for the TeamRoom support office, it would be a quick win to improve the bandwidth available to the TeamRoom applications so documents can be uploaded and downloaded more quickly.

Additionally, some participants commented on the TeamRoom support office. The TeamRoom support office is only available through an email address, while users would feel much more supported if the phone number of the support office would be provided as well. Therefore, another quick win can be accomplished if the TeamRoom support office would provide a telephone number.

The survey itself has also been helpful in creating feature awareness for some of the participants. Some participants simply did not know some of these features existed and indicated that the survey made them aware of these features. Some indicated they were going to try these formerly unknown features. Thus, a training or an awareness program would help users to get a better understanding of the different features of a TeamRoom application.
9.4 Limitations and directions for future research

This research opens several interesting avenues for future research, partially resulting from its limitations. First of all, all the data was perceptual in nature, including measures of feature usage. People’s self-reported measures of usage behavior might be less reliable than objective measures like the number of TeamRoom visits, number of documents uploaded, number of documents downloaded, time spent on certain pages, etcetera. Unfortunately, these measures were not available for this research. Therefore, testing the structural model presented in this thesis with objective usage measures would certainly be an interesting topic for future research.

Also, the lack of available data on TeamRoom users and time constraints have led the researcher to pursue a method of convenience sampling, where the available data of TeamRoom users was dependent on Dutch TeamRoom managers who could be contacted by the researcher within the timeframe that was set for this research. Thus, future research should consider a random sampling method to provide further validation for the presented structural model. In order to generate even more empirical evidence for the presented structural model, future research should consider samples from a wider range of groupware technologies. Moreover, the model would be more robust if it were to be tested across different cultures, organizations and other contextual variables.

While supervisor influence and competitive pressure have not been found to play an important role in groupware adoption, the four different categories of social influence deserve further attention in future research. The social influence of peers, supervisors, competitors, and customers might play a different role in other non-groupware settings.

Furthermore, while the conceptual model presented in this thesis has considerable explanatory power, the inclusion of additional constructs, such as experience, previous performance and technology-specific support (such as a helpdesk) is likely to increase the explained variance in the model. Especially for the feature usage constructs, additional predictor variables might cause significant improvements in the explained variance of both feature usage constructs, which should lead to a more comprehensive understanding of the determinants that drive these constructs.

Additionally, this research was conducted on an individual level, while an analysis on a group level might also reveal interesting results. This avenue for future research is especially interesting for groupware technologies as group level interpretations of variables are likely to provide additional insights into the groupware adoption process.

Another direction for future research is to test this model in an inter-organizational context, where partner companies implement a groupware technology to stimulate collaboration between organizations. In such a setting, collective confidence will probably be very important as well. In today’s economy where the open innovation model becomes a more commonly accepted innovation strategy, it is important to realize how groupware can support these inter-organizational relationships. Obviously, groupware adoption is very important for the success of such a groupware-supported inter-organizational innovation network. This remains a challenge for future research.
References


Appendix 1. TeamRoom screenshots

This appendix shows two screenshots of the TeamRoom application, which was the subject of this groupware research.
Appendix 2. Survey screenshots

The next few pages will show the 8 pages of the actual survey instrument that was used for this research.

---

Dear Capgemini employee,

Thank you for participating in this research on TeamRooms. Your answers are completely confidential and will be released only as summaries in which no individual’s answers can be identified. If you have any further questions, please contact the survey designer. Please enter your email address at the end of the survey if you want to be eligible to win an Apple iPod touch. Your email address will be used for this purpose only.

Please click the button below to start the survey. Thanks again for your cooperation.

Kind regards,

Jeroen Klooster
Survey on TeamRooms

2. Your TeamRoom

TeamRooms are collaboration tools that allow us to share information and ideas within and throughout Capgemini. If you are registered as a user of more than one TeamRoom application, it is important that you answer the questions in this survey with one particular TeamRoom application in mind. Preferably, this is a TeamRoom that is used to support a team working on a project.

*1. Please enter the name of your TeamRoom here

Next >>

Survey on TeamRooms

3. Collective beliefs

1. With regard to the team that uses the TeamRoom application, please indicate to what extent you agree with the following statements.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our team has confidence in its ability to cooperate using the TeamRoom application.</td>
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<tr>
<td>Using the TeamRoom application, my team is capable of working together.</td>
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<tr>
<td>Our team expects to be known as a unit that uses the TeamRoom application effectively.</td>
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<tr>
<td>Our team feels it is able to solve problems using the TeamRoom application.</td>
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Next >>
### Survey on TeamRooms

#### 4. Social influences

1. With regard to the TeamRoom application, please indicate to what extent you agree with the following statements.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The majority of the colleagues in my team uses the TeamRoom application.</td>
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<tr>
<td>In my team, the TeamRoom application is heavily employed by everyone.</td>
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<tr>
<td>A lot of my colleagues rely on the TeamRoom application.</td>
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</tbody>
</table>

2. With regard to the TeamRoom application, please indicate to what extent you agree with the following statements.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am continuously encouraged by my immediate supervisor to use the TeamRoom application in my job.</td>
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<td>My immediate supervisor explicitly supports my use of the TeamRoom application.</td>
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<td>My immediate supervisor truly believes in the benefits of the TeamRoom application.</td>
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</tbody>
</table>

3. With regard to the TeamRoom application, please indicate to what extent you agree with the following statements.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our competitors' employees extensively use an application similar to the TeamRoom application.</td>
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<tr>
<td>Our competitors' employees rely on an application similar to the TeamRoom application in dealing with their customers.</td>
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<tr>
<td>Competing companies use an application similar to the TeamRoom application.</td>
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</tbody>
</table>

4. With regard to the TeamRoom application, please indicate to what extent you agree with the following statements.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>My customers show great interest when I use the TeamRoom application.</td>
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<tr>
<td>Many of my customers like it when I rely upon the TeamRoom application.</td>
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<tr>
<td>The fact that I use the TeamRoom application is very appealing to my customers.</td>
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</tbody>
</table>
## Survey on TeamRooms

### 5. Perceptions of technology

1. With regard to the TeamRoom application, please indicate to what extent you agree with the following statements.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the TeamRoom application improves my performance in my job.</td>
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<tr>
<td>Using the TeamRoom application in my job increases my productivity.</td>
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<tr>
<td>Using the TeamRoom application enhances my effectiveness in my job.</td>
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<tr>
<td>I find the TeamRoom application to be useful in my job.</td>
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</tbody>
</table>

2. With regard to the TeamRoom application, please indicate to what extent you agree with the following statements.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>My interaction with the TeamRoom application is clear and understandable.</td>
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<tr>
<td>Interacting with the TeamRoom application does not require a lot of my mental effort.</td>
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<td>I find the TeamRoom application to be easy to use.</td>
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<tr>
<td>I find it easy to get the TeamRoom application to do what I want it to do.</td>
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</tbody>
</table>

3. With regard to the TeamRoom application, please indicate to what extent you agree with the following statements.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the TeamRoom application is fun.</td>
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<tr>
<td>Using the TeamRoom application is pleasurable.</td>
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<tr>
<td>I enjoy using the TeamRoom application.</td>
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<tr>
<td>Using the TeamRoom application is dull.</td>
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</tbody>
</table>
### Survey on TeamRooms

#### 6. TeamRoom usage

1. Please indicate to what extent you use the following features of the TeamRoom application.

<table>
<thead>
<tr>
<th>Feature</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Download files</td>
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<tr>
<td>Upload files</td>
<td></td>
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<tr>
<td>Read announcements</td>
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<tr>
<td>Make announcements</td>
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<td>View team tasks</td>
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<tr>
<td>Create or update team tasks</td>
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<tr>
<td>Read discussion forum</td>
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<tr>
<td>Contribute to discussion forum</td>
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<td>View links to web pages</td>
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<tr>
<td>Create or update links to web pages</td>
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<tr>
<td>Use contact list to find contact information</td>
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<tr>
<td>Update contact list with new contact information</td>
<td></td>
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<tr>
<td>Integrate contact list with Microsoft Outlook</td>
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<tr>
<td>Use calendar to find upcoming events</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Create or update calendar with upcoming events</td>
<td></td>
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<tr>
<td>Integrate calendar with Microsoft Outlook</td>
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<tr>
<td>Subscribe to email notification (which notifies you when items are uploaded or changed)</td>
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</tr>
</tbody>
</table>
Survey on TeamRooms

7. Individual characteristics

1. What is your age?

2. What is your gender?
   - Male
   - Female

3. What is the highest level of your education?
   - None
   - Primary school
   - Secondary school
   - Vocational education (MBO)
   - Vocational university (HBO)
   - University
   - Doctorate
1. Please enter your email address if you want to be eligible to win an Apple iPod touch.

   Email address:  

2. If you have any additional comments, please enter them here.
Appendix 3. Email invitation

This is an example of a personalized email invitation, which was send out with the subject “Participate in Capgemini TeamRoom survey and win an Apple iPod touch!” to all 400 potential respondents.

Hi Jeroen,

You probably know we continually try to improve the working conditions at Capgemini. Therefore, we have started a research on TeamRoom applications to determine how these applications assist you in your work. Since you are registered as a user of the TeamRoom application for the Innovate project, you have been selected to participate in this research.

We would like you to participate in this research by filling out a survey. This will take about 10 to 15 minutes of your time. Also, you are eligible to win an Apple iPod touch if you complete the survey.

Click the link below to go to the survey:
http://www.surveymonkey.com/s.aspx?
sm=bf0b6ZXXVziJHnJCadEnnelSSAH9KM_2r9m4nhWLAa71_3d
This link is uniquely tied to this survey and your email address, please do not forward this message.

Your answers are completely confidential and will be released only as summaries in which no individual’s answers can be identified. Please note that this survey will be available until July 13, 2008. This survey is part of a master thesis project within Capgemini. Please contact survey designer Jeroen Klooster if you have any questions or remarks.

Thank you very much for your cooperation.

Kind regards,

Theo Adrians

Please note: If you do not wish to receive further emails regarding this survey, please click the link below.
http://www.surveymonkey.com/optout.aspx