Usability and Interactivity: The Diffusion of Important Website Characteristics on Corporate Websites.

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The President:

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Summary

The main goal of this research project was to explore the two most important characteristics of websites – usability and interactivity – and consecutively to get insights into the attitude and behavior of companies towards innovation diffusion on their corporate websites. The major reason behind is that many companies still seem to be uncertain about the application of innovative tools and features on their corporate websites and that there is a gap between the potential estimation and the actual application. The examination is focused on web-based customer self-service applications (usability) and corporate websites (interactivity).

For a potential customer who is in the evaluation stage, a corporate website can provide product- or requirement-based offer calculators, comparison calculators, discussion forums and tell-a-friend features. For more complex products it can provide call-back features, instant messaging and chat features (both initialized by a user or the company itself) and contact forms for arranging consultancy appointments. These tools and features require a high level of usability and always include some sort of interactivity. Corporate websites can also be the main channel of customer self-service for existing customers. Here, too, a high level of usability within customer self-service applications on the Internet is essential for covering the users’ needs in a successful way.

This accumulative dissertation is split into three parts. Part I covers the general motivation, the research intention, the research question and the research approach. Part II shows the three research papers in full length. All contributions have been published in or submitted to academic journals or conferences of the field. Paper A first shows a model that states the content design dimensions which are relevant to the usability of an Internet application and then presents the factors which significantly affect a system’s user-friendliness by testing the model in a large-scale experiment. Paper B examines the evolution of research on interactivity of corporate websites and categorizes issues of prior research. Paper C investigates the critical factors influencing the firm’s adoption of online innovations related to interactivity on its website. Part III summarizes all findings of the research project. It concludes with the theoretical and practical contributions and a critical reflection.

Overall, the results of this dissertation enlarge the existing knowledge of Information Systems (IS) research. It shows the importance of specific usability factors and presents the drivers that are important for the diffusion of innovation related to interactivity of corporate websites.
Zusammenfassung


Part I
1 Exposition

“Organizations should consider adding a social dimension to a conventional website or application and should adopt a social platform sooner, rather than later, because the greatest risk lies in failure to engage and thereby, being left mute in a dialogue where your voice must be heard.”

(Gartner, 2008)

1.1 Introduction and Motivation
Companies have realized that a growing share of their potential customers is likely to base its buying decisions on information from the Internet. To meet this need, companies publish a multiplicity of data on their websites, ranging from pure information to communication services and transactional features and applications.

Recently, an increased offer of online consulting services on company websites can be observed. These services mainly provide product information or product evaluation features and target the evaluation stage of a customer relationship. They present increasingly innovative ways to access sometimes complex topics. Yet, so far, few approaches involving innovative interaction and participation can be found in this area. Many companies outside the Internet industry itself are still unsure about how to integrate innovative interactivity services into their corporate websites. Sometimes there is a large gap between companies’ estimation of the potential and the actual application. Investments in usability enhancements dominate investments in Web 2.0 oriented customer services. However, trends show that back-channels or social peer-to-peer channels are being set up and traditional teaching methods are becoming less important.

The core of this work is to consider, in the above context, an enhanced philosophy of handling existing and potential customers online. The inclusion into the service process, an open and bilateral communication and a high level of transparency, are the main characteristics of this enhanced philosophy.

1.2 Problem Description and Research Question

1.2.1 Background and Relevance
In 2005, when Tim O’Reilly first mentioned Web 2.0 as a concept [O’Reilly 2007, p. 17], interaction and participation were amongst the defining principles. The examples stated include Google, Flickr, Wikipedia, Wikis and other companies, platforms and
software tools. These examples show that Web 2.0 and its underlying design patterns have helped new companies to successfully implement new platforms and new services on the Internet. All these new platforms and services offer many different ways of interaction and participation to Internet users.

Accordingly, over the last couple of years, Internet users have become familiar with these new ways of involvement. They also expect a certain level of interaction and participation with perfect usability on the Internet, independent of the nature of the company and its services [Anderson 2007, pp. 14-25]. However, non-Web 2.0 companies do not offer interaction and participation possibilities on their websites on a larger scale. Despite a few notable examples, it seems that so far, such companies have not been aware of how to meet the expectations mentioned above.

1.2.2 Scope

According to [Fitzsimmons et al. 2006, pp. 112/113], corporate websites fulfil four main functions. They can constitute the only or an additional distribution channel, they provide technical support, help to improve existing services or support order transactions, information brokerage and member communication. These four main functions can be assigned to the implementation stages of e-business solutions (presence installation, basic self-service functions, enhanced self-service functions, business applications integration), as [Koushik et al. 2002] proposed. Nowadays, many companies have reached stage three or even four. The essential self-service functions within these stages are subsumed under the concept of customer self-service according to [Fritz 2007] and [Englert et al. 2002].

Customer self-service can play an important role in every stage of the customer buying cycle, as described by [Muther 2000]. For this project, the first stage of motivation, the third of purchase and the fourth of after-sales go beyond the scope of consideration. Instead, only stage two of the customer buying cycle – evaluation – has priority, because of its fit with Web 2.0 paradigms (acquiring new customers and marketing are two of the main reasons for implementing Web-2.0-related features on corporate websites). Besides this focus, the present research also investigates customer self-service applications that improve existing services (Internet Banking) from a usability point of view.

In contrast to other work in this field, this study focuses neither on business models (Business 2.0) nor on the internal use of social software (Enterprise 2.0), but on the external use of interactive tools and features at the level of customer interfaces. Accordingly, external third-party platforms like Facebook, Twitter, Youtube and so on, which are often found on corporate websites as links or mash-ups (depending on the level of integration) can be regarded as interaction auxiliaries.
1.2.3 Research Question

Many books, research papers, handbooks and articles describe general usability guidelines and the consumer perspective. So far, the corporate perspective has not been emphasized at an assessment level and based on IS research theories. Hence, no scientific investigations can be found which determine usability success and identify the factors influencing company attitudes towards the adoption of Web 2.0 principles on corporate websites. Therefore, the research gap consists of the identification of content dimensions influencing usability success and the identification of factors influencing company attitudes towards the adoption of Web 2.0 principles on their websites. The specific research question is as follows:

*What determines usability success and company attitudes towards the adoption of Web 2.0 paradigms on their corporate websites?*

The research hierarchy, according to [Punch 2000, p. 23], can be depicted as follows:

![Figure 1 Research Hierarchy](image)

1.3 Contribution and Audience

The findings of this dissertation address two different audiences, namely a broad audience in IS- and innovation research, as well as practitioners in different positions within companies who are associated with marketing, communications and e-business management.
For the latter, our usability research offers a quantitative method that can be used in development and quality management projects. There are practical implications for the fields of user-centered development, usability testing and return on investment, and for the acceptance of usability methods. The proposed six usability dimensions and the new, more differentiated term of success provide additional orientation for practitioners, more specifically for website operators, web developers and usability service providers. They can also remove the current unstructured lists of usability defects in test results. Lastly, the dimensions can help professionalize the handling of usability and provide more systematic proof of success.

Exploring the attitudes of corporate managers can advise practicing professionals on how organizational practice could change, regarding the aims of a corporate website and its overall online interaction intensity. The results should benefit organizations considering initiatives for adjusting their online interaction services.

The scientific contribution of our usability research consists of adding a novel approach for usability measurement in the field of Usability Engineering. The main theoretical input is the development of a model based on a deductive literature review process and a preliminary explorative investigation.

Secondly, exploring the attitudes of corporate managers can close the identified gaps in theory and research. For example, when examining the determinants of the diffusion of online applications which enable interaction at the business level, prior research did not consider the company’s point of view. We therefore hope to contribute to knowledge in the field by developing a new conceptual model based on a combination of four primary research streams and by providing evidence of rationale underlying the adoption mechanism.

1.4 Structure

As a cumulative dissertation, this study contains three components. Part I presents an overview of the dissertation, Part II provides the three research papers in full length, and Part III shows the overall results and conclusions. Figure 2 shows the structure of the dissertation.
In Part I, the motivation behind exploring website characteristics in the business context is stated, followed by a description of the research problem and the research question. The background to the problem and its relevance are considered and the scope of research specified. On this basis, the main audiences are identified. Subsequently, the research foundation is described, based on the theoretical background from three main research areas and their overlap as well as an analysis of the current state of the art research. Lastly, the research approach is described and the research framework is built.

In Part II, the papers are listed. Paper A has been published in the proceedings of a peer-reviewed international IS conference, Paper B in a peer-reviewed, ranked scientific journal, and Paper C is currently under second review within a peer-reviewed, ranked scientific journal. Because these contributions have been published in or are submitted to different academic outlets, the work varies in structure, scope, and citation style. For easier reading, the general formats (font, font size, spacing, and so on) have been unified, and the dissertation contains consolidated lists of content, figures and tables. To provide greater traceability of the separate papers, the original content declaration is provided. The content itself has not been changed at all, from the published or submitted articles, although the graphical layout of figures and tables has
been aligned and numbers in the figures and tables have been adjusted appropriately in the text.

In Part III, the overall research results are presented. At the very end, the theoretical contribution and managerial implications are presented and some reflections made.

2 Research Foundation

In accordance with standard dissertation processes, the research foundation was developed during the preliminary study, which was submitted in July 2011 and accepted in August 2011. In order to establish the research foundation, one main part of the preliminary study was to explore the prior research in the relevant fields by conducting a literature review. As a result, a first rough analysis of the current state of the art research was also part of the preliminary study.

Since the emergence of the term Web 2.0 in 2004, publications about many different facets of this buzzword have appeared. Some focus on corporate divisions (e.g. corporate communications, public relations, marketing) while others examine a company-wide application of social software or the strategic level, e.g. [Shuen 2008]. A few publications describe general concepts, applications and technologies, whereas the more recent refer to about terms like “social semantic Web”. This broad scattering of domains makes it necessary to explain the research areas more precisely.

Therefore, the next sections contain the initial literature review and summarize its core findings. The review starts with a short examination of the theoretical background of the three core research areas – Human Computer Interaction (HCI) / Usability Engineering, Internet and Communication – and identifies the overlapping components. For this overlap element, the current state of the art research is listed and analyzed in order to conceptualize and define the scope of the research project.

2.1 Research Area HCI / Usability Engineering

The term HCI was introduced by [Shneiderman 1987]. As a sub discipline of computer science, its evolution had already started in the 1970s. One of its research areas is the development of user-friendly interfaces. During the last few decades, the focus centered on the subject of usability engineering. Seminal works include [Shneiderman 1987], [Rubin 1994], [Mayhew 1999], [Faulkner 2000] and [Lazar 2001]. Over the last few years, usability method profitability considerations attracted attention and one basic work is [Bias et al. 2005].

The usefulness and therefore the success of software products and Internet applications is determined – besides objective technical utility – by the fact of how easy it is being
made for users to capture this potential [Nielsen 1993]. It is Usability Engineering’s main task to design the handling as easily and as intuitively understandable as possible. Usability is considered an important building block for the acceptance of an entire system and there are measures that apply to every kind of software. Concerning the Internet, special recommendations have been published to consider the differences between a web interface and a general graphical user interface.

An example of relevant current research is [Liao et al. 2008], which shows six service quality attributes and examines their effects on customer satisfaction in Internet banking services, referring to the Technology Acceptance Model [Davis 1989]. The scientific contribution of [Hogenkamp 2008] serves as point of origin for the usability research in this dissertation.

2.2 Research Area Internet
What is meant by the term Internet is mainly the World Wide Web itself and its Web 2.0 aspects as a newer viewing perspective. In this area, the research topic focuses on Web 2.0 paradigms. Following [Gissing et al. 2007], the term Web 2.0 stands for attitudes and paradigms that go beyond the usual collection of techniques and business models; it is a question of how and by what means the Web enables and supports interaction and participation. At a very early point of the Web 2.0 discussion, [Davis 2005] has stated: “Web 2.0 is an attitude, not a technology. It’s about enabling and encouraging participation through open applications and services.” And three years later, [Stenmark 2008, p. 3] confirmed: “[…] it seems Web 2.0 can be understood as an innovative mix of technologies and attitudes, and we shall now look at how these technologies and attitudes can be described.” Accordingly, the working definition for this project reads as follows: The term Web 2.0 stands for web-based interaction and participation paradigms, independent of the kind of tools, technology or products used to enable them.

Seminal works used for concept mapping mainly include [O’Reilly 2007], [Musser et al. 2007] and [Governor et al. 2009], but also [Kim et al. 2009] and [Song 2010] are contributions at the level of conceptual frameworks. [Winter et al. 2009] serves as the basis for explaining and discussing patterns as tools, whereas [Pole 2010, pp. 6/7] presents a survey on the different efforts at defining the term Web 2.0.

2.3 Research Area Communication
From a company perspective, the term Communication denotes the field of interaction with existing or potential customers, e.g. customer dialogue. Many different divisions within a company attempt to set up and maintain some sort of customer dialogue: Sales, Marketing, Corporate Communications / Public Relations, After Sales, etc.
Within this area, the present research focuses on *E-Communication* (an alternative term is *Digital Communications*, see [Cayhill 2010, p. 10]). The working definition for this term reads as follows: *E-Communication covers every form of user interaction on electronic channels, mainly in the Internet.* In this respect, the company’s corporate website plays a decisive role as a platform for corporate customer interaction. Corporate websites have already been an object of research in many studies – and in this research project, they are regarded as a means to an end.

Seminal works that are highly relevant to this project are [Muther 2000], [Salomann 2008], [Englert et al. 2002], [Fitzsimmons et al. 2006] and [Crumlish et al. 2009]. These contributions are mainly used for establishing and limiting the research focus. For example [Muther 2000] and his customer buying cycle approach are the basis for theoretically structuring the customer relationship and selecting the relevant stage of the customer buying cycle. Another example is [Salomann 2008], which provides a very useful overview of state of the art research in the field of customer self-service with a focus on customers or technologies [Salomann 2008, p. 29]. In addition, [Englert et al. 2002] set the basis with their analysis of provider goals and requirements (enhancement of customer retention and competitive differentiation, accumulation and utilization of customer knowledge and potential for reducing process costs). The work of [Fitzsimmons et al. 2006] is helpful for classifying corporate website functions and matching them with communication tasks relevant for interaction and participation. Lastly, [Crumlish et al. 2009] is helpful for connecting company efforts with user needs.

### 2.4 Overlapping and Concretization

Following [Muther 2000], a provider on the Internet has three main tasks in the evaluation stage, in order to ensure optimal customer self-service: requirement analysis and consulting, product and price information, and configuration and offer preparation. With more complex products – such as certain services in the finance sector – a potential customer always needs, or at least expects, some sort of consulting effort from the supplier side [Fritz 2007]. For the supplier itself, this generates costs without a certain return. In the Internet, such consulting services in terms of customer self-service can be delegated to a potential customer who is then able to conduct research and evaluation tasks on his own without time pressure or any obligations – but ideally with a high level of usability. Thus, as a co-creator, the potential customer voluntarily performs part of the pre-sales services as by operating the online consulting process. Some authors refer to this as *Customer Participation Empowerment* and *Customer Information Empowerment*, which, however, only starts when the user possesses an adequate level of usability of the application.
[Salomann 2008] states that during this stage, a transparent evaluation of the options which are suitable for need satisfaction is in the spotlight. The main goal should be that potential customers are able to choose the product or the product combination which meets their needs best. Hence, a corporate website should provide product- or requirement-based offer calculators, comparison calculators, discussion forums and tell-a-friend features. For more complex products, it can provide call-back features, instant messaging and chat features (both initialed by a user or the company itself) and contact forms for arranging consultancy appointments.

These tools and features can support or contain interaction and participation in terms of Web 2.0 principles. Accordingly, new challenges are emerging for companies, which can be subsumed as follows: increasing transparency, shifting power to consumers, loss of control of communication and augmented expectations of the (potential) customers (i.e. users), and greater importance of superior user experience and usability of its public Internet applications. [Pole 2010, pp. 14/15 and p. 53] also identified and classified these external business applications.

2.5 Theories
With respect to the adoption of new technologies, the first IS theory that generally occurs to a researcher is the Technology Acceptance Model (TAM). [Hirschheim 2007] presents an introduction to a still current debate on the past and the future of TAM, which is amongst the most popular theories in IS research [Schneberger et al. 2010]. Unfortunately, the level of analysis within TAM targets only individuals.

According to [Schneberger et al. 2010], one of the top theories used in IS research which target groups, companies, industries or societies, is the Innovation Diffusion Theory (IDT). IDT analyzes companies as research objects regarding implementation success or technology adoption. IDT’s five factors which impact on the adoption of innovations presented by [Rogers 2003] have been expanded upon by [Moore et al. 1991] in an IS context, generating eight factors that impact on the adoption of IT (voluntariness, relative advantage, compatibility, image, ease of use, result demonstrability, visibility, and trialability). Scales used to operationalize these factors have been validated and conceptually enhanced by [Wejnert 2002].

A rationale for choosing IDT can be found at [Hwang et al. 2004], where technology acceptance at the organization level is examined (data collection from sending a questionnaire to 50 CIOs). Another example is [Ramamurthy et al. 2008], a study which targeted two senior executives within each company, and IDT was used for developing the research model. A very helpful overview of IDT research in nine major diffusion research traditions is provided by [Heesen 2004, pp. 86-118]. Since then, IDT has been a cornerstone of many other studies in the field of IS.
[Venkatesh et al. 2003] reviewed the user acceptance literature, compared eight models and formulated and validated a unified model. This work gives a good overview of user acceptance in IS research. Another helpful overview of theories used in IT innovation adoption research comes from [Jeyaraj et al. 2006]. Beside IDT, they identified two other theories used in organizational adoption studies: Kwon and Zmud’s Diffusion/Implementation Model [Kwon et al. 1987] and Swansons Tri-Core Model [Swanson 1994]. As IDT is one of the most popular theories in IS research and has influenced the other two, it forms the theoretical foundation for this project.

2.6 Literature Review: Approach, Scope and Journals
Given that paper B contains a rigorous literature review in order to ensure the relevance and rigor if the entire research process, only an overview of the state of the art research is given at this point, with the preliminary study constituting the research foundation.

The procedure for a rigorous literature review is in accordance with the guidelines of [Webster et al. 2002] and the five steps proposed. Figure 3 depicts these five steps adapted to this project.

Of the two types of review that exist in IS research (synthesis of a mature body of research and theoretical framework for researching an emerging area of inquiry), the latter is much more applicable, because of the relatively new term Web 2.0 and the resulting fact only limited research emerged in the short timeframe. [Webster et al. 2002] is the main source for the literature search process (step 3 in their method) and their concept-centric approach is fundamental.

![Figure 3 Literature Review Procedure](image-url)
Relevant journals were found from the Institute’s list:

<table>
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<th>Rating</th>
<th>Weighting</th>
<th>Journal</th>
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<td><strong>Communications of the Association for Computer Machinery (CACM)</strong></td>
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<td><strong>Electronic Markets (EM)</strong></td>
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<td><strong>European Journal of Information Systems (EJIS)</strong></td>
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<td><strong>Information &amp; Management (I&amp;M)</strong></td>
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<td><strong>International Journal of Information Management (IJIM)</strong></td>
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<td><strong>Journal of Strategic Information Systems (JSIS)</strong></td>
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<td><strong>Journal of the Association of Information Systems (JAIS)</strong></td>
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<td><strong>Management Information Systems Quarterly (MISQ)</strong></td>
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<td><strong>Wirtschaftsinformatik (WI)</strong></td>
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<td><strong>Tagung Wirtschaftsinformatik</strong></td>
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<td><strong>ACM Transactions Journals (ACMT/IS)</strong></td>
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<td><strong>Journal of Management Information Systems (JMIS)</strong></td>
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<td><strong>Information Systems and eBusiness Management (ISeB)</strong></td>
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<td><strong>Proceedings of the International Conference on Information Systems (ICIS)</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>Proceedings of the European Conference on Information Systems (ECIS)</strong></td>
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</tbody>
</table>

*Table 1 Journal List*

This list is based primarily on [WIWK 2008]. Additions from a study group led by Prof. Dr. H. Oesterle while composing the final list for the assignment of a research award (January 2011), are listed in italics. A few particular A- or B-journals are also considered, e.g. the *Journal of Interactive Marketing* and other cross-referenced and promising publications (identified through a backward/forward search process).

### 2.7 Literature Search

The search criteria by title, abstract and keywords (as available) in the journals mentioned above read as follows:

*Interaction OR Participation AND Web 2.0 OR Internet OR Online*

Only scientific publications in the form of peer-reviewed research articles from 2004 on are considered (the journal *Electronic Markets* contains articles only from 2009 onwards). The journal *Tagung Wirtschaftsinformatik* was not included as it is only available in German.

This initial search produced 88 unique articles shown in Table 2.
Regardless of relevance, the abstract of all 88 articles were manually run through to gain an initial impression of the applicability of each and every article. The next section shows a summary of this run-through.

2.8 Literature Analysis and Discussion of Findings

In the appendix, all articles and their initial ratings are listed. Of the 88 publications, several are not relevant for further application because they are not topically suitable. A few contain potentially helpful methodological approaches (i.e. [Papathanassiou 2004], where managers are the research object) or may contribute to the project with relatively minor, but relevant advice (rated as average relevant in Table 14). Topically relevant and potentially fundamental for discussion include the following contributions:

- [Al-Natour et al. 2011] and [Hess et al. 2009], because the former examines shopping assistants, which are closely associated with the specific customer buying cycle stage and the latter focuses on decision aid characteristics and social presence on websites (including a comparison with insights for the evaluation stage at [Smith et al. 2005] and [Wells et al. 2005]),
• [Anfinnsen et al. 2011] and [Casaló et al. 2010], because participation effects are considered, and the findings are very relevant for online consulting or enhanced user self-service from a provider point of view,

• [Campbell et al. 2009], because of their online community governance focus as part of Web 2.0 projects,

• [Erat et al. 2006], because business customer communication with the use of ICT is examined, which helps to explain the third research topic E-Communication,

• [Hackbarth et al. 2004], because of the use of the net-enabled business innovation cycle (NEBIC), in conjunction with their organization’s adoption focus,

• [Harrison et al. 2006] and [Hung et al. 2011], because they use Rogers’ IDT in the context of companies as a research object, and adopt a clear management view,

• [Heldal 2004], [Mithas et al. 2007] and [Singh et al. 2005], because the research objects are corporate websites and the models may be conjointly enhanced towards Web 2.0,

• and [Richter et al. 2011], because they research the use of social network sites (SNSs) in a corporate context.

Summing up, the term Web 2.0 was encountered relatively rarely, whereas all three main search objects (corporate websites as research object, online support for evaluation tasks, and participation as a variable) were found many times. Interestingly, there is already a large number of articles with an organizational focus of which Rogers’ IDT is already a part.

Going deeper into the relevant contributions, a backward/forward search – as stated in section 2.6 – was applied. Furthermore, with Web 2.0 being a relatively new topic, unpublished working papers like [Helfenstein et al. 2008] were searched for and analyzed as well.

Paper B contains a more detailed discussion of the relevant papers with source, unit of analysis, sample, research design, analysis methodology and findings.

2.9 Conclusion
In this section, the research areas have been explained and at the same time, the research foundation framed by exploring the major theoretical contributions and prior research in the relevant fields, in order to define the scope of the project. The
conceptualization has been outlined and is part of paper B. For the purpose of obtaining a clearer view of the topic, an initial literature review has been conducted and an impression of the applicability of each and every contribution under review has been stated. The main results are:

- Self-service applications for e-commerce and online consulting are frequently used in the evaluation stage of the customer relationship,
- new ways of business customer communication clearly require novel user interfaces,
- both of these findings make high demands on the usability of such application and interfaces,
- adoption and diffusion mechanisms play a crucial role and need to be examined more closely at the organization level.

With this research foundation, it emerges clearly that, on the one hand, the originally identified gap in theory and research really exists, and on the other hand, the gap can partly be closed by the seminal contributions and prior research endeavors at hand.

### 3 Research Framework

Following the research proposal requirements suggested by [Punch 2000, p. 22], the second essential question of how will be answered in this section. Accordingly, the explanation of the research framework shows how the research question will be addressed.

#### 3.1 General Process

The aim of this dissertation is to identify relevant dimensions and research issues for relatively new phenomena and then to test the existing theories and assumptions empirically. The aim is not to explore new methods, but to find empirical evidence supporting existing theories and to consider the adequacy of existing methods. Therefore, methods which are well established within IS research are used (experiments, integrative literature review, and structural equation modeling (SEM)) to analyze a research objective with an already existing theoretical basis.
The process for a dissertation project generally complies with the following research model:

```
Research area → Problem → Research questions → Hypotheses → Design → Data collection → Data analysis → Test hypotheses

<table>
<thead>
<tr>
<th>Pre-empirical stage</th>
<th>Empirical stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature</td>
<td>Data collection</td>
</tr>
<tr>
<td>Theory</td>
<td>Data analysis</td>
</tr>
<tr>
<td>What data are required to test hypotheses?</td>
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</table>
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Figure 4 Research Model according to [Punch 2000, p. 67]

With regard to [Hevner et al. 2004, p. 80], this research approach is neither pure artefact building nor full theory development, but rather assessing an adjusted theory quantitatively. The foundations of the knowledge base consist of a theory and a methodology (similar to [Hwang et al. 2004] and [Ramamurthy et al. 2008], which analyze their data using SEM techniques).

### 3.2 Research Design

This section shows each identified research gap, the selected research approach and the steps in detail.

#### 3.2.1 Usability Success

For paper A, four specific research gaps have been identified:

- First, the field of usability research lacks a model that states which design dimensions, with regard to content, are relevant to the usability of a website.

- Secondly, there is a shortcoming concerning clearly defined usability standards. Statements about the usability of websites are usually subjective and often are based on either the practical knowledge of experts or detailed formation guidelines with no systematic scientific verification.

- Thirdly, in many cases, the cost-benefit relationship of website usability is not clear.
Lastly, the absence of scientifically established findings of the relationship between usability and success constitutes another research gap. There are publications which contain allegations, plausible statements and case studies, while showing positive effects of usability and more often negative effects of insufficient usability, but such statements have a low generalizability level.

In order to address these gaps, a two-step approach has been chosen as the research design in paper A. In the first step, several qualitative empirical investigations have been accomplished for acquiring the foundations to establish the model prior to testing it. Each study was designed as a qualitative examination of the usability of commercial websites and web applications. First, a design outline was tested by groups of six to eight participants. Secondly, different design versions of the same application were tested comparatively between ten and twenty-one participants. These tests were composed of a standardized pre-interview, the usability test itself, and a standardized post-interview. Finally, particular functionalities of the same application were tested in groups according to their main interests. This final study was conducted with groups of between 16 and 21 participants. Each test was conducted with a clickable interface and recorded on video. The main goal of these studies was to explore the central usability dimensions and their effect on success. The main question was: Which design elements influence usability to a substantial degree and how can this best be measured? This explorative questioning was used to develop the model.

In the second step, six main hypotheses were formulated based on the literature review and explorative studies. The hypotheses describe the assumed correlation between the usability dimensions and usability success. In order to determine the specific usability benefit, the correlation with usability success was formulated in each case with four subordinate hypotheses. To validate the model empirically, two different versions of a click through prototype of a fictitious Internet Banking application were used in an experiment. Experiments as a research methodology offer the advantage of systematically observing specific situations under circumstances that are controlled and modified by the researcher. This essential characteristic of experiments – the active manipulation of the test conditions by the researcher himself – was the main decision criterion, in order to differentiate effectively between cause and effect.

### 3.2.2 Interactivity – Literature Review

For paper B, three specific research questions were formulated:

- How has research on the interactivity of corporate websites evolved?
- How can prior research be categorized?
• In each category, which of the research challenges have little or no research support?

For addressing these questions, the integrative literature review methodology was chosen as the research methodology in paper B. First of all, this ensures that the research is balanced by conducting a systematic, transparent and reproducible literature review process. Secondly, it helps to develop inclusive, robust and replicable literature reviews for the purposes of surveying the state of the art on a given topic, identifying gaps in the literature, and proposing future research agendas [Ramey et al. 2011]. An integrative literature review is a distinctive, sophisticated form of research that generates new knowledge about the topic being reviewed. Its quality is ensured by reviewing, criticizing and synthesizing representative literature on a topic in an integrated manner [Torraco 2005]. As a result, new frameworks and – to some extent – provocative perspectives on the topic are generated. Authors are expected to identify an appropriate topic for the review, justify why a literature review is the appropriate means of addressing the topic, to search and retrieve the appropriate literature, analyze and critique it, and create new understandings of the topic through synthesis [Torraco 2005]. The basic approach was first formulated in the field of medicine and has since been adapted to a wide range of disciplines, including management sciences, software engineering and technical communication [Ramey et al. 2011].

Following the taxonomy of literature reviews by Cooper, paper B focused on research outcomes and theories, and its goal was to identify central issues that should take precedence in future studies. Based on Cooper’s categories, relevant literature has been arranged conceptually and covered exhaustively with selective citation in a neutral representation. The review should be beneficial for IS scholars and practitioners working in the Internet field [Cooper 1988].

3.2.3 Interactivity – Model and Test

For paper C, the main research question is as follows:

• What are the critical factors influencing a firm’s adoption of online innovations related to interactivity on their websites?

To address this question, a quantitative approach was chosen as the research methodology in paper C, in order to test the hypotheses of the preliminary research model. Multiple regressions were employed to test the hypotheses, as multiple regression analysis is used to analyze the relationship between a single dependent variable and several independent variables. Regression analysis is a special case of SEM, which itself is probably the most commonly used method within the social sciences.
Thus, a traditional SEM approach was applied for paper C. First, the conceptual model with supporting propositions was developed. The development of the model derived from literature review, because the issue being reviewed would most certainly benefit from exposure to theoretical foundations. Based on theory and previous studies, the most appropriate variables were chosen for each context. In most cases, items were taken from previously used scales in related research. Otherwise, the operationalization of the research variables was developed by slightly adapting and combining existing scales. Secondly, a web-based questionnaire was developed, tested and sent out to collect data for validating the factors as postulated in the research model. Thirdly, dimensionality and internal consistency as two major aspects of construct validity were examined by observing the correlation matrix, conducting two types of factor analysis and inspecting construct reliability. Lastly, the comprehensive multiple regression analysis was conducted.

3.3 Research Framework Development

The overall research framework of the thesis can now be built by combining the research questions with the research methods mentioned above. The research framework reflects the general structure of the thesis (see Figure 2) and conveys the stream of work, as well as the approaches chosen within each paper. To summarize, Table 3 illustrates the research questions, methods and datasets of each paper.

<table>
<thead>
<tr>
<th>Paper</th>
<th>Research Question(s)</th>
<th>Method(s)</th>
<th>Datasets</th>
</tr>
</thead>
</table>
| A     | • Can a model be developed that states which content design dimensions are relevant to the usability of a website?  
       • Can usability standards be clearly defined in a non-subjective manner with systematic scientific verification?  
       • Is there a cost-benefit ratio of website usability that can be formulated and demonstrated?  
       • Can we scientifically establish the relationship between usability and success at a high level of generalizability? | Explorative questioning (qualitative empirical investigations) for establishing the model, based on literature review and the explorative studies  
Experiments for empirically validating the model | Preliminary empirical investigation: groups of 6 to 8 participants for the design outline, groups of 10 to 21 participants for comparative tests of different versions and pre- and post-interviews, and groups of 16 to 21 participants for testing in main interest groups  
Model validation: 51 participants (each conducting 6 tasks): 306 partial experiments |
### Table 3 Research Framework

<table>
<thead>
<tr>
<th>Paper</th>
<th>Research Question(s)</th>
<th>Method(s)</th>
<th>Datasets</th>
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</table>
| B     | • How has research on the interactivity of corporate websites evolved?  
      | • How can prior research be categorized?                                            | Integrative literature review             | 166 articles of the initial search (including a structured forward and backward search) |
|       | • In each category, which of the research challenges have little or no research support? |                                          | 40 relevant articles for further analysis     |
| C     | What are the critical factors influencing the firm’s adoption of online innovations related to interactivity on their websites? | Structural equation modeling (multiple regression) | Sample: 986  
      |                                                                                       |                                          | N = 824 (alterations)  
      |                                                                                       |                                          | Responses: 161 (20%)  
      |                                                                                       |                                          | n = 138  
      |                                                                                       |                                          | (23 uncompleted questionnaires)          |
Part II
Abstract:

Internet users can fail at several hurdles, e.g. issues related to trouble-free and self-explanatory interaction. Not only users but also organizations are affected adversely by these difficulties. The purpose of this study is to enhance the limited repertoire of methods for quantifying web applications usability, which have remained unchanged for years. It first develops a model explaining the relationship between usability dimensions and success variables. Consecutively, the model’s hypotheses are empirically validated by conducting an experiment for testing Internet Banking applications. Results show positive usability effects of increased recognizability, real world metaphors, anticipating support, dominant designs and a higher degree of freedom through the undo button. For practitioners, this research offers a quantitative method for development and quality management projects. Its scientific contribution consists of adding a novel approach for usability measurement in the field of Usability Engineering. It provides findings about the relationship between usability dimensions and usability success factors which presents a basis for further research in this field.

Keywords:

website usability, Internet Banking, experiment, usability dimensions, usability success
A.1 Introduction

No other medium than the Internet – the fastest growing form of communication media in history (Berners-Lee, T. and Fischetti, M. 1999) – has ever confronted its (new) users with such vast and diverse difficulties of use. Even nowadays as the Internet is used as a common instrument, its utilisation often evokes problems. Whereas the use of a TV set could be conceived as convenient handling, successful activity on the Internet is unequally complex. Users – especially beginners – can fail at several hurdles, starting on with issues related to technical infrastructure and the appropriate use of a computer to issues related to finding the required offerings and target-oriented interaction. These issues can occur separately or in a usage sequence, but the implementing steps’ chronological order is predefined (first one needs a terminal, secondly a connection, lastly one has to search and find the desired supplier to use his offerings) in such a way that the “total system” reaches a high degree of complexity (Park, K. and Willinger, W. 2005).

Not only users but also organizations are affected adversely by these difficulties. Sales and saving potential can be endangered when users are not able to easily and quickly complete the essential search and order processes. Organizations having a website which does not allow trouble-free and self-explanatory handling for less experienced users will need to implement costly support and assistance (Stockburger, S. and Fernandez, T. 2002). Moreover, they risk losing turnover to the benefit of their rivals which put less or no usability obstacles at all in the way of their users. In summary, deficient usability can put successful online business transactions at risk.

The two main factors that have an effect on the usefulness of a software product or an Internet application are usability and utility (Nielsen, J. 1993). Most software products’ features are not only sufficient but often very complex, due to the technological development over the last decades, and therefore tend to overstrain the average user. This makes it economically necessary for every firm to strive for minimizing potential difficulties of use and optimizing the usability. For example a study considering 66 usability tests showed that usability-based redises of commercial websites could increase key performance indicators (e.g. number of orders, number of newsletter subscriptions) on average by 82 percent (Nielsen, J. and Giluz, S. 2007). Research in usability is aimed at such improvements. Its purpose is to detect the usability thresholds of software products or Internet applications, to reduce them and thus generally facilitate human-computer interaction (Canny, J. 2006).

The purpose of this study is first to develop a model explaining the relationship between usability dimensions and success variables. In an attempt to enhance the limited repertoire of methods for determining web applications’ usability quality,
which have remained unchanged for years. Following this, the model’s hypotheses are empirically validated by experiments in the context of usability-related design of Internet Banking applications. The banking industry has been chosen because of the fact that Internet Banking applications are considered one of the most successful and most established Internet applications ever (Pikkarainen et al. 2004, p. 224) and the fact that Internet Banking contains many interesting characteristics from the usability point of view (multi-stage processes, diverse and complex basis, independent transactions, etc.).

The empirical work of modelling is currently still valid in this context as usability is going to be an even more relevant topic when it comes to publishing websites on mobile devices, especially in relation to mobile commerce (m-commerce).

A.2 Foundations

A.2.1 Classification

Along with the growth of the Internet, academic research in the field of web usability has increased during the last two decades. Most of the contributions only have low scientific aspirations. In fact practical manuals and handbooks for usability improvements are dominant (e.g. (Bawa, J., Dorazio, P. and Trenner, L. 2001), (Brinck, T., Gergel, D. and Wood, S. 2002) or (Jacko, J. and Sears, A. 2003)). Key contributions to usability research originate from Jakob Nielsen ((Nielsen, J. 1993), (Nielsen, J. and Mack, R. 1994), (Nielsen, J. 2000), (Nielsen, J. and Tahir, M. 2002), (Nielsen, J. and Loranger, H. 2006)), although the focus of his work is shifting from methodical to contentual aspects.

Besides the research concerning web usability, research on human-computer interaction (HCI) also needs to be taken into account. HCI as a sub discipline of computer science evolved in the 1970s (Jacko, J., Stephanidis, C. and Harris, D. 2003). Work covering a comprehensive view includes (Dix, A., Finlay, J., Abowd, G. and Beale, R. 2004), (Jordan, P. 1998) and (Sears, A. and Jacko, J. 2007).

In the field of HCI research, one of the research directions is the development of user-friendly interfaces. During the 1990s, the thematic priority has been usability testing. In the last decade, the focus has shifted towards usability engineering. (Shneiderman, B. 1987), (Rubin, J. 1994), (Mayhew, D. 1999), (Faulkner, X. 2000) and (Lazar, J. 2001) are key contributions in this field. Over the last years, usability methods’ profitability considerations were gaining attraction; one basic work is (Bias, R. and Mayhew, D. 2005).
A.2 Foundations

A.2.2 Theoretical Background
Referring to (Nielsen, J. 1993), the relation between Personal Computers’ dissemination and their success can be described as follows: The usefulness and therefore the success of software products and Internet applications is determined – besides objective technical utility – increasingly by the fact of how easy it is being made for users to capture this potential (usability). It is Usability Engineering’s key task to design the handling as easily and as intuitively understandable as possible.

Whereas usability can be described in the user’s context, the term has also been allocated in the field of human-computer interface (Shneiderman, B. 1987). (Nielsen, J. 1993, p. 25) classified the term within the context of system acceptability. There has been an academic discussion going on for the last few years about the field of acceptability-oriented computing, a term initially introduced by (Rinard, M. 2003). Usability is considered to be a specific and important building block for the acceptance of a whole system.

The term human-computer interaction (HCI) has been introduced by (Shneiderman, B. 1987) and superseded its predecessor “Computer-Human Interaction” (Myers, B. 1998, p. 45). However, there is no general accepted agreement on which subjects are covered by the area of HCI (Hewett, T. et al. 1996) as it is considered to be an interdisciplinary science (Sears, A. and Jacko, J. 2007, pp. 12/13). The ideal strives for user-centred design in every element of the computer system; user software’s usability is one part of it amongst many (Myers, B. 1998).

There are a great number of national and international obligatory norms and non-obligatory guidelines for software and website developers. ISO norms aim at setting standards, whereas guidelines aim at advising developers on how to increase a system’s usability (e.g. (Koyani, S., Bailey, R. and Nall, J. 2001, p. III) and (Vanderdonckt, J. 1999)). Special domains cover accessibility and intercultural aspects (Mandel, T. 1997). Usability measures generally apply for every software product. Due to the Internet’s particular characteristics, special recommendations have been published (e.g. (Mariage, C., Vanderdonckt, J. and Pribeanu, C. 2004)) to distinguish between characteristics and requirements of a web interface and a general graphical user interface. Although the benefit of guidelines is unquestioned, their application is criticized based on missing systematics (Burmester, M. and Machate, J. 2003, p. 43). The usability engineering process is responsible for developing user-friendly interfaces (Rosson, M. and Carroll, J. 2002). Models, for example the Usability Engineering Lifecycle by (Mayhew, D. 1999) split this process into three or four phases (requirements analysis, concept, design/testing/development, and deployment).
A.2.3 Usability Research
Current research effort in the field of usability studies covers the work of e.g. (Pearson, M. and Pearson, A. 2008), which proved that ease of use and navigation are two critical components in determining website usability. Another example is the work of (Cappel, J. and Huang, Z. 2007), which showed that most of the improvement potentials of company websites’ usability is related to link appearance, navigation and the inclusion of more positive features such as breadcrumb trails and search boxes to improve usability. (Tarafdar, M. and Zhang, J. 2007) identified usability as a significant predictor of reach, one of the two website performance indicators.

In their paper, (Liao, Z, and Cheung, M. 2008) define six service quality attributes and examine their effects on CSIBS (customer satisfaction in Internet banking services). Regarding the derivation of these six attributes, they refer to the Technology Acceptance Model (Davis, F. 1989) and to the SERVQUAL model (Parasuraman, A., Zeithaml, V. and Berry, L. 1988). Results show that each service quality attribute has a positive effect on CSIBS, but this impact has not yet been quantified. This paper differs from (Liao, Z, and Cheung, M. 2008) in so far as we develop a model explaining the relationship between usability dimensions and success variables and consecutively validate it in the context of Internet Banking applications.

A.2.4 Research Gaps
Based on our literature review, four fundamental research gaps have been identified.

In the first place, methods for assessing usability of a system are much more discussed than their content – the usability issues – themselves. Quality, effectiveness and efficiency of usability methods are being discussed based on the issues found while the nature of an issue and its importance are not being analyzed. There is no content framework that systemizes usability issues in order to make them comparable, like e.g. in (Zaphiris, P. and Kurniawan, S. 2007). The field of usability research is lacking in a model that states which contentual design dimensions are relevant to the usability of a website.

Secondly, there is a shortcoming concerning clearly defined usability standards (Sears, A. and Jacko, J. 2007, p. 1107). Contentual statements about usability of websites are usually subjective and are often based on either practical knowledge of experts or detailed formation guidelines (Burmester, M. and Machate, J. 2003). The latter have been developed in practice without systematic scientific verification.

Thirdly, in many cases the cost-benefit relation of website usability is not clear, neither to companies nor within publications (Bias, R. and Mayhew, D. 1994, p. 16). This could be attributed to the fact that the terms success or benefit of website usability are not differentiated and only vaguely used. Sometimes these terms are even used in a
contradictory way (Kuniavsky, M. 2003, p. 353). Success criteria are often composed of the constructs “perceived usefulness” and “perceived ease of use” (Ratner, J. 2003, p.19), deriving from Davis’ “Technology Acceptance Model” (Davis, F. 1989, p. 320).

Lastly, the absence of scientifically established findings of the relationship between usability and success is another research gap. There are publications which contain allegations, plausible statements and case studies while showing positive effects of usability and more often negative effects of insufficient usability, but those correlative statements have a low generalizability level.

A.3 The Model
The model’s main objective is to limit, to describe and to array usability aspects based on theory and partially in accordance with existing norms, e.g. ISO 9241. As a first result, six usability dimensions emerged which could be associated as characteristics with any user interface.

The comprehension of usability success is being defined, arrayed and structured based on theory. As a second result, four clearly outlined success variables emerged. Two of them are objectively measurable; the other two are subjectively describable by a test person. The coherence between the six usability dimensions and the four success variables is being described by hypotheses. In total, they represent the empirically verified model which provides a so far nonexistent basis for explaining usability success.

A.3.1 Dimensions
Existing literature differentiates between dozens of factors which affect usability, from colour composition of user interfaces through to support features (Stander, A. and van der Merwe, N. 2003). Our model does not aim at quantitatively including all those factors. To a greater degree it tries to identify fundamental and success-related usability dimensions in order to explain a critical part of the performance.

A.3.2 Success Variables
Until now, no generally accepted, consistent and measurable criteria exist for quantifying usability of a system (Bias, R. and Mayhew, D. 2005), despite a few approaches, e.g. (Bevan, N. 1995), (Keevil, B. 1998), (Winter et al. 2007). Usually, only the completion rate is being determined (Johnson, T. 2006, p. 546). A system is usable for a user when he can complete an interaction successfully. Using completion rate as the only measurement parameter is not sufficient. Besides completion success
in a strict sense, also other factors, e.g. processing speed (Schaffer, E. 2004, p. 125), are decisive for the users’ experience.

In addition to the completion rate, there are more criteria necessary in order to define the term success and make it quantifiable. Through the process of literature review and preliminary investigation, three more variables have been identified. As a result, the following four sound measurement parameters have been chosen and taken together, they explain as much usability success as possible: completion rate (Nielsen, J. 2001), processing speed (Toms, E., Dufour, C. and Hesemeier, S. 2004, p. 52) and (Baca, B. and Cassidy, A. 1999, p. 777), perceived ease of use (Davis, F. 1989, p. 298) and perceived usefulness (Davis, F. 1989, p. 320). Completion rate and processing speed are the more objectively measurable qualities of success in terms of effectiveness and efficiency, perceived ease of use and perceived usefulness are the more subjectively measurable qualities of success in terms of users’ satisfaction.

A.3.3 Preliminary Empirical Investigation
For acquiring the foundations to establish the model, several qualitative empirical investigations have been accomplished prior to testing the model. Every study has been designed as a qualitative examination of commercial websites’ and web applications’ usability. First, a design outline has been tested by groups of six to eight participants. Secondly, different design versions of the same application have been tested comparatively by ten to 21 participants. These tests have been composed of a standardized pre-interview, the usability test itself, and a standardized post-interview. Finally, particular functionalities of the same application have been tested in groups according to their main interests. This last study has been conducted with groups between 16 and 21 participants. Every test has been realized with a clickable interface and recorded on video. The main goal of these studies was the exploration of the central usability dimensions and their effect on success. The main question was, which design elements influence usability to an eminently wide degree and how can this effect best be measured. This explorative questioning was used to prepare the model’s development.

A.3.4 Hypotheses
Based on literature review and the explorative studies, six main hypotheses have been formulated. They describe the supposed correlation between the usability dimensions and usability success. In order to determine the specific usability benefit, the correlation with usability success is formulated in each case with four subordinate hypotheses.
Recognizability is a system’s quality which allows the user to identify quickly and without difficulty how he can accomplish a certain purpose while using the system. This through exploration ascertained finding is supported by scientific sources, e.g. (Holzinger, A. and Ebner, M. 2003, p. 782) and (Keevil, B. 1998). The subordinate hypotheses assume a positive effect of recognizability on all four success factors.

Real world correspondence summarizes figures, signs, icons, terms and other design items of an interface, which are oriented towards objects and common symbols in the users’ material environment. Usability issues are often related to the unsatisfied need for clarification of abstract phenomena, see (Becker, S. 2004) and (Czaja, S. 2006). The subordinate hypotheses assume a positive effect of real world correspondence on all four success factors.
Anticipating support is a system’s ability to allow autonomous understanding and actively propose the presumable next step of a user’s procedure with the objective of facilitating the fulfilment of his task. The term in a non-technical sense does not exist in scientific literature. The subordinate hypotheses assume a positive effect of anticipating support on all four success factors.

Compliance with dominant designs describes the adoption of established design standards which are familiar to users. This through exploration ascertained finding is supported by scientific sources, e.g. (Morville, P. and Rosenfeld, L. 2006), (Nielsen, J. 2007) and (Voss, A. 2003). The subordinate hypotheses assume a positive effect of compliance with dominant designs on all four success factors.
Figure 9 Degrees of Freedom within the Path (H5)

The degrees of freedom within the path indicate the extent to which a system allows the user to reach a specific goal on several alternative ways, if possible with the help of shortcuts. For this subject, only a few scientific sources exist, e.g. (Mayhew, D. 1999). The subordinate hypotheses assume a positive effect of the degrees of freedom within the path on all four success factors.

Figure 10 Degrees of Freedom through the Back Action (H6)

The degrees of freedom through the back action indicate the extent to which a system allows the user to undo one or more erroneous or incorrect entries. Scientific sources confirm the back action’s role, e.g. (Shneiderman, B. 1987, p. 239) and (Rosson, M. and Carroll, J. 2002, p. 175). The subordinate hypotheses assume a positive effect of the degrees of freedom through the back action on all four success factors.
A.4 Research Methodology

For empirically validating the model, two different versions of a click through prototype of a fictitious Internet Banking application were used in an experiment.

A.4.1 Test Design

Using experiments as research methodology offers the advantage of systematically observing specific situations under the circumstances controlled and modified by the researcher. The essential characteristic of experiments – the active manipulation of the test conditions by the researcher himself – was the main decision criterion for having the possibility to differentiate cause and effect. The three conditions for choosing experiments as research methodology according to (Hager, W. 1987, p. 73 et seq.) are complied: dependent variables are definable from independent variables, the sequence from independent to dependent variables is given, and data from two or more groups is being compared.

Here, the method of a synchronous remote usability test has been used for testing the six hypotheses regarding the correlation between the usability dimensions and the success factors. With the help of two different versions of a 77-page click through prototype, the participants were guided towards these varied characteristics. These varied characteristics are not the solution to the participants’ tasks itself but should have an influence on the process of resolution. The two different prototype versions differ from each other in a high or low form of the respective usability dimension.

Pre-tests were used to ensure the prototype’s randomized configuration of the varied characteristics and to eliminate technical and operational defects. Those pre-tests already showed that the dependant variable “completion rate” might be too rough for a target-aimed analysis. The participants have been divided into two groups, based on the usability dimensions’ varied characteristics (later, the analysis compared the two groups). Every participant received a set of tasks, in total 51 participants completed the experiment.

A.4.2 Test Item

An Internet Banking application considered one of the most successful and most established Internet applications ever has been chosen. Usability issues are important in this field as a great number of Internet users accomplish their banking affairs online and as banks will expand this channel in the future (Pikkarainen et al. 2004, p. 224). From the usability point of view, Internet Banking contains further interesting characteristics: its nature is application-like (it is used in the form of multi-stage,
completed processes), its basis is diverse and complex (balance queries, transactions, search, withdrawals, etc.), transactions can be processed independently from each other (in contrast to an online shopping process), it is very obvious whether a transaction has been successful or not and lastly, there are many existing examples which serve as a reference.

A.5 Results

A.5.1 Assessment
Each of the 51 participants solved six tasks. In total, 283 out of 306 partial experiments were completed successfully. This relatively small number of failures does not allow drawing reliable, statistically valid conclusions and it implies that “completion rate” can not be a suitable measurement parameter. Instead, it should be considered as a fundamental condition of usability (and as a knockout criterion in this model): if a task cannot be completed successfully, there is a usability problem.

The remaining three success factors have been analysed regarding their variance as the standard element of examining causal correlation. Because the participants have been treated differently, treatment variables were used to build groups. In this experiment, the treatment variables are the prototype’s two different versions. The variance analysis’ goal is to work out whether the observed differences within the critical variables are based on the varied treatment or on the random composition of the groups. The data has been assessed using a univariate analysis, which considers one dependent variable at a time. In total, the statistical assessment contains six univariate covariance analyses, carried out separately for each partial experiment.

Demographic data (gender, age, education, Internet experience, Internet Banking experience) has also been taken into account during the pre-assessment, but both age and gender did not show significant relevance to the test’s outcome. Demographic data proved to be relevant are Internet experience and Internet Banking experience. Therefore the variable “Internet Banking experience” has been added to the final assessment as a covariate. The variables “positive characteristic of a usability dimension” and “negative characteristic of a usability dimension” have been added as categorical variables.

A.5.2 Outcome
The remaining three success factors and the corresponding 18 subordinate hypotheses have been reassessed; nine of them could be confirmed.
Increased recognizability proved to lead to a higher perceived ease of use. Real world metaphors proved to lead to a higher processing speed and to a higher perceived ease of use, so does anticipating support. An interface that complies with dominant designs proved to lead to a higher perceived ease of use. A higher degree of freedom through the back action proved to lead to a higher processing speed and to a higher perceived ease of use and usefulness.

All data in this experiment have been interpreted by using a univariate analysis. The statistical methods used included variance analysis for the several indicators (processing speed, perceived ease of use, perceived usefulness) as the standard element for determining causal correlation. This step included the use of treatment variables (in this case the different versions of the prototype). A confidence interval of 95% has been used to evaluate the results’ significance and to confirm or reject the single hypotheses. Overall, the statistical evaluation contained six different univariate covariance analyses which have been separately carried out using the variable “positive / negative version” as a categorial variable and “Internet Banking Experience” as a covariate.

**Figure 11 Confirmed Hypotheses**

A.6 Discussion
The main goal of the model’s development and the subsequent experiment consisted of verifying the fact that usability consists of single, distinguishable factors, which affect a system’s user-friendliness. Although not all of the hypotheses could be confirmed through the experiment, the usability dimensions turned out to influence the process success both for objectively measurable (processing speed) and subjective parameters
A.7 Conclusions

Key conclusions contain the following statements: A higher recognizability of the next step results in positive effects on usability. Real world metaphors are superior to abstract solutions. It is reasonable to prominently indicate the operation step which will in all probability be used next. Sticking to dominant design supports orientation. The higher availability of a back action results in notably positive effects on usability.

The rejected hypotheses could be subject to further research. By means of additional experiments, a modified test design could be assessed in order to confirm or reject the first experiment’s outcome. Every hypothesis has been tested with at least one task. This represents the usual approach for experiments. Nevertheless, measurement inaccuracies within the operationalisation of the model’s variables can not be
precluded. A possibility for further research could be to minimize the risks of measuring errors and increase validity through developing a larger-scale prototype and adding more tasks related to the same usability dimension. The success factors are more focused on single pages or input forms than on a whole process and are therefore geared to rather transaction-oriented websites. Interesting for further research would be the enhancement of the model with new context-specific dimensions.

Further research could also consist of a comparative study for the new platform generation. One the one hand, the work could concentrate on the problems which intensified since the conduct of this study, e.g. usability issues concerning the dynamic features of Web 2.0 interfaces; on the other hand it could investigate patterns for web usability according to (Crumlish, C. and Malone, E. 2009) and continue this approach with a focus on usability.

As usability is going to be an even more relevant topic when it comes to publishing websites or rich applications on mobile devices, especially in relation to mobile commerce (m-commerce), this study’s findings could be a basis for further research in the field of m-commerce usability.

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Paper B

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<th>Title</th>
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<td>Authors &amp; Affiliation</td>
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Table 5 Bibliographical Information for Paper B

Abstract:

Research problem: Corporate websites have been the subject of several research endeavors, and most of the research has been focused on usability and interactivity. Since the emergence of the term Web 2.0, more and more websites have added social features to their base functionality, and this new type of interactivity has yet to be investigated. This study explores the research evolution in this field. Research questions: How has research on interactivity in corporate websites evolved? How can prior research be categorized? In each category, which of the research challenges have little or no research support? Literature review: Our approach to the topic is guided by four major streams of research – the diffusion of innovations theory; the technology, organization, and environment (TOE) framework; the institutional theory; and the model from Iacovou et al. The analysis of the evolution of corporate websites showed three common types of corporate websites classified by their purpose and interaction intensity. Corporate websites hereby often benefit from the inclusion of design principles and patterns induced by the term Web 2.0. While examining the characteristics of corporate websites, usability and interactivity were found to be most important with reference to positive user response. Therefore, we clarified the concept of web-based interaction and reviewed the research on consumer response.
Methodology: In order to gain a deeper understanding of the evolution of research on the interactivity in corporate websites, our study conducted a systematic and exhaustive literature review in which we identified and categorized several research issues. We conducted a qualitative analysis of 166 articles and classified relevant contributions by research issue and category. Results and conclusion: Among the identified research issues concerning interactivity that facilitates communication of the organization, only relationship management emerged as a dominant issue. Research issues concerning interactivity that facilitates e-commerce could be found most and they tend to focus on two main areas: decision support systems and recommendation agents on sales oriented e-commerce websites and loyalty, satisfaction and trust as key variables. Research issues concerning interactivity for interpersonal communication mainly focus on the user’s individual motivation and successive behavior, and contain many different references to computer-mediated interaction and online communities. Research issues in the field of designing for interactivity discuss interface design questions and focus on numerous website characteristics and their impact. Given those issues, we make suggestions for future research that would explore the organizational behavior related to innovation diffusion on corporate websites.

Keywords:
Corporate websites, interactivity, Internet, literature review, Web 2.0

B.1 Introduction
The last two decades has seen an increase in academic research about the Internet, and the results show that one of the most prominent trends on the Internet is the emergence of a new generation of online applications that enable users to collaborate and share information [1], [2]. Frequently, this trend is described as Web 2.0. It is a general term, encompassing all Internet-based social technology that enables participation and interaction.

In the field of Enterprise 2.0 – Web 2.0 principles applied to corporate intranets – there are many examples of articles in prior research that define and explore intra-company usage of online applications that enable interaction. In most cases, these research examples investigate acceptance and adoption of Enterprise 2.0 by employees in the areas of knowledge management, collaboration, and communication (e.g. [3], [4], [5], and [6]). Prior research was less focused on external usage of corporate websites, which is surprising because over the past few years, Internet users have become familiar with these new means of engagement. As a result, users tend to expect a certain level of interaction on a company’s corporate website and its microsites, regardless of the nature of the company and its services [7]. A recent Gartner report states that the rapid growth of social media and crowd sourcing techniques could lead
corporate websites toward extinction if companies do not create the tools, technologies and applications needed to deliver a customer-centric website [8]. This statement is supported by many current contributions in the field of professional communication with quotes like “interactive systems, not just the web” that can be found in pertinent publications of communication professionals. Thus, in practice, there is a clear tendency towards a more distinguishable model of roles with more specific functions like visual designer and interaction designer.

With that information in mind, the following research questions are raised:

(a) How has research on interactivity in corporate websites evolved?

(b) How can research issues of prior research be categorized?

(c) What are the research challenges in each category that have little or no research support?

To answer these questions, this study begins by clarifying key terms of research and evolutionary aspects in the Internet field. Then the study provides a systematic review of the literature in order to identify and categorize research issues in the area of interactivity in corporate websites. Finally, conclusions, limitations and suggestions for future research are listed.

B.2 Literature Review

In this section, the theoretical foundations of this study are stated and the study is situated within the larger context of corporate websites. The section begins with the study’s theoretical orientation and continues with definitions of the terms corporate website and Web 2.0, followed by an outline of important characteristics of corporate websites, in which the concept of web-based interaction is clarified and research on consumer response is reviewed.

B.2.1 Theoretical Orientation

Our approach to the topic is guided by the four major streams of research. Most studies on IT adoption within companies are derived from two of these streams [9]: the diffusion of innovations theory [10] and the technology, organization, and environment (TOE) framework [11]. While most theories apply to research at the individual level, these are the only two that apply to research at the corporate level [12]. The TOE framework is consistent with the diffusion of innovations theory and includes an additional component: the environmental context, which presents both constraints and opportunities for technological innovation [12]. Many studies combine the TOE
framework and diffusion of innovations theory because when they are combined, the diffusion of innovations theory is then better able to explain intra-company innovation diffusion and is considered to be more complete [12], [13]. Some studies also combine the TOE framework with the institutional theory which adds external pressure as an additional factor to the environmental context of the TOE framework. Other studies combine it with the model from Iacovou et al. [14] which adds perceived benefits as an additional factor. It has become clear that by combining theoretical models, we can achieve a better understanding of the IT adoption and diffusion phenomenon.

B.2.2 The Evolution of Corporate Websites
The first corporate websites appeared soon after the launch of HTML 2.0 and the first graphical web browsers in 1993 and 1994. Corporate websites differ from an intranet in that they are accessible by the public via the Internet, and typically offer information about the company and its products and services [15]. In addition to this mostly static information, corporate websites also enable communication and interaction between the public and the company, thereby supporting customer relationships [16], [17], [18], and [19]. According to Fitzsimmons and Fitzsimmons [20], corporate websites have four main types of use:

- as a company’s primary or secondary distribution channel
- as a means to provide technical support to customers
- helping to improve existing customer services
- supporting customer orders, disseminating information, and facilitating member communication

Often, corporate websites enable customer self-service, which can play an important role in every stage of the customer buying cycle [19]. The stage most often affected is the second stage – evaluation. It benefits most from the interaction features on corporate websites because acquiring new customers is a company’s main focus at this stage. According to Muther and Österle [19], a company has three main tasks in order to ensure customer self-service in the evaluation stage. They are:

- requirements analysis and consulting
- product and price information
- configuration and offer preparation

With more complex products, potential customers typically expect support from the supplier, such as product evaluation support features [21], [22]. Examples of support features on corporate websites include call-back features, instant messaging or chat
features (e.g. synchronous live web help, service and sales chat), video conferencing, and asynchronous contact forms for arranging consultancy appointments. According to Fink, Zeevi and Te’eni, commonly used customer relation features on corporate websites include configurators, newsletters, notifications, feedback and contact forms (contact data and e-mail), added-value information (e.g. FAQs and online discussion forums), and order tracking systems [23]. Real-time chatting and co-browsing within assistive web applications during purchasing or for post-sales procedures represent the state of the art. For all of the features mentioned above, interactivity is the common underlying characteristic.

A corporate website can also serve as the hub for a company’s social media activities, which are likely to contribute to the ability to communicate with customers more effectively [24], [25], and [26]. Since the emergence of the term Web 2.0 in 2004 – it was originally defined by O’Reilly and later revised by Musser et al. – its design principles and patterns have become commonly known [2], [27]. Although they primarily define the common characteristics of web-based business models [28], these characteristics can also be used as guidelines when analyzing customer-facing corporate websites [29]. The past few years has seen the development of several varied definitions and approaches for Web 2.0. An overview of previous studies can be found in Lim and Palacios-Marques [30]. A common set of Web 2.0 characteristics has been assembled by Pole et al. [31]. Some of the prior publications focused on corporate departments (e.g. corporate communications, public relations, marketing, and after sales) whereas others examined a company-wide application of social software, e.g. [32]. Applications are classified into categories such as internal and external tools according to the purpose of the corresponding service. They are also classified into categories such as company-run and non-company-run [31], [33]. In summary, the broad scattering of domains and classification schemes makes it necessary to classify research in this field more precisely. Figure 12 illustrates three common types of corporate websites classified by their purpose and interaction intensity.
B.2.3 Important Characteristics of Corporate Websites

Research on web-based interaction began early in the second half of the nineties and has continued ever since, e.g. [34], [35], [36], and [37]. Academic studies in various fields (e.g. marketing, communication, advertising, and information systems) have tried to gain insights into the response of consumers to corporate websites. Through the analysis of website evaluation research, Chiou, Lin and Perng have showed that an IS-approach was used by the majority of website evaluation studies prior to 2001, and since then a combined IS- and marketing-approach has emerged as dominant [38]. In an early large-scale study, Fogg et al. found that when people evaluate website credibility, the aesthetic design of the site was mentioned most frequently [39]. Later, the extensive literature review by Voorveld, Neijens and Smit revealed that the actual – i.e. objectively assessed – interactivity mostly leads to a positive effect on affective and cognitive reactions to the website [40]. In addition to interactivity, websites include aspects such as design, modality, fit, usability and function. Among these aspects, usability and interactivity are the factors that lead most often to positive user response.
According to Nielsen, the term *usability* is defined as follows: The usefulness and therefore the success of software products and Internet applications is determined increasingly by the ease with which users capture the product's potential [41]. A study of 66 usability tests showed that usability-based redesigns of commercial websites were able to increase key performance indicators (e.g. number of orders, number of newsletter subscriptions) by an average of 82 percent [42]. Research in usability is aimed at these kinds of improvements. The purpose of this research is to help website creators to identify and reduce the usability thresholds of software products or Internet applications, and to facilitate human-computer interaction [43]. The study by Pearson and Pearson is an example of current research efforts in the field of usability [44]. They proved that *ease of use* and *navigation* are two critical components in the determination of website usability. Another example is the work of Cappel and Huang, which showed that link appearance, navigation and the inclusion of features such as breadcrumb trails and search boxes are two key ways to improve the usability of corporate websites [45]. Tarafdar and Zhang identified usability as a significant determinant of *website reach*, which itself is one of the two main website performance indicators [46].

*Interactivity* is one of the most examined elements of all. According to Lee and Kozar, interactivity is defined as the website's ability to create vivid interaction and communication with users, and previous research has found significant effects of interactivity on *user performance* [47]. From a user’s point of view, *nontransaction-related interactivity* is the second most important factor of a website [37]. Furthermore, a website’s perceived interactivity has a positive influence on a consumer’s impression of that website and his initial online trust [48], [49]. Interactivity itself is a process-related construct within the field of communication, and computer-mediated communication has the ability to enable high levels of interactivity [50]. The interactivity of a website facilitates an active dialogue with customers, and therefore plays an important role in helping consumers form perceptions of the website. Interactivity ranks among the top ten research topics in Internet-related research in the fields of communications, marketing, and advertising [1], and is one of six primary emerging topics according to Kim and McMillan [51]. Relative to the development speed of the Internet, online customer dialogue and web responsiveness have been emphasized at a very early stage [34]. Popular forms of interactivity include customer support, marketing research, personal-choice helpers, advertising, and entertainment [35]. When searching through previous studies on website evaluation, it became clear that *interactive communications* is the most often used criterion of *customer relations*. The increase in website interactivity makes communication an even more valuable element of marketing, and IT-enabled interactivity strongly impacts established marketing practices [36], [52]. In past studies, interactivity is among the most important constructs of website characteristics in every theory.
B.3 Methodology

The purpose of this section is to present the approach and underlying foundation of this study as well as the way the study was conducted with regards to the literature selection and processing. The section starts with a description of the choice of research methodology and then demonstrates how data was collected, analyzed, and validated.

B.3.1 Choice of Research Methodology

In order to ensure the research is balanced, a systematic, transparent and reproducible literature review process is necessary. The most suitable research methodology for achieving this goal is the integrative literature review methodology, because it helps to develop inclusive, robust and replicable literature reviews for the purposes of surveying the state of the art on a given topic, identifying gaps in the literature, and proposing future research agendas [54]. Therefore, this methodology is superior to any other quantitative or qualitative method concerning the general purpose and specific research questions of this study.

An integrative literature review is a distinctive, sophisticated form of research that generates new knowledge about the topic being reviewed. Its quality is ensured by reviewing, criticizing and synthesizing representative literature on a topic in an integrated way [55]. As a result, new frameworks and – to some extent – provocative perspectives on the topic are generated. Authors are expected to identify an appropriate topic for the review, justify why a literature review is the appropriate means of addressing the topic, search and retrieve the appropriate literature, analyze and critique the literature, and create new understandings of the topic through synthesis [55]. The basic approach was first formulated in the field of medicine and has since been adapted to a wide range of disciplines, including management sciences, software engineering and technical communication [54]. The contribution of Rao and Ramey [56] and the contribution of Carliner and Bernard [57] are two examples of studies that use this approach. Following the taxonomy of literature reviews by Cooper, this study focuses on research outcomes and theories, and its goal is to identify central issues that should take precedence over future studies [58]. Based on Cooper’s categories, relevant literature will be conceptually arranged and covered
exhaustively with selective citation in a neutral representation [58]. The review might be beneficial for IS scholars and practitioners working in the Internet field.

B.3.2 How Data Was Collected

Research in the computing field can be divided into its most common academic subdivisions: computer science, software engineering, and information systems. Of the nine topic categories that Glass, Ramesh and Vessey have identified, information systems (IS) research contributes the most to the topic category organizational concepts [59]. Herein, the subcategory technology transfer (including technology innovation, technology acceptance, technology adoption, technology diffusion) is the most researched topic. Thus, IS research seems to be a promising research area in which to start examining existing literature related to the subject matter of this study. This decision is supported by the remarks of Parameswaran and Whinston, who note that social computing transforms and extends both the scope and nature of IS research [60].

The list of journals to search was derived from multiple sources: senior scholars’ baskets of journals in IS research, the rankings of management information systems journals, and supplementary references like Mylonopoulos and Theoharakis [61]. The process of composing the list of journals began with a search of the most reputable and promising sources. The final list is comprised of 16 international top-ranked academic journals in IS research that were found using meta-search solutions like EBSCO Discovery Service and ProQuest.

Because Web 2.0 is a relatively new term [62], the breadth and depth of the literature review was limited. Therefore, only scientific publications in the form of peer reviewed research articles from 2004 to 2011 were considered. Obviously, the backward search procedure then also led to cross-referenced sources outside this limit. We performed a keyword search to identify as many relevant contributions as possible. The selected journals were searched using the search criteria for words and phrases in title, abstract and keywords (as available). The search string read as follows: interaction or participation and Web 2.0 or Internet or online.

B.3.3 How Data Was Analyzed

After performing the search and removing duplicate results, we evaluated the abstract of each article in order to judge its relevance. The author thoroughly examined each article’s focus, main statements, outcomes, and judged the probability that it would add to further research. The two key criteria used to judge the relevance of each article were its business context and the enclosed consideration of important website characteristics.
B.3.4 How Data Was Validated
A structured backward search was conducted by reviewing the citations in the articles found in the first round of searching. Therefore, all citations in the articles found so far were checked by title evaluation. The aim of this process is to check each article’s foundations in order to ensure that possibly relevant articles not found in the first round of searching are not omitted for further examination. The same procedure was followed in conducting a structured forward search. Finally, for all additionally found articles through the backward and forward search procedure, the author performed an identical abstract evaluation as mentioned above in order to check each article’s relevance to this project.

The concept matrix as proposed by Webster and Watson [63] was chosen as the system for classifying the whole set of articles and building the categories. Each article has been classified within the matrix by concept and by unit of analysis (organization, group, individual). We identified each article’s underlying research issue by matching it to a covering concept and then grouped the issues into categories based on the concept. With only a few exceptions, the units of analysis within the categories were consistent. This means that in the category “organizational issues”, the organization is the relevant unit of analysis; in the category “commercial issues”, the online shop is the relevant unit of analysis; in the category “communication issues”, the user is the relevant unit of analysis; and in the category “formation issues”, the website is the relevant unit of analysis.

B.4 Results
This section provides the quantitative and qualitative results and the subsequent analysis of those results for addressing the research questions about the research evolution regarding interactivity in corporate websites. It begins with a subsection about the literature included in the review. Next, it presents the four key themes resulting from the analysis of the results from the literature review. Finally, it provides an assessment of the research on interactivity in corporate websites.

B.4.1 About the Literature Included in the Review
Following the methodology described above, the keyword search produced a total of 109 articles (after removal of duplicates). In the end, 29 articles (27%) were selected through the abstract evaluation procedure which rated the article’s relevance in terms of business context and website characteristics. After removal of duplicates, a backward search produced a total of 24 articles and a forward search produced a total
of 33 articles. Next, an identical abstract evaluation was performed for the 57 articles that came from the backward and forward search. Finally, 11 articles (19%) were selected for further consideration. The 11 articles from the structured backward and forward searches were added to the 29 articles of the initial search, making for a total of 40 articles. That means that 24% of all hits were judged to be relevant in terms of the scope of each article. The publications represented in this sample are:

- *Information & Management* (7 articles)
- *European Journal of Information Systems* (6 articles)
- *International Journal of Information Management* (6 articles)
- *MIS Quarterly* (4 articles)
- *ICIS 2009 Proceedings* (2 articles)
- *Information Systems Journal* (2 articles)
- *Information Systems Research* (2 articles)
- *Journal of Management Information Systems* (2 articles)
- *Journal of the Association for Information Systems* (2 articles)

And there were seven other publications with one article each.

The concept matrix shows that the majority of articles (29) can be assigned to the perceptual psychology theory or to the social psychology theory. The former examines human-computer interaction and user perceptions on the level of individuals, the latter studies user behavior and individual motivation on the level of individuals and groups, using elaborated theories like the social capital theory. Additionally, eight articles can be assigned to the organization theory which uses the resource based view of the firm and examines value creation using the value chain approach on the level of organizations and groups. Three more articles can be assigned to the innovation diffusion theory, which studies the rate of adoption of innovations on the level of organizations.

During the first step of analysis, a few noteworthy patterns were found:

- Not surprisingly, the term *Web 2.0* has been found relatively rarely. There were multiple instances of studies about corporate websites, studies that use *interaction* as a key variable, and studies about consumer response to online advice and other website characteristics. The number of studies about organizations was unexpectedly high.
Concerning the origin of the articles, most of the contributions found in IS-related papers do not draw solely upon an IS theory. Instead, they use an interdisciplinary approach that includes theories of different fields, e.g. sociology, psychology, communication, and management. Backward and forward searches led to a multiplicity of sources outside the IS-related literature, e.g. [64].

Distribution over time shows a fairly steady evolution and constant interest in the subject of interactivity in corporate websites. The first research efforts were undertaken at a very early stage when compared to the development of the Internet, for example [65].

Numbers of citations were checked at the time of writing. Commonalities can be found when looking at the keywords: website success, interactivity, and playfulness are common constructs in the earliest class of highly cited contributions. In the subsequent class (2004 to 2006), business-to-consumer relationships in auction and e-commerce settings are the common areas of focus in the most cited studies of that era. In the most recent class (2007 an onwards), the most cited contributions centered their research on e-commerce constructs like social presence, trust, loyalty and on recommendation mechanisms.

Methodologies used by the most cited contributions were content analysis of business websites by a jury (sometimes in connection with self-collected or agent-collected data on websites and third-party information), online surveys and laboratory experiments.

The second step of analysis of the final list of papers showed numerous research issues. They have been identified by reading through every article in the final set of 40 articles. Several articles contained more than one research issue. Table 7 illustrates the identified research issues, mapped to the respective articles. As a result of the concept matrix classification process, the research issues can be categorized in four general categories. The respective unit of analysis is embedded in the issues categories.
<table>
<thead>
<tr>
<th>Research issues</th>
<th>Contributions</th>
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<tr>
<td>Value chain</td>
<td>84, 87</td>
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<tr>
<td>Business value of IT and transformation</td>
<td>74, 87, 103</td>
</tr>
<tr>
<td>Innovation adoption and innovation diffusion</td>
<td>65, 71</td>
</tr>
<tr>
<td>Sales and marketing functions on corporate websites</td>
<td>69, 70, 72</td>
</tr>
<tr>
<td>Branding</td>
<td>66, 68</td>
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<tr>
<td>Mass customization</td>
<td>104</td>
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<tr>
<td>Relationship management</td>
<td>64, 72, 73, 74, 75</td>
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<tr>
<td>Performance (website success)</td>
<td>67, 69</td>
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<table>
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<th>Organizational issues</th>
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<table>
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<th>Commercial issues</th>
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<tr>
<th>Formation issues</th>
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Table 6 Issues in Researching Corporate Websites
Among the organizational issues that were identified, only relationship management emerged as a dominant issue. Commercial issues could be found most and they tend to focus on two main areas: decision support systems and recommendation agents on sales oriented e-commerce websites (supplier view) and loyalty, satisfaction and trust as key variables (consumer view). The category communication issues focuses mainly on the user’s individual motivation and successive behavior, and contains many different references to computer-mediated interaction and online communities. The fourth category, formation issues, groups studies that discuss interface design questions and focus on numerous website characteristics and their impact.

Considering this collection of research issues in the broad area of corporate websites, the subsequent step is their refinement and interpretation in the context of interactivity in corporate websites. Each category is analyzed in the following sections.

B.4.2 Key Theme 1: Interactivity That Facilitates Communication of the Organization

For the purposes of our study, interactivity shall be defined as consumer-supplier interaction. In this context, some of the organizational issues mentioned above obviously carry more weight. Examples for differing definitions of the term interactivity include [66], [67], and [68]; and they show a fairly different understanding of the term, as compared to the one mentioned above.

First of all, many studies have emphasized the importance of two-way online communication between customers and companies as stated by Liu and Arnett [69]. They empirically found two specific factors that positively influence website success: interactive feedback between customer and business, and quick responsiveness to customers. Palmer found similar results while researching website success [67].

Secondly, innovation adoption by companies is at least as important as the issues mentioned above, and have been investigated in several areas, including the adoption and use of websites, the factors and reasons influencing initial adoption, and the characteristics of adopters and patterns of website use [70], [71]. In addition, Ha and James use the attributes of successful innovations as suggested by Rogers [10] to explain the rapid adoption of the web and they use his definition of interactivity to reexamine the concept by building five dimensions of interactivity: playfulness, choice, connectedness, information collection, and reciprocal communication [65].

A third group of issues deals with particular marketing and sales functions on corporate websites. Results show that sales-related functions mostly follow a marketing approach [70]. Other authors classify functions and features on company websites related to e-commerce into three marketing phases – presales, online sales,
and aftersales [69] – and *interactivity* is regarded as one of the factors enabling the initiation of the relationship with the customer [72].

Lastly, relationship management issues influence the potential of corporate websites to help establish and sustain online relationships with customers. One important factor that is positively related to the consumer’s length of relationship to the supplier is *trust* [73]. Trust is a determinant of *customer loyalty* and customer loyalty to a website is also influenced by website design elements [74], [75], which involve constructs like *content*, *context*, *communication*, *community*, *connection*, *customization* and *commerce* [72]. For many sites, interactivity plays a role in supporting buyer’s initial trust and then customer loyalty.

One area that is in need of more research support is the effects of different forms and levels of interactivity on website’s success (from asynchronous interaction with feedback forms and e-mail, to synchronous interaction with real-time chat and co-browsing). Furthermore, future research initiatives should focus on the adoption of interaction patterns on corporate websites. Adoption issues are critical when considering the diffusion of innovations, like *Web 2.0* principles for social web design. Two more interesting areas of inquiry would be the examination of the view of different corporate departments, and the application of marketing and sales functions that have been interactively extended on their corporate websites. Lastly, the influence of different forms and levels of interactivity on *trust* and *loyalty* as central relationship management factors could be a stimulating research challenge. The work of Yoon, Choi and Sohn [64] would be continued when refining their *relationship investment model* by, for example, closely examining the effects of interactivity on consumer-supplier relationship building.

### B.4.3 Key Theme 2: Interactivity That Facilitates e-Commerce

In e-commerce research, the most challenging issue appears to be online support and online advice (through assistive web applications like online shopping assistants, decision support systems, recommendation agents or avatars). Often, assistive web applications possess interactive characteristics, humanoid representations, and the ability to communicate. *Perceived similarity* is an important factor in an online user’s perceptions of a tool’s *usefulness*, *ease of use*, *social presence*, *trustworthiness*, and the level of *interaction enjoyment*. When combined, these perceptions act as a mediator for the effects of *perceived similarity* on *reuse intentions* [76]. The level of one of those factors – *social presence* – can be increased with the addition of recommendations and consumer reviews [77]. With these additions, the influence of *website socialness* results in significant effects on *user intentions* [78]. A recommendation agent's *personality*, *vividness*, and *computer playfulness* were found to influence *social presence* [79].
The second challenging issue in e-commerce research is trust. Social presence can help to increase user trust of the recommendation agent in a mediating role [79]. Trust itself is an important factor that is positively correlated to customer satisfaction [80] and the length of the relationship between the consumer and supplier [73]. However, sometimes trust and social presence are both regarded as independent variables influencing factors like uncertainty in online exchange relationships [81].

In addition to the potential areas of future research identified by Xiao [82] and – more related to social presence – by Karimov, Brengman and Van Hove [83], areas that have no research support include the question of how different interactivity representations and design choices can influence socialness perception and social presence. What’s more, different forms and levels of interactivity may help to build higher online trust and subsequently loyalty and satisfaction.

B.4.4 Key Theme 3: Interactivity for Interpersonal Communication
Communication issues can be split into two main areas. Computer-mediated interaction is the most referred-to topic in the first area, while online communities and a user’s individual motivation and user behavior is the most referred to topic in the second area.

Generally, interactivity is seen as the key advantage of computer-mediated communications and therefore counts as a critical concept in the medium [65]. Interaction tools like feedback options, contact data, FAQs, post-sales procedures and so forth contribute to the responsiveness of a corporate website [67] and can be classified as communication content [84]. Specific communication applications such as instant messaging [85] or online discussion forums [86] have been examined, and the results are mixed: while the level of actual implementation is rather low, the measured effects on user response and value creation are promising [72], [87], and [88]. Human factors are central to the development of web-based applications, which is why research into human factors has grown in the past years [89]. In his model of optimized communication through the corporate website, Heldal goes a step further and proposes a combination of branding, human-computer interaction and usability focus [66]. In e-communication research, the media naturalness hypothesis by Kock claims that a communication medium with a higher degree of naturalness leads to a higher perceived quality by customers [90].

The second facet of communication research concerns online communities and behavioral aspects. Interactions in online communities have been thoroughly studied from a social point of view in recent years, e.g. [91] and [92]. For companies, consumer involvement [93] and participation [94] are two relevant aspects of online communities. Results show that a greater identification with the community may increase satisfaction with the community, and satisfaction itself may increase the level
of consumer participation in that community and loyalty to the subject matter [95]. As proposed by Erat et al., interactivity enables direct and active support, which influences consumer involvement and participation [96]. Individual motivation to share information and knowledge in an online community has been examined by Chang and Chuang and results show – inter alia – that altruism, identification, reciprocity, and shared language have a significant and positive effect on knowledge sharing [94].

Two areas that have no research support are the factors driving implementation of communication applications on corporate websites, and the behavioral effects of interactivity in the context of the motivation of users to participate in an online business customer community.

### B.4.5 Key Theme 4: Issues in Designing for Interactivity

Formation research focuses mainly on interface design and website characteristics. Website design elements as stated by Mithas et al. include website structure, website content and website functionality [74]. Website characteristics like informativeness [81], richness [93], usability [65], [80], and [73], interactivity and responsiveness [67], playfulness [69], social cue design [83], and synchronicity and two-way communication [64] are either used to draw website comparisons or as constructs explaining user perceptions or website success. Interestingly, some of the characteristics – e.g. usability – are frequently utilized, whereas interactivity is applied in different shapes and notations. It’s also interesting that social presence, also described as website socialness, is getting steady if not increasing attention [77], [78], [79], [81], and [83]. As noted by Singh, Dalal and Spears, most of the constructs used seem to capture elements from other constructs [93].

One area that has no research support concerns the examination of relationships between constructs emerging from different theoretical lenses in order to look for synergies and commonalities. By drawing on existing constructs, interactivity elements could be isolated and combined with the intention of investigating their effects on the socialness of websites.

### B.4.6 Assessment of the Research on Interactivity in Corporate Websites

Existing research covers a diversified area of research issues related to the interactivity in corporate websites. Topics that are copiously addressed include relationship management (including sales and marketing functions), decision support systems and recommendation agents in commercial settings (e-commerce), their effects on customer response (loyalty, satisfaction, trust), computer-mediated interaction, online
community, individual motivation and user behavior, interface design, and the characteristics and success of corporate websites. Topics that are only partially addressed or not addressed at all include the effects of different forms and levels of interactivity on social presence, on trust, on loyalty and on online conversion; the determinants of the adoption of interaction patterns; the factors driving implementation of communication applications on corporate websites; and the differences between the behavior of corporate departments towards adoption.

In order to address these topics, it is obvious that we need to gain insight into organizational decisions that drive the adoption and implementation of interaction-related tools and features on the respective corporate website. Given a relatively low level of diffusion, this is necessary before we are able to measure the effects of different forms and levels of interactivity. Among the four key themes, the first key theme positions managers as an important element in the study of the interactivity in corporate websites. Their attitudes and behavior appear to have a considerable impact on the present implementation level. For that reason, they also hold ties with the other three domains and play an influential role in creating research challenges within the other three research directions. The positive potential of web-based interactivity has been investigated in many contexts, but managers in the role of a Chief Information Officer, Head of Marketing and similarly, more specific positions like Head of Digital Communications [97] that hold a strategic responsibility for a company’s Internet activities might assess this potential differently. It is their attitudes and behavior that facilitates adoption and diffusion of novel and innovative interface features on their respective corporate website.

B.5 Conclusion, Limitations, and Suggestions for Future Research
The purpose of this section is to draw a conclusion, acknowledge limitations of the study, and provide suggestions for future research. The section starts with a conclusion that presents the implications of the findings. It continues with an open discussion of limitations of the study, and closes with suggestions for future research.

B.5.1 Conclusions
Referring to the research questions, our study examined the evolution of research on interactivity in corporate websites and categorized research issues of prior research. In the context of professional communication, this study has investigated web-based interactivity for interpersonal communication and commercial reasons, and issues in designing for interactivity. Interestingly, in some research traditions, more than one meta-study could be found. Research challenges remain in each category. Most
surprisingly, no research has been found for one important issue: the understanding of
the formation and application of interactivity in corporate websites as an outcome of
an internal decision process. Research endeavors that put the topic into a business
context and investigated innovation diffusion for external usage of interaction patterns
in online applications at organizational level could not be found. Another issue that has
not been addressed and needs further exploration is the perceived relative importance
of technology issues among managers (see Smith et al. as an example [98]). Moreover,
despite the fact that interactivity features show promising effects on consumer
response and have the ability to create business value, implementation levels remain
low. This contradiction has not been resolved in prior research.

We hope to contribute to present knowledge by extensively collecting, judging and
categorizing scientific literature in an emerging area. As for implications to research
and theory, our work can be the foundation for a) developing a fresh conceptual model
for the diffusion of interactivity in corporate websites and b) providing evidence of
adoption mechanisms and their rationale. This study might be valuable to practitioners
as well, because the findings can enhance their knowledge on consumer response to
interactivity and give advice for implementing interactive tools and features on their
respective corporate website in order to achieve a required level of social presence.

B.5.2 Limitations
A limitation of the study could be the fact that the article’s coding procedures have
been conducted solely by the author. Thus, classification results could be verified by
having a second person follow the same searching and coding steps. However, the
judgment of relevance was very strict as a large quantity of the search results has been
excluded for further consideration (73% of the initial search and 81% of the
subsequent backward and forward search – 76% in total). Hence, this limitation should
not harm the findings.

B.5.3 Suggestions for Future Research
The results of this study suggest that behavior within organizations – as it relates to
innovation diffusion on corporate websites – should be researched in the future. This
research challenge can be decomposed into a number of primary research questions
that require further attention:

- What are the critical factors influencing a company’s adoption of online
  innovations related to interactivity on its website?

- Is there a significant difference in perception depending on the respondent’s
  position in the company?
• What effects do different forms and levels of interactivity have on website success?

To answer these questions, an exploration of the initial adoption as the basis for eventual diffusion of interactivity in corporate websites is needed. In order to make that exploration possible, the perceptions of corporate managers needs to be measured. Existing instruments in the area of innovation diffusion research like the work of Moore and Benbasat can serve as a reliable foundation for measuring perception in survey research [99]. The work of Jeyaraj, Rottmann and Lacity, which distinguished individual IT adoption from organizational IT adoption and evaluated the best predictors of each respectively, could be the major source for the development of a theoretical model [100]. As found in other contributions related to organizational IT adoption research, such as Ramamurthy, Sen and Sinha [101] or Hwang et al. [102], the model can draw upon two primary research streams – organizational theory and diffusion of innovation theory – to develop the research model and its hypotheses.

Exploring the attitudes of corporate managers will close the gaps in the theories and research identified by this study. For example, when examining the determinants of the diffusion of online applications which enable interaction at the business level, prior research did not engage in the company’s point of view. What’s more, exploring the attitudes of corporate managers in charge will also advise practicing professionals on how organizational practice could change regarding the purpose of a corporate website and the overall online interaction intensity.

B.6 References


**Paper C**

<table>
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<tr>
<td><strong>Authors &amp; Affiliation</strong></td>
<td>Roman Zollet, Andrea Back, Institute of Information Management, University of St. Gallen (IWI-HSG), Mueller-Friedberg-Strasse 8, 9000 St. Gallen, Switzerland, <a href="mailto:roman.zollet@student.unisg.ch">roman.zollet@student.unisg.ch</a>, <a href="mailto:andrea.back@unisg.ch">andrea.back@unisg.ch</a></td>
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<td>Zollet, Roman and Back, Andrea, “Critical Factors Influencing Diffusion of Interactivity Innovations on Corporate Websites” (2014), <em>IEEE Transactions on Professional Communication</em>, forthcoming</td>
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*Table 7 Bibliographical Information for Paper C*

**Abstract:**

*Research Problem:* Most of the previous research into corporate websites has focused on the users’ point of view and their perception of usability and interactivity as the two predominant website characteristics. It has showed that interactivity plays an important role in consumers’ perception and their responses. This study explores the companies’ point of view and seeks to investigate the organizational motivation to adopt new interactive features on corporate websites. *Research Question:* What are the critical factors influencing the firm’s adoption of online innovations related to interactivity on their websites? *Literature Review:* Many theories are used in IT adoption studies, but most studies on IT adoption at firm level are derived from only two of them: the diffusion of innovations theory and the technology, organization, and environment (TOE) framework, because they are the only ones that apply at the firm level. Comparable to other contributions related to organizational adoption research, our research model draws upon a combination of different primary research streams, adding the institutional theory and the model of Iacovou et al. to the two traditional theories. *Methodology:* The research design aims at quantitatively investigating the diffusion of customer faced online usage of interaction-related services at
organizational level. After developing the conceptual model with supporting propositions, it was tested in a survey with an online questionnaire. Data were collected from 138 firms in Switzerland and Germany and analyzed with multiple regression analysis. **Results and Conclusions:** The results suggest that complexity, perceived benefits, top management support and information intensity are the drivers that are important for the diffusion of innovation related to interactivity on corporate websites. We hope to contribute to present knowledge by developing a fresh conceptual model and by providing evidence of the adoption mechanisms’ rationale. The results will also be valuable to practitioners, because they may be beneficial for organizations considering initiatives for adjusting their online interaction services. The study is limited in terms of respondents’ origin and selecting mechanism. Future research could focus on the key drivers and particular motivation behind adoption and non-adoption decisions.

**Keywords:**

Internet, corporate websites, Web 2.0, interactivity, diffusion of innovations, information technology diffusion

C.1 Introduction

As the public Internet has evolved tremendously over the last about 20 years, almost every firm runs its own online presence as a corporate website by now. Corporate websites usually offer static information (about the company itself and its products and services) but they also offer – at least partly – means of communication and interaction [1]. Their main functions are to be the single or an additional distribution channel, to provide technical support, to help to improve existent services or to support order transaction, information brokerage and member communication [2]. When serving as a hub for the company’s social media engagement, the corporate website is likely to contribute to an organization’s ability to communicate with customers more effectively [3].

Academic interest into corporate websites and website characteristics has increased early [4] and steadily continued in recent years. This topic has also been discussed previously in journals in the field of technical communication (see e.g. [5], [6] and [7]). Among all research endeavors, usability and interactivity of corporate websites are constructs that have been examined most predominantly. The term Web 2.0 (coined by O’Reilly [8] and later revised by Musser [9]) and the increase of application of its paradigms added a new dimension to those constructs, especially to interactivity. The resulting new generation of online applications – often referred as Web 2.0 applications – permit people to collaborate and share information on the web and enable online interaction and participation [8]. Since the term Web 2.0 has evoked
principles for social web design [10], the underlying interaction patterns are increasingly important for corporate websites as well. Thus, not only users but also organizations are simultaneously affected by this evolution. This research will analyze this how and why organizations deal with this specific business problem.

Already soon after the birth of the Internet, live online interaction was recognized as a customers’ requirement [11] caused by an increasing customer demand for customer interaction in general, due to the efficient, rapid and 24/7 nature of the Internet. Video conferencing for example was seen as possible way of making communication a pleasurable collaboration with customers even at an earlier time [12]. Nowadays, a recent Gartner report on web-based customer communication channels assumes that by 2015, companies will generate 50% of web sales via their social presence and mobile applications. Amongst others, web chat, collaborative browsing and virtual assistants are mentioned as web-based customer service channel options for sales, marketing and service [13].

So far, prior research paid more attention to intra-company usage in terms of Enterprise 2.0 [14]. In contrast, the purpose of this research is to engage in the companies’ point of view and examine the external usage of online applications for enabling interaction at business level. Little research has approached this specific subject, so this research’s objectives are to contribute to a better understanding of a particular information technology (IT) diffusion phenomenon by developing a fresh conceptual model and subsequently providing evidence of factors influencing adoption as well as delivering beneficial findings for organizations considering initiatives for rethinking and eventually adjusting their online services. The main question underlying this study refers to the organizational behavior with regard to innovation diffusion on corporate websites and reads as follows: What are the critical factors influencing the firm’s adoption of online innovations related to interactivity on their websites?

To answer this question, the study begins by providing a short overview of the major theories and the relevant literature. Then, the study describes the development of the conceptual model. Next, it presents the approach as well as the way the research was conducted. Subsequently, it shows the quantitative results with a validation of the scales, the diagnostics of reliability and the hypotheses’ tests. Finally, conclusions, limitations and suggestions for future research are listed.

C.2 Literature Review

In this section, the theoretical foundations of this study are stated and the study is situated within the larger context of corporate websites. This section starts with explaining the theoretical orientation by discussing the major theories in information system (IS) research that will be considered. Current research issues are specified,
especially organizational issues dealing with innovation adoption by organizations and innovation diffusion within organizations, by presenting the relevant literature with a focus on previous research about interactivity. Lastly, the main research question and its elaboration are enlisted and this section ends with a presentation of the research model, including explicitly all of the hypotheses to be tested in the study.

C.2.1 Theoretical Orientation
By comparing the topics and methods of the three major subdivisions of the computing realm, the analysis of research in computing disciplines of Glass, Ramesh and Vessey [15] showed that IS research’s primary topic category is organizational concepts. In that, information technology (IT) usage and operation as well as technology transfer including innovation, acceptance, adoption, and diffusion, are the two most examined topics. The disciplines whose theories form a basis for IS research in general are mainly cognitive psychology, social and behavioral science, economics, and management.

Specifically, IT innovation research is based on a large number of seminal theories: Theory of Reasoned Action, Innovation Diffusion Theory, Social Cognitive Theory, Technology Acceptance Model, Theory of Planned Behavior, Perceived Characteristics of Innovations, Technology Acceptance Model II, Unified Theory of Acceptance and Use of Technology, Diffusion/Implementation Model, Tri-Core Model) [16]. Empirical studies on adoption and diffusion of IT innovations published prior to 1992 have been reviewed by Fichman [17], and studies in the following period have been reviewed by Jeyaraj et al. [16].

The term innovation is defined as an idea, practice, or object that is perceived as new by an individual or other unit of adoption [18]. When analyzing corporate websites, we focus on information systems (IS) innovation. IS innovation can be defined as innovation in the organizational application of information technology (IT) [19]. Hence, innovation diffusion of IT-based innovations by organizations is key to this study. Diffusion is defined as the extent to which a person or an organization exploits an innovation, usually measured as a percentage of available features used, possible sites adopted, or possible applications [16].

In past literature, in every theory perspective (Technology Acceptance Model, Human-Computer Interaction, and integrated frameworks incorporating diverse streams of research), interactivity is amongst the major constructs of website characteristics [20]. A comprehensive literature review looking for research challenges in the area of corporate websites found issues related to organization, commerce, communication and formation [14] with all of them addressing interactivity to a certain degree. Organizational issues seem to deal mostly with innovation adoption by organizations and innovation diffusion within organizations as well as online customer relationship
management. Commercial issues tend to focus on two main areas: decision support systems and recommendation agents on sales oriented e-commerce websites (suppliers’ view) and loyalty, satisfaction and trust as key variables (consumers’ view). Communication issues enclose many different aspects of computer-mediated interaction and online communities and refer to the user’s individual motivation and successive behavior. Formation issues cover interface design questions and focus on numerous website characteristics and their antecedents or their impact.

Considering organizational issues dealing with innovation adoption by organizations and innovation diffusion within organizations, adoption and use of websites, the factors and reasons influencing initial adoption, the characteristics of adopters and patterns of website use have been investigated, e.g. [21], [22], [23]. These contributions draw on the diffusion of innovations theory by Rogers [18] and position managers as an important element in the study of interactivity of corporate websites, because their attitudes and their successive behavior appear to have a considerable impact on the present implementation level. The positive potential of web-based interactivity has been investigated in many contexts, but managers holding a strategic responsibility for a firm’s Internet activities might assess this potential differently.

Besides the diffusion of innovations theory by Rogers [18], many other theories are used in IT adoption studies [24]. Most studies on IT adoption at firm level are derived from only two of them [25]: the diffusion of innovations theory itself [18] and the technology, organization, and environment (TOE) framework [26], because they are the only ones that apply at the firm level [27].

The TOE framework is consistent with the diffusion of innovations theory and includes an additional component, the environmental context, which presents both constraints and opportunities for technological innovation [27]. It makes Rogers’ diffusion of innovations theory better able to explain intra-firm innovation diffusion and is considered to be more complete [27], [28]. Hence, many studies combine the TOE framework and diffusion of innovations theory, e.g. [29], [30]. Some studies also combine the TOE framework with the institutional theory [31] which adds external pressures to the environmental context of the TOE framework and furthermore with the model of lacovou et al. [32] which adds perceived benefits as an additional factor, e.g. [28], [33]. Assumingly, combining more than one theoretical model can achieve a better understanding of the IT adoption and diffusion phenomenon.

C.2.2 Selection of Literature for the Review
For conducting the literature review, the selection process was focused on the key topic interactivity which was chosen based on the theoretical orientation of this study as well as based on the subject matter and of this research and its research question. The foundation of the search for literature can be found in the preliminary integrative
literature review [14]. The following sections presents the relevant literature derived from the initial work in-depth.

Interactivity is a process-related construct about communication, and computer-mediated communication has the capacity of enabling high interactivity [34]. Interactivity ranks among the top ten research topics in Internet-related research in the fields of communications, marketing, and advertising [4], but it is a complex construct which lacks a clear definition [35]. For this reason, very differing descriptions (social presence, responsiveness, or website socialness) and varied definitions of the term interactivity can be found in literature, e.g. definitions related to the interaction between the user and the website [14]. Apparently, interactivity is a multidimensional construct that has therefore been defined differently by several researchers [36], but online customer dialogue and the web responsiveness have been emphasized already at a very early stage [37]. The website's ability to create vivid interaction and communication with users [38] enables an organization to utilize its corporate website as an interactive function between its customers and the business organization itself. Consequently, this study will only focus on consumer-supplier interactivity that aims at setting up an active dialogue with (potential) customers.

Previous research has found significant effects of interactivity on user performance, for example that the actual (i.e. objectively assessed) interactivity mostly leads to a positive effect on affective and cognitive reactions to the website [39]. Amongst all website-related factors, interactivity and usability both hold the most positive relation to consumers’ responses. Additionally, perceived interactivity positively influences consumers’ impression of that website [40] as well as their initial online trust [41]. Summing up, interactivity is a central website characteristic and plays an important role in consumers’ perception and their responses.

With more complex products or services, potential or existing customers may prefer speaking to a live person over pure self-service. At least, they expect some sort of consulting efforts from the supplier side, e.g. product evaluation support features [42]. Besides asynchronous feedback and contact forms (contact data and e-mail) and added-value information (FAQs / online discussion forums) [43], call-back or chat features (e.g. synchronous live web help, service and sales chat [4], [44]), and video conferencing [12] are examples for more innovative forms of online support features providing advice on corporate websites. Latest state of the art is real-time chatting and co-browsing within assistive web applications during purchasing or for post-sales procedures. The implementation levels of those features vary across different web retailers and results showed that a website’s offering of sophisticated decision aids does not necessarily guarantee increased conversion rates – while conversion rates alone are not automatically an indicator of good or bad performance [45].
In conclusion, interaction-related online services on corporate websites can be regarded as an innovation and different factors play a role for its diffusion. In order to understand the organizational behavior with regard to innovation diffusion on corporate websites, it is first needed to explore the adoption as the basis for eventual diffusion of interactivity on corporate websites. Using existing instruments in the area of IT adoption and innovation diffusion research as a reliable foundation, this study will examine the influence of relevant factors on diffusion by measuring managers’ perception of using interactivity as an IT innovation related to web-based customer interfaces. While inquiring the perceived relative importance of the technology issues among managers, the attitudes of corporate managers in charge have not been explored by e.g. Smith, Koohang and Behling [46], so further exploration is positively needed. Moreover, ambivalent results regarding the low actual implementation level and the promising effects on users’ responses make further exploration necessary and possibly valuable.

C.2.3 Research Model and Hypotheses

Jeyaraj et al. distinguished individual IT adoption from organizational IT adoption and evaluated the best predictors respectively in a meta-study analyzing 99 empirical studies on individual and organizational IT adoption [16]. In total, the sample contained eight dependent variables. Diffusion is one of them and is defined as the extent to which a person or an organization exploits an innovation, usually measured as a percentage of available features used, possible sites adopted, or possible applications (q.v. [29] and [47]). In general, the best predictors of IT adoption by organizations (examined at least five times and having a weight of ≥0.80) were top management support, external pressure, organizational size, external information sources, professionalism of the IS unit and organizational characteristics. For examining the dependent variable of diffusion in organizational studies, 40 independent variables have been used. As none of them were examined more than five times, an analysis of the best predictors of diffusion was not possible.

Comparable to other contributions related to organizational adoption research (e.g. [28], [29], [30], [33], [48], [49]), the research model can draw upon a combination of theories. For developing the research model and its hypotheses, this study is based on four primary research streams: the diffusion of innovation theory [18], the TOE framework [26], the model of Iacovou et al. [32], and the institutional theory [31]. As stated by Oliveira and Martins, for more complex new technology adoption it is important to combine more than one theoretical model to achieve a better understanding of the IT adoption phenomenon [27].

Given the facts that corporate websites are the outcome of different decisions by managers inside the company, that they are mostly company-run on the basis of IT,
and that they are public and available for every Internet user worldwide, three
dominant contexts are important: the organizational, the technological, and the
environmental context. For each context, the most appropriate variables and the
context they belong to were chosen based on previous studies which differently
combine the four research streams mentioned above. Figure 13 illustrates the factors
and their association with the dependent variable.

Belonging to the environmental context, the first factor tested in the study is
information intensity. On a corporate website offering complex products or services,
potential or existing customers may prefer and expect some sort of interactivity in
matters of consulting efforts from the supplier side, because information-intensive
products are generally more complicated to order and usually require more
accompanying information. The second factor in the environmental context is external
pressure. On the Internet, everything is public and users can easily compare different
suppliers, so external pressure can arise from competitors in the same industry already
offering interactivity features on their corporate website or it can arise from customers
already used to and therefore expecting or even requesting these features.

In the organizational context, top management support is the first factor tested because
it is necessary to enable the organization to engage generally in new information
systems and specifically in new online services by obtaining the needed financial and
technical resources. In addition, organizational compatibility is a second factor tested in the organizational context because an innovation in the area of interactivity on the corporate website needs to be consistent with the needs and the existing practices of the company. The third factor tested in the organizational context is perceived benefits, because innovation diffusion on corporate website is influenced by the responsible managers’ assessments and attitudes.

For the technological context, complexity is the first factor tested in the study, because interactivity on corporate website is probably regarded as an innovation difficult to implement and operate. The second factor in the technological context is technical compatibility, because an innovation in the area of interactivity on the corporate website needs to be consistent with the existing IT infrastructure and work procedure needs of the company.

In most cases, the factors’ items were inherited from previously used scales in related research. Otherwise, the operationalization of the research variables was developed by slightly adapting and combining existing scales. As Oliveira and Martins declared, the same context can have different factors in a specific theoretical model [27] while researching IT adoption at firm level. The final questionnaire measurement scales and the sources are depicted in Table 8.

<table>
<thead>
<tr>
<th>Construct/Measures</th>
<th>Sources</th>
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<tbody>
<tr>
<td>Information Intensity (INI)</td>
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<tr>
<td>C1_INI_Information. The products/services in our industry generally require a lot of information to sell.</td>
<td>Wang et al. (2010)</td>
</tr>
<tr>
<td>C2_INI_Complex. The products/services in our industry are complex to use or complicated to understand.</td>
<td></td>
</tr>
<tr>
<td>C3_INI_Ordering. In our industry, the ordering of products by customers is generally a complex process.</td>
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<tr>
<td>External Pressure (EXP)</td>
<td></td>
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<tr>
<td>D1_EXP_Systems. Our company’s competitive advantage depends - amongst other things - on the use of new information systems that help to differentiate its products and services from its competitors’ products and services.</td>
<td>Zhu et al. (2006), Hsu et al. (2006), Li (2008), Lin and Lin (2008)</td>
</tr>
<tr>
<td>D1_EXP_Position. My organization believes that online services have a positive influence on the competitive position in our industry.</td>
<td></td>
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<tr>
<td>D1_EXP_Competitors. Important competitors are offering innovative online services on their corporate websites.</td>
<td></td>
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<tr>
<td>D1_EXP_Users. New online services have been requested by a considerable amount of users of our corporate website(s).</td>
<td></td>
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<tr>
<td><strong>Top Management Support (TMS)</strong></td>
<td>Pae et al. (2002), Li (2008), Wang et al. (2010)</td>
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<tr>
<td><strong>E1_TMS_Support.</strong> Top management in my firm is likely to be supportive towards the implementation of new information systems for enhancing our company’s online services.</td>
<td></td>
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<tr>
<td><strong>E2_TMS_Enhancing.</strong> Top management in my firm is likely to be interested in continually enhancing online services.</td>
<td></td>
</tr>
<tr>
<td><strong>E3_TMS_Importance.</strong> Top management in my firm is likely to consider the adoption of new online services as strategically important.</td>
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<tr>
<th><strong>Organizational Compatibility (OC)</strong></th>
<th>Beatty et al. (2001), Wang et al. (2010)</th>
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<tbody>
<tr>
<td><strong>F1_OC_Values.</strong> Online interaction with our (potential) customers is consistent with our organization’s existing beliefs/values.</td>
<td></td>
</tr>
<tr>
<td><strong>F2_OC_Attitudes.</strong> Attitudes towards online interaction with our (potential) customers are positive in our organization.</td>
<td></td>
</tr>
<tr>
<td><strong>F3_OC_SimilarSystems.</strong> Online interaction with our (potential) customers is compatible with our organization’s existing experiences with similar systems for e.g. internal web-based interaction (instant messaging).</td>
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<tbody>
<tr>
<td><strong>I1_PB_Costs.</strong> ...will reduce my company’s costs of performing business transactions.</td>
<td></td>
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<tr>
<td><strong>I2_PB_Service.</strong> ...will enable my company to provide better customer service.</td>
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<tr>
<td><strong>I3_PB_Compete.</strong> ...will increase my company’s ability to compete.</td>
<td></td>
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<tr>
<td><strong>I4_PB_Reach.</strong> ...will allow my company to reach new customers.</td>
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<tr>
<td><strong>I5_PB_Relationships.</strong> ...will improve our relationships with our existing customers.</td>
<td></td>
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<tr>
<td><strong>I6_PB_Procedures.</strong> ...will improve my company’s level of efficiency in terms of improved operational procedures.</td>
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<tr>
<th><strong>Complexity (COM)</strong></th>
<th>Beatty et al. (2001), Li (2008), Wang et al. (2010)</th>
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<tbody>
<tr>
<td><strong>H1_COM_Process.</strong> My organization believes that implementing online interaction tools and features on the corporate website(s) is a complex process.</td>
<td></td>
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<tr>
<td><strong>H2_COM_Operate.</strong> My organization believes that online interaction tools and features on the corporate website(s) are complex to operate.</td>
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<tr>
<th><strong>Technical Compatibility (TC)</strong></th>
<th>Beatty et al. (2001), Zhu et al. (2006)</th>
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<tbody>
<tr>
<td><strong>G1_TC_Infrastructure.</strong> Online interaction with our (potential) customers on our corporate website(s) is compatible with our IT infrastructure.</td>
<td></td>
</tr>
<tr>
<td><strong>G2_TC_Disruptive.</strong> Adoption of tools and features for online interaction with our (potential) customers on the corporate website(s) will not be disruptive for our work environment.</td>
<td></td>
</tr>
<tr>
<td><strong>G3_TC_Changes.</strong> Adoption of tools and features for online interaction with our (potential) customers on the corporate website(s) will not require changes in our operating procedures.</td>
<td></td>
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</table>

Table 8 Sources of Questionnaire Items
The theoretical explanations and logical reasoning for the propositions derived from the research model are based on past empirical findings as well as on practice and experience. Subsequently, the key findings from sources they build upon are enlisted.

Information-intensive products and services can benefit from the use of IT and firms in such environments are more likely to adopt new IT [30]. Although switching costs and complexities of adopting new IT may be generally higher in firms with more information-intensive products, it is suggested that the information intensity of products and services will have a positive impact on the diffusion of innovation related to interactivity in the specific context of corporate websites, because such products always need accompanying information and some sort of consulting efforts from the supplier side.

External pressure significantly drives e-business usage [50] and its influence on the adoption decision has been proved [51]. Trading partner pressure and competition intensity was found to be significant factors influencing the diversity of e-business use [28] and is “obviously a key determinant of integration and diffusion of e-business” [47]. So it is assumed that external pressure will bear a positive influence on the diffusion of innovation related to interactivity on corporate websites.

Past empirical findings support the proposition that intra-organizational diffusion is positively affected by top management support [52]. Furthermore, the adoption decision is also positively affected by top management support [51]. Therefore, top management support is regarded as positively related towards the diffusion of innovation related to interactivity on corporate websites.

Organizations that perceive an online innovation being inconsistent with their established value system and formalized business experiences will tend to delay their adoption [22]. Organizational compatibility has a positive impact on organizational likelihood to adopt an IT innovation [30]. Hence, it is assumed that organizational compatibility is positively related towards the diffusion of innovation related to interactivity on corporate websites.

Managers’ perceived benefits of an online innovation have been shown to affect both initial adoption and subsequent use of a technology [22]. Perceived benefits have also been found to be a significant factor affecting e-business adoption [33] and the volume of e-business use [28]. Consequently, it is suggested that perceived benefits have a positive influence on the diffusion of innovation related to interactivity on corporate websites.

Complexity is the extent to which an innovation is perceived as relatively difficult to understand and use and is typically negatively associated with adoption [30]. Managers in charge may not have any experiences with interactivity on corporate websites from a user’s point of view, that’s why it might be something relatively new
to them. Thus, complexity is regarded as negatively related towards the diffusion of innovation related to interactivity on corporate websites.

Organizations that perceive an online innovation being consistent with their work environment and their operating procedures will tend to accelerate their adoption [22]. Technical compatibility significantly drives e-business usage [50]. So, it is assumed that technical compatibility is positively related towards the diffusion of innovation related to interactivity on corporate websites.

Table 9 summarizes the hypotheses derived from the research model.

| (+) | H1: The more complex and therefore information-intensive a company’s products and services, the more likely interaction-related online services on the corporate website will be implemented. |
| (+) | H2: The higher the external pressure from competition and users, the more likely interaction-related online services on the corporate website will be implemented. |
| (+) | H3: The greater the top management support towards the implementation of new information systems for enhancing a company's online services, the more likely interaction-related online services on the corporate website will be implemented. |
| (+) | H4: The more consistent an innovation in the area of interactivity on the corporate website is with the values and the existing practices of the company, the more likely interaction-related online services on the corporate website will be implemented. |
| (+) | H5: The more perceived benefits of online interaction tools and features on the corporate website by the responsible managers, the more likely interaction-related online services on the corporate website will be implemented. |
| (-) | H6: The less complex the implementation and operating of online interaction tools and features on the corporate website is regarded, the more likely interaction-related online services on the corporate website will be implemented. |
| (+) | H7: The more consistent an innovation in the area of interactivity on the corporate website is with the existing IT infrastructure and work procedure needs, the more likely interaction-related online services on the corporate website will be implemented. |

Table 9 Hypotheses

Based on related research, the impact of the constructs the environmental context might be H2 > H1, as information intensity has sometimes proven to be judged contradictorily. In the organizational context, it could be that H5 > H3 and H5 > H4, because the perceived benefits might trigger endeavors in the direction of getting top management support and efforts towards change management regarding existing values and practices. Finally, in the technological context, it could be H7 > -H6, because complexity of online tools and features has sometimes proven to be judged very low.

C.3 Methodology

The purpose of this section is to present the approach of this study as well as the way the study was conducted with regards to data collection and processing. The section
C.3 Methodology

starts with a description of the research methodology and participants and then demonstrates how data was collected. Lastly, it describes how data was analyzed and how reliability and validity were assured.

C.3.1 Choice of a Research Methodology
In order to test the research model, a quantitative methodology was chosen because it is widely used in adoption and diffusion research and could draw upon a broad background of existing research, items and scales. In most cases, the items were inherited from previously used scales in related research. In only a few cases, the operationalization of the research variables was developed by slightly adapting and combining existing scales, based on past empirical findings.

C.3.2 Participants
Findings of an exhaustive literature review [14] showed that innovation diffusion on corporate websites is mainly influenced by the responsible managers’ assessments and attitudes. Therefore, we decided to send the questionnaire link to two potential respondents out of different departments per company. By seeking multiple responses from each organization, this study overcomes the problem of response-bias that has plagued a number of past research studies in IS and innovation. So the questionnaire targeted unsolicited responses from two senior executives within each company, one in Information Systems (CIO, Head of IT, or a specific leading position within e-Commerce / e-Business) and the other in the functional area of Marketing (Head of Marketing).

The final questionnaire was sent to a large sample that consisted of 986 managers who were chosen out of the customer relationship database of one of the leading professional service firms for e-business in Switzerland and Germany. The database contains company addresses of past, actual and potential customers. No filtering techniques have been used while selecting the respondents except that the respective companies’ data records contained both a high-ranking IT and Marketing manager’s contact data. Participant reimbursement or incentives were not offered. The study did not receive approval from a Research Ethics Committee as this is generally not required.

C.3.3 How Data Was Collected
This section shows how we managed to collect the data. It starts with explaining the data collection instrument and then presents the process for administering the instrument.
C.3.3.1 Instrument
A web-based questionnaire was developed to collect the data for validating the factors as postulated in the research model. In its final version, the questionnaire contained 23 questions and was divided into three parts. The first part contained questions about the company (sector, size) and the respondent’s department. The second part included twenty-five questions that measured the dependent variable diffusion and the seven factors in the proposed model. All items were measured by five-point Likert scales representing a range from "strongly disagree" to "strongly agree”, except for measuring the dependent variable diffusion. There, the respondents were asked to report which interaction-related online services their respective company’s website currently offers. The following services were enlisted (no mandatory fields or limitations, multiple responses possible): contact data / e-mail, contact form(s), online discussion forum(s), a call-back feature, virtual assistants (text- or speech-based), a real-time chat feature / instant messaging, video conferencing, collaborative browsing within assistive web applications, and other (free text field). This measure indicates the degree to which interactive features has already been adopted on the corporate website. The third part contained an invitation to use the space provided there for additional comments, as the questionnaire has been made completely anonymous.

First of all, a paper-based questionnaire has been pretested with ten participants of a focus group of advanced researchers. Secondly, refinements regarding instructions, order and phrasing were conducted, based on the feedbacks and wording issues provided. Lastly, the instrument testing process was finalized by another pretest with the web-based questionnaire with four participants.

C.3.3.2 Process for Administering the Instrument
The link to the online survey tool was sent out by E-Mail on June 6th 2012. After the summer holiday break, we sent out a reminder in August. The survey was open until August 27th 2012, which totals to a survey duration of almost 12 weeks (including the summer holiday break time). The survey was administered entirely online.

C.3.4 How Data Was Analyzed
Even though the items used to measure the constructs are grounded in theory, they are drawn from different sources and have been slightly adapted to fit the adoption of online innovations context. As a consequence, dimensionality and internal consistency as two major aspects of construct validity could have changed. Prior to testing
hypotheses, it is first critical to examine those properties of the measures after the survey was fully completed.

Using IBM SPSS Statistics Version 20, dimensionality was first checked by inspecting the correlation matrix and conducting a factor analysis using the principal component analysis first and a VARIMAX rotation subsequently. Later, reliability diagnostics were examined. To test the hypotheses, multiple regressions were employed. Multiple regression analysis is applied to analyze the relationship between a single dependent variable and several independent variables [53]. Therefore, it was selected to be the best method for this study [54].

C.3.5 Assuring Reliability and Validity

Dimensionality has been inspected by examining the intercorrelations among the measurement items. The correlation matrix is shown in Table 10.

![Table 10 Correlation Matrix for the Original 24 Items*](image)

* Items 1-3 are C1_INI_Information, C2_INI_Complex and C3_INI_Ordering meant to measure information intensity. Items 4-7 are D1_EXP_Systems, D1_EXP_Position, D1_EXP_Competitors and D1_EXP_Users meant to measure external pressure. Items 8-10 are E1_TMS_Support, E2_TMS_Enhancing and E3_TMS_Importance meant to measure top management support. Items 11-13 are F1_OC_Values, F2_OC_Attitudes and F3_OC_SimilarSystems meant to measure organizational compatibility. Items 14-16 are G1_TC_Infrastructure, G2_TC_Disruptive and G3_TC_Changes meant to measure technical compatibility. Items 17-18 are H1_COM_Process and H2_COM_Operate meant to measure complexity. Items 19-24 are I1_PB_Costs, I2_PB_Service, I3_PB_Compete, I4_PB_Reach, I5_PB_Relationships and I6_PB_Procedures meant to measure perceived benefits.

The correlations among all respective items thought to measure information intensity (items 1-3), top management support (items 8-10) and complexity (item 17 and item
are strong (> .5) for the whole construct. The correlations among the items thought to measure organizational compatibility (items 11-13) are medium (.3 to .5).

The correlation between item 6 and item 7 is also strong and another item thought to measure external pressure (item 5) has strong correlations with item 9 and item 10 which are thought to measure top management support. Thus it appears that item 5 may measure a construct other than what it originally proposed to measure.

The correlation matrix also indicates that among the items thought to measure perceived benefits (items 19-24) the strongest correlations are between items 19 and 24 and between items 20 and 21. As the others are somewhat weaker, this construct may not be well measured by this set of six items. Additionally, the correlations among the items thought to measure technical compatibility (items 14-16) indicate that there may be a weak relationship among these items.

Only assessing dimensionality from observing the correlation matrix is difficult. If one or more items measure more than one construct, then it is hard to establish reliability, which is also a required element of construct validity. So for a more profound construct validation, a factor analysis was conducted to better assess the properties of the measures by using the correlation matrix to derive factor loadings that represent the correlation between an item and the construct it is thought to measure.

The first factor analysis was conducted to validate the research model using the principal component analysis as extraction method and the Kaiser’s criterion (only items with an eigenvalue of 1.0 or more are retained for further investigation) and to make sure that there are no major common method variance effects. It showed that the first seven components recorded eigenvalues above 1 and explained 66.46 per cent of the variance. Studying the scree plot and the component matrix supported the conclusion to retain seven factors for further investigation.

A second factor analysis using a VARIMAX rotation with Kaiser Normalization was conducted. Table 11 shows the results of the VARIMAX rotation described in this section.
C.3 Methodology

<table>
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<tr>
<th>Component</th>
<th>1</th>
<th>2</th>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 C1_INTL Information</td>
<td>0.826</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2 C2_INTL Complex</td>
<td></td>
<td>0.886</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3 C3_INTL Ordering</td>
<td></td>
<td></td>
<td>0.834</td>
<td></td>
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<tr>
<td>4 D1_EXP_Systems</td>
<td>0.377</td>
<td></td>
<td></td>
<td>0.556</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 D1_EXP_Position</td>
<td>0.645</td>
<td></td>
<td></td>
<td></td>
<td>0.357</td>
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<td></td>
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<tr>
<td>6 D1_EXP_Competitors</td>
<td></td>
<td>0.650</td>
<td></td>
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<tr>
<td>7 D1_EXP_Users</td>
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<td></td>
<td></td>
<td>0.753</td>
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<tr>
<td>8 E1_TMS_Support</td>
<td>0.882</td>
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<tr>
<td>9 E2_TMS_Enhancing</td>
<td></td>
<td>0.920</td>
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<tr>
<td>10 E3_TMS_Importance</td>
<td></td>
<td></td>
<td>0.899</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>11 F1_OC_Values</td>
<td>0.440</td>
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<td></td>
<td>0.412</td>
<td></td>
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<tr>
<td>12 F2_OC_Attitudes</td>
<td>0.337</td>
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<td></td>
<td></td>
<td>0.502</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 F3_OC_SimilarSystems</td>
<td></td>
<td></td>
<td></td>
<td>0.751</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>14 G1_TC_Infrastructure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.658</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 G2_TC_Disruptive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.673</td>
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<tr>
<td>16 G3_TC_Changes</td>
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<td></td>
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<td></td>
<td>0.756</td>
</tr>
<tr>
<td>17 H1_COM_Process</td>
<td></td>
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<td></td>
<td>0.856</td>
<td></td>
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<tr>
<td>18 H2_COM_Operate</td>
<td></td>
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<td></td>
<td></td>
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<td>0.805</td>
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<tr>
<td>19 H1_PB_Costs</td>
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<td></td>
<td></td>
<td>0.463</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>20 I2_PB_Service</td>
<td></td>
<td>0.589</td>
<td></td>
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<tr>
<td>21 I3_PB_Compete</td>
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<td>0.781</td>
<td></td>
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</tr>
<tr>
<td>22 I4_PB_Reach</td>
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<td>0.748</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 I5_PB_Relationships</td>
<td>0.663</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 I6_PB_Procedures</td>
<td></td>
<td></td>
<td>0.624</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 11 Rotated Component Matrix after VARIMAX Rotation

The rotation converged in six iterations and showed that each component explains between 5.99 and 14.46 per cent of the variance. The rotated component matrix confirmed an obvious match between the highest loading items on each of the components and the original constructs. Thus, the underlying construct represented by each component can be clearly identified (component 3: information intensity, component 5: external pressure, component 1: top management support, component 4: organizational compatibility, component 7: technical compatibility, component 6: complexity, component 2: perceived benefits).

Cross loadings (items that load on more than one component) are consistent with the observations of the correlation matrix (item 5 is loading on component 1 stronger than on component 5). As the respondents probably thought of their top management representatives’ opinion while answering the question about the company’s current beliefs on the influence of online services on competitive position, this is inevitable. The same might have happened for item 4, item 11 and item 12, where a similar type
of question probably led to a quasi-personification of the terms “company’s beliefs/values” and “company’s attitudes”. As those entire cross-loading items load less strong on component 1 than the other items loading on component 1 and as in half of the cases they load stronger on the component they were thought to load on, they don’t necessarily need to be removed. Item 19 is cross-loading on component 4, but less strong than on the component it was thought to load on. Item 14 is loading only on component 4 but was thought to load on component 7 which could mean that IT infrastructure is rather regarded as an organizational compatibility than a technical compatibility.

Regarding the components, only two of the seven have cross-loadings. Component 1, which has the strongest loadings of items 8-10 (all of them meant to measure top management support) and component 4, which has the strongest loadings of items 11-13 (all of them meant to measure organizational compatibility). So both of the constructs – top management support and organizational compatibility – are slightly cross-loaded by the items mentioned above.

The factor analysis process proved that our model is very close to an optimal solution: a very large proportion of the items are loading strongly on only one component, and each component is represented by a number of strongly loading items which belong to the same original construct. Hence, no more rotations are needed and no items need to be removed. Switching item 14 (G1_TC_Infrastructure) from technical compatibility to organizational compatibility seems to be the only adjustment needed urgently.

After adjusting the mentioned constructs, construct reliability is inspected. The recommended value for Cronbach’s α is 0.6 and above. Table 12 shows that we can conclude that the reliability of the model is largely supported.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Items</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Intensity</td>
<td>C1_INI_Information</td>
<td>.821</td>
</tr>
<tr>
<td></td>
<td>C2_INI_Complex</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C3_INI_Ordering</td>
<td></td>
</tr>
<tr>
<td>External Pressure</td>
<td>D1_EXP_Systems</td>
<td>.727</td>
</tr>
<tr>
<td></td>
<td>D1_EXP_Position</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D1_EXP_Competitors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D1_EXP_Users</td>
<td></td>
</tr>
<tr>
<td>Top Management Support</td>
<td>E1_TMS_Support</td>
<td>.947</td>
</tr>
<tr>
<td></td>
<td>E2_TMS_Enhancing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E3_TMS_Importance</td>
<td></td>
</tr>
<tr>
<td>Organizational Compatibility</td>
<td>F1_OC_Values</td>
<td>.663</td>
</tr>
<tr>
<td></td>
<td>F2_OC_Attitudes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F3_OC_SimilarSystems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F4_G1_TC_Infrastructure</td>
<td></td>
</tr>
</tbody>
</table>
C.4 Results

This section provides the quantitative results and the subsequent analysis of those results for addressing the research questions. It begins with detailed information about the study’s participants. Next, it provides the results of the hypothesis testing.

C.4.1 Who Participated in the Study
Due to alteration, 162 messages of the 986 E-Mails sent were not properly delivered. Accordingly, 824 potential respondents were asked to take part in this study (thus N = 824). We received 146 responses from June 6th to June 28th 2012. After sending out a reminder in August, we received another 15 responses between August 3rd and August 27th. In total, the number of responses is 161 which equates to a response rate of 19.5 per cent. Given the fact that no participant reimbursement or incentives were offered, this response rate can be judged as satisfactory. Regrettably, in 23 cases the questionnaire was not fully solved. This yields a total of 138 complete responses (n = 138).

<table>
<thead>
<tr>
<th>Technical Compatibility</th>
<th>G2_TC_Disruptive</th>
<th>.421</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G3_TC_Changes</td>
<td></td>
</tr>
<tr>
<td>Complexity</td>
<td>H1_COM_Process</td>
<td>.752</td>
</tr>
<tr>
<td></td>
<td>H2_COM_Operate</td>
<td></td>
</tr>
<tr>
<td>Perceived Benefits</td>
<td>I1_PB_Costs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I2_PB_Service</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I3_PB_Compete</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I4_PB_Reach</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I5_PB_Relationships</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I6_PB_Procedures</td>
<td>.780</td>
</tr>
</tbody>
</table>

Table 12 Reliability Diagnostics

Two constructs, Organizational Compatibility and Technical Compatibility are either slightly above or below the reliability coefficient value of 0.6 which is typically considered satisfactory. By checking the degree to which each item of the construct Organizational Compatibility correlates with the total score, no low values <0.3 could be found. This indicates that all items of this construct are not measuring something different from the scale as a whole. So it is not necessary to remove any item. By doing the same check for the construct Technical Compatibility, it comes clear that each item correlates with the total score at a level <0.3. Thus, for internal consistency reasons the construct Technical Compatibility will be removed for further consideration.
Out of the 138 respondents, one half of the companies are in the financial service sector (37) and in the manufacturing sector (32). The remainder of the companies is in the following industry segments: retailing (18); transportation, communication and gas services (18); business and information services (11); healthcare (7); media (4), and others (11).

In terms of organization size, 107 (77.5%) of these organizations have more than 500 employees, 26 (18.8%) have between 50 and 500 employees, and 5 (3.6%) have 50 or less employees.

Concerning the respondents’ corresponding corporate department, most of them are in the Marketing department (56), followed by the Information Technology department (28), Corporate Communications (25), general management (14), Sales (9) and others (6).

C.4.2 Results of Testing for Hypothesis 1
For comparing the contribution of each independent variable, standardized beta coefficients show the variables’ unique contributions to explaining the dependent variable when the variance explained by all other variables in the model is controlled for. Results show that Information Intensity ($\beta = 0.105, p = 0.209$) is positively associated with the diffusion of innovation related to interactivity on corporate websites, but significance is arguable (this variable seem not to make a significant unique contribution to the prediction of the dependent variable). This may be due to overlap with other independent variables in the model. For Information Intensity, factor analysis has showed before that all its items are loading strongly on only one component and this component is not cross-loaded by other items outside the original construct. Therefore, a general overlap with other independent variables in the model can be excluded and statistical significance is medium. So if companies offer products and services requiring a lot of information to sell, if products and services are complex to use or complicated to understand, and if the ordering of products by customers is complex, they implement interaction-related online services on the corporate websites somewhat more frequently.

C.4.3 Results of Testing for Hypothesis 2
Results show that External Pressure ($\beta = 0.066, p = 0.484$) is faintly and not significantly associated with the diffusion of innovation related to interactivity on corporate websites. So neither competition in general, nor the specific behavior of important competitors, nor the demands of users have a noteworthy influence on the implementation level of interaction-related online services on the corporate websites.
C.4.4 Results of Testing for Hypothesis 3
Results show that Top Management Support ($\beta = 0.144$, $p = 0.134$) is positively associated with the diffusion of innovation related to interactivity on corporate websites, but significance is arguable (this variable seem not to make a significant unique contribution to the prediction of the dependent variable). This may be due to overlap with other independent variables in the model. For Top Management Support, factor analysis showed some items cross-loading on its main construct, but statistical significance is higher than e.g. for Information Intensity. Thus, we decided not to ignore the positive association with the diffusion of innovation related to interactivity on corporate websites. So the facts that the top management is generally supportive and interested in continually enhancing online services as well as considering the adoption of new online services as strategically important are somehow decisive for the implementation level of interaction-related online services on the corporate websites – even though not to a very weighty degree.

C.4.5 Results of Testing for Hypothesis 4
Results show that Organizational Compatibility ($\beta = 0.064$, $p = 0.504$) is faintly and not significantly associated with the diffusion of innovation related to interactivity on corporate websites. So neither the consistency of online customer interaction with the company’s existing beliefs/values, nor a positive attitude towards online customer interaction, nor the compatibility with existing experiences with similar systems have a noteworthy influence on the implementation level of interaction-related online services on the corporate websites.

C.4.6 Results of Testing for Hypothesis 5
Results show that Perceived Benefits ($\beta = 0.208$, $p = 0.021$) is positively associated with the diffusion of innovation related to interactivity on corporate websites. So if companies attach certain benefits to the adoption and the enhancements of online interaction tools and features on the corporate websites (cost reduction, improvement of customer service, higher ability to compete, better reach of new customers, improvement of relationships with existing customers, higher level of efficiency), they implement interaction-related online services on the corporate websites more frequently.
C.4.7 Results of Testing for Hypothesis 6
Results show that Complexity ($\beta = 0.220$, $p = 0.009$) is positively associated with the diffusion of innovation related to interactivity on corporate websites. So if companies believe that implementing online interaction tools and features on corporate websites is not a complex process and that online interaction tools and features on the corporate websites are not complex to operate, they implement interaction-related online services on the corporate websites more frequently.

C.4.8 Results of Testing for Hypothesis 7
Results showed that for internal consistency reasons, the factor Technical Compatibility needed to be removed for further consideration. Table 13 shows the summarized results of the hypothesis testing.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: The more complex and therefore information-intensive a company’s products and services, the more likely interaction-related online services on the corporate website will be implemented.</td>
<td>Yes</td>
</tr>
<tr>
<td>H2: The higher the external pressure from competition and users, the more likely interaction-related online services on the corporate website will be implemented.</td>
<td>No</td>
</tr>
<tr>
<td>H3: The greater the top management support towards the implementation of new information systems for enhancing a company's online services, the more likely interaction-related online services on the corporate website will be implemented.</td>
<td>Yes</td>
</tr>
<tr>
<td>H4: The more consistent an innovation in the area of interactivity on the corporate website is with the values and the existing practices of the company, the more likely interaction-related online services on the corporate website will be implemented.</td>
<td>No</td>
</tr>
<tr>
<td>H5: The more perceived benefits of online interaction tools and features on the corporate website by the responsible managers, the more likely interaction-related online services on the corporate website will be implemented.</td>
<td>Yes</td>
</tr>
<tr>
<td>H6: The less complex the implementation and operating of online interaction tools and features on the corporate website is regarded, the more likely interaction-related online services on the corporate website will be implemented.</td>
<td>Yes</td>
</tr>
<tr>
<td>H7: The more consistent an innovation in the area of interactivity on the corporate website is with the existing IT infrastructure and work procedure needs, the more likely interaction-related online services on the corporate website will be implemented.</td>
<td>n./a.</td>
</tr>
</tbody>
</table>

Table 13 Result of Hypotheses Tests

Pearson’s correlation shows a moderate correlation level between the independent variables and dependent variable (between 0.085 and 0.256). Additionally, none of correlations between each of the independent variables is strong (between 0.16 and 0.457), which means that all variables could be retained. Tolerance values are high (>0.698) and show no presence of multicollinearity. Studying the normal probability plot supports the conclusion to suggest the absence of major deviations from normality. The study of the scatterplot shows no presence of outliers as there are no cases that have standardized residuals of more than 3.3 or less than -3.3. Furthermore,
the maximum value for Cook’s Distance is 0.082, which supports this decision to suggest no major problems with outliers and offending cases.

The R square value is 0.162, i.e., the model can explain more than 16 per cent of the sample variation in diffusion of innovation related to interactivity on corporate websites, which is regarded as medium to solid effect strength. The F-statistics produced a value for $F = 4.219$ which is significant at the level $p = 0.001$. This indicates that the variables’ relationships in the model are statistically significant.

C.5 Conclusions, Limitations, and Suggestions for Future Research
The purpose of this section is to draw a conclusion, to acknowledge limitations of the study, and to provide suggestions for future research. The section starts with a discussion that analyses the results and presents the practical and theoretical implications of the findings. It continues with an open discussion of limitations of the study, and closes with suggestions for future research.

C.5.1 Conclusions
This section presents the findings and implications of this study. It starts with discussion the implications to practice and then presents the implications to research and theory.

C.5.1.1 Implications to Practice
The results of this study revealed that the complexity of implementing and operating online interaction tools and features on corporate websites is the foremost factor influencing the diffusion of innovation related to interactivity on corporate websites. Interestingly, it is the only factor in our model that is negatively related to the diffusion of innovation and shows somehow the expenditure side. But with the perceived benefits that managers credit with of implementing and operating online interaction tools and features on corporate websites, the second central factor is the equivalent on the benefit side.

Top management support is also a necessary determinant for the diffusion of innovation related to interactivity on corporate websites, but is not as central as it might be suggested. Given the fact that top managers are mainly interested in strategically important initiatives like reducing costs of business transactions, enabling better customer service or improving relationships with existing customers, it becomes obvious that their support and its influence can also be indirect via the benefit side.
mentioned above. Unexpectedly, information intensity of the companies’ products and services is only a medium strong determinant for the diffusion of innovation related to interactivity on corporate websites. Apparently, online interaction tools and features on corporate websites do not necessarily be aimed at a customer dialogue about products and services and their sales process. This is an interesting finding that is worthy of deeper analysis, because the full potential of the Internet doesn’t seem to be entirely addressed in terms of sales and online consulting.

This study also shows surprising results concerning the pressure of competitors and customers: differentiation by innovation related to interactivity is not one of the main reasons for diffusion. Whether a company is internally working with similar systems or has shared values and positive attitudes towards online interaction or not is not determining the level of diffusion of innovation related to interactivity on corporate websites too.

Comparing the contexts’ overall influence, the technological context is the most dominant context in terms of total influence of all underlying factors on the level of diffusion of innovation related to interactivity on corporate websites. Second, the organizational context is an important context as well. Lastly, the environmental context does not play an important role for diffusion of innovation, which is a surprising finding, because corporate websites are public and available for every Internet user worldwide. This means that today, most of the companies’ online offerings derive from internal decisions and are mainly technologically driven.

Regarding the practical implications for organizations, managers and practitioners, organizational practice concerning the purpose of a corporate website and online customer interaction should change in terms of focus: instead of internally focusing on technological restrictions, it should focus on the environmental factors and pay attention to the stakeholders’ different goals. A multiple diffusion of interaction tools and features on corporate websites may be beneficial for the company as a whole, because different applications and features for web-based interaction can serve different internal goals (i.e. support different departments’ strategies: marketing, sales and service) and external goals as well (certain possibilities of choice is unquestionably helpful for different kind of users), as organizations are definitely affected by the current evolution of the Internet and the interaction patterns underlying the term Web 2.0 need to be addressed. Hence, the recommendation is to adopt hybrid customer communication strategies when thinking about implementing new interaction tools and features on the corporate website. Some of the participants of the study mentioned supportive points like “in Business-to-Business settings, our sales representatives are unfortunately still more important for the sales process than the presentation of our products on our website”, “our corporate IT department is repeatedly not able to follow technological change” and “in our organization, we are very afraid of not being able to control social media interaction processes“.
C.5 Conclusions, Limitations, and Suggestions for Future Research

C.5.1.2 Implications to Research and Theory
Besides its practical implications, this study contributes to present theory by developing a fresh conceptual model based on past research combining four research streams and by providing evidence of the diffusion mechanisms’ rationale. No prior research has engaged in the companies’ point of view and examined the factors influencing external usage of online applications for enabling interaction at business level this way, so this research contributes to a better understanding of this particular IT diffusion phenomenon. Now as the relevant factors are known through empirical validation within our theoretical framework, key drivers behind adoption and non-adoption decisions can be inspected. The most critical factors are visible now, so the subsequent step can be to move beyond the conceptual level. In doing so, follow-up interviews could help to clarify the rationale behind specific factors related to the organization in terms of value chain, business value and performance. The typology of IS innovations provided by [19] will help to match the respective business innovation area.

C.5.2 Limitations
This research has been conducted in Switzerland and Germany and further research should be carried out to investigate whether the results from this study will be consistent with findings from different countries. Furthermore, this study used the customer relationship database of Switzerland’s market leading e-Business agency for selecting the respondents, so a different selecting mechanism might deliver findings that could be compared to our results.

C.5.3 Suggestions for Future Research
Future research efforts could focus on this study’s unexpected findings, e.g. the fact that the information intensity of the companies’ products and services is only a medium strong determinant for the diffusion of innovation related to interactivity on corporate websites. This is a counterintuitive finding so deeper analysis is needed, especially when real online customer dialogue about products and services and their online sales process are in the research’s focus. Generally, now as the relevant factors are known through empirical validation, key drivers behind adoption and non-adoption decisions could be inspected by moving beyond the conceptual level and elaborating specific factors, e.g. complexity. Qualitative research with the help of e.g. follow-up interviews could possibly clarify the particular motivation behind diffusion decisions. With a potentially increasing level of diffusion over the next years, it would also be interesting to reproduce this study in a longitudinal research design.
C.6 References


References


Part III
4 Research Results
This thesis consists of three individual research publications (papers A, B and C) that have been submitted to and consecutively published in academic outlets over the last four years. The order of the papers reflects the publication timeline and all three are presented in full in Part II of this thesis. The results presented in this section derive directly from these papers and are listed as a summary of findings or synopsis of results, without a detailed analysis (which is part of the papers themselves).

4.1 Usability Success

4.1.1 Overall Finding
The main goal of the model development and the subsequent experiments was to verify that usability consists of single, distinguishable factors, which affect a system’s user-friendliness. Although not all the hypotheses could be confirmed through the experiment, the usability dimensions turned out to influence the process success both for objectively measurable (processing speed) and subjective parameters (perceived ease of use and perceived usefulness).

4.1.2 Specific Results
First of all, the nearly 300 partial experiments proved that the completion rate cannot be a suitable measurement parameter for usability success. Instead, it should be considered rather as a fundamental condition of usability. Secondly, demographic data was also taken into account during the pre-assessment, but neither age nor gender yielded significant relevance to the test outcome. Demographic data that proved to be relevant are Internet experience and Internet Banking experience. Lastly, besides the factor completion rate, the remaining three success factors were assessed. Of the corresponding 18 subordinate hypotheses, nine could be confirmed. The findings show that increased recognizability leads to greater perceived ease of use. Real world metaphors proved to increase processing speed and perceived ease of use, as does anticipating support. An interface that complies with dominant designs leads to higher perceived ease of use. A greater degree of freedom through the back action raised processing speed and enhances perceived ease of use and usefulness.
4.1.3 Summary
The key results are the following:

- *Higher recognizability of the next step results in positive effects on usability.*
- *Real world metaphors are superior to abstract solutions.*
- *It is reasonable to prominently indicate the operation step which is likely to be used next.*
- *Sticking to dominant design supports user orientation.*
- *A greater availability of a back action results in positive effects on usability.*

4.2 Interactivity Research

4.2.1 Overall Finding
The concept matrix showed that most prior research articles can be assigned to perceptual psychology theory or to social psychology theory. The former examines human-computer interaction and user perceptions at the level of individuals, and the latter studies user behavior and individual motivation at the level of individuals and groups, using elaborated theories like social capital theory. Additionally, eight articles can be assigned to organization theory, which uses the resource based view of the firm and examines value creation, using the value chain approach at the level of organizations and groups. Three more articles can be assigned to innovation diffusion theory, which examines the rate of adoption of innovations at the level of organizations.

4.2.2 Specific Results
As a result of the concept matrix classification process, prior research can be categorized into four general categories based on the specific research issues (several past research articles contain more than one research issue):

- *Organizational issues:* interactivity that facilitates communication by the organization
- *Commercial issues:* interactivity that facilitates e-commerce
- *Communication issues:* interactivity in the context of interpersonal communication
- *Formation issues:* issues in designing for interactivity
Among the identified research issues concerning interactivity that facilitates communication by the organization, only relationship management emerged as dominant. Research issues concerning interactivity that facilitates e-commerce could be found most, and they tend to focus on two main areas: decision support systems and recommendation agents on sales oriented e-commerce websites (supplier view) and loyalty, satisfaction and trust as key variables (consumer view). Research issues concerning interactivity for interpersonal communication focus mainly on individual user motivation and successive behavior, and contain many different references to computer-mediated interaction and online communities. Research issues in the field of designing for interactivity discuss interface design questions and focus on numerous website characteristics and their impact.

4.2.3 Summary

Existing research covers a diversified area of issues related to the interactivity of corporate websites. Topics that are addressed copiously include relationship management (including sales and marketing functions), decision support systems and recommendation agents in commercial settings (e-commerce), their effects on customer response (loyalty, satisfaction, trust), computer-mediated interaction, online communities, individual motivation and user behavior, interface design, and the characteristics and success of corporate websites. Topics that are only partially addressed (or not at all) include the effects of different forms and levels of interactivity on social presence, on trust, on loyalty and on online conversion; determinants of the adoption of interaction patterns; factors driving the implementation of communication applications on corporate websites; and differences between the behavior of corporate departments towards adoption.

4.3 Innovation Diffusion on Corporate Websites

4.3.1 Overall Finding

The results revealed that the complexity of implementing and operating online interaction tools and features on corporate websites is the dominant factor influencing the diffusion of innovation related to the interactivity of corporate websites. Interestingly, it is the only factor in the model that is negatively related to the diffusion of innovation and reveals the expenditure side. However, with the perceived benefits that managers attribute to implementing and operating online interaction tools and features on corporate websites, the second dominant factor is the equivalent on the benefit side.
Top management support is also a necessary determinant of the diffusion of innovation related to the interactivity of corporate websites, but is not as dominant as is often suggested. Given the fact that top managers are mainly interested in strategically important initiatives like reducing the costs of business transactions, enabling better customer service or improving relationships with existing customers, it becomes obvious that their support and its influence can also be indirect via the benefit side mentioned above. Unexpectedly, information intensity of the companies’ products and services is only a moderately strong determinant of the diffusion of innovation related to interactivity on corporate websites. Apparently, online interaction tools and features on corporate websites are not necessarily aimed at a customer dialogue about products and services and their sales process. This is an interesting finding that merits further analysis, because the full potential of the Internet does not seem to be addressed entirely in terms of sales and online consulting.

The study reveals some surprising results concerning pressure from competitors and customers: differentiation through innovation related to interactivity is not one of the main reasons for diffusion. Whether a company is internally working with similar systems or has positive attitudes towards online interaction also does not determine the level of diffusion of innovation related to the interactivity of corporate websites.

4.3.2 Specific Results
In order to compare the contribution of each independent variable, standardized beta coefficients show which variable makes the strongest unique contribution to explaining the dependent variable, when the variance explained by all other variables in the model is controlled for. The results show that Complexity (β = 0.220, p = 0.009) and Perceived Benefits (β = 0.208, p = 0.021) are positively associated with the diffusion of innovation related to the interactivity of corporate websites. Top Management Support (β = 0.144, p = 0.134) and Information Intensity (β = 0.105, p = 0.209) are also positively associated with the diffusion of innovation related to the interactivity of corporate websites, but significance is debatable (these two variables do not seem to make a significant unique contribution to predicting the dependent variable). This may be due to overlap with other independent variables in the model. For Information Intensity, factor analysis has demonstrated that all its items load strongly on only one component, and this component is not cross-loaded by other items outside the original construct. Therefore, a general overlap with other independent variables in the model can be excluded and statistical significance is moderate. For Top Management Support, factor analysis showed some items cross-loading on the main construct, but statistical significance is higher. Thus, we decided not to ignore the positive association with the diffusion of innovation related to the interactivity of corporate websites. External Pressure (β = 0.066, p = 0.484) and
Organizational Compatibility ($\beta = 0.064$, $p = 0.504$) are only marginally and not significantly associated with the diffusion of innovation related to the interactivity of corporate websites.

The R square value is 0.162, which is regarded as a moderate to substantial effect strength. The F-statistics produced a value for $F = 4.219$, which is significant at the level $p = 0.001$. This indicates that the variables’ relationships in the model are statistically significant.

4.3.3 Summary

The results suggest that

- Complexity,
- Perceived Benefits,
- Top Management Support,
- and Information Intensity

are the drivers that are important for the diffusion of innovation related to the interactivity of corporate websites.

Looking at the contexts, the technological context is the most dominant context in terms of total influence on the level of diffusion of innovation, related to the interactivity of corporate websites. Secondly, the organizational context is an important context as well. Lastly, the environmental context does not play an important role for innovation diffusion, which is a surprising finding, because corporate websites are public and available to every Internet user worldwide. This means that today, most of a company’s online offerings derive from internal decisions and are mainly technologically driven.

5 Conclusion

In this final section, the relevance of this research project for both audience groups mentioned in section 1.3, namely IS- and innovation researchers and practitioners in different positions within companies, who are associated with marketing, communications and e-business management, is stated. Hence, the two core questions here are:

1) What does this dissertation add to scientific knowledge in the field?
2) How does this dissertation help practitioners?
Furthermore, the limitations of the research, as well as potential future research directions, are considered.

5.1 Theoretical Contributions
The research on usability success produced a suggestion for a generic set of universally valid characteristics. Because this set uses neither sector-specific nor website-specific dimensions, they are equally relevant in different contexts. Thus, the main theoretical contribution consists of a new and differentiated model that can be used in contexts other than online self-service applications. Because the model is based on a deductive literature review process and a preliminary, explorative empirical investigation, as well as large-scale testing, it should be more reliable and valid than the usual (qualitative) usability key performance indicators.

The present research on the interactivity of corporate websites contributes to current knowledge first by extensively collecting, evaluating and categorizing scientific literature in this emerging area. It can serve as a foundation for many studies that engage in the subject matter. Secondly, the quantitative study contributes to current theory by developing a fresh conceptual model based on past research, combining four primary research streams and providing evidence of the diffusion mechanisms’ rationale. No prior research has considered the company point of view and examined the external use of online applications for enabling interaction at the business level in this manner, so that the work contributes to a better understanding of this particular IT diffusion phenomenon.

5.2 Managerial Implications
The research on usability success and its results have practical implications for user-centered development, return on investment of usability testing and the acceptance of usability methods. For example, an early inclusion of target group into the development process will lead to considerably higher usability of the final product. Website operators, web developers and usability service providers will benefit from the model’s six usability dimensions and the new, more differentiated definition of success for professionalizing the handling of usability and providing more systematic proof of success.

The research on interactivity of corporate websites should be valuable to practitioners, because the findings can enhance their knowledge on consumer responses to interactivity and provide advice on implementing interactive tools and features on their respective corporate websites, in order to achieve the required level of social presence. This shows how organizational practice, concerning the purpose of a corporate website and online customer interaction, could and should change. Such processes may be
beneficial for organizations considering initiatives for adjusting their online interaction services. When thinking about how to implement new interaction tools and features on the corporate website, adopting hybrid customer communication strategies is probably the most fundamental suggestion.

5.3 Critical Reflection

5.3.1 Limitations

Although the research on usability success presented neither a set of sector-specific nor website-specific dimensions, the experiment involved a few limitations. These include geographic limitations (Swiss participants), application limitation (Internet Banking) and sector limitation (financial affairs). These limitations confine the scope of the results, but the model itself is nonetheless equally relevant in different contexts, because it is based on a deductive literature review process and a preliminary, explorative empirical investigation.

One specific critical point within the research on interactivity is the inter-rater reliability in paper B, as the coding procedures were conducted solely by the author. The inter-rater reliability could be calculated with the help of Cohen’s Kappa according to [Landis et al. 1977], but a second rater would be needed in order to verify the classification results by following the same searching and coding steps. However, as the judgment of relevance was very strict with a large proportion of the search results being excluded from further consideration (73% of the initial search and 81% of the subsequent backward and forward search – 76% in total), this limitation should not harm the findings.

A specific critical point in paper C may have been a biased outcome of the questionnaire. Therefore, pre-tests and adequate adjustments were employed before launching. The research itself was conducted in Switzerland and Germany, which is a geographic limitation. Furthermore, the selection mechanism for potential respondents applied can be considered as a limitation as well, because the sample derived from one single source of addresses.

5.3.2 Potential Future Research Directions

Further research on usability success might focus on the identification of further dimensions, or on an enhanced differentiation of the existing dimensions, given the topic’s complexity. Additionally, the rejected hypotheses could be investigated by conducting supplementary experiments with a modified test design to possibly identify measurement inaccuracies within the operationalization of the model variables. Further research could also consist of a comparative study focusing on the problems which
have intensified since the conduct of this study, e.g. usability issues concerning the
dynamic features of Web 2.0 interfaces and patterns for web usability according to
[Crumlish et al. 2009]. Product complexity and the resulting information intensity are
an aspect that could also drive further research on usability. As usability is a
particularly more relevant topic when it comes to publishing websites or rich
applications on mobile devices, this study’s findings could be a basis for further
research in the field of mobile website usability or mobile application usability.

The research on interactivity has created a broad foundation for developing any fresh
conceptual models for examining different aspects of interactivity on corporate
websites (organizational, commercial, communicative or design-related aspects) from
different perspectives (users, organizations). Secondly, as the relevant factors
influencing innovation diffusion related to the interactivity of corporate websites are
known, the key drivers behind adoption and non-adoption decisions could be
examined in detail (factor by factor). Therefore, a useful subsequent step may be to
move beyond the conceptual level with the help of follow-up interviews to clarify the
rationale behind specific factors related to the organization in terms of value chain,
business value and performance. Furthermore, future research could be carried out to
investigate whether the results from this study (limited to Switzerland and Germany)
would be consistent with findings from different countries. Moreover, the correlation
between the companies’ level of maturity in terms of Enterprise 2.0 and their level of
diffusion of innovations related to the interactivity of corporate websites could be
investigated. Lastly, a clustered industry-specific examination or a longitudinal
diffusion study could be viable potential future research directions as well.

**5.4 Closing Remarks**

The main goal of this research project was to explore the two most important
characteristics of websites – usability and interactivity – and to obtain insights into the
attitudes and behavior of companies towards innovation diffusion on their corporate
websites. The examination focused on web-based customer self-service applications
(usability) and corporate websites (interactivity).

The results of these research efforts show the importance of specific usability factors
and present the drivers that are important for the diffusion of innovation related to the
interactivity of corporate websites. The findings derive first from qualitative and then
quantitative studies and are important for companies aiming for better customer self-
service on the web and for using the web channel’s interactivity facilities with
potential and existing customers. What becomes clear is that a user-centered approach
to designing, implementing and enhancing such applications and tools is essential.
Companies need to understand stakeholder behavior and goals instead of focusing
internally on technological restrictions. This is undoubtedly beneficial for both parties
and somehow inherently self-evident, as organizations are unquestionably affected by the current evolution of the Internet and the interaction patterns underlying Web 2.0.

Some of the participants of the study mentioned such issues as “our corporate IT department is repeatedly unable to keep up with technological change” and “in our organization, we are very afraid of not being able to control social media interaction processes”. Apparently, the need has been identified, but the willingness and capability to react is still hampered by barriers that are not really understandable from the outside.

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## Appendix: Literature Stock Analysis

<table>
<thead>
<tr>
<th>Authors / Title</th>
<th>Focus</th>
<th>Main statements and outcome</th>
<th>Relevance and further application</th>
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<tbody>
<tr>
<td>Al-Natour, S., Benbasat, I., Cenfetelli, R. (2011) The Adoption of Online Shopping Assistants: Perceived Similarity as an Antecedent to Evaluative Beliefs.</td>
<td>IS adoption research: user perception within the context of online shopping (social psychology and human-computer interaction).</td>
<td>“Perceived decision process similarity” acts as an antecedent to the beliefs (enjoyment, social presence, trust, ease of use, usefulness). It’s important to design artefacts that can be matched to users’ characteristics.</td>
<td>TAM-relation means user perspective. But does an automated shopping assistant allow an online consulting dialogue? <strong>Average relevant.</strong></td>
</tr>
<tr>
<td>Albors, J., Ramos, J., Hervas, J. (2008) New learning network paradigms: Communities of objectives, crowdsourcing, wikis and open source.</td>
<td>Collaboration paradigms in academic and scientific, business and social contexts. Variables are related to communication, social interaction, information, intellectual property, knowledge access and values.</td>
<td>Development and proposition of taxonomy of these practices.</td>
<td>Rather chaotic paper (a lot of analyzing, a lot of sources), no tangible results. <strong>Not relevant.</strong></td>
</tr>
<tr>
<td>Albors-Garrigós, J., Hervas-Oliver, J. L., Márquez, P. (2009) Internet and mature industries. Its role in the creation of value in the supply chain. The case of tile ceramic manufacturers and distributors in Spain.</td>
<td>The role of the Internet for low tech sector companies (the shift from a production push to customer demand model). Evaluation of innovative services and e-commerce penetration.</td>
<td>IT and Internet provide competitive marketing tools and seem to be efficient facilitators for capturing valuable information from the final customers of traditional industries.</td>
<td>Companies are the research object. Methodology: survey among manufacturers and distributors (support by field interviews and analysis of the financial database of the sample.). <strong>Methodologically relevant.</strong></td>
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<tr>
<td>Anfinnsen, S., Ghinea, Gheorghita, Cesare, S. de. (2011) Web 2.0 and folksonomies in a library context.</td>
<td>Folksonomies in a library environment.</td>
<td>Folksonomies seem to have a beneficial effect on the users’ involvement as well as encourage users to browse in more depth.</td>
<td>Strong user perspective. Participation effects! Relevant.</td>
</tr>
<tr>
<td>Avital, M., Bjork, B. C., Boland, R. J., Crowston, K., Majchrzak, A. (2008) Open access publishing and the future of information systems research.</td>
<td>The panel aims to stimulate new thinking about the role of open access publishing.</td>
<td>-</td>
<td>Panel. Not relevant.</td>
</tr>
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<tr>
<td>Barua, A., Konana, P., Whinston, A. (2004). An empirical investigation of net-enabled business value.</td>
<td>Processes through which business value is created through Internet-enabled value chain activities (relying on the resource-based view of the firm).</td>
<td>Supplier-side digitization has a strong positive impact on customer-side digitization, which, in turn, leads to better financial performance.</td>
<td>Strategic management view, but too old for Web 2.0. <strong>Average relevant.</strong></td>
</tr>
<tr>
<td>Campbell, J., Fletcher, Gordon, Greenhill, A. (2009) Conflict and identity shape shifting in an online financial community.</td>
<td>Online communities’ trust and social cohesion (known) and conflicts (new). Link between identity shape shifting behaviors and the power relations.</td>
<td>The analysis reveals how conflict between positions of power can help to align the values and ideals of an online community.</td>
<td>Design and governance of online communities as part of Web 2.0 projects. <strong>Relevant.</strong></td>
</tr>
<tr>
<td>Casaló, L. V., Flavián, C., Guinalíu, M. (2010) Relationship quality, community promotion and brand loyalty in virtual communities: Evidence from free software communities.</td>
<td>Determination of the main antecedents and consequences of the consumer involvement in free software collaboration platforms.</td>
<td>Satisfaction with a virtual community may increase the level of consumer participation in that community. A greater identification may increase indirectly the consumer participation thanks to the enhancement of his satisfaction.</td>
<td>Effects on participation. <strong>Relevant.</strong></td>
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<tr>
<td>Chang, H. H., Chuang, S.-S. (2011) Social capital and individual motivations on knowledge sharing: Participant involvement as a moderator.</td>
<td>Why do Internet users share their knowledge with strangers for no apparent benefit? Combination of the theories of social capital and individual motivation, applying a participant involvement concept.</td>
<td>Altruism, identification, reciprocity and shared language had a significant and positive effect on knowledge sharing. Participant involvement had a moderating effect on the relationship of altruism and the quantity of shared knowledge.</td>
<td>Effect of participant involvement.</td>
</tr>
<tr>
<td>Chen, S. Y., Macredie, R. (2010) Web-based interaction: A review of three important human factors.</td>
<td>Human factors are key issues for the development of Web-based applications. Identification and review of 3 important human factors (gender differences, prior knowledge, cognitive styles).</td>
<td>Females have more disorientation problems than males, flexible paths are more beneficial to experts while structured content is more useful to novices, and Field Dependent and Field Independent users employ different search strategies.</td>
<td>Strong user perspective, but managerial implications.</td>
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<tr>
<td>Gan, L., Gu, B., Jarvenpaa, S., Yang, G. (2009) Habit Formation in Online Communities.</td>
<td>The long standing dilemma that a small group of community members account for a disproportionate amount of contributions.</td>
<td>The concept of habit formation as a key driver of individual contributions (how it is formed and influences participation behavior).</td>
<td>Strong user perspective. Not relevant.</td>
</tr>
<tr>
<td>Hackbarth, G., Kettinger, W. J. (2004) Strategic aspirations for net-enabled business.</td>
<td>NEBIC (net-enabled business innovation cycle) model and its ways of strategically usage by firms.</td>
<td>Firms adopt accelerated leapfrogging strategies when faced with more severe external competitive pressures.</td>
<td>NEBIC might be worth to check, organizations’ adoption is basically internal. Relevant.</td>
</tr>
<tr>
<td>Hall, H. (2004) Creation and recreation: motivating collaboration to generate knowledge capital in online communities.</td>
<td>Examination of the factors that motivated individuals competing to win an award to interact collectively in an e-group.</td>
<td>The initial impetus to join was to discover information for personal benefit. Over time, individual desire to reciprocate the help received developed.</td>
<td>Strong user perspective, mainly relevant for internal usage. Not relevant.</td>
</tr>
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<tr>
<td>Harrison, T., Waite, K. (2006) A time-based assessment of the influences, uses and benefits of intermediary Web site adoption.</td>
<td>Intermediary e-commerce development, focusing on data from financial services intermediaries.</td>
<td>Statistically significant differences in terms of key company characteristics, key factors influencing the initial decision to develop a website and its subsequent use.</td>
<td>Rogers’ IDT used to identify adopter groups, companies as a research object. Relevant.</td>
</tr>
<tr>
<td>Heldal, F. (2004) Success on the Internet - optimizing relationships through the corporate site.</td>
<td>This paper shows how the communications can be optimized through the corporate site. Three fields are discussed: usability, HCI and branding.</td>
<td>Each field alone is insufficient, taken together they can enlighten all perspectives of communication through the Internet. Result: a model that incorporates usability, HCI and branding.</td>
<td>Corporate website as a research object; model ready for 2.0-enhancement? Highly relevant.</td>
</tr>
<tr>
<td>Hercheui, M. D. (2009) Virtual communities and democratic debates: a case study on institutional influences.</td>
<td>Virtual communities and democratic debates (the influence of conflictive institutions on the way members perceive their online interactions as being supportive or not of a more democratic debate).</td>
<td>Lessons inform research on other virtual spaces, highlighting how the institutional environment influences these collectives.</td>
<td>Topically not suitable. Not relevant.</td>
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<tr>
<td>Hess, T., Fuller, M. (2009) Designing interfaces with social presence: Using vividness and extraversion to create social recommendation agents.</td>
<td>Social presence as a key factor in the design of online RA (experiments).</td>
<td>RA personality, vividness and computer playfulness were found to influence social presence, with social presence serving in a mediating role and increasing user trust.</td>
<td>Decision aid focus, social presence on websites. Relevant.</td>
</tr>
<tr>
<td>Hu, N., Liu, L., Bose, I., Shen, J. (2009) Does sampling influence customers in online retailing of digital music?</td>
<td>Investigation of strategic decisions of online vendors for offering different mechanisms (sampling, online reviews) to increase their online sales.</td>
<td>Online markets behave as communication markets, and consumers learn about product quality information passively (reading) and actively (listening).</td>
<td>Topically not suitable. Not relevant.</td>
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<td>Huang, A., Yen, D., Zhang, X. (2008) Exploring the potential effects of emoticons.</td>
<td>Instant messaging and emoticons in personal communication.</td>
<td>Structured equation modelling analysis showed positive effects on enjoyment, personal interaction, perceived information richness, and perceived usefulness.</td>
<td>Research object on individual level, but probably a good example for SEM. Methodologically relevant.</td>
</tr>
<tr>
<td>Hung, C.-L., Chou, J. C.-L., Dong, T.-P. (2011) Innovations and communication through innovative users: An exploratory mechanism of social networking Web site.</td>
<td>Which users to target (combination of Hippel’s lead user and user innovation toolkits with Rogers’ IDT).</td>
<td>Individuals with a large number of hits in a social network are highly active users of new functions. Within a Web 2.0 context, the toolkits’ efficacy is not equivalent.</td>
<td>Rogers IDT used, and strategic management view / implications for companies. Relevant.</td>
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<td>Kleinberg, J. (2008) The convergence of social and technological networks.</td>
<td>Web 2.0 platforms and social processes; scientific inquiry.</td>
<td>Discussion of two settings, where the research strategy of looking at big datasets and at the fine-grained level is being pursued.</td>
<td>Topically not suitable. Not relevant.</td>
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<td>Phang, Chee Wei, Kankanhalli, Atreyi, Ramakrishnan, K., Raman, K. S. (2010) Customers’ preference of online store visit strategies: an investigation of demographic variables.</td>
<td>Investigate the effects of demographic variables in the online shopping context.</td>
<td>The results reveal various effects of age, income, and education on online consumers’ needs being reflected in their store visit strategies.</td>
<td>Topically not suitable. Not relevant.</td>
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<td>Posey, C., Lowry, P. B., Roberts, T. L., Ellis, T. S. (2010)</td>
<td>Social impact and business opportunities, afforded by online communities in a cross-cultural context. Model is based on social exchange theory and social penetration theory.</td>
<td>Positive social influence to use an online community increases online community self-disclosure, etc.</td>
<td>Strong user perspective, but managerial implications (antecedent of self-disclosure and underlying theories may be worth checking). <strong>Average relevant.</strong></td>
</tr>
<tr>
<td>Richter, D., Riemer, K., Brocke, J. vom. (2011)</td>
<td>Social network sites and transferring social software to the corporate context.</td>
<td>Literature review, key findings and suggested directions for general research on ISN.</td>
<td>Literature sources and section 5.3 (<em>SNSs as medium</em>) <strong>Relevant.</strong></td>
</tr>
<tr>
<td>Ridings, C., Wasko, M. M. L. (2010)</td>
<td>Over a five year period, a successful online discussion group has been investigated in terms of dynamics.</td>
<td>Each online discussion group is a product of its structural and social dynamics, and the influence of these factors on sustainability is best understood when they are examined over time.</td>
<td>Topically not suitable. <strong>Not relevant.</strong></td>
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<td>Stewart, K. (2006) How Hypertext Links Influence Consumer Perceptions to Build and Degrade Trust Online.</td>
<td>Online reputation and trust.</td>
<td>A link between two organizations’ websites will have simultaneously effects on trust in both the link sender and the link recipient.</td>
<td>Topically not suitable. Not relevant.</td>
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<td>Webster, J., Ahuja, J. S. (2006) Enhancing the design of Web navigation systems:</td>
<td>A wide literature base has been used to develop a model relating Web navigation systems, disorientation, engagement, user performance, and intentions.</td>
<td>The model is tested and the outcome of the global navigation system was not superior to the simple system. Design guidelines are developed and suggested.</td>
<td>Topically not suitable. Not relevant.</td>
</tr>
<tr>
<td>Wells, J. D., Fuerst, W. L., Palmer, J. W. (2005) Designing consumer interfaces</td>
<td>B2C e-commerce interfaces that effectively support experiential tasks.</td>
<td>Interfaces based upon the business domain metaphor stimulated higher levels of retention and recall of information and thus provided the desired support for experiential tasks.</td>
<td>Corporate website as a research object; maybe contributing to the customer buying cycle by supporting evaluation tasks? Relevant.</td>
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<td>Network Sites: An Investigation of Tie Strength, Endorser Expertise and Product</td>
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<td>Type on Consumer Purchase Intention.</td>
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<td>online communities.</td>
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<td>Xu, Y. C., Zhang, C., Xue, L., Yeo, L. L. (2008) Product adoption in online social network</td>
<td>Maintaining a list of friends – what is the influence and how to measure it?</td>
<td>Comparison of four models of member behavior. Frequency and valence of interactions among members are incorporated in the measurement model.</td>
<td>Product-oriented online social network might be relevant. Average relevant.</td>
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| Zhang, Xiaojun, Venkatesh, V., Huang, B. (2008)  
**Not relevant.** |
| Zhao, Q. (2011)  
10 Scientific Problems in Virtual Reality. | Virtual reality.                                                      | VR has still a long way to go.                                                               | Essay length of (only) two pages.  
**Not relevant.** |
| Zhou, W., Duan, W. (2009)  
Product Variety, Online Word of Mouth and Long Tail: An Empirical Study on the Internet Software Market. | Online software download: long tail versus superstar (descriptive analysis). | A significant interaction effect between the demand-side factor (online user review) and the supply-side factor (product variety) on users’ download. | Online user review might be relevant.  
**Average relevant.** |
User satisfaction from commercial Web sites: The effect of design and use. | Measuring user satisfaction, usability, and user-based design on commercial websites. | Trading sites are the lowest rated and online shopping and customer self-service site should serve as models for website developers. | User-centric approach, but focused on commercial websites.  
**Average relevant.** |

*Table 14 Appendix: Literature Stock Analysis*
Curriculum Vitae

Family Name: ZOLLET
First Names: Roman Christoph
Date of Birth: 01.07.1976
Address: University of St. Gallen
Institute of Information Management
Chair of Prof. Dr. Andrea Back Mueller-Friedberg-Strasse 8
CH-9000 St. Gallen / Switzerland

Office: +41 71 228 65 18
Email: roman.zollet@student.unisg.ch

Work Experience

2014 - current
Business Unit Manager @ Namics AG, St. Gallen, Switzerland and @ Namics GmbH, Frankfurt, Germany
- Responsible for companywide business segment “Mobile Business Solutions”
- Responsible for account management, sales, human resources management, financial affairs, knowhow and project management within business unit (30 employees)

2013 - 2014
Senior Principal Consultant @ Namics AG, St. Gallen, Switzerland
- Member of Business Unit Management team (70 employees)
- Key Account Management Responsible within business unit (CHF 12 Mio business volume)
- Head of Consulting for main branch office (80 consultants)
- Consultant for UBS, Schindler, Swiss Life, DKM, Helvetia and other customers

2009 - 2013
Business Unit Manager @ Namics AG, St. Gallen, Switzerland
- Responsible for account management, sales, human resources management, financial affairs, knowhow and project management within business unit (30 employees)
- Consultant for Raiffeisen, CSS, cashgate, Repower, Helvetia and other customers

2009
Senior Manager @ Namics AG, St. Gallen, Switzerland
- Responsible for account management and sales within business unit (30 employees)
- Consultant for Raiffeisen, CSS, cashgate, Repower, Helvetia and other customers

2008
Senior Consultant @ Namics AG, St. Gallen, Switzerland
- Consultant for Raiffeisen, CSS, cashgate and other customers

2006 - 2008
Consultant / Project Manager @ Namics AG, St. Gallen, Switzerland
- Consultant and Project Manager for Raiffeisen, CSS and other customers
2003 - 2005
Project Manager CRM @ D&A Management & Beratung AG, St. Gallen, Switzerland
- Responsible for setup and launch of the new CRM system within the group (20 branches across Switzerland)

1998 - 2002

Education

2009 - 2014
Ph.D.-Student in Business Innovation @ University of St. Gallen, St. Gallen, Switzerland
- Doctoral Studies (Ph.D. in Management) at the Institute of Information Management (IWI-HSG)

1997 - 2003
Student in Business Administration and General Management @ University of St. Gallen, St. Gallen, Switzerland
- Specialization in Media and Communications Management

1989 - 1996
Student @ Gymnasium Friedberg, Gossau SG, Switzerland
- General qualification for university entrance

Further Information

Interests
- Family: three children
- Sports: volleyball, running, mountain biking, snowboarding, mountain hiking
- Travelling: Asia, Australia, Italy