Success Prediction Induction Framework
Success models for online applications, introducing network effects and trust constructs

Stefan J. Fountain

November, 2007

Masters thesis
Business Information Technology
University of Twente
Enschede, the Netherlands

Thesis commission:

dr. E. Constantinides	**prof. dr. ir. M. Aksit**	**ir. H van Oosten**
NIKOS, Faculty of Management & Governance, *Enschede, the Netherlands*	TRESE, Faculty of Electrical Engineering, Mathematics and Computer Science, *Enschede, the Netherlands*	Da Capo Al Fine, *Voorburg, the Netherlands*

i

Abstract

This thesis analyses the broad scope of information systems success models and applies these principles to the online application domain. It argues that network effects and trust are missing constructs that need to be included into online application success models. A study of existing literature on 'network effects' and 'trust' is performed and from this literature the constructs are introduced into the existing models. These existing models are the DeLone and MacLean model of information success and the Unified Theory of Adoption and Use of Technology. The thesis introduces an improved success model based on these two models: the Success Performance Induction Framework. This model offers a five window view on success for online organizations. The five windows are: organizational perspective, users perspective, influencing perceptions view, positive feedback view and a product life-cycle view. The organizational view offers a general overview of the success constructs and shows causal relations from an organizational perspective. The users' view offers the perspective on how adoption decisions of (potential) users are made. The influencing perceptions view outlines causal relations to influence users' perceptions. The positive feedback view shows how network effect relations increase the quality characteristics of an online organization. These postivie feedback effects are dependent on adequate network facilitation methods. The last view is the product life-cycle view, which helps identify what phase the online application is in and what target audience is relevant in that phase. Together these views offer a deeper understanding of success in online applications for practitioners and theorists.

Acknowledgments

I am grateful for the involvement of my thesis commission – first of all the head of my commission dr. Efthymios Constantinides, prof. dr. ir. Mehmet Aksit and ir. Hans van Oosten. Without their support, understanding, patience and proactive attitude this thesis would have been abandoned long ago. I owe a great deal of thanks to my fellow students who have helped me during the course of my studies.

A special thanks goes to the student coordinator Corrie Huijs, who had the tremendous job of getting all laggards such as myself to finish their study within the old norm of the "ingenieur" title when the laws of the land decided going for a Bachelor / Master structure was a better course.

Contents

List of Figures

List of Tables

Chapter 1

Introduction

1.1   Background

Many research papers concerning internet topics start off with how important the internet has become, or how the internet is continuously growing at enormous speeds[13, 156, 28, 47, 20, 85, 106]. Other researchers have tried to dampen some of the hype regarding the internet's importance[24, 81, 60]. However the increasing importance of e-commerce *is* clear with the total retail sales via internet heading for 200 billion USD[25] in 2007. This same year the total number of people using the Internet will exceed 1 billion[65] in 2007. Also acquisitions such as the Youtube Video sharing site being bought for USD 1.65 Billion[57] which is more than the GDP of Suriname[30]. Some are predicting that online applications are going to be increasingly gain market share[59]. Add to this the changing environment of the internet industry we are seeing and evolution of the nature of online organizations[92].

   Many aspects have been changing on the internet, many speak of a new phenomenon called Web 2.0, where virtual networks rule, corporate and private blogging affect consumers choices, critical consumers are becoming harder to retain and online communication between the customers of a company is becoming more commonplace. The growing importance of this new generation of online applications and their effects on consumers and organizations are issues frequently making headlines and increasingly attraction academic attention[26, 43]. These applications are contributing to customer behaviour change and the new challenges facing decision makers is how to mimic the successes of these new generation of online applications. This thesis aims to provide an academic basis for the causal relationships identified in these applications. Existing IS Success models provide a basis from within which some of the phenomena can be explained. Some important factors that are key in explaining the success of key Web 2.0 initiatives, such as Wikipedia, YouTube, MySpace and Flickr are not reflected in these models. The most important missing concepts are social networking[136], a renewed focus on customer value[6, 61] and the increasing importance of trust[26, 77, 153]. This thesis will provide researchers with an updated IS Success Model that can specifically be applied to e-commerce initiatives in order to identify areas that can be improved.

Many online companies are still failing, so it is important to understand the underlying principles and dimensions that lead to these failures. What makes this difficult is the inherent nature of the web, it is both a technical infrastructure and a social system. One of the founders of the world wide web Time Berners-Lee (2006) [13] says about this:

> Web science has to be a merging of these two paradigms; the Web needs to be studied and understood, and it needs to be engineered. At the micro scale, the Web is an infrastructure of artificial languages and protocols; it is a piece of engineering. But the linking philosophy that governs the Web, and its use in communication, result in emergent properties at the macro scale (some of which are desirable, and therefore to be engineered in, others undesirable, and if possible to be engineered out). And of course the Web's use in communication is part of a wider system of human interaction governed by conventions and laws. The various levels at which Web technology interacts with human society mean that interdisciplinarity is a firm requirement of Web Science.

Also key is the vast investments being made in the e-commerce industry. Decision makers at are continuously making vast investments in developing websites for e-business without having clear knowledge of what factors contribute to developing a high quality website and how to measure effects on e-business success[79]. Many researchers are concerned about this issue, DeLone and McLean (2003) pointed out that "companies are making large investments in e-business applications but are hard-pressed to evaluate the success of their e-business systems. . . . Researchers have turned their attention to developing, testing, and applying e-business success measures"[35]. Similarly, Zhu and Kraemer (2002) indicated that "while sizeable investments in e-business are being made, researchers and practitioners are struggling to determine whether and how these expenditures improve the business performance of firms, or even how to measure the Internet-based, e-business initiatives in the first place"[157]. Studies reported that less than 5% of customers shopping at physical stores engaged in online purchases. Therefore, there is an urgent need to help decision makers gain a better understanding of online customers' perceptions of more desirable websites[106, 75].

It is clear that the success of online firms is an important subject that up till now has received a large amount of research. This research has been very diverse spanning causes of IS success such as quality constructs, social and psychological aspects such as trust and technology adoption. However an overall framework that binds these discipline does not exist. This thesis aims to provide managers and decisions makers with answers to the question how online organizations can become successful.

1.2 Research problem

This thesis aims to provide both practitioners and researchers with better understanding of how online organizations become successful. The research problem addressed in this thesis is:

> *How can the success of online organizations[1] be increased?*

Answering this thesis' research problem will provide online organizations with better understanding of how to achieve success in their online operations. This study uses existing models that explain and predict information systems (IS) success. However these success models need to be updated to reflect current industry developments. Essentially this thesis argues that by updating existing IS success models, a better understanding of online organizations' success can be achieved. I propose that the

---

[1]Throughout this thesis the term online organizations is used in place of other terms such as online applications, web applications or e-commerce site. See Section 1.6 key definitions in this chapter for an explanation and a definition.

existing causal relationships of IS success models, need to be updated with *network effects* and *trust* constructs. The prime objective of this research is to *integrate trust-based causes and network effects causes into the causes found in existing models into one cohesive theoretical model*. A five windowed model is presented in Theoretical contribution (chapter 6) to better identify strategic priorities that includes an organizational view, a users view, technology adoption influences view, a positive feedback view and a life cycle view.

When analyzing the success of online organizations it is helpful to analyze how existing research approaches success. A problem identified in the literature is that many different assumptions regarding success and measuring success exist. There is no consensus on a common definition[34]. It is a complex variable, measured by many researchers by 'system use', 'user satisfaction', 'system quality' and also as 'system impact' or 'user performance'. In thesis the same approach is used as in Delone and MacLean (1992)[34], where success is modelled as a complex set of multiple constructs. Throughout this thesis the success construct will be seen as an amalgamation of the different constructs presented in the models applied and introduced in the following chapters.

1.2.1 Theory

In order to provide an answer to the research question first some broad parent theories will be introduced in Research Issues (2.2.1). Existing theories that deal with IS success and technology acceptance provide the necessary framework for further study. A challenge when looking at IS success is applying the correct view level. A systems level approach will provide information regarding the effectiveness of a system but will not shed light on how individual users decide to adopt technology. Both the systems level and (individual) user level are used in this thesis. For both levels a different model will be used.

Two fundamental and widely discussed theoretical models are used as a starting point to guide this research. The first model, the DeLone and McLean IS success model[34, 35], looks at the system level of technology from a systems perspective, of which the collective usage is also a part. The second important theory is the Unified Theory of Acceptance and Use of Technology (UTAUT)[144] which handles individual users' adoption decisions. Both theories provide perspectives that show the gaps in existing literature which this thesis will focus on.

1.2.2 Research questions

In order to successfully answer the research problem, it will be further refined into a set of research issues. The research problem mentioned above refers to a decision of direction for this thesis, research issues on the other hand require information to be solved. More information is required to adequately satisfy the research agenda. The research issues for this thesis are presented and explained in Research Issues (2.2.1), as an initial guide to this research the following research (sub)questions can be stated:

1. What success models are there now, i.e. what research has been done for IS field?

2. What industry developments are there that demand change of the IS success models?

3. How can the success models be applied to web applications?

4. How can web applications be influenced to be more successful?

Research Issues (2.2.1) will further expand these research questions into finer grained questions which will be further explored in chapter of Network effects (chapter 4) and Trust (chapter 5). These chapters provide in depth literature studies of these areas and conclude with an updated version of the models that better reflect the success constructs.

1.2.3 Contributions

As stated before, this thesis aims to provide online organizations with better understanding of how to improve the success of their operations. Specifically the contributions help initiatives:

1. Explain, predict and monitor success of online organizations

2. Provide developers with a tool to prioritize e-commerce product development and marketing efforts

3. Provide characteristics of different life-cycle phases and their respective strategic priorities

1.3 Justification

The justification of this thesis goes further than stating that there are gaps of knowledge in existing literature. The gaps in the existing body of knowledge must also be important gaps[141, 100]. Some IS success models have been applied to e-commerce situations[35, 66, 98]. However they miss a number of fundamental elements:

- None deal with network effects, where network effects have been identified as fundamental to e-commerce success[134].

- None combine the individual users' view with the system levels view, where in order to correctly understand users this has been found fundamentally important[150].

- Existing models do not explicitly model trust in technology adoption decisions.

- Success models have not incorporated changes in causal relationships during the online organization's life cycle.

The research question increases the scientific body of knowledge in regards to IS success, expanding it with new developments online organizations. A higher reliability than current IS Success models can be attained by providing qualitative research on applying success models specifically to the online organizations. This will further insight and understanding of the research area on success models, trust and network effects.

1.4 Methodology

The methodology used in the thesis to support its claims is is an extensive literature study. Some (short) examples have also been included to illustrate the presented theoretical model.

The literature study is the main focus of this thesis and aims at bringing together the overwhelming amount of theory and research available in the chosen topics. The success models create a basic framework from which certain gaps in knowledge can be identified. These gaps are network effects and trust, for both areas an extensive review of the literature has been conducted and is presented in Network effects (chapter 4) and Trust (chapter 5). All variables identified by the authors are summarized and incorporated into a number of updated models. The goal of the literature study is to synthesize a coherent model from existing literature into one non-trivial model that will increase the quality of measurement of success in online organizations. The goal of a literature study is to provide readers with a practical tool that can be used.

1.5   Outline of report

This first chapter of this thesis provides the reader with an overal outline. Included are the initial decisions of direction recorded in the research question and initial research findings, such as the major bodies of theory and research issues. A large part of this chapter is creating a general overview of how the following chapters are structured.

Research issues (2.2.1) provides a literary review of existing knowledge in IS success and its relation to e-commerce. It identifies the gaps in knowledge that are present and need researching. From this a number of key research issues are identified that will be investigated in later chapters. The research issues identified will provide the information needed to answer the research question. In this chapter the Hypotheses that this thesis attempts to answer are formulated and presented.

Research Design (chapter 3) describes how the research issues will be researched: methodologies are discussed and chosen. The collection of data in this research is different than normal masters thesis[2] in that the major research work is a literature study. The justification and procedure is outlined in Research Design (chapter 3).

Network effects (chapter 4) provides the literature research on network effects, Trust (chapter 5) provides the literature research on trust. Both chapters argue the various points made in the literature and provides overview of the causal relationships identified. The dependancies identified in the literature study support the proposed theoretical model that is the main contribution of this thesis and is presented in Theoretical contribution (chapter 6).

Examples (chapter 7) shows the reader how the model presented in Theoretical contribution (chapter 6) can be applied in practise on two short examples.

Concluding remarks, contributions, discussion and further research that naturely follow the research performed in this thesis are presented in Conclusion (chapter 8).

Appendices and References can be found at the end of this document: [Appendices][], [References][].

1.6   Key definitions

Definitions used by researchers are often not conform, so it is important to define the positions and views taken in this thesis in regards to some key concepts. Definitions of core constructs will also be dealt with in more depth when the various literature is discussed. Providing an overview here will give readers a clearer understanding of important concepts.

Online application

An online application can be defined as *a consumer-oriented internet-based application.* The online application is an online service that is delivered through a browser directly to costumers. This choice excludes a major part of the total software, which is packaged software. Examples of internet applications are Google Mail, YouTube.com, Basecamp.com, MySpace.com. An online application is not restricted to non-physical goods, Amazon.com is an example of an internet application that sells physical goods.

Online organization.

A definition for an organization from Scott (1981) is: 'Social unit . . . deliberately constructed . . . to seek specific goals'[127]. In this thesis we examine online organizations, thus Scott's definition applied to an online situation is: *the social unit deliberately constructed to be responsible for an online application.*

---

[2]For this reason guidelines are taken from Perry (1998)[112], which provides a good overview on literature studies for Phd. theses.

The online organization is the term used throughout this thesis to identify the unit of analysis. This group or organization can be a profit driven firm, a group of technology enthousiasts, an open source initiative, or an individual.

E-commerce or e-business

The terms e-business and e-commerce are often used interchangeably. E-business has a more inclusive meaning in that it refers to three strategic roles of information technology: inward, outward and across. These are business-to-employee, business-to-consumer, and business-to-business. In the context of this paper e-commerce refers to a business to consumer context[110].

Network effects vs Network externalities

Network effects are often incorrectly used interchangeable with network externalities [83]. Their difference lies in the fact that network effects concerns *all added value* a network gains by it's size and network externalities are *only those direct benefits* gained by existing users joining a network[69, 83]. Thus network effects encompass network externalities. An example of network externalities is the added value an existing user of Skype will gain if a friend of his joins, network effects is the added value users get from support information available online due to the size of the user base of Skype. To avoid confusion this thesis will use 'positive feedback' as a term in stead of 'network externalities'.

Trust

Trust is an ambiguous term that needs clarification[91]. In this thesis trust refers to a family of constructs that influence users' adoption of technology. Sub-construct of trust is perceived trust: the degree to which a user sees an online organization as being trustworthy[70], and disposition to trust as a user's likelihood to trust others[70]. This thesis will employ the following definition for trust: *"a consumer's willingness to accept vulnerability in an online transaction based on their positive expectations regarding an online organization's future behaviors"* – adapted from Kimery (2002)[73].

1.7   Delimitations

Scope

In order to provide a clear scope the following delimitations[3] will be defined.

- *online organization*, the key unit of analysis has been defined as the online organization. The online organization provides services delivered through a web browser. This choice excludes a major part of the total software, which is packaged software. This will not be incorporated in this research. For example an online gaming site can be part of this study, but video games which are played on a console or PC are not[4].

- *Homogenous goal.* online organizations will be examined that have a single or family of products that have similar goal. For example Google Docs is applicable as a family of products, but Amazon books together with Amazon S3 (Simple Storage Service) is not. Separately however they *can* be examined. The IS success models are complex already, by incorporating multiple exogenous online applications it will be harder to grasp the essence of success for online organizations.

---

[3]Limitations are limits beyond the researchers control, delimitations are specifically chosen to be limits of the research by the researcher.
[4]However an online organization that sells videogames through their website obviously is.

- *Potential network externalities.* One might argue that new success models might only apply to initiatives that embrace a social networking. However initiatives that don't, should especially need to review their value proposition in accord with the proposed success model. As they might be able to increase their success substantially by improving the areas this study aims to highlight. The only restriction is that there are potentially network externalities to be gained in the chosen industry.

- *Development process is out of scope*, this study will be limited in its incorporation of Software Engineering development methods. For example it does not seek to answer *how* to create system quality. It seeks to provide the reader with enhanced understanding of the causal relationship that stem from systems quality. And thus providing answers as to what development process should be focused on. For examples aspects such as functional and non-functional requirements specification.

- *Existing constructs adopted unchanged.* Some existing constructs will be adopted unchanged in this research, specifically the operationalization of the various quality variables, information quality, systems quality and service quality will be adopted as is. This thesis does not pay attention to possible flaws in existing literature regarding these variables.

Key assumptions

An important aspect to consider when looking at online organizations is that the web has a basic duality in its nature [46]. It is both used as a software interface and as a hypertext system. The software interface is mainly concerned with user tasks: here we consider the site as a tool that the user employs to accomplish one or more tasks. The hypertext system is more concerned with information distribution and retrieval: the site is an information space that users can move through. Most sites aren't easily categorized as either an application or a hypertext system, they are a sort of hybrid, incorporating aspects from both sides. In this thesis we will view online applications within a spectrum that incorporates both interaction aspects and information aspects. This means we exclude simple websites that just provide information and no interaction.

This thesis is applicable for initiatives that have already created significant presence, but can also be relevant for startups and small companies.

Generalizability

A unique aspect of the problem address in this thesis is how it embraces one of the main features of the internet: the distributed character which connects users and services into direct information sharing. This is how the internet was envisioned when it was designed[12], only now have technology and business practices started to leverage the possibilities for users to interact and be co-creators of their the services they use. It is unclear if this is relevant to areas outside of the internet, and it is not a generalization for which this thesis is intended. The unique connection capabilities provide distinctive features that will be hard to reproduce outside of the technological environment that the internet offers.

1.8   Conclusion

This chapter has laid the foundation for this thesis. It introduced the research question and research issues. The research was justified, definitions were presented, the methodology was briefly described and justified, the report was outlined, and the limitations were given. On these foundations, the thesis can proceed with a detailed description of the research.

Chapter 2

Research Issues

This chapter aims to build a theoretical foundation for the research in this thesis by reviewing the relevant literature to identify research issues. First a look at parent theories will provide a context from within which the problem domain can be approached. A review of the research problem (or problem domain) theories will provide the outstanding research issues. These will be presented as hypotheses to guide the research of this thesis.

2.1 Parent theories

In this section I analyze some general parent theories that are applicable to the research question. These parent theories are marketing, information systems and software engineering. Marketing is able to provide context for online organizations in identifying customer needs. From the Information Systems field solution view-levels are provided to clarify IS success factors. Software engineering is a helpful approach to explain process and product quality in order to create systems that meet customer needs.

2.1.1 Marketing

Marketing's basic function is identifying needs and the process of creating, communicating and delivering value to customers in order to meet these needs[76]. It is a problem solving activity of transforming unmet needs (the problem) into a business service (the solution) that meets these needs. In order for a online organization to be successful the needs must be fulfilled successfully, this starts with identifying the needs correctly in the first place.

Identifying needs

Marketing literature provides us with numerous strategies for identifying potential needs of customers and identifying target groups (e.g. SWOT analysis, 4P Marketing mix, et cetera). Traditional strategies have been applied to e-commerce, however recent literature suggests that new aspects are more important. Managerial attitudes based on flexibility, innovation and and short-term strategic focus are important contributions to the long-term survival and market leadership of successful online organizations[26]. In other words, identifying the online customers' needs is increasingly hard. Even if a customer needs are identified successfully, it is prone to change often and quickly. Thus organizations should build this uncertainty into their business operations.

Figure 2.1: Solution and Problem decomposition
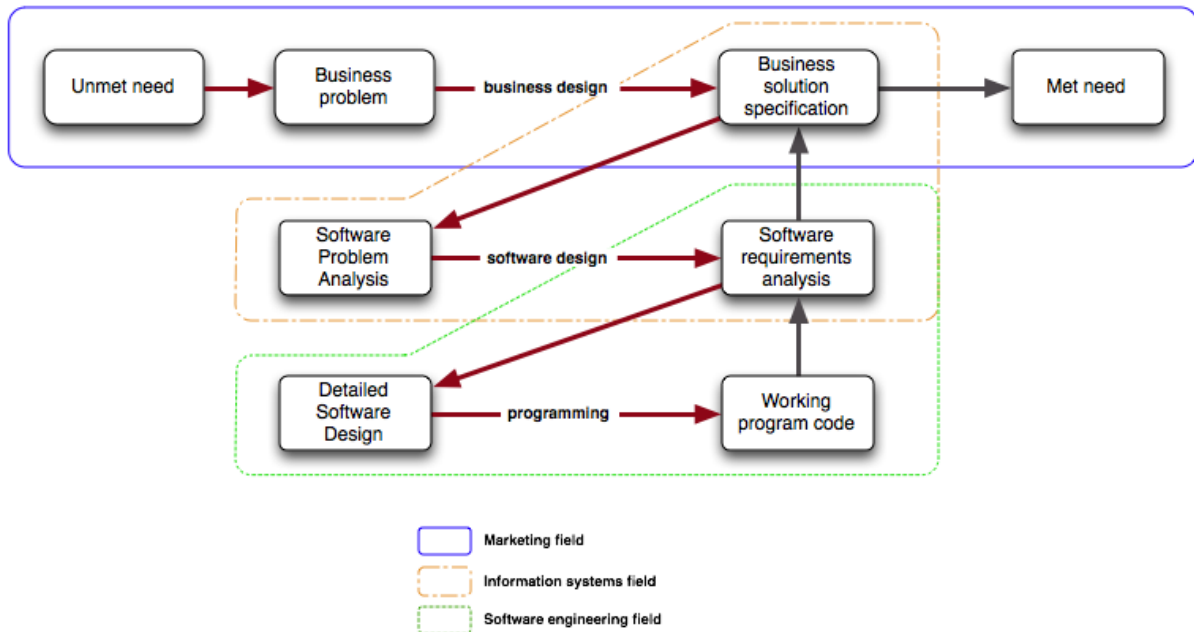
Meeting needs

Once the marketing function determines a need in the market, a business solution is designed that is believed to lead to success. Business designers will analyze the business goals, objectives, strengths, weaknesses, threats and opportunities and generate business solutions. Interestingly one persons solution will be another persons problem. In online organizations the solution to meeting the identified needs is some form of an online application. Thus the business solution of creating an online application becomes a software engineering problem of creating software that meets the business goals or solution specification (See Figure 2.1). The decomposition of solutions into finer grained problems and their solutions, is fundamental in understanding how marketing and software engineering integrate.

Nature of exchange

The exchange of goods is fundamental to marketing activities. In broad lines organizations develop a marketing strategy to enhance the exchange of their goods[145]. Traditionally the exchange of goods or services is for some form of financial payment. Increasingly however the costs of services for consumers are less tangible shifting from financial recompenses to time, effort or attention. The basic principle still holds, that a supplier provides something of value (a product, service, or idea) to a consumer in exchange for something else of value (money, effort, time, etc.). It is key in this exchange that the marketing function of an organization understands the value of online organizations and the recompenses that consumers expect to pay. Customers are increasingly unpredictable in their evaluation and empowered in their choice options of this exchange[26]. Customer experience is also becoming increasingly important part of the exchange transaction[94].

Figure 2.2: Customer decision making process

A. Controllable stimuli:
Traditional Marketing Mix

B. Uncontrollable stimuli:
Demographic, personal,
cultural, attitudinal, perceptual,
sociological, economic, legal,
environmental etc.

Customer

Black box:
Processing center

Customer decision

- Product
- Brand choice
- Dealer choice
- Purchase timing

C. WEB Experience:

**Online Controllable
Marketing Factors**
Web site Usability,
Interactivity, Trust,
Aesthetics, Online
Marketing Mix

D. WEB 2.0 Experience:

**Online Uncontrollable
Marketing Factors**
Weblogs, Social Networks,
Podcasts, Communities,
Tagging, Forums, Bulleting
Boards etc.

Customer decisions

Consumers' buying behaviour is influenced by a number of factors, some factors are controllable, others aren't. The environment determines some uncontrollable factors such as demographic, economic, cultural, legal etc. Marketing strategies offer ways to influence the consumer by changing controllable aspects such as the product or price[145]. These controllable and uncontrollable stimuli provide inputs for the consumers Black Box, processing information before the decision is made[76]. Online marketing can also be used to influence the buyers' decision, these are aspects such as product quality, usability, and the online marketing mix[26]. However recent developments have shown that there are new uncontrollable factors that onfluence customer buyers decisions, these are factors such as social networks, communities and weblogs[43]. One could argue that there is control over these factors, and there is to some limited degree, however online users have quite a decent influence in these media. See Figure 2.2 for an overview of the decision making stimuli influencing online customers.

Influencing customer decisions

Literature suggest that there are numerous ways to influence the buying decisions of customers. If we narrow the scope of this literature to online organizations we see that key in influencing online buyers

is trust[26]. The creation of trust is done mainly by creating quality products, other factors are also important. Communication regarding current and future features, general philosophy and company culture is key in influence users perceptions online organizations. Another key factor in influencing customer decisions is a past record of proven reliability, in this thesis I will adopt service quality, to indicate the visible quality of updating aspects such software, communication and documentation from a customer perspective. Thus we conclude that information quality regarding the online organization and service quality in regards to updates are very important in building trust and influencing customer buying decisions and thus the success of online organizations.

2.1.2 Information systems

In this section a brief look will be given to elements that are relevant to this thesis from an Information Systems perspective. The focus is on the role of technology within the online organization, that is the link between the identified need and the software systems that fulfills that need. The next section will review software engineering aspects on the process of creating software that fulfills the needs. Information systems is broader than software engineering in this aspect as it encompasses the organizational design as well as the software systems.

Composite system

The identified needs will be attempted to be fulfilled by creating a solution to the defined business problem. This solution is not just a software system (e.g. the online application) but the whole online organization. This online organization includes organizational aspects of how it will try to influence it's environment. This is the primary distinction between an online organization and online application: the online organization is broader including communication aspects such as for example (un-)official weblogs and API documentation. Thus the business solution encompasses organizational solutions as well as the software solution. In online organizations organizational aspects are however heavily integrated with technical software solutions thus it is important to incorporate the whole initiative when modelling a software solution.

Environment

Not only can the solution be seen as merely a software system, it also cannot be seen as dependent of the environment it is in. The solution to the needs also incorporate environmental aspects that the initiative has no control over. The environment can be a part of the solution of meeting customer needs. The basic supposition here is that the online organization is part of a composite system that includes assumptions about the environment. The composite system is a collection of elements that interact to form a whole. The composite system has properties that emerge due to interaction of its components[151] (See Figure 2.3). In this figure the environment can be seen as the two external entities, and the system is decomposed into subsystems, the software solution (e.g. online application) will be one of these subsystems. An example of external elements in the environment of online organizations can be client browsers (such as Firefox, or Apple's Safari), mobile phones (if the online application makes use of mobile phone capabilities) or third party technology (such as Google's search engine, third party API's or W3C specifications).

Approach levels

Because this thesis' research question is one regarding the success of a given online organization it is helpful to model the causal relationships from the organizations perspective. Even though many IS success models view success from an organizational view they do adopt users behaviour into their

Figure 2.3: The system hierarchy
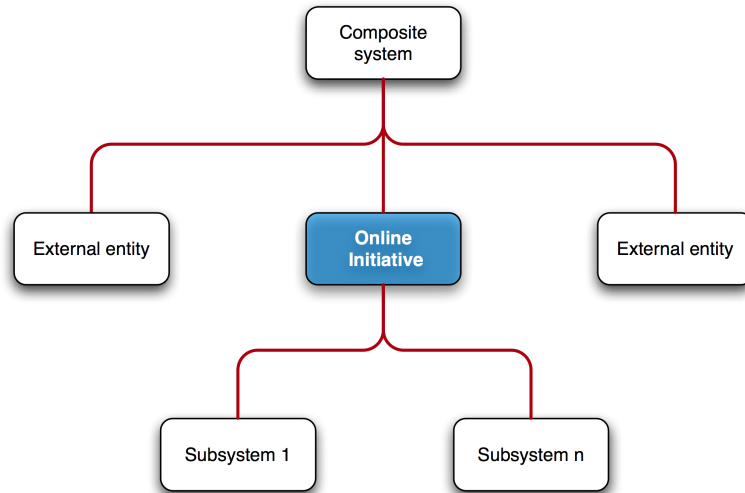
models. This is approach differs from a users perspective, where technology adoption models explain the influences on usage behaviour. It is clear that users will have different incentives to use technology than an organization has. Users can choose between differing rival technologies or online organizations, where companies try to create services that appeal to users. It is fundamental for an organization to understand the incentives that influence the user. In this thesis we adopt both views, the systems view from an organizational perspective and the users view in regards to technology adoption influences.

Duality of the web

An important aspect to consider when looking at the success of online organizations is that the web has a basic duality in its nature[46]. It is both used as a software interface and as a hypertext system. The software interface process is mainly concerned with tasks: here we consider the site as a tool that the user employs to accomplish one or more tasks. The hypertext system is more concerned with information distribution and retrieval: the site is an information space that users can move through. Most sites aren't easily categorized as either an application or a hypertext system, they are a sort of hybrid, incorporating aspects from both sides.

Changing business practises

Something about the changing nature of interaction online, this thesis no longer just pertains to monetary interactions but to all types of interactions that involve the user. It is insufficient to only analyze the willingness of users to purchase online, it is too limited. These days users interact by providing information which is also a 'cost' to users. Time, effort, attention are all currencies that users' can 'pay' with. Therefor limiting success models to merely transactions such as in traditional e-commerce will limit the success of the online organization.

Figure 2.4: Quality levels in the software development life cycle
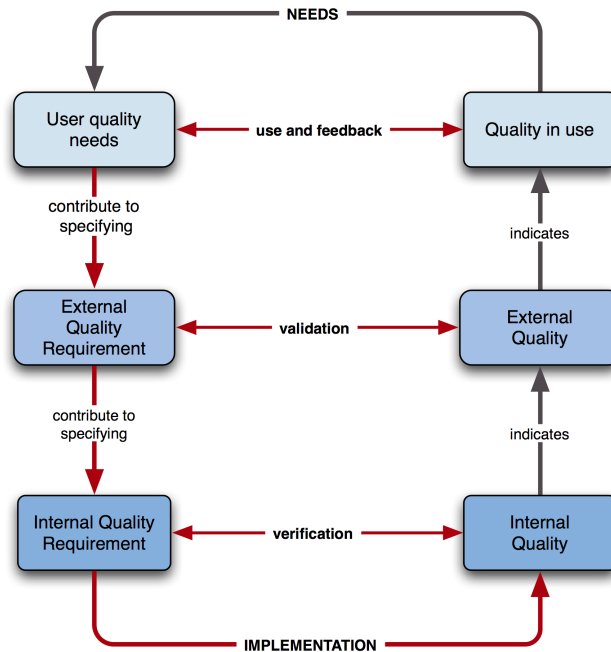
2.1.3 Software Engineering

This section looks at software engineering aspects that are relevant to the research question. Software engineering is the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software [1]. Software engineering principles are necessary to produce long-term successful online organizations. Some key aspects are highlighted here before going deeper into specific issues of the research question.

Software quality

The business value of a software product results from its quality as perceived by both acquirers and end-users[49]. Therefore, quality is more and more often seen as a critical attribute of the product, since its absence results in dissatisfied users and financial loss, and may even endanger lives[50]. Increasing recognition of the importance of software quality causes a shift in the "center of gravity" of software engineering from creating a technology-centered solution toward satisfying the stakeholders[128]. Software development in organizations confronted with such a shift need quality-related measurement instruments that facilitate the engineering of quality throughout the entire software product life cycle. The ISO 9126 standard offers help, it provides a general overview of software quality throughout the product life cycle and describes a quality model framework which explains the relationship between different approaches to quality. A graphical representation of this model is provided in Figure 2.4, this model is modified slightly to more closely resemble the problem decomposition view mentioned previously.

User quality needs include requirements for quality when the software is used by users. These identified needs can be used when specifying external and internal quality using software product quality

---

[1]Definition taken from the "IEEE Standard Glossary of Software Engineering Terminology," IEEE std 610.12-1990.

Figure 2.5: Quality relations in the software development life cycle
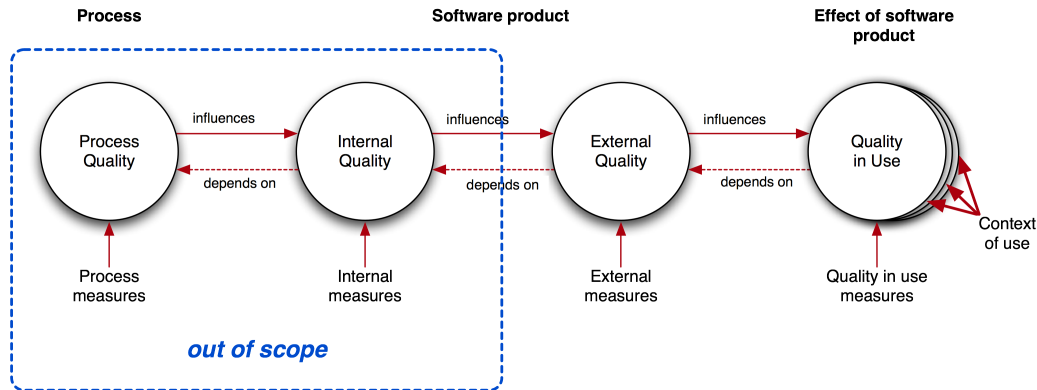
characteristics and subcharacteristics. Evaluation of software products in order to satisfy software quality needs is one of the processes in the software development life cycle. Software product quality can be evaluated by measuring internal attributes (typically static measures of intermediate products - such as documentation, lines of code or test coverage), or by measuring external attributes (typically by measuring the behaviour of the code when executed), or by measuring quality in use attributes. The objective is for the product to have the required effect in for the end user in a particular context of use, such as ordering books from an online bookstore.

Process quality

Quality in the software product life cycle has the difficulty of finding the appropriate quality engineering mechanisms that could be applied in all phases of the life cycle of a software product[128]. Or simply: software quality depends on the quality of the development process. In order to create sustained quality products, although not the only factor, good software engineering processes are key[7, 45]. ISO 9126 incorporates process quality as a cause to software quality, this can be seen in Figure 2.5. Process quality contributes to improving product quality, and product quality contributes to improving quality in use. Therefore, assessing and improving a process is a means to improve product quality, and evaluating and improving product quality is one means of improving quality in use. Similarly, evaluating quality in use can provide feedback to improve a product, and evaluating a product can provide feedback to improve a process. This thesis will omit the process and internal aspects of quality. The reasoning is that both aspects are not directly seen by users even though they are a cause of software quality.

Dealing with uncertainty

The quality of the product in the long term depends largely on how the business processes deal with change. The assumptions regarding the environment could be incorrect, and on top of that the environment is constantly changing. This uncertainty is introduced by changing customer needs, changing technology, incomplete skills, and many more unknowns on which an organization has little or no influence. All of these uncertainties can be incorporated into the assumptions about the environment, however over the course of time things will be become more clear. It does mean that the views of internal quality, external quality and quality in use change during the software lifecycle. These aspects need not spell doom for software systems, they can be embraced as opportunities as well. However it

is clear that in order to create a successful systems, there is an internal need for the organizational processes to handle change. This counts both for business processes as software development processes.

Defining quality

Unfortunately the term software quality has become quite an ambiguous term, it can mean many things. If we want to understand the success of online organizations it is therefore key to provide a clear view of software quality. First we will look at how quality is viewed in general then use a more narrow software approach. According to Garvin (1984)[49] and Reeves et. al (1994) [118] there are four types of quality definitions:

1. *Quality is conformance to requirements.* According to this view, product quality is synonymous with meeting specifications.

2. *Quality is fitness for use.* This approach is more user-oriented. Stripped to the essentials, it boils down to the claim that "quality lies in the eyes of the beholder." Different users have different needs, and to the extent that a product is designed and manufactured to meet those needs, it is of high quality.

3. *Quality is innate excellence.* This definition reflects the belief that though styles and tastes change, there is something enduring about works of high quality. They provide a standard against which other products are judged. Excellence, according to this view, is both absolute and universally recognizable; whatever it consists of, we all know it when we see it.

4. *Quality is value.* Depending on the price you pay for the product, it can be of either high or low quality. This definition takes into account the price paid for a good. Essentially high quality products are those with a low costs/value ratio.

All these approaches to quality have weaknesses and they all have strengths. Without explaining these we suffice to say for the purposes of this thesis we wil adopt the following definition of quality. In the international ISO/IEC-standard 8402 on quality management terminology, quality is described as:

> "*Quality*: the totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs"

Even though this is just one of many definitions of quality it does reflect the most important aspects of quality: *the extent in which expected and implicit needs can be met.* As this thesis will focus on meeting the needs of online users, this definition of quality fits well with the stance of meeting customer needs identified in the previous section. The way an online organization meets these needs is by creating online applications, and their support systems.

2.1.4 Conclusion

In order to have a successful online organization it is important to understand the needs of your target customers. The decision to adopt your online organization is a technology adoption choice that can be influenced. Creating success is influencing this decision by all marketing, organizational and technical means, this includes crafting an online product that fits customer needs. The following factors summarize the relevant marketing, information and software engineering aspects:

1. Identification of customer needs is hard, customer needs and the environment change often

2. The nature of the exchange of goods has changed to trading attention and time for an online service

3. Customer decisions can be influenced by communication and reliable updating

4. The online organization is a composite system consisting of many subsystems one of which is software

5. Approach levels from systems and users point of view is needed

6. Software engineering is a continuous problems solving discipline in the context of the software elements of online organizations

7. Development process must be able to handle change

2.2 Research problem theories

This section sets forth the research issues of this thesis. It shows where the existing literature fails to answer the research question and what needs to be researched in order to have a satisfying answer. First the research question is approached from a systems and user view. From these views gaps in the research theory appear. Then each identified research area is introduced and the corresponding research issues are identified.

2.2.1 System level

As mentioned in the previous section in this thesis we adopt both the systems view (the organizational perspective) and the individual user view (the technology adoption perspective). For both views existing models are available to explain causal relationships. These models combined answer a large part of the research question, however gaps still exist and will be identified in this section.

DeLone and McLean IS Success Model

Since the beginning of the IS field attention has been given to identifying the factors that lead to success of IS systems. IS success is a controversial issue that has eluded researchers for many years[48]. One of the reasons is that it is a multidimensional and interdependent construct and that it is therefore necessary to study the interrelationships among those dimensions [35]. The problem is complex because success is a multidimensional concept that can be assessed at different levels (such as technical, individual, group, organizational) and using a number of not necessarily complementary criteria (such as economic, financial, behavioral and perceptual)[98]. In 1992 a paper was published that for the first time provided an integrated and cohesive approach that was adopted by researchers, this paper was a literature review that presented a new model for IS Success: the DeLone and McLean Model (henceforth, D&M) [34]. Since then more than 500 articles in refereed journals have referred to, and made use of, the DeLone & McLean IS Success Model as the basis for measuring the dependent variable in IS research[2].

Many researchers have used and expanded the D&M model, however a number of contention points were raised against the 1992 D&M model. Authors such as Seddon (1997)[129], Molla and Licker (2001) [98] have critiqued and extended the model specifically applying it to e-commerce. The main difference in the Molla and Licker model was the introduction of Trust as a independent variable. The D&M model has since been updated by the original authors [35], which is the model we discuss here (See Figure 2.6).

---

[2]Search performed in July 2007 on ISI Web of Knowledge yielded 521 cited references to the 1992 article.

Figure 2.6: DeLone & McLean IS Success Model
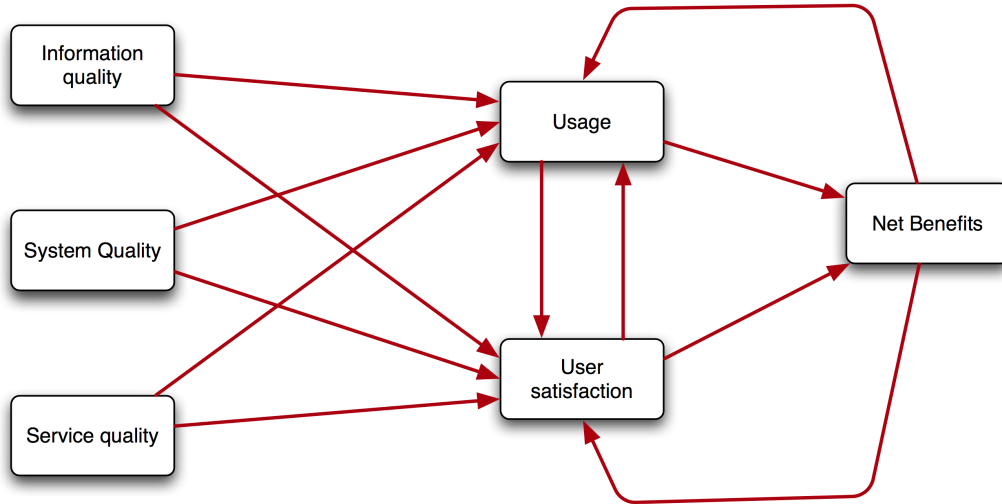
D&M success measures

The six constructs of the D&M model when applied to online organizations can be defined as follows:

1. *System quality,* measures the desired characteristics of an online organization's software systems. Usability, functionality, reliability and efficiency are examples of qualities that are valued by users of an online organization.

2. *Information quality,* captures the value users experience from the available information content within an initiative's online application. Content can vary in completeness, accuracy, relevance, personalization, security and other factors. Information quality is the degree in which the information present in an online application satisfies users information needs. In current developments social networking features are improving information quality of many websites, such as Wikipedia, Flickr and YouTube[136].

3. *Service quality,* the overall support delivered by the online organization, this can be in the form of help pages, online manuals, wiki's, toll-free phone lines, online tracking systems, and other user support features. Measuring service quality entails looking at responsiveness, help availability, assurance, technical competence and service information availability. This dimension is more important in an e-commerce environment than ever before, because the users are now customers rather than employees, and therefore, poor user support will translate into lost customers and lost sales.

4. *Usage*, measures the total current use, including types of use of the online organization. Examples of metrics are visit statistics (including totals, lengths, customer paths etc.), current memberships & growth, API calls, purchases, searches, service requests. Also important is the extent of use, is the use merely information retrieval or are users sharing information or even purchasing products. Repeat customer statistics are also important in analyzing use.

5. *User satisfaction,* attempts to measure the degree in which users are satisfied with entire customer experience cycle from landing through signup, potential payments and service. Satisfaction can

be measured with specifics features or in general, satisfaction measured by the difference between service needed and received.

6. *Net benefits,* are the most important success measures, because they capture the balance of the positive and negative impacts of the online organization on customers, industries, economies and even society as a whole. Is the online application of value to the user, does it solve a specific need for him? Is the online organization yielding positive net benefit in terms of profit gains? For some situations it can take longer for net benefits to become positive[3]. Net benefits success measures are the most important but they cannot be analyzed and understood without system, information and service-quality measurements[36].

Critique of D&M model

One of the contention points of D&M's model, raised by Seddon (1997)[129], is how process elements are mixed with cause and effect elements. Seddon further argues for the removal of "use" as a success variable in the causal success model, claiming that use is a behavior, appropriate for inclusion in a process model but not in a causal model. He argues that use must *precede* impacts and benefits, but it does not *cause* them. The problem to date has been a too simplistic definition of this complex variable[36]. Simply saying that more use will yield more benefits, without considering the nature of this use, is trivial and does not provide managers with useful measurement tools. Researchers must also consider the nature, extent, quality, and appropriateness of the system use[36]. The nature of system use could be addressed by determining whether the full functionality of a system is being used for the intended purposes[48, 66]. System usage continues to be used as a dependent variable in a number of empirical studies and continues to be developed and tested by IS researchers [119, 78, 98, 137, 90, 79]. However many IS researchers believe and that use, especially informed and effective use, will continue to be an important indication of IS success for many systems[98, 66, 36].

Context issues

Many contention issues arise from the confusion that the D&M model is context sensitive, that is that it can be applied at various levels of approach, individual, organizational and even complete industry or societal levels. In the D&M model the net benefits construct measures are determined by the context and objectives of the specific problem domain[36]. In this thesis we limit our approach levels to the organizational and individual level. Using the D&M model for an individual success model will have the undesired side effect of bypassing the users decision process, as the D&M model provides no constructs for user technology decisions. Assumption about customer decision factors are not trivial and is key in making an online organization successful. In order to provide a complete picture of success causes it is necessary to provide a framework of technology adoption decisions. This is the reason this thesis adopts the technology adoption perspective in the next section.

Missing variables

In this thesis I argue that the D&M model is missing some key constructs and relationships in order to explain success for online organizations. In order to retain explanatory power it is important to introduce these missing constructs. The first construct that is missing is that of *network effects*, much anecdotal evidence suggests the importance of network size for the continued growth of online organizations[86, 66]. Additionally economic theory suggests that perceived network size is key in influencing customer

---

[3]For example YouTube made losses right up until they we're bought by Google for 1.65 Billion USD. In general the rule is valid that if usage and user satisfaction are positive then sooner or later the net benefits for the online organizations will become positive.

adoption decisions[132]. The next subsection will introduce *network effects* as a possible research area that can enhance the D&M model. The second missing construct in the updated D&M model is the aspect of *trust. Some researchers attempting to extend the D&M model have included trust as an additional variables[98, 131]. DeLone and McLean revised their model based on critique by these authors the updated D&M model, still did not adopt trust as an additional variable. Research is needed to see _if* these constructs must be introduced and *how* they can be introduced, for example are they new variables or additions to the measures of existing variables.

IS Success variables overview

An overview of various dependent and independent variables are given in Causal relations in IS Success Models (Table 2.1). The rows are the independent variables that cause the dependant variable in the column according to the research in the corresponding cell.

Table 2.1: Causal relations in IS Success Models

Variable	PQ	IQ	SQ	U	US	NB	T
System Quality				[19, 33, 34, 35, 98]	[34, 35, 98]	[33, 110, 129]	[27]
Information Quality				[34, 35, 98]	[34, 35, 98]	[110]	[27]
Service Quality				[34, 35, 98]	[34, 35, 98]	[33, 110]	[27]
Use	?	?	?		[35]	[33, 35]	
User Satisfaction	?	?	?	[34, 19]		[34, 98, 110]	[62, 19]
Net Benefits				[36]	[36]		[27]
Trust				[19, 98]	[19, 62, 98, 119]	[119]	

Legend: **PQ = System Quality, IQ = Information Quality, SQ = Service Quality, U = Use, US = User Satisfaction, NB = Net Benefits, T = Trust**

Research issues

As can be seen in Causal relations in IS Success Models (Table 2.1) question marks indicate the lack of a feedback loop between 'Use' and the three D&M quality constructs (System, Information and Service Quality). The causal relationships between quality and usage however are all *one-way* in the D&M model, where as this thesis attempts to argue these relationships are two-way due to network effects. Specifically that 'Use' and 'User Satisfaction' also improve System, Information and Service quality. The aim is to provide reasonable evidence from existing research that these causal relationships should be added to success models for online organizations. The influencing factors that can cause network effects are important causes for online organizations to become successful. Also seen in Causal relations in IS Success Models (Table 2.1) (also indicated by question marks) are the causal relationships between 'Trust' and 'Use', 'User Satisfaction' and 'Net Benefits'. An additional aim of this thesis is to provide evidence of these relationships and is important to include in success models for online organizations.

Thus we can conclude that the research issues from a systems perspective are as follows:

1. Do network effects cause reciprocal causal relationship between the 'Use' and 'User Satisfaction' and the D&M quality constructs?

2. How can trust be best modeled in existing success models?

2.2.2   User level

In order to provide a complete picture of IS success it is also important to view success from a users perspective, that is the users perspective in the technology adoption decision. The total service (including the online application, support, content, etc.) of an online organization must fit the needs of the user for the user to have the intention to use the service. This perspective will answer the central question of 'Why do users use a technology?'. In order to understand the motives of users' adoption behaviour a tool is needed that assesses the likelihood of succes of new technology introductions. This section introduces a model in order to help decision makers proactively design interventions (including marketing, product design etc.) targeted at users normally less inclined to adopt new systems.

Technology acceptance model

IT acceptance research has yielded many competing models, each with a different set of independent and dependant variables. These models have roots in information systems, psychology and sociology and have usually been applied by research in an ad hoc 'mix-and-match' approach[144]. The first model to gain traction in IS circles was the Technology Acceptance Model, henceforth TAM, by Davis et al. (1989)[33]. This model was tailored to IS contexts and was designed to predict IT acceptance and usage within organizations. It's main contribution was to employ the construct of "intent to use" was the main cause of "actual use". Although in the TAM model only "perceived usefulness" influenced "intent to use", other research argued many other influences. Many other models have been introduced and the TAM model received an update as well[143], and has been empirically tested by the authors[142, 32] yet no consensus was reached on one overal cohesive model until a large review and empirical study of existing models aim at unifyung and replacing them. This model is the Unified Theory of Acceptance and Use of Technology (henceforth UTAUT) in 2003[144].

UTAUT

In a great effort by leading IS researchers, the UTAUT model reviewed 8 existing models and combined them into one. The UTAUT study was an extensive literary review and an empirical study based on old data (the same data that was used to verify the other models) and new data. UTAUT has received tremendous response in IS research circles. Unfortunately not much attention has been paid to it outside of the academic field. The model is included in Figure 2.7 where the independent and dependent variables are on the left and right of the red edges respectively; the variables below are the modifiers of the corresponding causal relationships.

UTAUT variables

Without repeating the details of the UTAUT model, it is helpful in the context of this thesis to introduce the 6 variables:

1. *Performance Expectancy* is the degree to which an individual believes that using the system will help him or her to attain gains in job performance

2. *Effort Expectancy* is the degree of ease associated with the use of the system.

3. *Social Influence* is the degree to which an individual perceives that important others believe he or she should use the new system.

4. *Facilitating Conditions* is the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system.

Figure 2.7: Unified theory of acceptance and use of technology
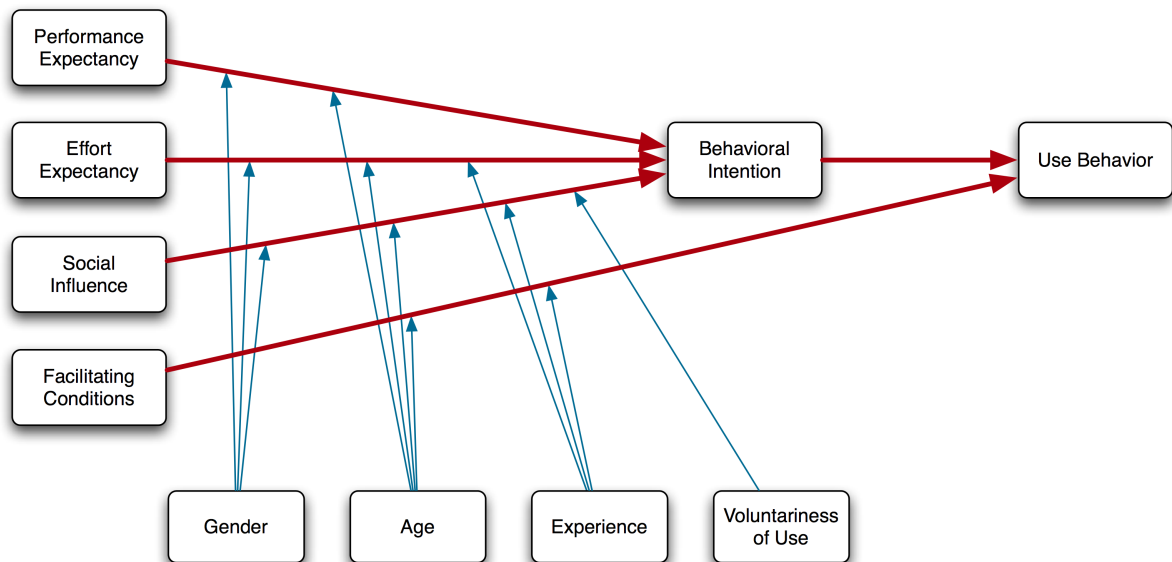
5. *Behaviour Intention* is the intention of an individual to use the new system

6. *Use Behaviour* is the actual use by a user to use the technology.

The modifying variables below are gender, age, experience and voluntariness of use. For example the influence of performance expectancy on behavioral intention will be moderated by gender and age, such that the effect will be stronger for men and particularly for younger men. Another example is that the influence of effort expectancy on behavioral intention will moderated by gender, age and experience, such that the effect will be stronger for women, particularly younger woman and particularly at early stages of experience. The moderating variables are well proven and studied constructs and will be left out of this thesis for simplification reasons.

User level research issues

The UTAUT model is the result of an extensive research, combining and re-testing 8 different previously empirically proven models. It is not necessary as with the D&M model to analyse literature in regards to differences, for this I refer to the original UTAUT study[144]. However what is interesting in this regard is the absence of trust and network effects, as with the D&M model.

At least one research has studied the effect of network effect in regards to the original TAM model[88]. This research argued that is is not the actual network effect that influences users, it is the network effect that users *expect* to happen with a technology or product. Specifically the study in question regarded the adoption of an internal groupware system primarily dependant on perceived critical mass. This corresponds with existing literature on network effects indicating the importance of adding the network effects construct to success models[86, 114, 72, 116, 132, 41]. Network effects however have their own set of determinants as set forth in prior literature, the next sub section will look more closely at network effects causes.

Trust is an aspect which I argue should be added to success models, this construct is also missing explicitly from the UTAUT model. An individuals feelings of trust toward an online organization are important factors in considering that individuals eventual intentions to use and usage behaviors related to any online organization. According to Bhattacherjee (2002)[16] trust has a positive effect on an individuals willingness to conduct transactions with an online vendor. Further, McKnight (2002)[95] shows that intention to use (and ultimately usage) is negatively affected by feelings of perceived risk. Bhattacherjee (2002) and Schoorman (2007)[126] underline this argument in regards to perceived risk. However, trust has been shown to reduce perceived risk [104] thus breaking down this barrier to use intentions and behaviors. Thus another research issue is to find out how trust should be included in the UTAUT model.

In this thesis the UTAUT model will be used as the approach to model user incentives and technology adoption causes. The research issue that comes forth from the user level view is as follows:

1. Is 'perceived network effect' an independent variable that causes 'intent to use'?

2. Is 'trust' an cause to 'intent to use'?

2.2.3 Introducing network effects

In this section network effects are reviewed from a general perspective. The aim is to identify the causes of network effects and how they relate to the success models identified in the previous sections. This section provides an initial review of extant literature and sees this thesis narrowing down the broad research question into domain specific research issues. Network effects (chapter 4) provides a more expanded realisation of the literature study regaring network effects.

Network externalities

Networks such as the internet as a whole, or certain features of online organizations exhibit positive consumption and production externalities. A positive consumption externality (or network externality) signifies the fact that the value of a unit of the good increases with the number of units used[39]. The key reason for the appearance of network externalities is the complimentarity between the components in the network. For example a component can be a telephone in a communications network. If this network has n phones, there are $n(n-1)$ potential connections, an additional $n+1th$ connection provides direct externalities to all other phone users in the network by adding $2n$ potential new phone connections through the provision of a complimentarity link to the existing connections.

Networking effects could be very important for the success of e-commerce mainly due to the feedback effect on customer value and thus customer satisfaction. One of the main forces in explaining the success of companies in the information economy is the network effect in technology markets[132, 130]. Other researchers have identified the effect of (perceived) critical mass in adoption of groupware systems [88, 86], corporate websites[72] and auction sites [133].

Perceived network effects

The above statement that "the value of a unit of a good increases with the number of units used" should be interpreted as "the value of a unit of a good increases with the *expected* number of units to be used"[132]. The primary factor of network effects is that it is a self-fullfilling prophecy, that is that if enough customers think that a product or technology will be the most used then it most likely will be the most used. This aspect of network effects means that "success begets success"[132], that is the perception of what users *believe* will be successful *will* be successful. Thus the most important aspect of creating network effects is influencing the perceptions of potential users about your product[132, 10].

The effects of network effects can lead to lock-in, monopolies and other situations[18] these could be beneficial to the online organizations but not to the consumer. Issues of compatibility, coordination of standards, interconnection and interoperability, and their effects on the online market place, are all important to grasp customer decisions[39, 40]. It is also precisely these factors that create adoption fear in customers, and a lack of trust regarding future success. It is important to provide an overal view of the consequences of network effects when adopting it as a construct within success models for online organizations. This thesis aims to identify the network effects critical success factors and incorporating them into an overal success models for online organizations. A comprehensive overview of the causes will be given in Chapter 4. What is clear is that network effects are strongly connected to customer trust and can be influenced by communication.

Network effects research questions

From this short literature review it is clear that network effects have an important role in the success of online organizations. The research questions are repeated and refined from the previous sections and expanded as follows:

1. What are the characteristics of network economies?

2. What are the causes of network effects?

3. How do network effects influence technology adoption of individual users?

4. How do network effects increase network value for online organizations?

5. How can network effects be measured in online organizations?

6. Can network effects be induced? If so, what strategies and tactics are effective?

2.2.4   Introducing trust

In this section a succinct introduction to trust is given and how it applies to the research question, this section is later expanded in Trust (chapter 5). However placing the concept of trust in a wider perspective is useful before narrowing down the research question into research issues. The purpose of this section is to identify specific research issues pertaining to trust.

Social capital

Trust is an integral component in many kinds of human interaction, allowing people to act under uncertainty and with the risk of negative consequences. For example, exchanging money for a service, giving access to your property, and choosing between conflicting sources of information all may utilize some form of trust[9]. In fact trust is central to what sociologists call "social capital": the ability of people to work together for common purposes in groups and organizations[23]. Social capital depends on people's ability to associate with each other, this is critical not only to economic life but to virtually every other aspects of social existence as well. The ability to associate depends, in turn, on the degree to which communities share norms and values and are able to subordinatie individual interests to those of larger groups. Out of such shared values comes trust, which has a large and measurable economic value[44].

Trust in online organizations

Just as trust is an important concept for the whole of society on a macro level it is important for online organizations on a micro level. However trust will not magically appear online and trust cannot be produced by creating the right tools and technologies. It is necessary to be aware of the importance of trust for online organizations for them to be successful. Fortunately it *is* possible to influence how customers view your online organization; that is it *is* possible to build and grow trust with customers in a market[13]. As can be seen in Causal relations in IS Success Models (Table 2.1) according to some researchers trust is one of the variables of influence in the success of IS[98, 19]. The increasing importance of online trust in e-commerce is inherent to the web's nature, that is its "limitation in its ability to offer high-trust persuasive communication"[60]. Trust is critical to the study of online business because it has a significant effect on consumer behavior[85] and thus on the success of any e-commerce site[119, 62].

Trust research questions

It is clear that trust plays an important role in the success of online organizations, this thesis aims to provide answers as to how trust plays a role in determining this success. In order to guide this research into more specific answers to the research problem, the following research questions are introduced:

1. How important is creating trust in improving success?

2. How can trust be included in the success models?

3. What are the causes of trust? What key influencing factors of trust should also be included?

4. Is 'trust' a cause to 'intent to use'?

5. How does trust relate to Network effects?

2.2.5 Problem theories conclusion

From the above discussion of the problem theories a number of (overlapping) research questions are identified. These are repeated here and presented in a summarized format in Research questions overview (Table 2.2), from these research questions hypotheses will be created in the following subsection.

These research questions will be attempted to be answered by this thesis, providing decisions makers of online organizations with a tool to analyze their online business.

2.3 Conclusion

In this chapter the research issues were identified from gaps in the current IS success models. These have been applied to online organizations in order to identify research issues in the problem domain theories. This chapter has narrowed down the broad research question into specific issues that the rest of this thesis will aim to provide sufficient information regarding their solution.

Table 2.2: Research questions overview

	Research questions
	System level research questions
1.	Do network effects cause significant reciprocal causal relationship between the 'Use' and 'User Satisfaction' and the D&M quality constructs?
2.	How can trust be best modeled in existing success models?
	User level research questions
3.	Is 'perceived network effect' an independent variable that causes 'intent to use'?
4.	Is 'trust' an cause to 'intent to use'?
	Network effects research questions
5.	How can network effects be included in success models?
6.	Does perceived network effect lead to increased intent to use?
7.	How can perceived network effect be influenced to increase use?
	Trust research questions
8.	How can trust be included in the success models?
9.	What key influencing factors of trust should also be included?
10.	How important is creating trust in improving success?

Chapter 3

Research Design

This chapter describes the methodology applied in order to answer the hypotheses and research issues. First a justification will be given to the chosen research methods which in this thesis has been a literature study. Secondly the research procedure will be explained followed by a conclusion and the exclusions of aspects that this thesis does not intend to encompass.

3.1 Justification

The research described in this thesis is twofold: a literature study and a short case study. The choice for these two methodologies will be justified in this section.

Literature study

According to IS Research Methods specialists a research question that is too general to be empirically investigated can use an extensive literature study of existing articles as a valid approach[99]. For this reason the choice was made for a literature study. A big part of the research question is answered by existing models such as UTAUT and D&M. However some key aspects are missing from these models. A possible alternative is to focus on one or more small specific construct and do an empirical investigation of this aspect, such as field or laboratory research. Although that would be a valid masters thesis approach, I have found it more interesting to look at the integral success of online organizations as a whole, not just one aspect. Also IS systems are so interrelated that field or laboratory is near impossible to make valid claims without narrowing the scope down significantly. This narrowing of scope creates a one dimensional study that loses the explanatory power for the success of online organizations.

The literature review performed in Research Issues (2.2.1) gives an initial indication of the validity of the hypotheses. However to properly create a framework that is internally and externally valid a more in depth study of the existing literature is needed. In comparison with Chapter 2 this means that the literature study as proposed in this chapter will be more extensive and more in depth. This section will provide a guideline how this in-depth literature study will be conducted, the importance of finding correct measurements and will give an example how the framework can be used by applying it to a case study.

The presented research issues can be analyzed and formalized into a set of constructs, specifically the relationships between them (propositions) and measures (operationalized)[37, 147]. This will help in providing a valid theory due to its basis on prior theory. Two important characteristics of any measure are reliability and construct validity. Part of the focus of the literature review will be to test if the measures accurately reflect the underlying construct. Literature study will aim to validate the causal effects as identified in Research Issues (2.2.1) or refute the proposed hypotheses[146].

In order to successfully validate the hypotheses top academic journals wil be reviewed and a selection of relevant literature used. The same approach is used by Glass et al. (2004)[56] and Geist et al. (1996)[54]. Empirical and theoretical studies performed by researchers can provide necessary academic claims to support the various hypotheses. It is expected that the hypotheses will be altered in some form, although the generalized nature will be preserved. Measures and metrics will be accumulated and combined to form cohesive measurements for the whole theoretical model. The next chapter will provide details in how this literature study will be conducted.

3.2   Literature study procedure

The goal of the literature study in this thesis is to validate or refute the six hypotheses proposed in Research Issues (2.2.1). Specifically this means testing the validity of introducing new constructs into existing success models (Hypotheses 1a and 2a) and reviewing if the newly introduced causal relationships are valid (Hypotheses 1b, 1c and 2b). Additionally it is important to review the literature for other significant independent variables which have a causal relationship to the variables in the framework. Another important research goal is to provide researchers and practitioners with an operationalized tool to measure success. This implies that the framework should supply adequate and internally valid metrics to support the causal relationships. From the literature measures will be obtained and categorized according to dependent and independent variables, and their causal relationships.

Journal selection

In order to select a representative collection of high-quality journals the Top 20 ranking journals will be used for this literature. See Top 20 ranking Journals in 2005 (Table 3.1) for a list of names, the ranking are based on Rainer and Millers (2005) ranking of IS Journals [115]. However the study will not be limited to these journals, many articles referenced by articles in these journals provide high quality and useful research into the topics regarded in this thesis. As a starting point the references mentioned in the initial review of literature of Research Issues (2.2.1) were used. Citation analysis further expanded the relevant literature into the topics of trust and network effects. Additional sources were used for the in-depth analysis of the proposed measurements.

Studies selection

To be included in the review the studies had to meet the following selection criteria:

1. Primary focus on business-to-consumer e-commerce, because business-to-business relationships significantly differ from relationships between consumers and on-line companies, e.g. when it comes to decision making and negotiations. However this does not mean that articles that deal with multiple markets (such as network effects articles dealing with two-side markets) are excluded.

2. Theory-guided research, because research has to be guided by Theoretical contributions, clearly defined constructs and validated scales.

3. In the case of trust literature: trust being investigated as a dependent and/or independent variable in the research model, to distinguish between trust, its causes and consequences.

4. In the case of network effects literature: network effects either being investigated as a variable such as network externalities that increase customer value or the perceived of network effects as a dependent and/or independent variable to distinguish between the constructs themselves, their causes and consequences.

Table 3.1: Top 20 ranking Journals in 2005

Rank	Abbreviation	Journal
1	MISQ	MIS Quarterly
2	CACM	Communications of the ACM
3	ISR	Information Systems Research
4	MS	Management Science
5	JMIS	Journal of Management Information Systems
6	HBR	Harvard Business Review
7	DS	Decision Sciences
8	DSS	Decision Support Systems
9	ACM T OIS	ACM Transactions on Office Information Systems
10	IEEE T SW	IEEE Transactions on Software Engineering
11	IEEE SW	IEEE Software
12	I&M	Information & Management
13	EJIS	European Journal of Information Systems
14	IEEETSMC	IEEE Transactions on Systems, Man, and Cybernetics
15	ACM T DB	ACM Transactions on Database
16	SMR	Sloan Management Review
17	COR	Computers and Operations Research
18	IEEE T C	IEEE Transactions on Computers
19	IEEE Comp	IEEE Computer
20	ACM CS	ACM Computing Surveys

5. A broad research approach: the review includes studies that investigate different dimensions of trust and network effects in order to have an acceptable extent of exhaustiveness.

Time frame selection

The timeframe selected for the literature will be broad in order to allow for seminal and important works that have been conducted before the massive adoption of e-commerce. This way works that deal with IS success in general can be included. The timeframe thus is 1981 - 2007, including the studies that DeLone and Maclean reviewed in order to create the original D&M model in 1992.[8]. The selection criteria above will narrow down the articles to sufficiently manageable quantities.

Categorization

The findings will be categorized in two chapters, network effects and trust. Both chapters will provide an overview of the articles studies in an appendix. The articles will be used in the explanatory text where appropriate, how the appendix provides an overview of the articles where for each article, the authors, publication year, journal, arguments, the type of study, field of study and the constructs studied will be included. This is essentially the same construct as DeLone and MacLean used in their findings[35, 34].

Other categorizations that can be useful is tracking the causes, consequences, dimensions that each article identifies per variable, for example Categorization by reciprocality (Table 3.2) or Causal relations in Social Network Models (Table 4.1). Reciprocal relationships can thus be found as well, providing supporting evidence for the hypotheses by graphing causes and consequences identified by various authors (approach from Seppänen et al. (2007)[42]). In this categorization the various constructs identified in the literature are provided, and mapped to the corresponding dependent variable. The rows are the independent variables that cause the variables in the columns according to the corresponding cells' source reference.

Table 3.2: Categorization by reciprocality

Independent variable	DV1	DV2	DV3	etc.
IV 1	[source x]			etc.
IV 2	[source y]			etc.
IV ...			DV3	etc.
IV (n)		[source z]		etc.

Confirming hypotheses

The above causal relations can signify wether a relationship is valid based on existing research, it is expected that Hypotheses 1b, 1c, and 2b can be answered this way. Confirming hypotheses 1a and 2a requires a different approach. Adding variables to a model has no truth value, only *pragmatic* value - a method cannot be true or false, only effective or ineffective[120]. However in order to provide a reasonable method of acceptance based on the found literature inductive reasoning will be used. This is not ideal and thus will be a weak point of this study, however as DeLone and Maclean have indicated it is necessary that:

> To be useful, a model must be both complete and parsimonious. It must incorporate and organize all of the previous research in the field, while, at the same time, be sufficiently simple so that it does not get caught up in the com- plexity of the real-world situation and thus lose its explanatory value ...[The] categories of taxonomy and the structure of the model allow reasonably coherent organization of at least a large sample of the previous literature, while at the same time providing a logic as to how these categories interact. In addition to its explanatory value, a model should also have some predictive value[35].

Operationalization

In order to adequately operationalize the given theoretical model measures will be analyzed and adopted. All measures and metrics will be combined per variable, then filtered based on their relevance and applicability. Some metrics however will be more influential for a chosen variable and should thus be present in the Theoretical contribution. An example of this operationalization can be seen in Perceived network effect measures (Table 4.3).

Chapter 4

Network effects

4.1 Introduction

One of the main forces in explaining the success of companies in the information economy is the network effect in technology markets[132, 130]. However network effects are not present in existing IS success models, reducing their explanatory power for companies active in the information economy. For this reason this thesis will introduce network effects constructs into existing models in order to increase the predictive and explanatory value of success in online organizations. This chapter looks at existing literature, specifically how network effects influence the success of online organizations. To guide this research this chapter seeks to answer the following questions (repeated from Introducing network effects (subsection 2.2.3)):

1. What are the characteristics of network economies?

2. What are the causes of network effects?

3. How do network effects influence technology adoption of individual users?

4. How do network effects increase network value for online organizations?

5. How can network effects be measured in online organizations?

6. Can network effects be induced? If so, what strategies and tactics are effective?

In order to answer the first question and provide a basis from which answers can be given to the other research questions an understanding of the dynamics of network effects is needed. Even though our problem domain is web applications it is therefore helpful to first look at the wider theory of network effects. Section Network effects characteristics (section 4.3) will begin looking at the broader economic theories of network effects and their characteristics. Next the causes (causes) of network effects are outlined in causes of network effects (section 4.4). The psychological influence on users' technology choices are analyzed and its influence on existing UTAUT constructs discussed. The effects of 'positive feedback' on increased network value, from an organizational perspective is discussed. Strategies and implications are discussed in how network effects might be positively influenced to induce the success of online organizations. Finally the Network effects conclusion (section 4.8) summarizes the findings in this chapter.

Physical and virtual networks

Network markets often have physical networks such as telecommunications, public utility companies (gas, water, electricity) and railroads. Some high-tech networks have much in common with these physical networks, such as the network of compatible fax machines, the network of ATM terminals and of course the internet itself. Other high-tech products have the same dynamics but are virtual networks[69]. Examples of virtual networks are Apple users, Nintendo Wii players or Myspace users. In physical networks, the linkages between nodes are physical connections such as railroad tracks or telephone wires. In virtual networks, the linkages between the nodes are invisible but no less critical for market dynamics and competitive strategy. Network effects found in the literature are examined from both physical and virtual networks in this chapter.

Network effect vs network externalities

Network effects are often incorrectly used interchangeable with network externalities [83]. Their difference lies in the fact that network effects concerns *all added value* a network gains by it's size and network externalities are *only those direct benefits* gained by existing users joining a network[69, 83]. Thus network effects encompass network externalities. An example of network externalities is the added value an existing user of Skype will gain if a friend of his joins Skype. An example of network effects in this context is the added value users get from support information available online because of the size of the user base of Skype (forums, mailing lists, blogs etc). To avoid confusion this thesis will use 'positive feedback' as a term instead of 'network externalities'.

4.2 Literature study

This chapter presents findings regarding network effects in general and how it applies to online organizations. The literature reviewed in this section is presented in Appendix A including the details regarding the publication, arguments and constructs. The literature study was performed as a qualitative means to identify relationships and constructs in order to synthesize new causal relationship that have explanatory power to identify success causes for online organizations. The results are presented throughout this chapter and causal relationships and measures are modelled based on the literature studied.

4.3 Network effects characteristics

Network effects can be described in short as the phenomena that *success begets success*. It is the "bigger is better" aspect of networks that gives rise to possibilities of dominant success in todays high tech economy[130]. This section introduces the basic economic forces at work behind network theory.

Positive feedback

Networks have one fundamental economic characteristic: the value of connecting to a network depends on the number of *other* people already connected to it[39]. This concept is called positive feedback: the strong get stronger and the weak get weaker. Compare this to feedback that happens in a professional sound system when a microphone picks up a feedback signal: the noise becomes deafening through repeat amplification until the limits of the system (or the human ear) are reached. Positive feedback in the market leads to extremes: dominance of the market by a singel firm or technology Figure **??**.

Figure 4.1: Positive feedback – adopted from Shapiro (1999)
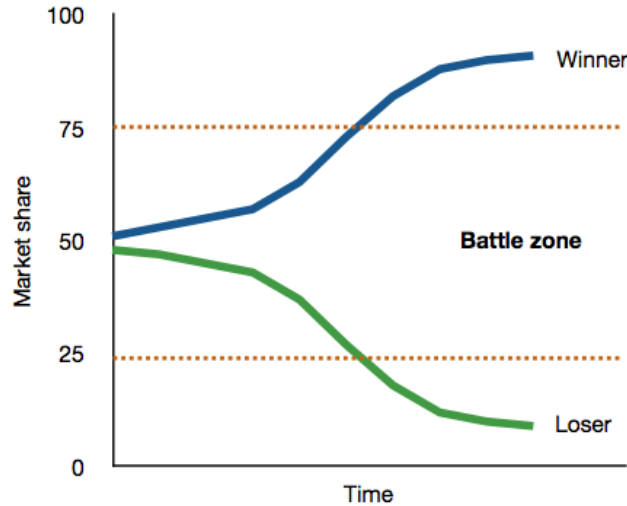
Networks are "tippy"

Positive feedback systems follow a predictable S-shaped curve Figure 4.2 with three phases: (1) flat during launch, (2) a steep rise during takeoff as positive feedback kick in, and (3) leveling off as saturation is reached. The second stage in these adoption dynamics sees great growth of the technology which is what economists call tipping. When two or more firms compete for a market where there is strong positive feedback, usually only one emerges as winner. The tipping of a market means that a network market will tip in favor of one player or another[130], it is unlikely that all will survive. The coexistence of incompatible products is unstable, with a single winning standard eventually dominating the market[15]. Tipping is a strong force in the adoption of technology and tipping of a network market can happen very rapidly, as in the case of the facsimile. Tipping is also present in markets with strong economies of scale or learning effects, but in network markets it is not current sales or usage which is that determines the winner. Instead, *expectations* about the future size of a network are crucial[39]. For this reason in markets with network externalities there is a natural tendency toward de facto standardization, which means everyone using the same system[69]. These dynamics are driven by the strong desire of users to select the technology that ultimately will prevail - that is to choose the network that has (or will have) the most users.

Market Equilibrium

Economic equilibrium is a state of market balance where economic forces are balanced and in the absence of external influences will remained unchanged[39]. In conventional markets an equilibrium occurs when supply and demand are in balance and thus a products price is set. In network markets the equilibrium laws are profoundly different: they do not depend on supply and demand they rely on how consumers form expectations of networks[69]. Network markets tend to find equilibrium in extremes[1]. The essence of this lies in the fact that the total benefits of one more user joining the network include benefits that

---

[1]For this reason network markets such as telecommunications and transport have been government regulated, they are (arguably incorrectly) so called natural monopolies.

Figure 4.2: Network adoption dynamics – adopted from Shapiro (1999)
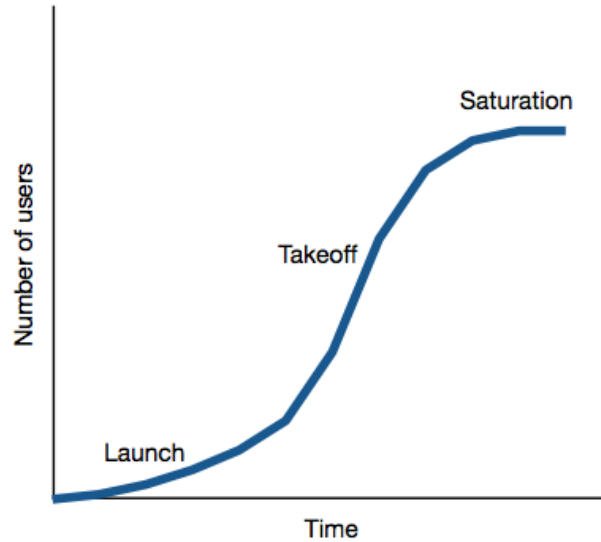
accrue to others already in the network. Each user that joins the network, even though it might be useful for the individual (the 'private marginal' benefits) the sum of the added benefit for existing users (the 'social marginal' benefits) is greater. Thus an equilibrium based on competition will not be efficient[2]. However network equilibria tend to be found in the consumers' expected outcome, thus if consumers expect a network to prevail then a prevailing state will be the equilibrium, the positive feedback winner (See Figure 4.1). If consumers expect a network to fail then the equilibrium can be found in the fact that no users will use the network, the positive feedback loser. These extreme equilibria mean that firms competing in these markets are subject to a polarization effect of all or nothing. It will cause them to either enter into a virtuous cycle where success begets success, or a vicious cycle where the weak get weaker (See Figure 4.3).

Potential value of a network

The theoretical potential value of a network is function of the number of users in that network[132]. Bob Metcalfe, inventor of the Ethernet, defined a law that in a network that allows any compatible node to transact or connect with any other node, the number of potential connections each of the N nodes can make is $N - 1$, giving a total number of potential connections as $N(N - 1)$ or $N^2 - N$. Even though Metcalfe applied his law to physical communication nodes, it has since been applied to network markets to explain in part the growth of the internet[55]. Metcalfe's law implies that a tenfold increase in size leads to a hundredfold increase in value. Merely interconnecting two independent networks creates value that substantially exceed the original value of the unconnected networks. Reed (1999) has suggested that networks have an even greater potential for value that grows exponentially with network size. In networks like the internet, Group Forming Networks (GFNs) are an important additional kind of network capability. A GFN has functionality that directly enables and supports affiliations (such as

---

[2] "Social marginal benefits exceed private marginal benefits the equilibrium network size is smaller than the socially optimal network size, and the perfectly competitive equilibrium is not efficient" From Oz Shy (2001)[132]

Figure 4.3: Viciousness and virtuesness – adopted from Shapiro (1999)
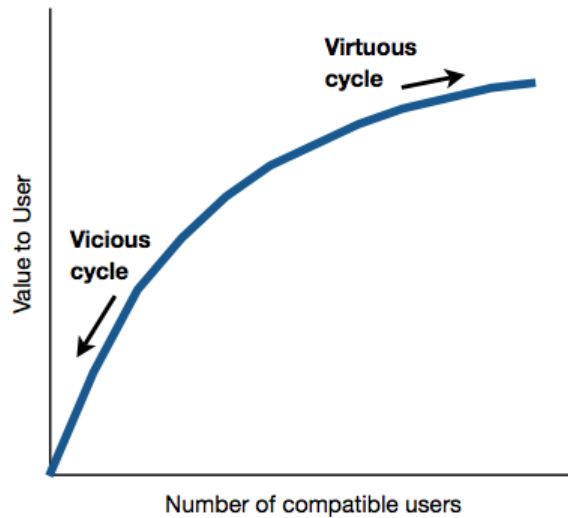
interest groups, clubs, meetings, communities) among subsets of its customers. The number of subsets that can be formed from a set of N members is $2^N(N-1)$, which grows as 2^N. Thus a network that supports easy group communication has a potential number of groups that can form that grows exponentially with N [117]. An example of such GFN's within the online organization domain is eBay's auction groups, where interested buyers have formed group markets for Pez candy dispensers.

Limitations to network value

As mentioned above the potential network value can grow exponentially, of course there are limitations to this growth. Size introduces friction and complicates connectivity, discovery, identity management, trust provisioning, etc. Does this mean that at some point the value of a network starts going down? Most likely, but it still means the potential value models of Metcalfe and Reed point to an interesting aspect of networks: *the dominant value in a typical network tends to shift from one category to another as the scale increases*[117] (See Figure 4.4). It is unclear if GFN's are the main drivers of the exponential value boost of networks: it assumes near perfect execution of turning groups into value. What is relevant for online organizations is that different dynamics are at play in different phases of the network size. In a network dominated by linear growth, inherent quality such as content is king. Where Metcalfe's law dominates, it will be the amount of members that dominate the value of the network. Where the GFN law dominates the central role is filled by value created collaboratively within groups, such as specialized newsgroups, chat rooms, eBay auction groups etc.)[117].

Differentiation and diversity

Not all network markets are equal in their tendency to tip: consumer heterogeneity and product differentiation tend to limit tipping and sustain multiple networks. The more consumers are rational [3] *and* informed the more the tendency of tipping occurs. The more differences in consumers' opinions and

---

[3]Rational behavior: given a certain input, the identical behavior can be expected of all users of the network.

Figure 4.4: Value phases – adopted from Reed (1999)
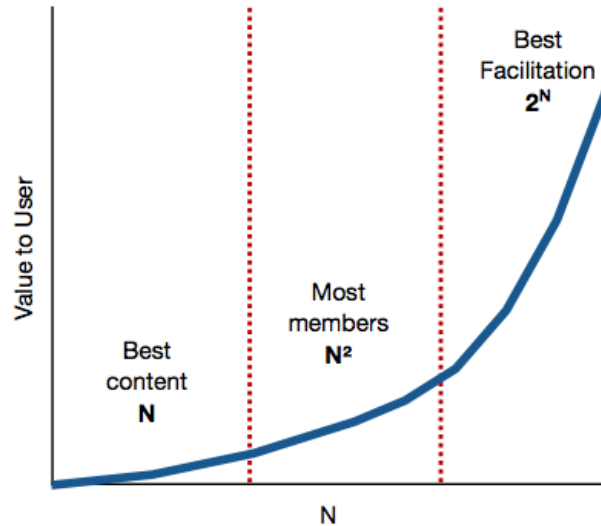
information availability the more their expectations will differ and thus allow for multiple networks to exist[130]. If rival systems have distinct features sought be certain customers, two or more systems may be able to survive by catering to consumers who care more about product attributes than network size[69]. For example an online music service might cater to sound enthousiasts who value sound quality (e.g. a high bit-rate) over breadth of selection (perhaps the offered music library only offers classical music). Thus inherent unique properties valued by consumers of smaller networks can be enough to balance the increased value of larger network externalities. Another well known example is that of Apple Macintosh operating systems popular in the graphic and music industry in a world otherwise dominated by Microsoft Windows.

Lock-in

Users who have started using one particular network will be restricted in some form to that network. Commitments to a particular network or technology can thus cause a lock-in. When lock-in occurs the switching costs are too high to switch to a better product [31] such as in the case of the QWERTY keyboard. Buyers who join what turns out to be losing networks either switch, which may be costly or stay and content themselves with less value from network externalities[15]. Once a certain system has been chosen, switching suppliers is costly because new relation-specific investments have to be made[69]. Users' decisions are strongly influenced by their forecasts of the future, they may or may not choose the best product. In these circumstances it is possible that it isn't the best or cheapest network that prevails, it will be the product that is widely expected to win[42, 39]. For example, the success of MS-DOS is usually attributed not to any technical superiority but to the fact that it was supported by IBM and thus widely expected to prevail[15]. The consequences of these dynamics is that a small difference, in either perception or reality, can be magnified in a process in wich certain firms gain large market shares and dominant technologies or products can be hard to displace. A firm that controls a technology that becomes established as a standard can have an extremely profitable market

position[39]. Examples of this are Microsoft dominance of operating systems and office software and Intel's dominance in PC microprocessors.

Inherent value

Witt et. al. (1997) however claim that lock-in is not as important as often claimed[152]. Lock-in is reduced because firms continue to innovate[21]. Under certain conditions new technology can successfully create new markets despite positive feedback mechanisms within the old market it tries to replace. These conditions are that the benefits of new technology can create a critical mass of potential adopters who then make an adoption decision and thus break the lock-in and create a new network standard. Essentially the initial benefits that a new innovation carries must have enough inherent value to lure users of existing products away. An example of high inherent value is how Skype provides their users a service for free international phone calls over the internet. This cost advantage is higher than the fact that Skype's network is not as big as traditional landline or mobile phone networks. The Skype example illustrates the importance of inherent value, as users will pro-actively push for the adoption of the service amongst their friends so they can reap the benefits in their direct surroundings. In summary inherent value must be high enough to lure users of existing products away. If this is the case then (a) users' expectations of network size will be positively influenced and (b) it will motivate users to help grow the network.

Two sided markets

Many if not most markets with network effects are characterized by the presence of two distinct sides whose ultimate benefit stems from interacting through a common platform. Platform owners or sponsors in these industries must address the celebrated "chicken-and-egg problem" and be careful to "get both sides on board"[121]. For example buyers of videogame consoles want games to play on; game developers pick platforms that are or will be popular among gamers. To succeed, platforms in industries such as software, portals and media, payment systems and many websites, must often compete on two fronts [122]. Often this means subsidizing one side of the market in order to increase profits in the other side of the market. A good example of this is the Adobe Acrobat PDF reader, which according to Adobe has 400 million users. Adobe provides the Acrobat reader for free, while charging content producers, such as enterprises for their Acrobat Writer software. More users of the Acrobat reader mean, that the network of PDF users is of greater value to enterprises who wish to share written documents, and thus are willing to pay more for the creation of PDF documents.

4.4 Causes of network effects

After having discussed the characteristics of network effects it is important to analyze the causes of network effects. This section will present the causes found in the literature and introduce them as constructs into the existing D&M and UTAUT models.

Two levels of network effects

Key in this analysis is the distinction between dynamics of the *actual* network effects and the *perceived* network effects. This distinction is implicitly present in the literature, where one of two approaches can be seen: (1) how network effects influence users' technology decisions and (2) how network effects increase the online organizations system, information and service quality. The first view is related to users' perceptions and the subsequent choice about using a technolog; it relates to a technology adoption decision which has previously been modelled by UTAUT constructs. The second view is that

of the organization and deals with how the organization can harness its usage into creating higher
network value. A higher network value in our problem domain of web applications can be seen as an
increase in system, information or service quality. Both views are fundamental to the success of todays
online organizations. This section on network effects causes will first analyze the user perspective and
subsequently analyze the organizational perspective.

4.4.1   Users perspective of network effects

The main cause of network effects is not an objective reason, it is the *perception* of users that drives
network effects. It is mainly determined by the fact that *consumers will base their purchase decisions
on expected network sizes*[67]. The technology or network that the most users *think* will prevail, *will*
prevail. Users are influenced in their technology choices by their expectations of how much network
effects will be present in the online organization. This means that a user's *perceptions* of positive
feedback effects influences a major part of his technology adoption choice. Thus the main construct
from a users' perspective are the perceived network effects.

- *Perceived network effects* are defined as: the total set of perceptions a user has regarding the
  expected network effects that will affect his future use of a particular online organization's services.

Perceived network effects are not a single construct, it consists of three independent variables that
together form the perceived network effects. Network effects are caused by (potential) users' perception
of:

1. *Direct effect* of the number of purchasers on the quality of the product or service. For example
   the utility that a consumer derives from getting a mobile phone depends on the number of (his)
   contacts he can call with it. These are network externalities and they arise in the act of exchanging
   assets or goods[39]. The most important factor that influences this is the expected network size.

2. *Indirect effects* in the case of complimentary products such as hardware and software. If a platform
   is widely adopted, it is more likely that software will be written for that platform. Indirect network
   effects lead consumers to place higher value on a more popular system[69], due to the availability
   and quality of post-purchase service and product information. These network effects arise in the
   array of vertically related services[39], an example is software available for the Windows operating
   system.

3. *Psychological effects* that marketshare can signify product quality[69], which are closely related
   to purely psychological effects such as the bandwagon effect[132].

Introducing network effects into UTAUT

These three dimensions of network effects influence customer decisions in their technology adoption
decisions. If managers want to better understand the influence of network effects on their customers'
technology decisions, they must also understand the influence of network effects on existing constructs
of technology decisions. The UTAUT model provides for aspects of network effects even if not explicitly
stated. The definition of the Social Influence construct of UTAUT is the degree to which an individual
perceives that important others believe he or she should use the new system. The role of social influence
in technology acceptance decisions is complex and subject to a wide range of influences. Social influence
has an impact on individual behavior through three mechanisms: compliance, internalization, and
identification[144]. While the latter two relate to altering an individual's belief structure and/or causing
an individual to respond to potential social status gains, the compliance mechanism causes an individual

to simply alter his or her intention in response to the social pressure – i.e., the individual intends to comply with the social influence. However UTAUT's definition of 'Social Influence' is too narrow to adequately fit the influences customers experience in their technology decisions when network effects are present. Thus I propose to replace and expand the concept of 'Social Influence' to include network effects' influence whilst not losing the original meaning. This new construct 'Social Effects' is defined as follows:

- *Social Effects* the degree to which an individual perceives that important others believe he or she should use the new system *or* that critical mass determines richer social or work satisfaction.

In this definition both the mandatory aspect present in UTAUT in regards to the forced technology adoption in work situations, and mandatory use due to critical mass reached in social contexts is present. In this thesis mandatory situations are rare, as customers can easily use alternatives. However Social Effects can be strong in the sense that alternatives are rendered less useful due to critical mass limiting the options of customers. An example is the social networking site MySpace where millions of users connect, alternatives are less useful due to a lack of mass when compared to sheer size that MySpace has built up.

UTAUT constructs and network effects

The direct network externalities, indirect network effects and psychological effects influence customers perceptions of perceived performance, effort expectancies, social effects and facilitating conditions. An overview of the identified variables is given in Causal relations in Social Network Models (Table 4.1). In this table the constructs identified in the literature are provided and mapped to the corresponding UTAUT variable. The independent variables (rows) cause the dependent variables (columns) according to the source in the corresponding cells.

Table 4.1: Causal relations in Social Network Models

Construct	Expected Perf.	Effort Expect.	Social Effects
Perceived Externalities	[136, 88, 17, 117, 152, 8, 15, 31, 42, 67]	[88, 117, 31, 136]	[152, 15, 31, 117, 136]
Indirect Effects	[136, 88, 152, 8, 42, 67]	[136]	[88, 15, 8, 136]
Psychological Effects			[136, 132]

The relationships between the network constructs and the UTAUT constructs is graphically modelled in Figure 4.5. In this figure the perceived network effects function as causes to the UTAUT constructs, this corresponds to the findings in the literature as can be seen in Causal relations in Social Network Models (Table 4.1). A number of strategies are presented in the next section on influencing the perceived network effects. In general it depends on the level of the system, information and service quality as the users perceive them. Part of this perception is how well the system is equipped for the feedback effects that occur when usage starts picking up, which will be analyzed in the next section.

4.4.2 Organizational perspective on network effects

Network facilitation

In addition to the *perceived* network effects the *actual* network effects are important in explaining the success of online initiatives. The question to answer here is *how* network effects increase the value of the network by its size. A useful perspective on how network effects affect organizational quality is given by Suroweicki (2004) in his book "The wisdom of the crowds" [135]. Suroweicki argues that under certain

Figure 4.5: 'Perceived network effects' influence UTAUT constructs
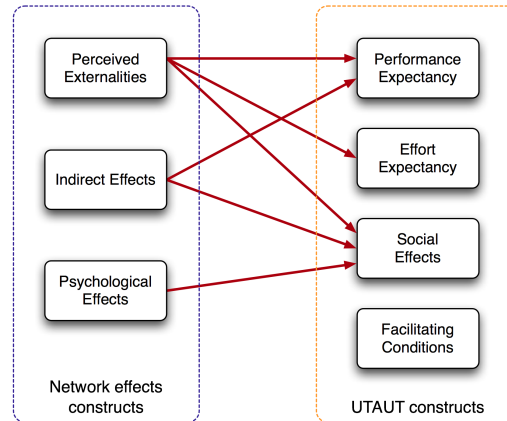
circumstances the aggregation of information in groups will result in decisions that are better than could have been made by any single member of the group. The advantages can be seen in better cognitive judgement, coordination and cooperation without a central guiding body making the choices. It is the same principle that increases the system, information and service quality of online organizations. However certain conditions apply: the online organization must be equipped to transform the usage patterns of their users into value. The online organization must be able to amalgamate the information and interactions of users into something useful. This ability is network facilitation, it is defined as follows:

- *Network facilitation* is the extent of the ability of the online organization to facilitate 'positive feedback' through features and mechanisms of the online application.

These features and mechanisms will be aspects of the online application and will primarily consist of participation features. Without the necessary network facilitation 'positive feedback' will not occur and thus is fundamental in inducing success in online organizations. The participation features can be further refined into three dimensions, these are:

- *Cooperation features*, the extent of which the system allows for the collaborative interaction where users work together to a common goal. Examples are collaborative content editing (e.g. wikipedia.org), buddy systems (e.g. friends on MySpace.com) and news sharing (e.g. digg.com). This aspect of network facilitation can increase all aspects of organization quality: system, information and service quality.

- *Coordination features*, the extent to which the system allows for structured interaction between users, it differs from cooperation in that its presence increases harmonious interaction and synchronizing movement amongst the users of the online organization. The definition put forth by Malone and Crowston (1994) is: "Coordination is managing dependencies between activities." Coordination implies managing the cooperation, and thus coordination aspects are features that collect information in a structured way so that the data can be used to improve system, information or service quality. Examples of coordination features are providing comments and discussion mechanisms in order to coordinate the content collaboration, or filtering input to comply with other information formats.

- *Aggregation features*, the extent to which the system successfully aggregates the collected information into useful added value. This can be information providing personalized navigation methods and recommendations or filters to guide users in useful news item.

The above dimensions are not completely disjunct, in other words it is possible that aspects mentioned are overlapping and thus measured twice. However each dimension is sufficiently different in view that measuring each dimension separately will provide additional perspectives on the quality of network facilitation.

Network facilitation constructs

The various dimensions of network facilitation have been used as a guide to find causal relations in the literature, and are presented in Network causal relations (Table 4.2). Network size is the only cause (the first row), the other constructs in the rows are modifiers of network size on the online organization's quality aspects. The existence of the modifying relationships are argued by the sources that are mentioned in the corresponding cells.

Table 4.2: Network causal relations

Measure	Product quality	Information quality	Service quality
Network size (usage)	[136, 117, 15, 8]	[136, 117, 8, 15, 69]	[8, 31, 69, 117, 136]
Cooperation features	[136, 39]	[39, 15, 69]	
Coordination features	[136, 39]	[39, 15, 69]	[15]
Aggregation features	[136, 152]	[136, 17, 152]	[136]

Modelling choices

The network facilitation features are arguably part of the system quality of the online organization, however modelling the network facilitators as modifiers of the causal relationships between usage and system, information and service quality provides a better picture of the effects of positive feedback. Therefore this thesis chooses to model the network facilitation features as modifiers as can be seen in Figure 4.6.

Target audience characteristics

As mentioned by a number of researchers [82, 135] the network facilitation features are not the only factor that induce positive feedback, the environmental conditions must also be right. The largest aspect of this is how the target audience will respond to the network facilitation. It is easy for participation and collaboration efforts to deteriorate into 'mob' psychology in which users produce bad judgment[135]. In these types of situations the cooperation or coordination fail because (in one way or another) users can be too conscious of the opinions of others and began to emulate each other and conform rather than think differently. Although for example crowds can collectively be swayed by a persuasive speaker, the main reason that groups of people intellectually conform is that the system for making decisions has a systematic flaw[135]. Surowiecki (2004) asserts that what happens when the decision making environment is not set up to accept the crowd, is that the benefits of individual judgments and private information are lost. The additional aspects are included in Figure 4.6 and are important factors in creating successful positive feedback. The challenge for online organizations is to influence these characteristics, either by choosing the target audience wisely or providing sufficient coordination mechanisms to deal with the lack of diversity, over emotion or imitativeness. This

Figure 4.6: Network effects facilitation modifiers on quality
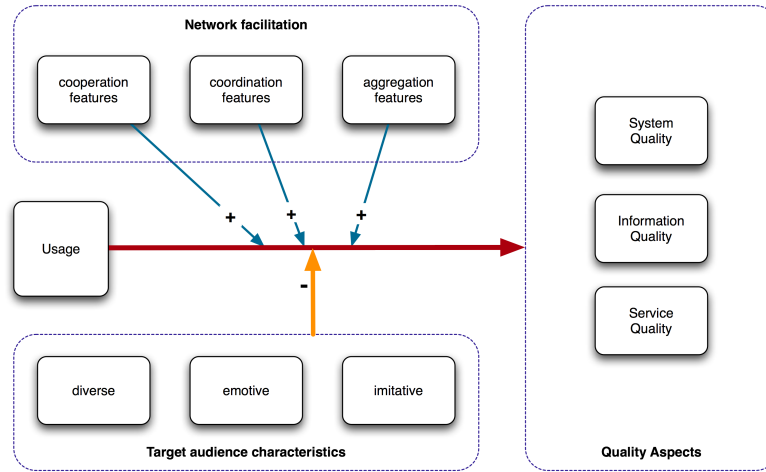
thesis will omit target audience characteristics, and will leave it to further research to examine these dimensions. Further investigation into the crafting of network facilitation in relation to target audience characteristics can be an interesting and useful research area.

4.5   Operationalization

In order to successfully measure the network effects within online organizations the constructs of both perceived network effects and network facilitation must be made measurable. In this final section of the network effects literature study the various measures are collected from the literature and expanded where necessary.

Perceived Network Effect measures

The perceived network effects are measured by surveying the user in regards to his or her expectations of network effects. The operationalization can take place in a simple survey based on a 5 or 7 point Likert scale[84]. The items have been inspired by various sources yet not directly present in the current literature, thus most items have been created or adapted specifically for this thesis. The operationalization is given in Perceived network effect measures (Table 4.3).

Network Facilitation measures

The network facilitation measures are aimed at capturing an objective measure of the online organizations network facilitation quality. For this reason a set of measures is developed from the literature and expanded to fit the online organization. The operationalization is given in Network facilitation metrics (Table 4.4).

4.6   Strategies

As has been argued above the benefits of gaining control of a network market can render large profits. For this reason companies try to influence their potential users and try to create as many users as

Table 4.3: Perceived network effect measures

Measure	Item	Source
Perceived Externalities	PNE1. I expect XYZ to be to have *a large* amount of users	[136, 39, 69, 88]
	PNE2. I expect XYZ to be to have *the largest* amount of users	[88]
	PNE3. I expect the value of XYZ to be great based on the amount of users	[136, 39, 69]
	PNE4. I expect compatibility with other users will ensure with XYZ	[69]
Indirect Effects	PNE5. I expect XYZ will have enough third party support	[136, 88, 152, 8, 15]
	PNE6. I expect compatibility with other products will ensure with XYZ	[15]
	PNE7. I expect other companies to also provide support of XYZ	[152, 8, 42]
Psychological Effects	PNE8. Other people using the system indicates that XYZ is worthwhile	[136]
	PNE9. I expect other users important to me will use XYZ	[136, 132]
	PNE10. Other people using the system indicates that XYZ is worthwhile	[136, 132, 144]
	PNE11. I will use the system if enough other people use XYZ	[136]

Table 4.4: Network facilitation metrics

Measure	Item (the extent of support for . . .)	Source
Cooperation features	NF1. features for users to submit content and collaborate on content	[136]
	NF5. features for users to participate by interaction	[136]
	NF2. features for users to help other users	
	NF3. features for users to provide feedback about the system	
Coordination features	NF4. control mechanisms for users to provide feedback about the system	[117]
	NF5. features for users to control their and others users interaction	[136]
	NF6. features to format users' input correctly	[88]
Aggregation	NF7. features for users to filter other users submissions	[117]
	NF8. understandability of aggregated content	[136]
	NF9. control mechanisms to filter undesired content	[136]

possible in order to reach a critical mass so that their product or technology becomes the prevailing technology. The basic strategy usually involves trying to encourage the expectation of success of their own network, while perhaps also trying to discourage the success of rivals[15].

Build an early lead

Network markets tend to display inertia, once a technology is known to have a substantial lead in its installed base, it is difficult for it to be displaced even by a technically superior and cheaper alternative[21]. Establishing a large installed base quickly and visibly is important[130].

Attract the suppliers of complements

Having complementary goods to a service or product creates a higher value for that service. Because the amount of (expected) complements can influence buyers' decisions, firms try to influence suppliers of complements to supply for their technology or network. These suppliers will want to supply a large market, so their supply decisions are affected by their expectations about the future size of each network. Influencing the supply of complements is thus an important tool both for establishing a new network technology and for competing against a rival[15].

Communication: influence expectations

Apart from the actual statistics of usage and the demonstrable commitments of suppliers[130] there are many other ways in which to influence potential customers. Because the expectations of users often become a reality[67] it is key to influence these expectations[68, 69, 15]. Communication about the network can be key to influence expectations, in general one firm will try to lower users expectation of rivals and increase expectations of their own network[42]. One form of this is product announcements to discourage the growth of the installed base of a rival. However product announcements can cut both ways: potential buyers of a companies' products might choose to wait for that better version thus shutting off it's current cash-flow. Firms with little or no current sales may be most tempted to use this tactic; but for the same reason product announcements are likely to have little credibility[15].

Public commitments

Public commitments (to for example low prices) over the long term is another way to convince prospective buyers that they will get large benefits from joining a particular network[15]. Early sunk expenditures may signal to consumers that a supplier is committed to the development of a network[69].

Standardization

Since there is a lot at stake for firms competition can be fierce, which can also have drawbacks for the whole industry. Users and other important stake holders can hold off on making a choice. Or a split between technologies can occur further delaying user adoption until a clear winner emerges[130] . This can be seen in the current battle between Blu-ray Disc and HD DVD where content creators are split between both formats, and users are holding off on investing in the next generation video equipment. Because the prize is so tempting sponsors of may compete fiercely and thus dissipate part of the potential gains. The alternative to competition is that firms standardize, thus explicitly or implicitly agreeing to make their products compatible. This does not eliminate competition it merely means competition will not happen *between* technologies it will happen *within* technologies[15].

A decision needs to be made whether or not a standards battle will be fought or if some mutual agreement can be found. In the case where rival networks are not confident that their network will prevail they will prefer to compromise and have one network in favour of two separate networks[130]. A networks sponsor would rather have the other firms join their network but would be willing to join the other's if the alternative is incompatibility. Persuasion, compromise, low-cost licensing, information sharing, joint development are all possible ways for firms and industries to reach standardization[130]. The competition will shift from *between* networks competition to *within* a network.

If you can't beat them join them

Smaller firms can adopt entirely the technology of a larger firm thus piggy backing on the size of the larger network. If one firm is significantly smaller than another or is not confident it will be prevail or that it play a part in influencing network technology it can choose to simply join their expected winning rival. In essence smaller firms adopt the largest firm network, and play by their rules. However the larger firm will try to resist imitation by asserting intellectual property rights, or by changing technology frequently. If there is a large installed base then the larger firm might be powerless to prevent smaller firms following and thus compatibility will ensue[15].

4.7 Implications

The literature studied provides a good base to examine our problem domain of web applications more specifically. An example of radical growth can be seen in the case of YouTube which displayed the fastest growth rate of any website[63, 64]. This looks like it could be a case of fast tipping, however what other forces were at play? We'll analyze the different strategic aspects of network effects that are relevant for web applications.

Unique product

The most important thing still remains the inherent value of the service itself. New product and services must have enough merit for early adopters to start using the product. Thus it is key that the online service has the potential to fulfill a need that no other established network is fulfilling[26]. Usually the 'Next Big Thing' exploits newly emerging technologies, these technologies will make something easy that was previously difficult[103]. Often the startups that create this sort of new product will first find their early adopters in different target markets, then gradually shift to the mainstream[21]. Often products with similar idea's will compete for the same target market, which pushes competition between networks to quality of execution. Product features and product quality start to become important as competitors fight for the early adopters.

In the case of YouTube, their idea was novel and clearly fulfilled an unmet need in the video sharing market. The market setting was ready for an online video sharing site: digital camera's and camera phones that could capture video, emerging clip culture[4], ubiquitous broadband, flash video and cheap bandwidth. However the essence of a product being ready is more inherent to the unique selling point of the service than technological or network externalities causing success to the service.

Third party adoption

One of the main factors of reaching critical mass is how well a product is supported by third parties[15]. For this reason web applications are releasing open API's[5] so that third parties can connect to their services. The amount of third parties that use the API of a given web applications will influence users' expectations. For example Facebook offers more than 5000 applications developed by third parties to their users. Its main rival MySpace does not (yet) have the ability for third party developers to create applications within MySpace. Users comparing MySpace to Facebook might be induced to adopt Facebook over MySpace due to the overwhelming presence of third party applications.

Communication

Another aspect how users can be influenced is simply by talking with them. With todays corporate blogs' pervasiveness it seems like communication between companies and customers is becoming widespread. It is not only communicating *to* customers – with blogs and other communication methods customers have the option of *talking back*. And it is not just the medium that has changed, it is also the transparent nature of the communication, companies are becoming more open regarding their practises, intentions and future plans. All of this helps users trust companies more, thus influencing their expectations of future success.

---

[4]Clip culture was evident in the events following the Superbowl XXXI when Justin Timberlake and Janet Jacksons "wardrobe malfunction" was aired only once. Internet users massively searched for this particular clip on YouTube thus catapulting YouTube's traffic in the days following.

[5]An API is an Application Programming Interface, which provides entry for third parties to write software that can interface with the underlying data and code.

Standards

Many web applications are seeing that the collective benefits of standards will be greater than the individual benefits web applications might receive from being proprietary. Thus many standards are becoming the norm to exchange data, for example the above mentioned API's are using standards. Compatibility creates more wealth for all involved. Additionally online users are increasingly becoming more selective in their technology choices and have begun to distrust possible vendor lock-ins due to the switching costs. An example is the pain experienced by windows users in switching to other platforms: many documents and files became unusable. This has changed in recent years due to standardization between platforms. A lack of choice due to possible vendor lock-in is something customers have become weary about.

Communication quality

Communication quality is important in influencing trust and perceived externalities, it can also be key in inducing psychological effects, in this thesis the communication quality has been assumed as being part of the service quality, however for better explanatory power it might be useful to introduce it as an additional construct. More research will have to be done to correctly model communication quality, for example marketing has much research in this area. Subsequent studies should examine the influence and importance of online organizations communication in influencing technology adoption decisions.

Incentives

For network effects to be created it is important for customers to have an incentive to create added value. Often added value can be derived from usage behaviors directly, such as the amazon book recommendations. Usually users will have to interact specifically for the purpose of adding information value for other users it is important that the correct incentives are there to add value and not detract value. Thus in order to have positive feedback that leads to increased system, information and service quality users must be offered some form of motivation. The correct incentives can be built into the system quality by offering discounts, free access or psychological effects such as karma. Further research is needed to correctly provide accurate constructs of measuring incentives and how it relates to network effects.

4.8   Network effects conclusion

This chapter analyzed the existing literature on network effects. It first provided an overview of the characteristics of network effects in other fields such as economics and psychology. It explained the direct causes of network effects and extracted from the literature their causal relation to the existing constructs in technology adoptions theories, and the causal relationships between network facilitation and the online organization's quality aspects. Subsequently the relationships were operationalized and measures were synthesized from literature. The implications of network effects for online organizations were also provided although much more research needs to be done to sufficiently answer these questions. In summary the following conclusions regarding network effects can be made:

- Network effects are relevant to the success of online organizations in two ways: (1) directly affecting the quality of the online application by turning usage into additional value by incorporating network facilitation (participation features) and (2) perceived network effects influence user adoption of the online application.

- Perceived network effects are the most important aspect of creating positive feedback, the perceptions of users are thus a *very* important factor in the success of online organizations. A small difference, in either perception or reality, will be magnified so that certain firms gain large market shares and dominant technologies or products can be hard to displace.

- The initial benefits that a new innovation carries must have enough inherent value to lure users of existing products away. If this is the case then (a) users' expectations of network size will be positively influenced and (b) it will motivate users to help grow the network.

- Measuring network effects can be done by applying two sets of metrics that measure (1) the perceived network effects constructs: perceived externalities, indirect effects and psychological effects and (2) the network facilitation constructs: cooperation, coordination and aggregation features.

- To succeed competition on two fronts might be necessary. Subsidizing one side of the market in order to increase profits in the other side of the market. Free services for users and online advertisement revenue is an example.

- Strategies for inducing network effects include: product uniqueness, support for third party adoption, communication levels and quality, applying standards and providing adequate incentives.

Chapter 5

Trust

5.1 Introduction

Trust has been extensively researched within computer science, spanning a wide diversity of disciplines such as security and access control, reliability in complex systems, and decision making under uncertainty. The concept of trust in these different research areas vary in how it is represented, computed, and used. This chapter aims to provide an overview of how the extensive literature has employed trust. It will review the extant literature and narrow it down into relevant aspects of trust for the online organization. I will identify the causes of trust and integrate them into an updated UTAUT model, providing an updated relational model as well as presenting measures of the trust constructs. Finally the Trust conclusion (section 5.9) gives a summary of the main findings in this chapter.

Trust research questions

The research questions presented in Introducing trust (subsection 2.2.4) are repeated here:

1. How important is creating trust in improving success?

2. How can trust be included in the success models?

3. What are the causes of trust? What key influencing factors of trust should also be included?

4. Is 'trust' a cause to 'intent to use'?

5. How does trust relate to Network effects?

Trust context

In order to answer the first question on the importance of trust it is useful to view trust in a societal context, before narrowing down the trust scope to online organizations. Trust plays an important part in creating wealth in society: it enhances "the ability of entities to associate"[44]. Association is interaction between entities such as people, organisations, governments or systems. It is rare that any form of interaction is without risk, in order to overcome this risk one or both parties must undertake some form of trust[44]. Traditionally customers have been able to form opinions of vendors by tangible factors such as store fronts, staff and browsing products prior to purchase. These opinions ultimately lead to an idea of trust on which customers subsequently act. On the web gaining such experiences are different to the lack of physical presence. The online consumer cannot personally inspect products or services and does not know what the online organization will do with the personal information that is collected during the interaction process. The internet's low-entry barriers allow untrustworthy parties

to explore online business opportunities increasing the risk for customers. The web motto "Anyone can say anything about anything" makes the web a unique source of information, but also "limits [the web] in its ability to offer high-trust persuasive communication"[60]. Trust is critical to the study of online business because it has a significant effect on consumer behavior[85] and thus on the success of any online organization[119, 62]. Although the focus is on empirical findings, first the basic question addresses *why* trust is so important for online organizations. The analysis in this chapter relates to customer technology adoption decisions as this is the prime aim of the online organization: to get users to use the services of the online organization. In this thesis the context of trust is that of (potential) users choosing whether or not to use the services of a particular online organization; i.e. it is an adoption choice. Because trust influences technology adoption choices of customers, this chapter works toward introducing trust constructs into the existing UTAUT constructs.

5.2 Literature study

This chapter presents findings regarding trust, narrows the findings down in explaining how it applies to online organizations. The literature reviewed in this section is presented in Appendix B including the details regarding the publication, arguments and constructs. The literature study was performed as a qualitative means to identify relationships and constructs in order to synthesize new causal relationship that have explanatory power to identify success causes for online organizations. The results are presented throughout this chapter and causal relationships and measures are modelled based on the literature studied.

5.3 Uncertainty

A consensus of the definition of trust has not been reached in literature, and one will be given in this chapter – see Defining trust (5.7). Before we arrive at this definition a common foundation of constructs and dimensions is presented. A fundamental theme is that trust only exists in uncertain and risky environments. "The need for trust only arises in a risky situation"[91], trust would not be needed if actions could be undertaken with complete certainty and no risk. In answering the question posed at the beginning of this chapter of why trust is important, uncertainty of the online environment plays a major role. In a virtual environment, such as the internet, the level of uncertainty is higher than in traditional settings[58]. Internet-based interactions can bring about several risks that are caused by two kinds of uncertainty:

1. *System-dependent uncertainty* comprises events that are beyond the direct influence of the customer or online organization and can be characterized as environmental uncertainty. It is the implicit uncertainty of using open technological infrastructures (such as the internet) for the exchange of information. Environmental uncertainty is caused by forces and complexity in the environment[91]. In the context of electronic commerce this uncertainty primarily relates to potential technological sources of errors and security gaps. The smooth and secure processing of online interactions depends on the functioning of underlying system, which is the hardware, software, as well as the security of internet connection services (including security protocols etc). For online organizations high uncertainty points are the end points such as the client system of the user, the server(s) of the online organization and, if applicable, third party servers, such as a possible payment transaction service. The user can directly control security only within his own system but not in the systems of other parties involved in the interaction. online organizations can try to reduce system-dependent uncertainty by using encrypted transactions, installing firewalls, utilizing authentication mechanisms and ensuring privacy seals and disclosures[111].

2. *Transaction-specific uncertainty* relates to the potential behaviours of the online organization
    in the transaction process from the perspective of the consumer. It can be seen as a kind of
    uncertainty that results from decisions of customers caused by not knowing how reliable the online
    organization is. Weiber and Adler (1995) call this "an asymmetric distribution of information
    between the transaction partners"[148]. This information relates to the quality of products, the
    quality of service (e.g. will a product be delivered as promised) and is the online organization
    really what they make out to be. The quality assessment of an online organization is often
    more difficult than in traditional markets[58]. In situations where buying decisions are made in
    a computer-mediated environment many elements of physical appearance, personal interaction
    or physical location disappear or are inapplicable (e.g. a store front, staff, tangible products)
    that are used in the real world[13]. Several authors have argued that the acting on trust and
    searching for information are alternative mechanisms to absorb uncertainty [89, 44, 149]. Simply
    put, the more a person trusts in a given situation, the less additional information is needed to
    make a certain decision. On the other hand, if there is little trust, there will be the need for more
    complete information in order to reduce system-dependent and/or transaction-specific uncertainty
    and to create more trust. The perceived level of uncertainty *and* the possible adverse outcomes
    (risk) of an action influence the balance between trust and information needed for coping with
    uncertainty[138].

The importance of trust

In the early stages of the adoption of the Internet we have seen a push to provide both improve-
ments in technology and increasing information concerning the basic functioning and security of the
internet in order to reduce system-dependent uncertainty[13]. The advancement and maturity of in-
ternet technology in areas such as security, broadband, connection quality has decreased the level of
risk perception of end users regarding system-dependent uncertainty. Because of this the perceived
uncertainty levels by customers have shifted towards transaction-specific uncertainty. This means that
providing information concerning characteristics and processes of the online organization have become
paramount to further reduce transaction-specific uncertainty. A situation where al parties have perfect
information is unattainable, however the function of trust is that perfect information is not necessary.
Exercising trust means that users will act favourably for an online organization even if they don't have
all the information regarding the online organization's potential behaviour, as long as the gap isn't
too large. Thus we can conclude that it is key that online organizations provide enough information
for users to be able to bridge the remaining uncertainties with trust[1]. Trust plays a central role in
helping consumers overcome perceptions of risk and insecurity. Trust makes consumers comfortable
sharing personal information, making purchases, and acting on online organization's advice – behaviors
essential to widespread adoption of e-commerce[96]. Therefore, trust is critical to both researchers and
practitioners.

5.4   Types of trust

In computer science, trust is a widely used term whose definition differs among researchers and appli-
cation areas. Studying trust online is particularly difficult because of the multiple contexts in which
trust interactions take place[95]. Prior research on e-commerce trust has used diverse, incomplete, and

---

[1]This often means that people that have the most information (or knowledge - such as technology enthousiasts) will
be the first to use a product, not necessarily because they are the most trusting but because for them the risks are lower.
This also means however that the engineering of trust will change based on where in the product life cycle the online
organization is. This is because the target adoption audiencee will change and will be susceptible to other impulses see
Theoretical contribution (chapter 6) for more information on the implications of the technology life cycle.

inconsistent definitions of trust, making it difficult to compare results across studies[58] and found the concept of trust difficult to quantify with a single definition[13]. Trust is variously defined as 'confident expectation'[111], 'a willingness to be vulnerable'[91], 'a general positive attitude'[95]. Trust in systems and trust in individuals are assimilated as if this is unproblematic. Before I give the definition of trust used in this thesis it is helpful to identify different forms of trust, and specify the context of how trust can be seen for online organizations. Grabner and Krauter (2003)[58] identify three forms of trust:

1. *System trust* is trust whereby a system is assumed to be operating in a predictable way (e.g. legal systems or electronic commerce systems are expected to function)[89]. This impersonal form of trust primarily helps to reduce system-dependent uncertainty, but it can also influence the perception of transaction-specific risks. It can be assumed that in the early stages of the adoption of new technologies such as the Internet online trust might have more to do with the general reliability and the functioning of the technology whereas in later stages, trust may depend more on differences in an online organization's implementation of their services.

2. *Institutional trust* is trust in which formal mechanisms are used to provide trust that does not rely on personal characteristics or on a past history of exchange[158]. Institutional trust helps to reduce both system-dependent and transaction-specific uncertainty[58]. In e-commerce new intermediary mechanisms such as trusted third parties play an important role, as they can help to promote trust among trading partners, minimize misrepresentation of product and service quality and encourage consumer confidence in conducting online business. This construct can be modelled as a belief about the reliability and security of an e-commerce systems based on its credentials from third parties. With the growth of trusted third parties and the increasing sophistication of the relevant technology, consumers' concerns about security of credit card numbers and personal data are likely to diminish in the near future.

3. *Interpersonal trust* is trust that is applicable to a relationship between (at least) two parties –a trustor and a trustee – and is personal in nature[123]. The object of trust is another person or a group of persons, but not an abstract or technical system. In the literature on trust in e-commerce usually the buyer is seen as the party who places him or herself in a vulnerable situation[14, 13]. The online organization then is the trustee, the party in whom trust is placed and who has the opportunity to take advantage of the trustor's vulnerability. To understand *why* a given party will be judged as trustworthy corresponding *characteristics* of the trustee which inspire that trust must be examined.

Trust area scope

In this thesis the context of trust is that of (potential) users choosing whether or not to use the services of a particular online organization; i.e. it is a technology adoption choice. In this context system trust is something that online organizations have little or no control over. Institutional trust is important for online organizations in that in having adequate third party credentials (such as security certificates) it will require less trust in order to qualify as a potential trustee. However the most important area of trust is that of personal trust: *it is by this trust construct that the technology adoption decisions are influenced.* For this reason institutional and system trust, will be left out of scope of this thesis and the focus will be on how to increase personal trust.

5.5 Trust constructs

After establishing the importance of trust and the relevant type of trust for the online organization. This chapter will now turn to more specific aspects how trust affects technology adoption for users.

Figure 5.1: Proposed Trust model
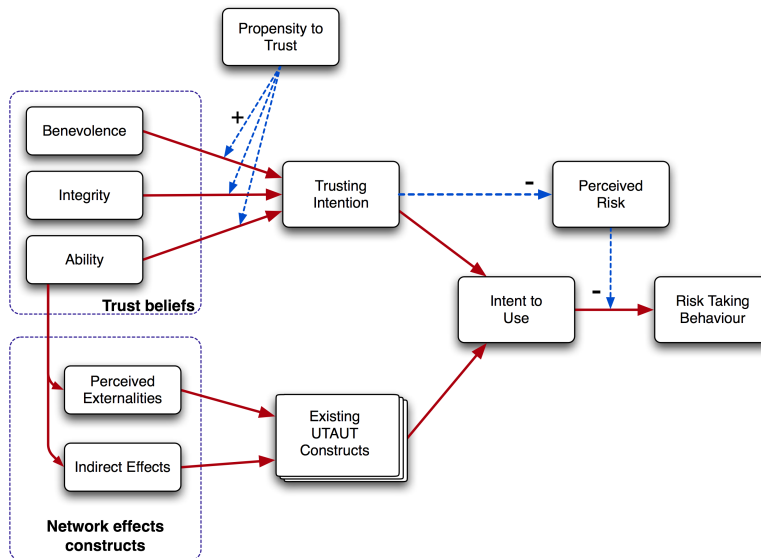
Trust constructs will distilled from the literature and are introduced here.

Trust in online organizations

Judging trustworthiness means understanding what characteristics of the trustee (in our case the online organization) inspire confidence with the trustors (in our case online consumers). When discussing trust in the context of e-commerce it makes sense to regard online organizations as entities that act in a particular way in order for trustors to trust them. From this perspective organizations such as online organizations can be seen as objects of trust. This organizational trust can be treated as a sub-construct of interpersonal trust. McKnight and Chervany (2000, 2002, 2002a) have proposed a trust typology that comprises different forms of interpersonal trust[96, 95, 94]. They distinguish between the constructs *trusting beliefs* and *trusting intentions*, other authors have introduced *perceived risk* and *propensity to trust* as trust constructs[89, 91]. These constructs and their causal relations will be explained in this section, the overal model of trust can be seen in Figure 5.1.

Trusting beliefs

In the context of e-commerce trusting beliefs include the online consumer's beliefs and expectancies about trust-related characteristics of the online organization[95]. The online consumer wants the online organization to be willing and able to act in the consumer's interest, to be honest in transactions (and not divulge personal information to unauthorized third parties), and to be capable of delivering the offered goods as promised. Mayer et al. (1995)[91] have found that ability, benevolence and integrity explain a major portion of a trustee's trustworthiness[2]. These constructs are defined as follows:

---

[2]Mayer et al. also note that Aristotle's Rhetoric suggests that a speaker's ethos is based on the listener's perception of three things: intelligence; character (reliability, honesty); and goodwill (favorable intentions toward the listener). These aspects provide an interesting parallel with the factors of ability, integrity, and benevolence.

1. *Ability* refers to the trustor's perception of trustee's competencies and knowledge salient to the expected behavior[91]. Such perceptions may be based on prior (firsthand or secondhand) experience or institutional endorsements (such as academic titles or ISO 9000-certification). In e-commerce contexts, user perceptions of firm's ability are based on two related beliefs: (1) whether the firm is competent (expert or skilled) enough to perform the intended behavior, and (2) whether the firm has access to the knowledge required to perform the behavior appropriately. Perceived lack of these beliefs can undermine perceptions of the trustee's ability. Ability is domain-specific in that trustees highly proficient in one area (and trusted with behaviors in that area) may be viewed as having little aptitude or experience in other areas. For instance, we trust doctors with medical treatment but not with retirement planning! Likewise, firms with demonstrated or perceived domain expertise in a certain area (such as banking) are more likely to be trusted by users in that area than those with less perceived expertise. To overcome this perception, newer online organizations attempt to "signal" their ability to users by publishing information that directly subscribes their ability, such as the number of accounts or customers they have, items sold, domain expertise (blogs about mortgages) and additional information that would increase the customers perception of the organizations ability.

2. *Benevolence* is the extent to which a trustee is believed to intend doing good to the trustor, beyond its own profit motive[91]. A benevolent trustee would help the trustor, even when the trustee is not required to be helpful or is not rewarded for being helpful. Benevolence introduces faith and altruism in a relationship, which reduces uncertainty and the inclination to guard against opportunistic behaviors. For example, Textdrive.com provides reduced hosting rates for open-source initiatives and small freelancers, whereas Google and Yahoo both offer many tools free of charge as a download for developers (such as Google's Webtoolkit[3] and Yahoo's User Interface toolkit[4]). However, in many e-commerce contexts, it may be difficult to anticipate user needs for designing benevolent services or it may be overly expensive to deliver such services. In such circumstances, benevolent firms should at the very least: (1) demonstrate empathy toward users' concerns and needs, and (2) proactively make good-faith efforts to resolve user concerns[91].

3. *Integrity* refers to the trustor's perception that the trustee will adhere to a set of principles or rules of exchange acceptable to the trustor during and after the exchange[91]. Ability in a particular domain is not adequate for building trust, trustees must also be relied on to fulfill obligations to trustors. Perceived integrity instills trustor's confidence in trustee behavior and reduces perceptions of risk. In e-commerce contexts, rules of integrity refer to: (1) conduct of online transactions, (2) customer service policies following a transaction, and (3) the online organization's use of private user information[91]. However, the specific rules are context-dependent. For instance, in the case of online retailing, rules include timely shipping of products, timely and accurate billing, and maintaining confidentiality of personal information, whereas online brokerage rules include providing accurate quotes, timely execution of client orders, and timely notification of fulfilled trades. online organizations may build integrity perceptions by explicitly stating their rules of exchange (such as, shipping policies, merchandise return policies, customer data privacy policies) on their Web sites, keeping customers informed of any change in rules, and unfailingly abiding by those rules. Note that adherence to any set of rules is not adequate; such rules must be perceived by the trustor as being fair and reasonable. Integrity is similar to honesty, fairness, credibility, consistency, predictability, reliability, and dependability dimensions proposed in the literature.

---

[3]See "http://code.google.com/webtoolkit/"
[4]See "http://developer.yahoo.com/yui/"

These three trusting belief constructs are causes of trusting intention and can be modelled as such (See Figure 5.1).

Perceived risk

There is no risk taken in the willingness to be vulnerable (i.e., having an intention to trust), but risk is inherent in the actual behaviour following the willingness to be vulnerable. One does not need to risk anything in order to trust; however, one must take a risk in order to engage in trusting action. The fundamental difference between *trusting intentions* and *trusting behaviors* is between a "willingness" to assume risk and actually "assuming" risk[95]. Trust is the willingness to assume risk; behavioral trust is the assuming of risk, and the acting upon it[91]. This critical differentiation highlights the importance of clearly distinguishing between trust intentions and actual use behaviour[111]. *Perceived risk* is the consumer's subjective belief of suffering a loss in pursuit of a desired outcome[11]. It is the perceived risk of using a system that will prevent users from using a technology, however trust can influence the perceived risk and thus lowering it to a level that could drive more users (See Figure 5.1). Whether or not the trustor will take a specific risk is influenced by trusting beliefs, trusting intentions and by the perceived risk of the trusting behaviour. Trust-related behaviour can be described as a risky advance concession in the expectation of a positive outcome without any explicit contractual security or control measure against opportunistic behaviour[58]. The probability that the online consumer will make a risky advance concession in a specific situation (e.g. providing his credit card number or other sensitive information) depends considerably on his assessment of the trustworthiness of the online organization, but also his assessment of the functional aspects of the online organization (e.g. the perceived performance), and on his general disposition to trust[14, 95, 58]. The higher the uncertainty factors are the higher the perceived risk will be, these uncertainty factors can be any of the previously described uncertainties.

Propensity to trust

Trust can also be conceptualized as independent of a trust object, that is trust not being between persons, groups or ogranizations. This form of trust is the general tendency consumers have in trusting anything and is called 'propensity to trust'[95]. This construct finds its roots in psychology and recognizes that people develop generalized expectations about the trustworthiness of other people. Dispositional trust is proposed to be a stable factor that will affect the likelihood a person will trust other individuals or groups of individuals[91]. Thus online organizations cannot influence dispositional trust by applying certain trust building strategies or measures. However, indicators for dispositional trust should be included in empirical studies either as moderating variable or as cause of trusting beliefs and intentions[58]. The propensity to trust is modeled as a modifier of the trusting beliefs and can be seen in Figure 5.1. Even though propensity to trust is an important trust construct, the rest of this thesis will not return to this aspect of trust. It is left to future research to examine the importance and effects of this construct in differing target audiences, phase in the product life cycle and other dynamics.

5.6 Trust dimensions

In addition to the trust constructs discussed in this chapter there are a number of other dimensions that are important and relevant when studying trust for online organizations. The first dimension that is relevant is the level of interaction and its relation to perceived risk. Secondly trust is not a static phenomenon, it is a dynamic concept that changes over time, this section will define this thesis' perspective on trust's time dimension. Lastly there are a number of constructs discussed in the literature

that have not been included in the constructs previously discussed. This section will shed light on these choices and provide reasoning behind these omissions.

Types of interaction

One of the variables in the D&M model is usage. It is useful to provide further detail of this variable by specifying different types of interaction a user can have with the system.. The uncertainties online consumers experience depends on their expected level of interaction. There are a number of levels of interaction a consumer can have, the risk a customer experiences will depend largely on the type and extent of interaction that a user has with the online organization. Pavlou (2003) identifies three levels of interaction, McKnight et al. (2002a)[96] discern a fourth. These four levels of interaction are:

1. *Information retrieval* all interaction between a user and the online organization where the information flows one-way, from the online organization *to* the user. It encompasses such interactions as browsing, searching the online organization's site, all product or service inquiries, gathering information. This is the lowest level interaction and only costs the user time, effort and/or attention.

2. *Information sharing* all interaction where information flows back from the user to the online organization. The information that comes from the user could be anonymous low-risk information information such as ratings (of products or news stories), anonymous comments and feedback systems. This also includes automatic information exchange that is intentionally or involuntarily captured through cookies, log-data, and data-mining tools. The information shared could be less anonymous and more time consuming such as registering for a site, providing product reviews, and usually involves some sort of personal information exchange (such as an email address). This level of interaction will cost the user not only time, effort and attention but users also risk their privacy by providing (possibly sensitive) personal information.

3. *Purchasing* interaction where consumers provide a financial transaction for services. The final step involves provision of private and monetary information, such as credit card information, actual purchase preferences, and payment and address information, in order to complete the purchase of a product or service. This step requires the users time, effort, attention, personal sensitive information *and* money.

4. *Acting on advice* the last type of interaction is even more pervasive and pertains to users behaviour outside of the interaction: namely that consumers will act on advice received online. This could be aspects such as a dating service or a legal advice service. This type of interaction could require the same costs of the users mentioned in the above interactions but additionally adds a higher risk that legal advice could turn out wrong, or a blind date could be a serial killer.

Generally speaking online organizations try to motivate users to increase the level of interaction. The extent and level of use will also depend on the type of service that the online organization is offering. For example Wikipedia[5] is primarily used for information retrieval; only 1% of their frequent users actually contribute information to the site, by adding or editing content. These editors can make anonymous contributions but usually have user accounts and help co-create the Wikipedia initiative by editing and reviewing entries. Wikipedia is not an online vendor or a commercial enterprise, thus influencing users to purchase items is not on the agenda. However Wikipedia is an open source initiative that does actively pursue financial contributions from its visitors. This is one example where the interaction is pushed toward a higher level of interaction that fits the online organization.

---

[5]See "http://www.wikipedia.org/"

Time dimension

Another important question that has only been sparsely addressed in the research of on-line trust is the fact that trust is not a static but a dynamic phenomenon[95]. Different phases of trust can be distinguished [124] the phase of trust building, where trust is formed; the phase of stabilizing trust, where trust already exists; and the phase of dissolution, where trust declines. Because the focus of this thesis is on consumers' technology adoption decisions, the relevant trust phase is initial trust. Initial trust is trust in an unfamiliar online organization, one with whom the consumer has no prior experience. Unfamiliar actors are those that do not yet have credible, meaningful information about each other[96]. Interaction over time provides credible, meaningful information. In the context of web-based commerce, such information is gained only after the trustor (a web user) has engaged in trust-related behaviors (e.g. purchasing or any form of interaction) and had the opportunity to assess the trustworthiness of the vendor by observing the consequences of those behaviours. Thus, the period during which a consumer visits and explores an online organization for the first time lies within the domain of initial trust.

Consider, for instance, a supplier-buyer relationship. The buyer may *believe* that a supplier is able to provide a quality product in a timely fashion. However, this belief only *asserts* that the supplier *could* perform. This does not mean that it *will* perform, and, therefore, the supplier will not necessarily be trusted. The perception that the supplier has integrity suggests that it will fulfill agreements as promised. Yet even if there is an agreement, if the supplier's ability to deliver is questionable, it will not be trusted. If the supplier is perceived as benevolent, it will have a strong desire to serve this particular buyer's needs. If the supplier's integrity is suspect because, for instance, its track record with other firms is inconsistent with its stated policies, trust will again be lacking. As the perception of each of these factors increases, we would expect an increase in willingness to take a risk in the relationship. This illustrates the importance of online organizations to try to influence users' perceptions by applying to their trusting beliefs.

Discussions on trusting belief constructs

Some researchers have included predictability as an additional trusting belief construct, and although there is clearly a relationship between predictability and trust the association is ambiguous[91]. Predictability can be defined as the 'consistency of trustee behavior'[93]. However to be meaningful, trust must go beyond predictability. To combine the two is to suggest that a party who can be expected to consistently ignore the needs of others and act in a self-interested fashion is therefore trusted, because the party is predictable[91]. What is missing from such an approach is the willingness to take a risk in the relationship and to be vulnerable. Additionally, the focus in this thesis is on initial trust and predictability would be more relevant to a model of trust in ongoing interactions between a user and vendor.

Other criticisms have included that integrity and benevolence are strongly correlated and thus should be combined. Because the "time" dimension plays an important role in the significance of the variables in the model, the following situation can explain the strong correlation (adapted from [126]):

1. Propensity to trust will be an important factor at the very beginning of the relationship.

2. Judgments of ability and integrity will form relatively quickly in the course of the relationship: "the effect of integrity on trust will be most salient early in the relationship prior to the development of meaningful benevolence data"[91].

3. Benevolence judgments will take more time to form: "the effect of perceived benevolence on trust will increase over time as the relationship between the parties develops"[91].

In a discussion of several empirical studies by Schoorman et al. (2002) observed that the findings as a whole were completely consistent with the model. Research conducted in laboratory settings are more likely to show a high correlation between benevolence and integrity because those relationships did not have the time to develop any real data about benevolence. In situations where the parties had longer relationships, benevolence and integrity were more likely to be separable factors[125].

5.7 Modelling trust

The three dimensions of trust (ability, benevolence and integrity) influence customer decisions in their technology adoption decisions. For managers to better understand the importance of trust on (potential) customers' technology decisions, they must also understand the influence of trust constructs on existing constructs of technology decisions. Therefore it is necessary to analyze the effects of trust on network effects and extent the technology adoption model with the trust concepts.

Defining trust

After narrowing down the various meanings and types of trust we can (finally) present a more precise definition of trust that is applicable within the problem domain of online organizations. Keat & Mohan (2004) [70] narrow down trust in a similar manor (also in an e-business context) as perceived trust: the degree to which a user sees an online organization as being trustworthy, and disposition to trust as a user's likelihood to trust others. This thesis will employ the following definition for trust: *"a consumer's willingness to accept vulnerability in an online transaction based on their positive expectations regarding an online organization's future behaviors"* – adapted from Kimery (2002)[73].

Effects of trust on network effects

Although the literature provides very few explicit links between trust and network effects, intuitively there is an overlap. Some constructs and causes of trust, are similar to causes or consequences of network effects. For example perceived ability can be argued to have causal effects on perceived externalities due to the fact that it is a trusting belief of the user regarding the quality of the online organization. This same belief will partially form the users views on whether externalities will occur[104]. That is if a users trusts an online organization to have the ability to create useful products, it will also find the online organization more likely to start having positive feedback effects. The same reasoning goes for a relationship between perceived ability and indirect effects. This relationship can be seen in Figure 5.1 and has been abstracted in Figure 5.2.

Model trust into UTAUT

Extending UTAUT with new trust constructs (i.e. trusting intentions and perceived risk) it important for these constructs to be operationally consistent with other, previously described variables (i.e., expected performance and intention to use). According to Ajzen and Fishbein (1980) when extending a model it is important that new variables be compatible with the model's existing ones [5]. First, trust and perceived risk in an online organization deal with a single transaction decision (task-specific) bounded by the surrounding circumstances (which are context-specific) at a single point in time (and thus time-specific). UTAUT's variables 'expected performance' and 'effort expectancy' also deal with a single technology-acceptance decision in a given system at a single point in time. Second, while objective reality may play a role, trusting intentions and perceived risk predominantly deal with a subjective interpretation of actual trustworthiness and risk, given limited information about reality. Similarly, expected performance and effort expectancy deal with a user's subjective assessment of usefulness and ease of use, given limited

Figure 5.2: Adding Trust and Network effects constructs to UTAUT
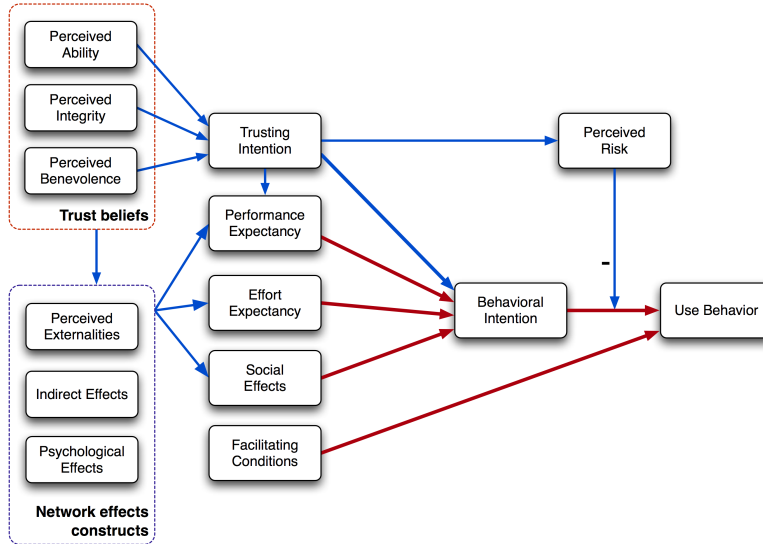
knowledge of the real-world artifact (e.g., the system). Trusting intention and perceived risk are at the same level of abstraction as the UTAUT variables, namely the user's perspective, which measure general beliefs without specifying the system's precise details. Similarly, trust and perceived risk are general perceptions regardless of the precise details of the online organization's characteristics. The resulting model is presented in Figure 5.2.

Trust causal relationships

The causal relationships found in the literature are provided in Trust Causal Relationships (Table 5.1), here the rows are the independent variables that have a causal relationship with the columns according to the corresponding cells author.

Table 5.1: Trust Causal Relationships

Construct	Trusting intention	Intent to use	Perceived risk	Use behaviour
Ability	[91, 93, 16, 155, 126]			
Benevolence	[91, 93, 16, 155, 126]			
Integrity	[91, 93, 16, 155, 126]			
Disposition to trust	[93, 51, 95, 16, 96, 58, 155, 22, 126]			
Trusting Intention		[91, 95, 58, 53, 155]	[91, 95, 58, 139, 111, 155]	[51, 98, 96, 58, 53, 111, 22]
Intent to use				[91, 94, 95, 16, 58, 139, 111, 22, 126]
Perceived risk				[96, 58, 139, 53, 111, 155]

Trusting beliefs' causes

As previously presented the three factors of ability, benevolence, and integrity can contribute to trust for an online organization. These three factors are perceptions an online consumer has regarding the online organization, how these perceptions are formed is based on the system, information and service quality of the online organization. The causes of the trusting beliefs are important to analyze in order to provide hooks for managers to influence customers technology adoption choices. If we look at the example of Amazon.com, users will form their perceptions on Amazon's ability, benevolence and integrity based on the supplied information, their system functionality and perceptions of service levels. These quality constructs of the online organization will influence an online consumer through characteristics such as openness of communication, functionality, service levels etc. The influence of the system, information and service quality will be further expanded in Theoretical contribution (chapter 6) where a cohesive view on the constructs of success are presented in one overal model.

5.8   Operationalization

Trust measures

The items used to operationalize the construct of trust came from a number of sources. Because negatively worded trust items tend to factor separately into distrust [105], which is conceptually separate from trust [94], the measures for trust in this thesis have all positively worded items. The trusting beliefs items were adapted from scales reviewed and summarized in [95]. In selecting items, I tried to capture the aspects of the belief that were most relevant to the online organization context. Thus, for competence, perceptions of how well the online organization did its job or how knowledgeable the online organization was. The integrity items captured perceptions of online organization's honesty, truthfulness, sincerity, and keeping commitments (reliability/dependability). Finally, the benevolence items focused on the online organization acting in the customer's best interest, trying to help, and being genuinely concerned.

Table 5.2: Trust causes

TRUST BELIEF MEASURES	Source
1. Competence	
(C1). ...is competent and effective in providing	[95]
(C2). ...performs its role of giving ...very well.	[95]
(C3). Overall, ...is a capable and proficient ...provider.	[95]
(C4). In general, ...is very knowledgeable about	[95]
2. Integrity	
(I1). ...is truthful in its dealings with me.	[95]
(I2). I would characterize ...as honest.	[95]
(I3). ...would keep its commitments.	[95]
(I4). ...is sincere and genuine.	[95]
(I5). ...has enough openness about their business practises.	[95]
3. Benevolence	
(B1). I believe that ...would act in my best interest.	[95]
(B2). If I required help, ...would do its best to help me.	[95]
(B3). ...is interested in my well-being, not just its own.	[95]

5.9 Trust conclusion

This chapter analyzed the existing literature on Trust and introduced it into the existing technology adoption model UTAUT. It first provided an overview of the different types of trust from a broad perspective. The trust literature is fairly broad in its definition of trust, and after explaining the constructs of trust a definition was given. The various additional trust dimensions were also discussed shortly. From the literature the trust constructs were amalgamated into the existing UTAUT model and an overview of the causal relations was provided.

In line with the research questions listed at the beginning of this chapter, some conclusions regarding the role of trust in the success of online organizations can be made. They are listed here:

- Trust plays a central role in helping consumers overcome perceptions of risk and insecurity. Trust makes consumers comfortable sharing personal information, making purchases, and acting on online organization's advice – behaviors essential to widespread adoption of e-commerce

- To understand *why* a given party will be judged as trustworthy corresponding *characteristics* of the trustee which inspire that trust must be examined. The most important area of trust is that of personal trust: it is by this trust construct that the technology adoption decisions are influenced.

- In order to influence trust intentions, the trusting beliefs must be influenced. These trusting beliefs consists of ability, benevolence, and integrity. The quality factors of the online organization (system, information, service and network facilitation quality) in turn influence the trusting beliefs.

- Trust is also essential in influencing perceived network effects': the ability and benevolence of an online organization have a positive causal relation to the perceived network effects.

Chapter 6

Theoretical contribution

6.1 Introduction

As stated in Research issues (2.2.1) this thesis aims to unify existing theory and improve the understanding of success in online organizations. Existing literature covers network effects, trust and IS success rather extensively. However there is no integral and cohesive model that covers *all* these aspects combined. This chapter aims to fill this gap by presenting a framework that will unify the existing theory into one overal model. The presented theoretical model provides five perspectives on success: the organizational view, the user view, the adoption influences view, the positive feedback view and a life-cycle view. Each window of the model is presented, discussed and will show how the model can help an online organization. Lastly the various constructs of the model will be operationalized with measures that can be used to identify weaknesses so that the necessary actions can be taken.

6.2 Success prediction and induction framework

The overal purpose of the framework is to help organizations increase the success of their online applications. To fulfill this purpose three (sub)goals are identified:

1. Identify weaknesses and offer discernment where changes must be made. This is done by applying the overal model to an online organization. The outcome will be a set of values that together provide a balanced scorecard of success. By identifying where the organization can improve a large step towards improving these weaknesses can be made.

2. Induce success by understanding the complex dynamics at play. Understanding what the causal relations are will help decision makers improve the correct area's of their organization's products. After identifying the weaknesses, the presented model will provide tangible clues what area's must be improved in order to improve overal success.

3. Aims to predict success by providing decision makers with understanding of the dynamics as they create their online applications. This goal of the framework relates to predicting where weaknesses might occur so that managers can take actions *before* they occur.

In summary the practical aim of the framework is that is helps to predict and induce success. For this reason the framework presented in this chapter will be called the Success Prediction and Induction Framework (henceforth SPIF).

Figure 6.1: Five windows
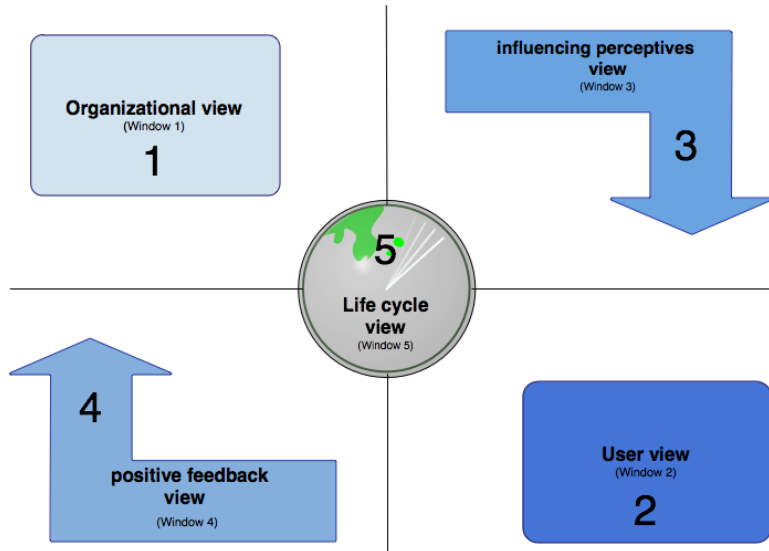
6.3 Five windows

The SPIF model incorporates five perspectives on success. Each window adds a distinct set of causal relations that further the understanding of success. Figure 6.1 provides an overview of the windows and how they relate to each other. The first window is the view of the organization, this view is an overal view that provides context for the other views. The second view is the user perspective, this view deals with technology adoption dynamics that users experience. The third and fourth views tie the organization and user view, by defining relationships between the views. Lastly the life-cycle view offers the perspective that in some phases certain relationships are more important than others. For example early in the life-cycle, facilitating network effects will be less important than influencing early adopters.

Together the windows provide an overal and balanced view of success within the online organization. The SPIF model includes objective quality characteristics (Window 1), perception characteristics (Window 2), characteristics that indicate an organizations effectiveness of influencing users (Window 3), characteristics that indicate network facilitation (Window 4) and a time dimension that helps identify priorities (Window 5). Each perspective will be explained independently in the next subsections.

6.3.1 Window 1: Organizational view

The organizational view of success provides the foundation for the SPIF model. It is based on the D&M model of IS success, using an existing theory as the basis for this model. The missing relationship of Network effects identified in Chapter 4 has been included. The causal relationships can be seen in Figure 6.2. This window is the broadest window and on its own will provide a balanced view of success of the online initiative.

The organization only has direct influence in how it shapes its online applications by its system, information and service quality. These aspects are under the organizations influence and affect the use and user satisfaction that users experience. Usage and user satisfaction is something the online organization has no direct control over, it can only influence these indirectly via the quality attributes

Figure 6.2: Window 1: organizational view (updated DeLone and MacLean model)
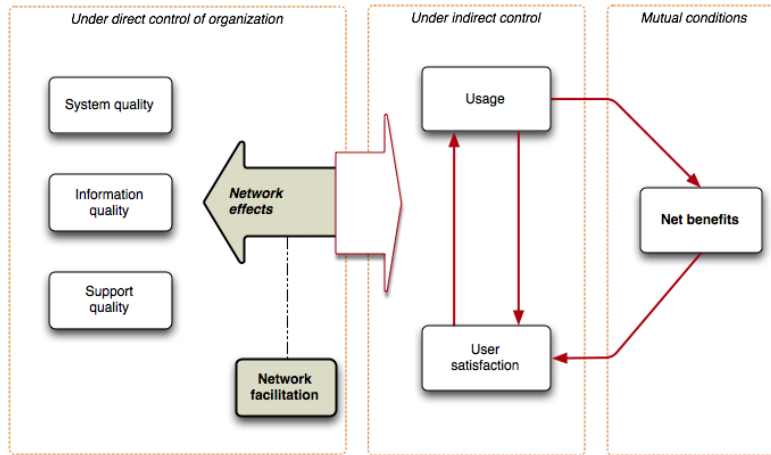
it does control. For example if an online organization wants to increase the user satisfaction, it can choose to change something in the information quality of its offerings.

For both the customer and the organization the expectations regarding the net benefits must be positive or one or the other will not agree to the transaction. The customer can leave the online application, and the online organization can choose to discontinue the product. Net benefits can be seen as conditions for the transactions between the users and the organization. For a company this means that there must be a prospect of positive benefits gained from the online organization. For the user it means some form of added value must be experienced from using the online organization's services.

The construct this thesis contributes to the D&M model is additional network effects dimensions by way of the causal relation identified by 'network effects' and the new 'Network facilitation' construct in Figure 6.2. Both new constructs are highlighted in the model.

The constructs in Window 1 are meant to be objective, for most constructs in this perspective this is not a problem. For example, for system, information quality, and service quality there exists measures that provide a certain degree of objectivity[1]. However the constructs of user satisfaction and the customer measures of net benefits can only be provide by the end-users, and thus will be subjective.

6.3.2   Window 2: User view

The user view window shows how users' technology adoption choices are influenced. This view is important as it can expose *why* customers choose not to use an online application. It provides a complex set of constructs that explain the influences customers experience. The existing UTAUT model provides the basis for this view, yet the previously discussed dimensions of trust and network effects are added. Combining these constructs with the existing UTAUT will provide managers with a clearer view of how users make technology adoption decisions. The updated UTAUT model is presented in Figure 6.3, the colored constructs are additions or modifications to the original model. The original modifying relations of the UTAUT model have been left out of this window in order to clarify the causal relations.

The use behaviour construct is the link between this window and the organizational view (window 1). In both models the use behaviour can be measured to indicate system use. The difference is that this window focuses on the constructs that lead to use behaviour. This view provides more

Figure 6.3: Window 2: User view (updated UTAUT model)
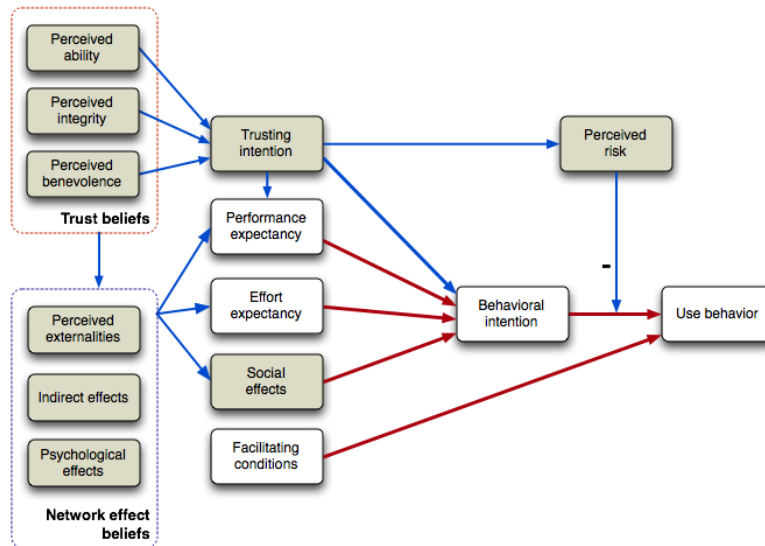
information regarding particular reason *why* customers do (or do not) use the online organizations services. Measuring these constructs will identify what area's are the cause of reduced use. If for example the perceived risk of using the online applications service is too high amongst users then the online organization should focus on increasing trusting intention by influencing customer perceptions of ability, integrity and benevolence. In the same way, if the performance expectancy is low, this could be due to lacking trusting intentions, network effect beliefs or other product characteristics. How these constructs can be influenced is the function of Window 3: Influencing perceptions.

6.3.3   Window 3: Influencing perceptions view

The basic premises of window 3 is that organizations *can* indirectly influence their users' adoption choices. They do this through the aspects under their direct influence: the quality factors. The quality factors are the combined systems, information, service and network facilitation quality constructs. These quality factors have direct effect on the perceptions users have of the online organization. And users' perceptions have direct effect on their intention to use, which leads to actual use behaviour. Thus *how* the quality is perceived by end users is of crucial importance to the success of an online organization.

   The quality factors can be seen as the stimuli that an online organization has at its disposal in order to induce potential users to use the system. The perception beliefs are the existing UTAUT constructs extended with the network effect beliefs and the trust beliefs as seen in Figure 6.4. In this figure all new constructs are colored, existing constructs are adopted from either the D&M model or the UTAUT model.

   An example of how window 3 can provide insight is how system quality can increase the users' perception of ability and expected performance. Amazon's quality of execution in their online book selling application as well as the timely delivery of books creates a high performance expectancy and trust in Amazon's ability to deliver. In the same way nearly all of the quality attributes have some form of causal relationship with the perception beliefs. The perception beliefs are key in forming users' adoption decision as is explained by the UTAUT model (see window 2).

Figure 6.4: Window 3: Adoption influence causal relations
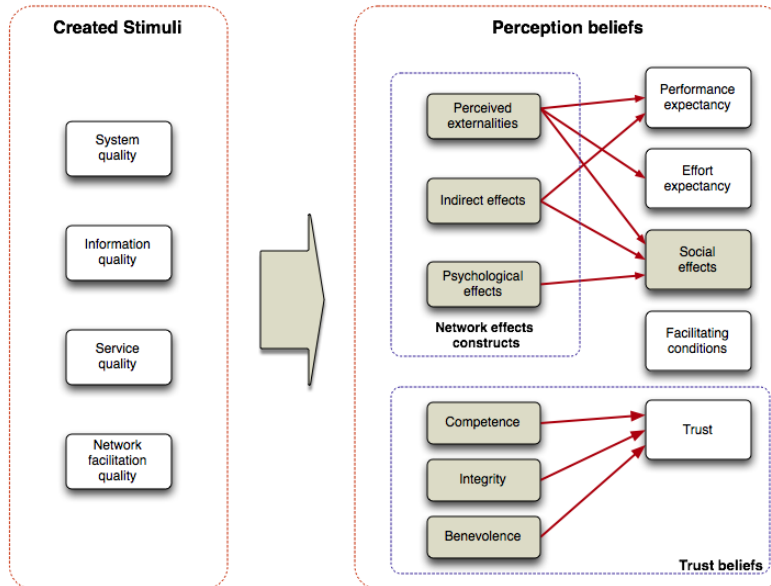
The contribution of this window does not lie in the introduction of new constructs as the constructs are repeated from windows 1 and 2. This window highlights the importance of the stimuli that the online organization has: the quality constructs. These stimuli are the means to affect the perceptions of users. The quality factors affecting the perception beliefs is the bridge between the organizational view and the user view. Window 3 functioning as a bridge can be seen in Figure 6.1 where this window is presented as a linking arrow between window 1 and 2. The quality constructs (system, information, service and network facilitation quality) in this window correspond with the same constructs in the D&M model (window 1). The perception beliefs constructs correspond with those in the updated UTAUT model (see window 2).

6.3.4   Window 4: Positive feedback view

Just like window 3, this window has a connecting function between window 1 and 2, but this does not consider how quality might increase use, it considers the effect of usage on quality. This perspective highlights the positive feedback that occurs when usage is correctly harnessed to improve quality aspects of the online organization. This is dependant on the network facilitation constructs as can be seen in Figure 6.5. The constructs usage and user satisfaction are the same as in the D&M model of IS success as are the quality aspects. This window however provides a more specific view on how usage can improve the quality constructs.

6.3.5   Window 5: Life cycle view

The proposed views on the success of the online organization have up till now been rather static, that is they don't look at how the dynamics change over time. In reality the focus of an online organization will have to be dynamic and change over time in reaction to market forces[94]. An additional view therefore can be helpful, a fifth perspective on the success of online organizations: the product life cycle view. As Schoorman et al. (2007)[126] mention 'it would be interesting for future research to establish

Figure 6.5: Window 4: Positive feedback
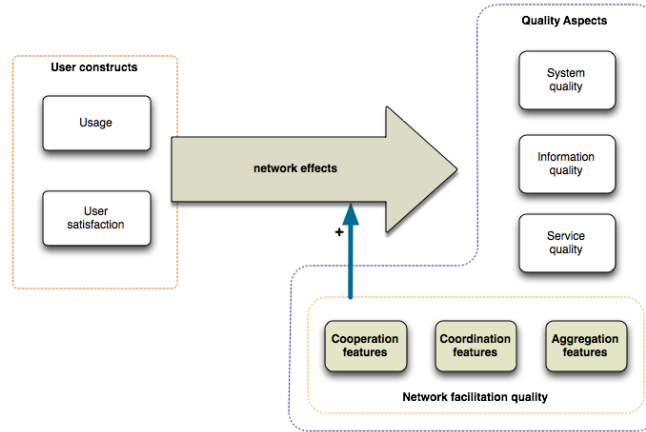
Figure 6.6: Window 5: Technology adoption life cycle – adapted from Moore (1991)
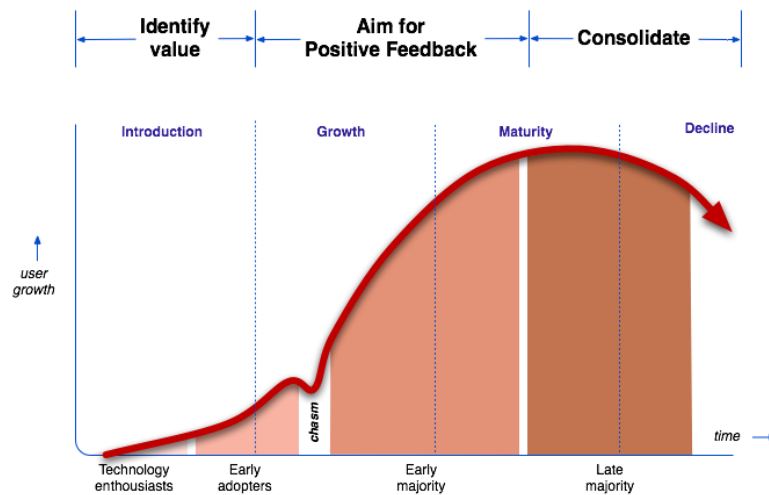
more specifically the process and time frames in which each of the variables contributes to trust'. This is equally valid for all the constructs in this model. The life cycle view looks at the online organization from a growth perspective and identifies priorities in the causal relationships depending on where in the product life cycle the online organizations is.

Adoption phases

The phases of the product life cycle are introduction, growth, maturity and decline, these phases can be seen in Figure 6.6. The following description of the traditional view of the various phases is helpful:

> When a product is introduced, there is considerable uncertainty about user preferences (also among the users themselves) and the technological means of satisfying them. Traditionally many firms producing different variants of the product enter the market and

competition focuses on product innovation. As users experiment with the alternative versions of the product and producers learn about how to improve the product, opportunities to improve the product are depleted and a defacto product standard, dubbed a dominant design, emerges. – Adapted from Klepper (1996) [74]

Within an e-commerce setting the adoption life cycle is similar. Consider the following example: first there is a technological advanced new online application, which is still an unfinished and unrefined product. With help and feedback from technology enthousiasts, the online organization refines its service. Competitors that have a head start might be creating similar (inferior) products. Early adoption choices customers experience will be influenced by the inherent value of the technological advancement and the *expected* network size of the new product. These must be greater than the current value of competitors' products, including their network size. Thus adoption of the online organizations service depends on how the inherent value compares to its competitors and their network sizes. The online organization wi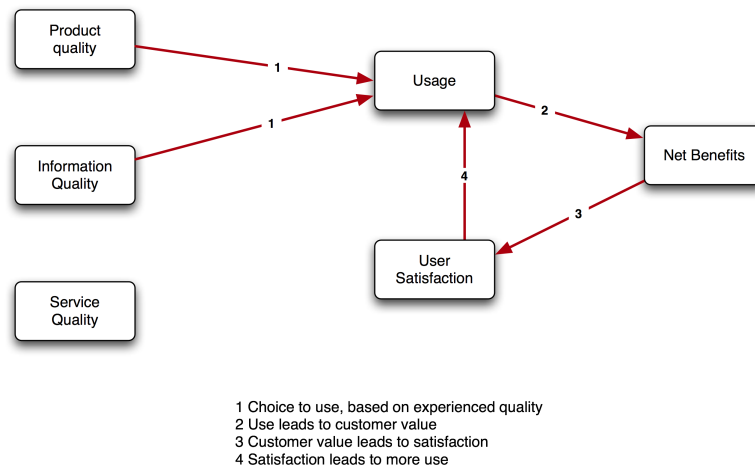th the highest combined value will continue to grow. Once a critical mass is reached by the organization the push to competete will be reduced slightly and tendencies to innovate will diminish. This will continue until the next technological advancement creates new opportunities for the next online organization.

Of course this description is rather simplistic and will not hold in the complexities of the real world but the general principle of the technology adoption life cycle is clear. The technology adoption life cycle is a means for classifying the market and its reaction to a high-tech product. Consumers tend to segregate themselves along an axis of increasing sensitivity to risk. As presented by Moore (1991)[102], consumers fall into one of five basic classifications: innovators, early adopters, early majority, late majority or laggards Figure 6.6. Each of these classes of consumers has a different set of needs, product criteria and reactions to new innovations. Consequently, it is necessary to market differently to each group. The differences between the consumers in the early market (composed of technology enthousiasts and early adopters) and the early majority are so great that the product frequently falls into a chasm marked by a decrease in sales and a loss of market share. It is in the chasm that many online organizations fail. The technology adoption life cycle is a critical tool for determining product, pricing and marketing strategies for online organizations. However, the proper strategy "does not just change as we move from stage to stage, it actually reverses the prior strategy," as Moore states in his book Inside the Tornado (1999)[103]. Obviously, this reversal in the required strategy presents great problems for the high-tech industry. Moore states that, "significant marketing expenditure and risk ultimately hinge on a choice about where the product is in the Technology Adoption Life Cycle." However it is not an easy task to determine what phase of the life cycle the online organization is in. "In particular, it will be easy for some people to think we are in one stage of the market, while others think we are in another. If this is allowed to persist, people will be working at cross purposes–violently"[103]. Incorrectly assessing a product's position within the technology adoption life cycle can have disastrous strategic and financial impacts. The problem to date has been in determining a product's position within this life cycle. The complex and fundamentally nonlinear nature of the market makes it difficult not only to forecast, but also to objectively determine what the current circumstances are. Studies have been performed on identifying the current stage of the life cycle phase[97], which includes comparing early data with industry averages, but this might prove hard for disruptive technologies.

Stages of focus

The goal of an online organization is to increase the use of their online services. In order for this to happen the focus in each life cycle phase will be different due to the difference in adopter markets for each phase. The provisions necessary for each phase are different. The online organizations must focus

Figure 6.7: Stage 1: Initiating value

1 Choice to use, based on experienced quality
2 Use leads to customer value
3 Customer value leads to satisfaction
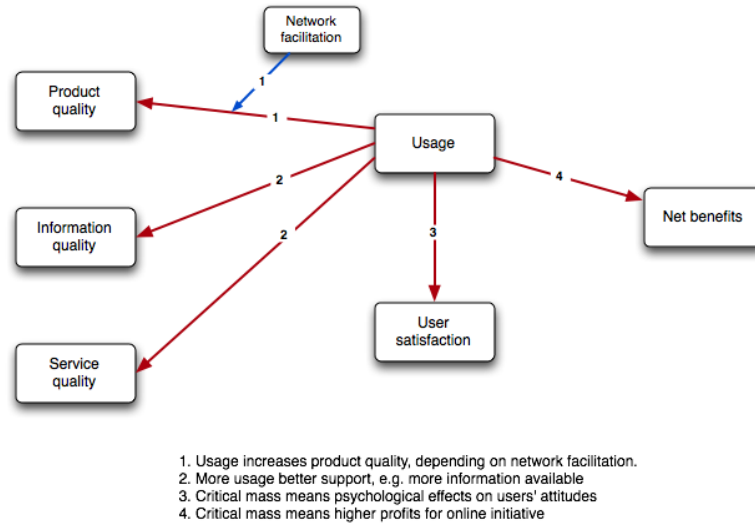4 Satisfaction leads to more use

on different constructs in the different stages of the life cycle. The different focusses of the stages can be grouped into three distinct phases:

1. *Stage 1: Identifying value.* For early adopters it is key to offer an increased inherent value of existing products, the product does not have to be perfect, early adopters and technology enthousiasts will even be keen to help improve the online application. In this early phase it is paramount to focus on creating potential quality and liaising with early adopters and technology enthousiasts about the direction of the online service. It is key to refine the product and satisfy their needs. This phase is influenced by the quality factors the online organizations has at its disposal: system quality, information quality and service quality, see Figure 6.7. This phase sees the online organization push to provision the potential inherent value to actual customer value for the end-users. Continuous improvements to the online organizations services are needed in order to create customer satisfaction. Creating customer satisfaction will not only increase the use of the satisfied customers but will also make these customers allies in finding new users.

2. *Stage 2: Aiming for positive feedback effects.* This phase aims to create critical mass, this phase is crucial to the success of an online organization. Either the online organization will gain market share and flourish or it will lose the network war and diminish and forced into a niche. The increased adoption of users leads to increased network size and thus the online firms needs to make sure their network facilitation features are working to increase value for customers. Additionally the focus of the online organization should no longer be aimed at technology enthousiasts and early adopters but on how the early majority experiences the online organization. Inherent value that might have proven to be decisive to early adopters will not sway the early majority. Marketing and product development should change focus on this new target audience. This means that the quality attributes will have to be altered in some way to better fit their target groups. It is important to re-execute the measures of the SPIF model in this phase and understand what areas need to be altered to fit the new target audience. See Figure 6.8.

3. *Stage 3: Consolidation and balance.* This phase aims at keeping the balance of success in the organization. In this phase the organization has net benefits that are positive, perhaps for the first time. This stage means that an organization has achieved a considerable amount of success due to the

Figure 6.8: Stage 2: Creating positive feedback

1. Usage increases product quality, depending on network facilitation.
2. More usage better support, e.g. more information available
3. Critical mass means psychological effects on users' attitudes
4. Critical mass means higher profits for online initiative

sustained growth of users. In order to retain this balance the organization must continue to balance the constructs of success and focus on all aspects in all windows. This does not mean that the organization can rest, as the market will shift and customer expectations will increase. For new entrants competing with companies in this phase they will have to offer substantial added value over the value customers of stage 3-organizations' experience.

6.4   Operationalization

In this section the variables of the system and user view are operationalized into specific metrics. This section aims to provide a set of measurement tools for helping managers to judge the success of their online organization. The various constructs have to be measured in order for cause and effect relations to become clear. Unfortunately the measures presented in D&M models are not sufficiently detailed for actual use, the recommendation of the authors is to apply the D&M to specific context and thus choose and create applicable measures for each construct. In this thesis an overal model is presented that can apply to all online organizations, thus the measures provided by D&M are extended with alternative sources. Fortunately for most constructs there exists a wealth of options and models that include measures which are presented in this section. Incorporating as many possible existing empirically proven measures from different sources this section aims to combine the measures into one new overal theory. The measures accompany the four windows model of the Success Prediction Induction Framework presented in the previous section.

Quality measures

Online applications are both a software interface and a hypertext information system, we need to measure the quality of both aspects to judge the success of the online organization. Fortunately the D&M model already has the distinction between the system and information quality. The system and information quality map nicely to the software interface and hypertext information system. Additionally the service quality adds a new dimension which is increasingly important for online organizations due to vol-

untary use and easy possibility of switching to competitors. The system, information and service quality measures are performed internally by managers or external auditors of the online organizations, the goal is to determine an objective means to online organization's quality from an internal persective[66]. The perceptions of users are measured by the other constructs, even if they are incorporated into the system, information and service quality constructs by D&M.

System quality measures

As mentioned previously system quality measures the desired characteristics of an online organization's software systems. The purpose of operationalizing system quality is to determine how the online organization's software quality can be measured. This can be difficult, as the many quality attributes are hard to quantify. For this reason the ISO 9126 standard has identified 6 main quality characteristics, and 21 sub-characteristics in order to provide a framework for measuring software quality[1]. Even though explicit measures are provided in subsequent updates to ISO 9126, the measures are provided as informative and not definitive[2, 3, 4]. Their purpose is to provide general guidelines in creating and evaluating quality requirements, not providing definitive means of measuring software quality. The original D&M model [34] and the updated D&M model [35] both provide measures for system quality, however the ISO 9126-2 external quality measures provide a more exhaustive even if not definitive set of measures.

Internal and external attributes

In specifying quality attributes of software products a distinction between internal and external attributes can be made[80]:

- *Internal*: attributes that are measured in terms of the product. Examples are thousands of lines of code (KLOC), test coverage, and length of documentation.

- *External*: attributes that can only be measured in terms of a relationship between product within other entities in their environment. Reliability, for example is dependant on many aspects of the environment such as webservers and users.

In this thesis we will limit the research to external quality attributes that relevant external entities will be able to measure. As mentioned previously internal metrics are not directly viewable by end users and are thus out of scope. The measures of software interface aspects are the system quality measures provided in System quality measures (6.4). In this table the measures of system quality are only provided as descriptions, I refer to the original ISO 9126-2 external measures for precise metrics[2, 3, 4].

Information quality measures

As previously defined information quality captures the value users experience from the available information content within an initiatives online application. Content can vary in completeness, accuracy, relevance, personalization, security and other factors. Information quality is the degree in which the information present in an online application satisfies users information needs, it is the quality of the hypertext aspect of an online application. Thus measuring information quality means measuring the hypertext system aspect of online organizations. The operationalization of information quality is based on the original and updated D&M model. It is provided here in Information quality measures (Table C.2), additional measures have been added from various sources and are added as a column where applicable.

Service quality measures

The importance of service quality can be seen in that online organizations with poor user support will translate into lost customers and lost sales[36]. Measuring service quality entails looking at responsiveness, help availability, assurance, technical competence and service information availability. Although a claim could be made that "service quality" is merely a subset of the online organizations "system quality," the changes in the role of IS over the last decade argues for a separate variable – the "service quality" dimension as in the updated D&M model. There is an existing tool that measures service quality for IS systems, this tool is SERVQUAL. The SERVQUAL instrument was originally developed by marketing researchers to assess service quality in general by Parasuraman et al. (1988)[107]. Underlying the 22-item SERVOUAL instrument are five dimensions used by customers when evaluating service quality regardless of the type of customer service. The model has been uased and refined by many researchers inducing the original authors to update the model [108]. The application of the measure to the IS field has garnered a great deal of recent debate [71, 113, 38] but has been applied to e-commerce settings before[71, 113, 140]. The SERVQUAL instrument has been applied to e-commerce setting as a general measure of success, actually measuring more than just the support quality of an online organization. Although it is true that studies have indicated customers' behavioral intentions show strong evidence of their being influenced by service quality[154]. In this thesis the SERVQUAL instrument is applied in such a way as to remain as close to the D&M model's definition. In this definition service quality is measured in its capacity as the support function of the online organization. The SERVQUAL items presented in Service quality measures (Table C.3) have been adopted from previous e-commerce applications of SERVQUAL yet adapted and narrowed to the original purpose where deviation from the support functions is too great. An example of this is the omission of the measures of tangibles because this is sufficiently covered by the constructs in system and information quality.

Usage Measures

As with traditional information systems, customer use is an important measure of success for online organizations, especially because customer use is voluntary. The nature and amount of the usage are both important indicators of success. Simply saying that more use will yield more benefits, without considering the nature of this use, however is insufficient. It is important to also consider the nature, extent, quality, and appropriateness of the system use. The nature of system use could be addressed by determining whether the full functionality of a system is being used for the intended purposes. Full functional use of an e-commerce system should include informational use, transactional use, and customer service use[78]. With regard to the nature of use, various states of systems utilization based on the use or nonuse of basic and advanced system capabilities can be used. Simply measuring the amount of time a system is used does not properly capture the relationship between usage and the realization of expected results[35]. On the other hand, for example, it can be argued that declining usage may be an important indication that the anticipated benefits are not being realized. The usage measures are included in Usage Measures (Table C.4), all measures are taken from the original and updated D&M model. The measures of use have been re-order to fit specific measurement dimensions introduced by this thesis pure for clarification reasons and reasons stated above.

User satisfaction metrics

In order for the user satisfaction metrics to be valid they must adequately measure the degree in which users are satisfied with the online organization. Satisfaction can be measured with specific features or in general by the difference between service needed and received, however it is difficult to measure this directly. Extensive research on measuring user satisfaction, and has been synthesized into one

overall model. Garrity and Sanders [48] extended the original DeLone and McLean model by adding more precise User Satisfaction constructs. The model identifies four subdimensions of User Satisfaction: Decision support satisfaction, Task support satisfaction, Interface satisfaction, and Quality of work life satisfaction[1]. These dimensions were synthesized from an extensive review of IS success research and reasoning from principles of IS systems and general systems theory. The measures from the Garrity and Sanders models are included in [User Satisfaction Measures][User Satisfaction Measures]. Many measures in the Garrity and Sanders model were taken from Davis et al.'S TAM model (1989) [33] and thus the source is listed as the original source.

Net benefit metrics

"Net benefits" are the most important success measures as they capture the balance of positive and negative impacts of the e-commerce on our customers, suppliers, employees, organizations, markets, industries, economies, and even our societies. The construct is presented in the D&M model as an means to explain success on multiple levels. The context within which the model applies must be specified, for example the D&M model can be applied to society as a means to explain technology success or within an e-commerce setting for one online organization. In this section we will apply the net benefit construct within the context of an online organization. The central question of online organizations is whether or not the initiative has created an added value for their users *and* the organization behind the online organization. Net benefits measure both the added value the online organization has to the organization and the users. The 'net' aspects of this construct means that not all these measures have to be positive. Thus an organization offering an online service might be booking large losses but *is* creating added value for its users could be considered to be a success[2]. Therefore it is important to measure the net benefits of both the organization and the individual user. Measuring the organizational net benefits this thesis uses a subset of the orignal and updated D&M model which are applicable within the context of online organizations. The ISO/IEC 9126-4 standard offers metrics to measure the quality in use, which essentially are the net benefits an individual user will experience. It measures the quality of software by analyzing the added value through increase in productivity, efficiency and potential negative effects[4]. The Net Benefit measures are included in [Net Benefit Measures][].

User Perception measures

To measure the user perceptions in the study by Venkatesh et al. (2003) [144] a questionnaire was created with items validated in prior research adapted to the technologies and organizations studied. The sources of the measures were diverse[53, 52, 33, 101, 137], all were previously used and thus consolidated by the UTAUT model. The measures are repeated in [Perception items of UTAUT][].

Conclusion

Having this many measures warrants the question whether or not the Success Prediction Induction Framework provides too many measures. Does insight regarding the success of online organizations require so many measures that the needed data is impossible? It might be that some practitioners will prefer to skip parts of the measures, however as many authors have noted the success variables

---

[1]The fourth dimension of the Garrity and Sanders' model is quality of work life satisfaction. This dimension looks at the influence of IS systems withint the work sphere of users. Quality of work life satisfaction is an important dimension of success in organizational settings. However, in the context of an online organization the users will likely not be impacted in terms of work-life or job satisfaction, and thus this dimension will not be included in this study.

[2]An example of this is the video sharing site Youtube.com that up till the day it was bought by Google was suffering large financial losses. Only in recent months are the revenues of Youtube picking up.

is a complex construct that in order to measure it correctly requires a multi-dimensional and multi-disciplined approach. However as has been presented in this chapter not all constructs are of equal explanatory prowess during the product life cycle and thus for example it is possible to apply only some the measures of some constructs during the initial life cycle phase.

6.5 Conclusion

This chapter presented a new model to better enable the success prediction within online organizations and to help practitioners induce success in their online organizations. This Success prediction and induction framework provides five perspectives based that each offer a different view on creating success. Three of the views are adaptations on existing models where important constructs were added. The model operationalizes the various constructs based on various sources and the results are in Appendix C. The next chapter will offer some short examples of how the SPIF model can be used in practical situations.

Chapter 7

Examples

7.1 Introduction

The utility of the Success prediction and induction framework and the related measures can be demonstrated with some short examples. In each example a situation will be presented where an online organization faces a lack of use due to a lack of trust or perceived network size. The SPIF model can be used to help focus and prioritize the actions an organization can take in order to improve the situation. The proposed examples are meant to be illustrative rather than exhaustive. These examples can be used to guide both practical and empirical success studies. Although in this chapter the examples are compelling logically the next step is to validate the measures empirically.

7.2 Example 1: Youtube.com

The first example to illustrate the SPIF model is of the well known site YouTube.com. This video sharing site was started in February 2005 by three friends that wanted to improve the existing ways to share video. Their idea quickly grew into what has become the biggest video sharing site on the internet. The situation that this example wants to illustrate is event that led to the growth spurt of YouTube during the course of 2005.

YouTube was started in February of 2005, in May the site had only around 50 videos. User feedback and usability tests indicated that the uploading capabilities and general use of the site had little problems. However usage growth was absent and therefor the original idea of the site to make video sharing easy was not being achieved. If (in retrospect) we analyze this situation with help of the SPIF model, first applying window 2 (user view) we can backtrace what cuases of the lack of use there are. Assuming that the user feedback and usability tests were accurate, it is clear that performance issues based on quality characteristics are not the cause of a lacking intent. The network effects beliefs seem to be the problem, users do not expect their video's will be seen in YouTube due to the small user base. Trying to create a sharing site implies that it is important to facilitate the networking features of the site. Thus the important aspect for YouTube to focus on would be network facilitation to increase the networking features. In this situation the youtube founders agreed on a number of changes, which were implemented in June of 2005:

1. The functionality of "Related videos" was added to increase the views of other contributors video's. A filter was created that allowed for related videos to be easily displayed next to the existing content.

2. An easy video sharing possibility was added, allowing for users to embed video's in third party sites. This was accomplished by creating an external video player, a special made video player

that could be installed on any website by simple copy-and-paste. This allowed anyone to put a video on their website within minutes.

3. Encourage user interaction by creating functionality such as comments and video responses. This increased the interaction between users from purely watching video, to reacting to video.

All these changes increased the network facilitation features that YouTube offered. Related videos created a better aggregation of content by filtering video's and displaying related content side by side. YouTube increased interaction between users by creating cooperation features such as comments and video responses. Lastly being able to share content more easily is a also a network facilitation feature allowing the quick spread of video's throughout the internet. Within a few weeks the type of interaction and the overal use increased tremendously and this increase kept exponentially growing, indicating that the positive feedback was indeed taking effect.

In this example the chasm between stage 1 and 2 was crossed by Youtube. While initial focus had been on getting the product right and creating value for its users, the next phase was to get the network facilitation right.

Of course other environmental factors also contributed to the YouTube success. These factors are out of scope of this example, yet I will quickly mention these aspects that clearly contributed to the success of YouTube. First of all broadband was becoming widely adopted, removing previous bandwidth restrictions that were inhibiting high traffic technologies such as streaming video. A related bandwidth element that was solved was the increasing availability of cheap dedicated bandwidth. Thirdly Adobe Flash technology had reached a milestone where streaming video could be played using a small footprint player that was already installed on 99% of internet connected computers. Lastly the proliferation of digital camera's and cellphones meant that content recording devices were near ubiquitous amongst YouTube's target audience.

7.3   Example 2: Soocial.com

The second example given in this chapter is that of an unknown service called Soocial. Soocial is a service that offers synchronization services for its users. The problem Soocial aims to solve is that people have many devices that all have their own distinct address books. Soocial provides a service that connects all contacts on existing devices and communicates changes between them. The soocial service stores users' contact information on a central server and allows its users to connect to it via mobile phones, an online application, API calls and Mac OS X desktop or laptop computers. The service has not been released yet as a public beta, yet a private alpha has seen some feedback from users helping to develop the site. The initial release has included an online application where users can access their contact information via a web interface, the soocial syncing engine that communicates with the online application and mobile phones. The direction of future features has intentionally been left open in order to regard customers feedback and identify important priorities customers may find.

In applying the SPIF model to Soocial, first it is helpful to identify the life cycle stage in order to identify what priorities are important. As Soocial is still in its alpha release, it is pretty safe to assume that Soocial is in the introduction phase. The important aspects are of the introduction phase are to create inherent value for technology enthousiast and early adopters that are greater than current competitors. The quality factors that the online organization controls have effect on the perceptions users have of the online organization. Soocial aims at creating an online organization that improves contact management for its users, in the introduction phase this means that Soocial should be focused on system, information and service quality that influences users' perception of trusting beliefs (ability, benevolence and integrity) and the UTAUT constructs such as performance expectancy, and effort expectancy. In this phase the most important aspects for creating intent to use are performance and

effort expectancy (window 2). Thus Soocials focus should be on influencing these constructs with the stimuli it has at it's disposal (window 3). Because Soocial wil be handling their users' contacts the perceived risk will be moderate to high, thus trusting intention is als an important factor to influence. Practically the system quality aspects should thus be focussed on creating the quality of syncing that is necessary. Additionally the usability of the online application and the easy sign-up features are aspects of system quality. In order to successfully influence early adopters and technology enthousiasts to use Soocial these aspects are of vital importance. Influencing these target groups also entails building confidence in trust beliefs, one of the means Soocial aims at influencing these beliefs is by having a blog specifically aimed at developers. However Soocial has failed in recent months to gain momentum, via infrequent blog posts and virtually no feedback via the blog. Another point users have indicated as a need is access to contact data via the use of an API. Currently there is no way for developers or users to use the data captured by Soocial's services in their own or third party applications. In order to create increased value this is also an area for improvement.

Up til now Soocial has not offered any network facilitation features, and according to the framework presented here this should not be part of the introduction phase. The next phase when Soocial starts to gain momentum network facilitation features should be implemented. However it is advisable that Soocial starts designing and creating the social networking features that would induce positive feedback effects.

7.4 Conclusion

In this chapter two short examples of applying the SPIF model to online organizations are presented. These examples indicate how the SPIF model can be useful to identify areas for improvement and what dimensions should receive focus during what phase of the product life cycle. Both examples showed that that the SPIF model provides sufficient insight into the dynamics of the online organization so that specific areas can be improved.

Chapter 8

Conclusion

8.1 Introduction

This thesis has aimed at advancing the body of knowledge by analyzing extant literature and adding to it a framework that helps predict and explain success of online organizations. It has done so by making an interpretation of the literature and creating a synthesis of this literature that has not been done before. The research problem and research questions laid out in the Introduction (chapter 1) will be revisited in this chapter and argued how this thesis has (in part) answered the issues laid out in Problem theories conclusion (subsection 2.2.5). Research Issues (2.2.1) presented an overview of the existing literature and identified a number of hiatuses. These gaps in the knowledge pertained to trust and network effects and their role in the success of online organizations. Some of the research's findings do confirm expectations from the extant literature but it is the first time that this has been done in a cohesive overal model including the important constructs of trust and network effects. The confirmations of these expectations can be seen as *advances* to the previous research – they are of interest because they add a new depth to our understanding of these phenomenon.

8.2 Conclusions

Conclusions about research issues

The research issues laid out in Problem theories conclusion (subsection 2.2.5) where extracted from the hiatuses identified in the literature. Both in the D&M model and UTAUT various constructs were found to missing. These aspects have been previously found to be important constructs of intention to use[86, 66] and IS success[98, 131]. The missing constructs have been studied and their respective causes and consequences introduced into the models. Based on the literature studied in this thesis the following conclusions can be made regarding the research issues:

1. It is recommended that "network facilitation" be added as a dimension in the systems view of success of online organizations. This is one half of the network effect coin. The 'network facilitation' construct enables the increase of system, information and service quality due to use of the online organization. Measures that operationalize the network facilitation construct have been synthesized from the literature and introduced in Network effects (chapter 4).

2. The other half of the network effects coin, is regarding the perceptions of users regarding the expected network effects. These expectations influence how each individual user will intend to use the services of an online organization. Perceived network effects have been added to the UTAUT model and further advance the explanatory power of this instrument. Measures for

perceived network effects have been included in Network effects (chapter 4) to allow researchers and practitioners to measure the influence of this construct on users' perceptions.

3. Trust is a construct important to the success of online organizations. It is key in influencing the adoption decisions of users. Therefore it is better modelled as part of the users' view and is less useful in a systems (organizational) view. To reflect this trust constructs have been added to the technology adoption model UTAUT and direct influences have been synthesized from the literature to indicate the influence of trusting beliefs on the intentions of users to use the online organizations services. The trust constructs have been operationalized in Trust (chapter 5) by amalgamating various literature sources providing practitioners with tools to measure the influence of trust in various stages of the life cycle.

4. With the growth of social networking features present in todays online organizations, voluntary system use is more common today than ever[36, 136]. Therefore the inclusion of "Use" is a critical dimension of the measurement of online organizations' success[119, 78, 98, 137, 90, 79]. Usage measures should capture the richness of use as a system phenomenon including the nature, level, and appropriateness of use, and should not simply measure the frequency of use[48, 66].

Conclusions about the research problem

This thesis presents a success model for online organizations that attempts to capture the multidimensional and interdependent nature of the e-commerce domain. The hundreds of research works that have applied, developed, challenged, or validated existing success models speak to the need for a common approach to success measurement and to the value of a model for framing research designs. The dynamic nature of the e-commerce field have seen tremendous progress in terms of the impacts on business and society. In light of this progress and change, this thesis was aimed at reviewing, evaluating, and updating existing success models. Considering the research studies that both validate and support the constructs in the proposed model, I conclude that this model and related conclusions form a sound basis for success measurement in the e-commerce environment.

1. Many empirical studies have validated the D&M and UTAUT models and its interrelationships, whereas other studies have recommended enhancements to these models. This thesis proposes that both a users technology adoption view and an organizational systems view are necessary. Based on the contributions presented in the literature study, this thesis proposes an updated D&M and UTAUT Model to reflect the changing e-commerce domain. The Success Prediction Induction Framework serves as a foundation for the positioning and comparing of online organizations. The model should continue to be tested and challenged. The changes introduced in this paper are examples of this continued growth and refinement seen in research.

2. The Success Performance Framework introduced in this work is a useful model for developing comprehensive e-commerce success measures as demonstrated in Theoretical contribution (chapter 6).

3. Managers and academics should be carried away by the hype of Web 2.0 or the 'Next Fad'^{TM} and led to believe that this new and rapidly changing environment requires entirely new measures of success. One should look first at the cumulative tradition (such as performed in this study), and determine which existing and validated success measures can be used in the e-commerce domain. The complex, multidimensional, and interdependent nature online organizations requires careful attention to the definition and measurement of all dimension of success constructs. It is important to measure the possible interactions among these success dimensions in order to

isolate the effect of various independent variables with one or more of these dependent success dimensions. The Success Prediction Induction Framework presented in Theoretical contribution (chapter 6) including the five windows on success presents the interdependent relationships that should continue to be considered and tested. As much as possible, tried and true measures should be enhanced and expanded with modifications or, where necessary, new measures should be considered. Selection of e-commerce success dimensions and measures should be contingent on the objectives and the context of the empirical investigation, but tested and proven measures should be used whenever possible. Completely new and untested metrics should be adopted only as a last resort.

4. The increasing importance of social networking online confirms this, especially in the e-commerce environment where customers are becoming increasingly involved in their consumption of online service.

5. Despite the multidimensional and contingent nature of the success of online organizations, an attempt should be made to reduce significantly the number of measures used to measure IS success so that research results can be compared and findings validated. Some progress has been made in this area as noted in the Operationalization (section 6.4) section of this paper. Where possible, researchers and managers should endeavour to apply existing, validated measures rather than the development of new measures.

6. Researchers must also consider the nature, extent, quality, and appropriateness of the system use[36]. The nature of system use could be addressed by determining whether the full functionality of a system is being used for the intended purposes[48, 66]. A more refined approach and careful examination of all variables mst be considering whilst crafting the success of the online organization.

8.3 Implications

Implications for theory

A number of implications can be drawn in regards to how the findings of this thesis relate to the existing theory. The following points are presented as the implications theorists should regard in consideration of the findings of this thesis:

1. The complex, multidimensional, and interdependent nature online organizations requires careful attention to the definition and measurement of all dimension of success constructs. It is important to measure the possible interactions among these success dimensions in order to isolate the effect of various independent variables with one or more of these dependent success dimensions. The Success Prediction Induction Framework presented in Theoretical contribution (chapter 6) including the five windows on success presents the interdependent relationships that should continue to be considered and tested.

2. For each research endeavor, the selection of relevant success dimensions and measures should be contingent on the objectives and context of the empirical investigation and the phase of the life cycle the online organization finds itself. Where possible, tested and proven measures should be used. The Seddon et al.[129] context matrix is a valuable reference for selection of success measures based on context. Even though the Seddon et al. study limits itself to the organizational view context sensitivity is less important on the users level, as the UTAUT model sufficiently encompasses users' influences in technology adoption.

Implications for policy and practise

Practical implications for practitioners and managers can be derived from the findings in this thesis. The following points deserve consideration by decisions makers that are concerned with implementing the proposed framework:

1. Managers and academics should be carried away by the hype of Web 2.0 or the 'Next Fad'[TM] and led to believe that this new and rapidly changing environment requires entirely new measures of success. One should look first at the cumulative tradition (such as performed in this study), and determine which existing and validated success measures can be used in the e-commerce domain. As much as possible, tried and true measures should be enhanced and expanded with modifications or, where necessary, new measures should be considered. Selection of e-commerce success dimensions and measures should be contingent on the objectives and the context of the empirical investigation, but tested and proven measures should be used whenever possible. Completely new and untested metrics should be adopted only as a last resort.

2. The proposed Theoretical contribution is a general overview to identify weak points for online organizations, it doesn't help much with creating specific solutions to identified problems, for example introducing a reputation based system can improve trust, yet *how* this reputation based system must function or will improve the technology adoption is up to the implementors. The Success Prediction Induction Framework provides online organizations with a general framework which can be filled in to each particular context.

8.4 Limitations

A number of limitations have explicitly defined in Delimitations (section 1.7), these were a deliberate part of the research. This section discusses other limitations that became apparent during the progress of the research. These limitations are acknowledged but they do not detract for the significance of the findings. This research has been carried out analyzing more than 250 academic articles and books, of which many were relevant and other after careful consideration appeared to be too far off scope. However these out of scope issues have brought some interesting limitations to light that will be mentioned here:

1. This thesis dealt with initial trust. However important for the success of online organizations is the ongoing relationship with users. When crafting an online organization it is also important to focus on later stages of the product life cycle and keep maintaining the trust that has been built up. Success can't just be based on hit and run strategies. Practically this means that research should be done into areas of how a more robust mechanism for repeat use can be included.

2. Online reputation can be very important to the technology adoption and thus to success of online organizations. Reputation might be an important factor to include as a construct and in the measurements for the Success Prediction Induction Framework.

3. Just as reputation is important other psychological and sociological aspects that have not been dealt with should be included. A limited view of environmental aspects such as culture has been adopted in this thesis. Future research should investigate the role of these environmental aspects.

8.5 Further research

A number of outstanding issues still remain in order to complete the picture of increasing success in online organizations. Most importantly is that future research should endeavour to empirically

test of the proposed theoretical contribution in a real life setting. As mentioned in the Delimitations (section 1.7) the software development process has been regarded as out of scope, this is an avenue that warrant more research as its incorporation can be of fundamental importance to the success of online organizations. As mentioned by the ISO 9126 standard[1] (development) process quality is fundamental to creating product quality aspects such as system, information and service quality. Examples of development methods that offer avenues for research are agile development in online organizations or applying old software methods such as testing to online organizations.

8.6 Finally

This thesis aimed at answering how online organizations can increase their success. While the complete answer to what causes success still needs more research, it is clear that the constructs of trust and network effects play a major role in todays online organizations. This thesis provided a framework that further advances the available tools for practitioners to evaluate, predict and explain the complex nature of their endeavours.

Appendix A

Network effects literature study

In the following table an overview of all network effects literature is given, the author names, publication year, a short description, the type, field and the journal in the article was published and an overview of the antecedents of network effects.

Network effects literature study

Author (Year)	Arguments	Type (Field - Journal)	Constructs
Tapscott and Williams (2006) [136]	Traditional collaboration—in a meeting room, a conference call, even a convention center—has been superseded by collaborations on a much larger scale.	Empirical study (E-commerce - Book)	critical mass, communication, compatibility, coordination
Li (2005) [81]	Network effects stem from the efficiency of a compatible product user base and the presence of significant technology switching costs. Li stresses the importance of communication in increasing the chance of network externalities and cautions decisions makers to identify cheap-talk in choosing technology partners.	Theoretical analysis (Marketing - MS)	network externalities, revenue sharing, compatibility, communication
Parker (2005) [109]		Theoretical analysis (Economic - MS)	Network externalities, lock-in

Network effects literature study(*continued*)

Author (Year)	Arguments	Type (Field - Journal)	Constructs
Surowiecki (2004) [135]	Surowiecki argues that under certain circumstances the aggregation of information in groups will result in decisions that are better than could have been made by any single member of the group. The advantages can be seen in better cognitive judgement, coordination and cooperation without a central guiding body being present. Key criteria 'Diversity', 'Independence', 'Decentralization' and 'Aggregation' are necessary for these advantages to occur.	Popular statistical study (Marketing - Book)	Diversification, Quality, Coordination, Cooperation, Cognition
Lou et al. (2000) [88]	Perceived critical mass has the largest total effect on intention to use groupware. It is essential to create critical mass of users in early stages of groupware implementation.	Case study of adoption of groupware systems (IS - EJIS)	Perceived critical mass, intention to use, use behaviour
Reed (1999) [117]	The value of potential connectivity is the value of the set of optional transactions that are afforded by the system or network. The value of the network grows slowly at first with the value per new user based on inherent value 'a', thus the value is aN. After a certain growth the value 'b' each individual gains based on existing members, however each extra individual also gains from existing users, thus the toal value of the network becomes $aN + bN^2$. Reed argues that there is a third level of increase, namely that each possible subgroup of the network also adds value, for example chat rooms, or eBay auctions. The value thus becomes $aN + bN^2 + c2^N$. The dominant value in a typical network tends to shift from one category to another as the scale of the network increases.	Theoretical analysis (Network theory - CM)	Network size, Value
Witt (1997) [152]	Technological lock-in is not as important as often claimed. In reality industrial change does not come to a halt. Under certain conditions new technology can successfully disseminate despite network externalities. These conditions are that the benefits of new technology can create a critical mass of potential adopters who then make an adoption decision and thus break the lock-in and create a new network standard.	Theoretical analysis (Economics - IJIO)	lock-in, innovation, critical mass, network externalities

Network effects literature study(*continued*)

Author (Year)	Arguments	Type (Field - Journal)	Constructs
Economides (1996) [39]	There are similarities between the economic structure of network markets and the structure of vertically related industries. Compatibility, coordination leading to technical standards, moving to interconnection and interoperability, are part of creating higher valued network externalities.	Theoretical analysis (Economics - IJIO)	pricing, network externalities, compatibility, coordination, standardization, quality of services
Arthur (1996) [8]	Arthur argues that traditional economics do not apply to high technology markets due to laws of increasing returns. Increasing returns are the tendency for that which is ahead to get further ahead, for that which loses advantage to lose further advantage. They are mechanisms of positive feedback that operate -within markets, businesses, and industries-to reinforce that which gains success or aggravate that which suffers loss. The reasons for increasing returns are network effects and customer lock-in. Some services start in the increasing returns world but later in their life cycle become virtual commodities. It is important for company strategies to model their approaches to high tech markets with specific increasing return stragies.	Theoretical analysis (Economics - HBR)	Increasing returns (network externalities), compatibility
Liebowitz and Margolis (1995) [83]	Liebowitz and Margolis argue that not all effects seen in network markets are due to positive feedback externalities. Often it is simple price drops that stem from technology improvements that cause growth. Past investments made possible by network success also increase financial externalities such as economies of scale. Which are not network externalities, yet they are part of the network effects.	Theoretical analysis (Economics - RLE)	network externalities, technology improvement, financial externalities
Liebowitz and Margolis (1995) [82]	This case study analyses the Video recorder market in regards to path dependance, and finds that the logic behind path-dependance is incomplete. Where there is a knowable and feasible improvement to be gained from moving to a better path, those who will benefit from the improvement will be willing to pay to bring the improvement about. There is no empirical data to show path dependance leading to less optimal market equilibirum, the QW-ERTY case is biased and incorrect.	Case study: video-recorder formats (Economics - JLEO)	path dependance, decentralization, lock-in costs

Network effects literature study(*continued*)

Author (Year)			Arguments	Type (Field - Journal)	Constructs
Besen and (1994) [15]		Farell	By promoting standard, or preventing their aadoption, firms cur-cially affect the competitive environment in which they operate. Firms can expect large profits if they pervail in a standards battle, but deciding whether to engage in such battles will be risky. Each firm must asses the extent in which the risk outweighs the poten-tial gains. If firms are similar in size they will probably choose the same compatibility strategy, if firms are dissimilar, conflicting strategies are more likely.	Theoretical analysis (Economics - JEP)	compatibility, firm size, user expectation, poten-tial profits
Katz and (1994) [69]		Shapiro	Firms must coordinate their product design decisions and com-patibility choices in order to best fit with the potential of the network market a firm is involved in. Technology adoption de-cisions are based on users' expectation which can be influenced. Pricing commitments, opening the market to indepedent suppli-ers, vertical integration with suppliers, commuincating sunk costs, reputation are all tools to secure network adoption.	Theoretical analysis (Management - JEP)	user expectation, coordi-nation, technology adop-tion, compatibility
Katz and (1986) [68]		Shapiro	Technology adoption by companies display certain properties in regards to network externalities: (1). There is not enough compatibility in the market compared to the potential benefits, over standardization sometimes can get in the way. (2). Technology that is superior now will dominate the market if competing technologies have no sponsors. (3). Sponsored technology is likely to beat technologically supe-rior technology. (4). When competing technologies are both sponsored, the tech-nology that is superior *tomorrow* has strategic advantage	Theoretical analysis (Economics - JPE)	technology quality, timing, expectations, sponsoring
Katz and (1985) [67]		Shapiro	Consumers will base their purchase decisions on expected network sizes. For some sets of expectations only one firm will produce out-put, while for other sets of expectations there will be several firms in the market. Typically, firms can choose whether to manufac-ture compatible products, this choice depends on comparable sizes of networks, possibilities of royalties or side payments and repu-tations. The firm expecting to win is less likely to have incentives for compatibility.	Theoretical proposal (Management - AER)	consumers' expectations, compatibility, network size

Network effects literature study(*continued*)

Author (Year)	Arguments	Type (Field - Journal)	Constructs
Farrell and Saloner (1985) [42]	'Excess inertia' impedes the collective switch from a common standard or technology to a possibly superior new standard or technology.' In the case of perfect unanimity and complete information, if all firms will benefit from the change, then all will change! With incomplete information about the "eagerness" of each firm to switch to the new technology bandwagons effects occur. If firms' preference for the new technology is identical, then coordination and non-binding communication of preferences and intentions can eliminate the inertia. If firm's preferences differ these coordination and communication attempts exacerbate the problem of inertia.	Theoretical analysis (Economics - RJE)	Technology adoption (inertia), compatibility, communication, coordination
David (1985) [31]	Case study on the adoption of the QWERTY keyboard. The Dvorak Simplified Keyboard was empirically proven by the US navy to improve efficiency after 10 fulltime days of working with it, yet still the QWERTY keyboard remained the industry standard. The need for compatibility between typewriters and writers, early (limited) adoption and expected adoption was enough to tip the scale in favour of QWERTY as a standard. David argues that strong technical interrelatedness, scale economies and irreversibilities due to learning and habituation can lead the market to prematurely standardization on the wrong system.	Case study (Management - AER)	technical interrelatedness, scale economies, irreversibilities

Appendix B

Trust literature study

In the following table an overview of the trust literature is given, the author names, publication year, a short description, the type, field and the journal in the article was published and an overview of the antecedents of trust.

Trust literature study

Author (Year)	Arguments	Type (Field - Journal)	Constructs
Schoorman et al. (2007) [126]	This literature review explicitly recognizes the notion that trust is not mutual and not necessarily reciprocal. It restates the three factors of trust: that ability, benevolence, and integrity can contribute to trust in a group or organization. As the perception of each of these factors increases, we would expect an increase in willingness to take a risk in the relationship.	Literature review (Sociology - AMR)	Benevolence, ability, integrity, trust, reciprocal
Artz and Gil (2007) [9]		Literature review (Computer science, Semantic Web - JWS)	N/A
Cody-Allen and Kishore (2006) [22]	Outlines an extension to the UTAUT model adding trust and quality attributes to the model. This study confirms the proposed causal relationships of trust on intent to use and other constructs of the UTAUT. However it also confuses the organizational and user perspective limiting the usefulness of the research.	Empirical study (E-commerce - SIG-MIS Proceedings)	Ability, Integrity, Benevolence, Intent to use, Information quality, System quality

Trust effects literature study(*continued*)

Author (Year)	Type (Field - Journal)	Constructs	Arguments
Zhang and Zhang (2005) [155]	Theoretical analysis (Sociology, IS - Proceedings ICEC)	Ability, Benevolence, Integrity, Environment	Argues the beliefs-attitude-intention-behavior model (similar to Theory of Reasoned Action) logic as the fundamental common trusting belief (ability, benevolence, integrity), system trust belief, and situational decision to trust as the core. Initial trust may turn into robust trust after long-term interactions.
Pavlou (2003) [111]	Empirical study (E-commerce - IJEC)	Trust, Perceived Risk, Intent to use, Use behavior	Study that introduces Trust and Perceived Risk into the TAM model. Pavlou performs two exploratory studies with 103 and 155 students respectively that confirms the causal relationships between Trust and Perceived Risk, and the modifying relationship that Perceived Risk has between Intent to Use and Actual Use.
Gefen et al. (2003) [53]	Empirical study (- MISQ)	Trust, Intent to Use, Effort Expectancy, Performance Expectancy,	The study provides evidence that online trust is built through (1) a belief that the vendor has nothing to gain by cheating. (2) a belief that there are safety mechanisms built into the Web site, and (3) by having a typical interface (4) one that is, moreover, easy to use.
Heijden et al. (2003) [139]	Empirical study (E-commerce - EJIS)	Trust, Risk, Intent to use, Ease-of-use	An empirical study in which the contributions of technology-oriented perspective and a trust-oriented perspective are investigated. The perceptions of 228 potential online shoppers are studied regarding trust and technology and their attitudes and intentions to shop online at particular websites. The trust-antecedent 'perceived risk' and the technology-antecedent 'perceived ease-of-use' directly influence the attitude towards purchasing online.
Grabner-Krauter and Kaluscha (2003) [58]	Literature review (E-commerce - IJHCS)	Intent to Use, Intent to Trust, Propensity to Trust, Use Behavior	Overview of 11 empirical research on trust in e-commerce. Synthesizes a set of trust constructs that facilitate better analysis of trust accross these studies. 'Intent to use', and 'use behaviour' require both 'Intent to trust' and 'Propensity to Trust'. Grabner-Krauter et al. use system trust and transactional trust as synonyms for 'Intent to trust' and 'Propensity to trust'

Trust effects literature study(*continued*)

Author (Year)	Arguments	Type (Field - Journal)	Constructs
McKnight et al. (2002) [96]	Building consumer trust is a strategic imperative for web-based vendors because trust strongly influences consumer intentions to transact with unfamiliar vendors via the web. Three key trust building levers that can be managed by web vendors (reputation, site quality, and structural assurance). Trust in the vendor is defined as a multi-dimensional construct with two inter-related components—trusting beliefs (perceptions of the competence, benevolence, and integrity of the vendor), and trusting intentions—willingness to depend (that is, a decision to make one-self vulnerable to the vendor). The model is tested in the context of a hypothetical web site offering legal advice.	Laboratory study (E-commerce - JSIS)	Site quality, Site Reputation, Willingness to depend, Trust beliefs, Intent to use, Risk, Stuctural assurance
Bhattacherjee (2002) [16]	Theoretically conceptualizes and empirically validates a trust scale within an e-commerce setting. The scale measure the dimensions: trustee's ability, benevolence, and integrity. Applies two field surveys of online retailing and online banking users, creates a final seven-item trust scale.	Empirical study (E-commerce - JMIS)	Familiarity, Intent to Use, Intent to Trust, Ability, Benevolence, Integrity
McKnight et al. (2002) [95]	Important paper in Trust literature. It contributes by proposing and validating measures for a model of trust in e-commerce. The model includes four high-level constructs—disposition to trust, institution-based trust, trusting beliefs, and trusting intentions—which are further specified into 16 measurable, subconstructs. A hypothetical legal advice Web site was used in surveying 1729 online users in order to provide empirical data to statistically test the model.	Theoretical analysis and Empirical study (E-commerce - ISR)	Propensity to Trust, Intent to Trust, Trusting beliefs: Benevolence, Ability, Integrity
Molla and Licker (2001) [98]	Proposal to update the original D&M model introducing two new variables — trust and support & service quality. No empirical study was performed.	Theoretical proposal (IS - JECR)	e-commerce system quality, content quality, use, user satisfaction, trust, support and service
Gefen (2000) [51]	Survey of 217 users testing the causal relationships of the antecedents 'Familiarity' and 'Propensity to trust' on constructs of 'Intent to Use' and 'Use Behaviour'. Both antecedents were found to have influecne yet Familiarity is far less significant than 'Propensity to trust'.	Empirical study (E-commerce - IJMS)	Familiarity, Intent to Trust, Propensity to Trust, Use Behavior

Trust effects literature study(*continued*)

Author (Year)	Arguments	Type (Field - Journal)	Constructs
McKnight et al. (1998) [93]	Literature study that introduces a typology of trust. It combines trust constructs found in extant literature into three main trusting beliefs: benevolence, ability and integrity. Also distuinguishes between trust beliefs, trust intentions and propensity to trust.	Theoretical analysis (Organizational science - AMR)	Propensity to Trust, Assurance, Benevolence, Integrity, Ability, Intent to Trust
Mayer et al. (1995) [91]	This frequently quoted article by Mayer, Davis and Schoorman lays the ground work for trust literature. The variables of 'Benevolence', 'Ability' and 'Integrity' are categorized and synthesized from the literature and combined as 'Trust beliefs'. Further important contributions include the constructs of 'Propensity to Trust', 'Perceived Risk' and 'Use Behaviour' (which is marked as a strange combination of Risk taking Relationship(!) and Outcomes).	Theoretical analysis and Literature study (Organizational science - AMR)	Benevolence, Ability, Integrity, Trust beliefs, Propensity to Trust, Perceived Risk, Use Behaviour

Appendix C

Operationalization

In the following tables the Success prediction and induction framework operationalization is given. Each table signifies an area of the model corresponding with the arguments presented in Chapter 6 - Theoretical contribution.

System quality measures

Dimension	Measure	Measures attributes such as
Usability	Understandability	whether new users can understand whether the software is (1) suitable and (2) how it can be used for particular tasks.
	Learnability	how long users take to learn how to use particular functions, and the effectiveness of help systems and documentation
	Operability	the suitability of the software for the task, self-descriptiveness of the software, suitability of the software for the task, self-descriptiveness of the software, controllability of the software and conformity of the software with user expectations
	Attractiveness	the appearance of the software, and will be influenced by factors such as aesthetics and style
	Compliance	adherence to standards, conventions, style guides or regulations relating to usability
Functionality	Suitability	the occurrence of an unsatisfied function or the occurrence of an unsatisfied operation during testing and user operation of the system
	Accuracy	the frequency of occurrence of inaccurate data
	Interoperability coverage	the number of functions or occurrences of less communicativeness involving data and commands, which is transferred easily between the software product and other systems, other software products, or equipment which are connected
	Security	the number of functions with, or occurrences of security problems

System quality measures(*continued*)

Dimension	Measure	Measures attributes such as
	Compliance	the number of functions with compliance problems, which is the software product failing to adhere to standards conventions, contracts or other regulatory requirements.
Reliability	Maturity	the software freedom of failures caused by faults existing in the software itself
	Fault tolerance	the software capability of maintaining a specified performance level in cases of operation faults or infringement of its specified interface
	Recoverability	the software with system being able to re-establish its adequate level of performance and recover the data directly affected in the case of a failure
	Compliance	the number of functions with, or occurrences of compliance problems, in which the software product fails to adhere to standards, conventions or regulations relating to reliability
Efficiency	Time behavior	the time behaviour of computer system including software during testing or operations
	Resource utilization	the utilised resources behaviour of computer system including software during testing or operating
	Compliance	the number of functions that fail to adhere to standards, conventions or regulations relating to efficiency
Maintainability	Analyzability	the maintainer's or user's effort or spent resources when trying to diagnose deficiencies or causes of failures, or for identifying parts to be modified
	Changability	the maintainer's or user's effort by measuring the behaviour of the maintainer, user or system including the software when trying to implement a specified modification
	Stability	unexpected behaviour of the system including the software when the software is tested or operated after modification
	Testability	the maintainer's or user's effort by measuring the behaviour of the maintainer, user or system including software when trying to test the modified or non-modified software
	Compliance	the number of functions with compliance problems, where is of the software product fails to adhere to required standards, conventions or regulations relating to maintainability
Portability	Adaptability	the behaviour of a user who is trying to adapt software to different specified environments
	Installlability	the behaviour of users trying to install the software in a user specific environment
	Co-existence	the behaviour of using the software with other independent software in a common environment sharing common resources
	Replacability	the behaviour of using the software in place of other specified software in the environment of that software

System quality measures(*continued*)

Dimension	Measure	Measures attributes such as
	Compliance	the number of functions with compliance problems, where the software product fails to adhere to required standards, conventions or regulations relating to portability

Table C.2: Information quality measures

Measure	Description	Source
Usefulness	The extent to which the information is useful	[34]
Relevance	How relevant is the content to users	[34, 98]
Importance	The importance to users of provided information	[34, 35]
Completeness	The extent to which the information is complete	[98, 106, 35]
Understandability	The extent to which the information is understandable	[34, 98]
Customisability	How much of the sites information can be customized	[34, 10]
Currency	How current is the information, how often is the content updated	[35]
Personalization	The extent to which information can be personalized	[35, 10]
Accuracy	How accurate is the provided information	[34, 98]
Privacy	Is personal information adequately closed	[34]
Clarity	How clear is the provide information	[34]
Conciseness	The extent of conciseness of information	[34]
Reliability	How reliable is the presented information	[34]
Uniqueness	The extent of uniqueness of given information	[34]
Variety	The variety of the presented information	[106, 35]

Table C.3: Service quality measures (adapted from ServQual)

Measure	Description
Reliability	A complete overview of the order is presented before final purchase decision
	Pricing, tax and/or other charges are clearly detailed
	Different payment options are stated clearly
	All relevant order confirmation details is sent by email within 24 hours
	Access to anticipated delivery times is available at all times
	Terms and conditions of sales are accessible
	Order tracking details are available until delivery
	Order cancellation and returns details are confirmed within three days
	Full details of product or service pricing are available
	The registration process is simple
	Full product or service characteristics are available
Responsiveness	The frequently asked questions and answers contain links that take the user to the relevant page(s)
	Information is provided to frequently asked questions and answers
	Queries or complaints are resolved within 24 hours
	User feedback is sought to measure customer satisfaction
	An email address for queries and complaints is provided
Assurance	Privacy policy is accessible and clear
	Security policy is accessible and clear
	Terms and conditions are accessible and clear
	External validation of trustworthiness is present
	The web site contains company details
Empathy	Links are provided to pages on related products and services
	Customization preferences and the personal information is retained
	Search is provided for important or all information
	A customer platform is provided for exchange of ideas

Table C.4: Usage Measures (from D&M model)

Dimension	Measure	Source
Amount of use	No. hits	[29, 35, 34]
	Length of stay	[35]
	No. users	
	Regularity of use	[34]
	Recurring use	
	Growth rate	
	External measures (e.g. Alexa)	[106]
Nature of use	Functions used	[34]
	Received orders	
	Conversion rate	
	Service requests	[106, 87]
	General vs specific	[34]
	Interaction type	[96, 111]
Potential use	Actual vs reported use	[78]
	Use vs nonuse	[78]
	Use vs Opportunity to use	[78, 35]

Table C.5: User Satisfaction Measures

Dimension	Measure	Source
Decision support satisfaction	Use of the website enables me to make better purchasing decisions	[48]
	This website enables me in making decisions more efficiently	[33]
	Use of this website enables me to set my priorities in making the decision	[48]
Task support satisfaction	This web site is more useful than I had expected	[47]
	This web site is extremely useful	[48]
	Using this web site enables me to accomplish tasks more quickly	[33]
	This web site makes it easier to do my task	[33]
Interface satisfaction	The information provided by this web site is clear and understandable	[47]
	Learning to use this web site was easy for me	[33]
	This web site is user-friendly	[33]
	This web site is easy to use	[33]
	I found it easy to get this web site to do what I want it to do	[33]
	My interaction with this web site was clear and understandable	[33]
	It would be easy for me to become skillful at using this web site	[33]
	This web site is easy to navigate	[33]

Table C.6: Net Benefit Measures

NET BENEFIT MEASURES	Source
Organizational Benefits	
(NB1). Sales revenue	[34]
(NB2). Stock value	[34]
(NB3). Incremental additional sales	[34]
(NB4). Total profit	[34]
(NB5). Market share	[34]
Customer Benefits	
(NB6). Task effectiveness: What proportion of the goals of the task is achieved correctly	[4]
(NB7). Task completion: What proportion of tasks are completed	[4]
(NB8). Task time decrease: How much shorter does it take to complete a task	[4]
(NB9). Task efficiency: How efficient are the users	[4]
(NB10). Economic productivity: How cost effective are the users	[4]
(NB11). Productive proportion: Proportion of the time the user performs productive actions	[4]
(NB12). Relative user efficiency: How efficient is a user compared to an expert	[4]
(NB13). User safety: What is the incidence of health problems among users	[4]
(NB14). Populace Safety: What is the incidence of hazard to people affected by the system	[4]
(NB15). Economic damage: What is the incidence of economic damage	[4]
(NB16). Software damage: What is the incidence of software corruption	[4]

Table C.7: Perception items of UTAUT - adapted from Venkatesh et al. (2003)

PERCEPTION ITEMS

1. Performance expectations

(PE1). Using the system would enable me to accomplish certain tasks more quickly.
(PE2). Using the system would enhance my effectiveness in doing my tasks.
(PE3). Using . . . would make it easier to do . . . which is important to me.
(PE4). Using . . . would increase the quality of my work.

2. Effort Expectancy

(EE1). Interaction with the system would be clear and understandable.
(EE2). It would be easy for me to become skillful at using the system.
(EE3). I would find the system easy to use.
(EE4). Learning to operate the system is easy for me.

3. Social factors

(SF1). People who influence my behavior think I should use the system.
(SF2). People who are important to me think I should use the system.
(SF3). I use the system because of the proportion of people I know who use the system.
(SF4). People who use the system have more prestige than those who don't.

4. Facilitating conditions

(FC1). I have the information necessary to use the system.
(FC2). I have the resources necessary to use the system.
(FC3). The system is not compatible with other systems I use.
(FC4). I feel I can find enough help service if I need it.

5. Behavioral Intention

(BI1). I intend to use the system in the next few weeks.
(BI2). I predict I would use the system in the next few weeks.
(BI3). I plan to use the system in the next few weeks.

Bibliography

[1] *ISO/IEC 9126-1, Software Engineering - Product quality – Part 1: Quality model*, 2001. 62, 69, 80

[2] *ISO/IEC 9126-2, Software Engineering - Product quality – Part 2: External quality metrics*, 2003. 69

[3] *ISO/IEC 9126-3 Software Engineering - Product quality – Part 3: Internal quality metrics*, 2003. 69

[4] *ISO/IEC 9126-4 Software Engineering - Product quality – Part 4: Quality in use metrics*, 2004. 69, 71, 95

[5] I. Ajzen and M. Fishbein. *Understanding Attitudes and Predicting Social Behavior*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1980. 56

[6] Chris Anderson. The long tail. *Change This Manifesto*, Dec 2004. 1

[7] David J. Anderson. Stretching agile to fit cmmi level 3. June, Dec 2005. 14

[8] W. B. Arthur. Increasing returns and the new world of business. *Harvard business review*, 74(4), 1996. 38, 40, 42, 83

[9] Donovan Artz and Yolanda Gil. A survey of trust in computer science and the semantic web, 2007. Journal of Web Semantics. 23, 86

[10] A Barua, AB Whinston, and F Yin. Value and productivity in the internet economy. *Computer*, 33:102–105, 2000. 22, 92

[11] R. A. Bauer. *Risk Taking and Information Handling in consumer behavior*, chapter Consumer behavior as risk taking, pages pp. 389–398. Cambridge: Harvard University Press, 1960. 53

[12] Tim Berners-Lee. Weaving the web. *Harper*, 1999. 7

[13] Tim Berners-Lee, W. Hall, J. Hendler, K. O'Hara, N. Shadbolt, and D. Weitzner. A framework for web science. *Foundations and Trends in Web Science*, 1(1), 2006. 1, 2, 24, 49, 50

[14] Tim Berners-Lee, J. Hendler, and O. Lassila. The semantic web. *Scientific American*, 2001. 50, 53

[15] Stanley. M. Besen and Joseph Farell. Choosing how to compete - strategies and tactics in standardization. *The journal of economic perspectives*, 8(2):117–131, 1994. 32, 35, 38, 40, 42, 43, 44, 84

[16] Anol Bhattacherjee. Individual trust in online firms: Scale development and initial test. *Journal of Management Information Systems*, 19(1):211–241, 2002. 22, 57, 88

[17] Timothy F. Bresnahan. Technological competition and the structure of the computer industry. *The Journal of industrial economics*, 47(1):1–40, 1999. 38, 40

[18] Timothy F. Bresnahan. Network effects and microsoft. Timothy Bresnahan served as chief economist of the antitrust division in 1999 and 2000 and as a consultant to the division on U.S. v Microsoft., 2002. 23

[19] Rui Chen. Modeling of user acceptance of consumer e-commerce website. *WISE*, Oct 2005. 19, 24

[20] CHANG-HOAN CHO, JAEWON KANG, and HONGSIK JOHN CHEON. Online shopping hesitation. *CyberPsychology and Behavior*, 9(3):261–274, Jun 2006. 1

[21] Clayton M. Christensen. *The innovators Dilemma*. HarperBusiness, 2000. 36, 42, 44

[22] Erin Cody-Allen and Rajiv Kishore. An extension of the utaut model with e-quality, trust, and satisfaction constructs. In *SIGMIS CPR '06: Proceedings of the 2006 ACM SIGMIS CPR conference on computer personnel research*, pages 82–89, New York, NY, USA, 2006. ACM Press. 57, 86

[23] James S. Coleman. Social capital in the creation of human capital. *Amercian Journal of Sociology*, 94:95–129, 1988. 23

[24] T. Coltman, T. M. Devinney, A. Latukefu, and D. F. Midgley. E-business: Revolution, evolution, or hype? *CALIFORNIA MANAGEMENT REVIEW*, 44(1):57–+, Fal 2001. 1

[25] Comscore. Total e-commerce reaches usd95 billion during first half of 2007, September 2007. 1

[26] Efhtymios Constantinides. *Virtual Marketing - New rules and challenges in the networked marketplace*. PhD thesis, University of Twente, 2005. 1, 8, 9, 10, 11, 44

[27] CL Corritore. On-line trust: concepts, evolving themes, a model. *International journal of human-computer studies*, 58(6):737–758, 2003. 19

[28] Cynthia L. Corritore, Robert P. Marble, Susan Wiedenbeck, and beverly Kracher. Measuring online trust of websites: Credibility, perceived ease of use, and risk. In *Proceedings of the Eleventh Americas Conference on Information Systems*, volume 11, Omaha, NE, USA, August 2005. 1

[29] J. D'Ambra. Emerging factors in user evaluation of the world wide web. *Information & management*, 38(6):373–384, 2001. 94

[30] World Development Indicators database. Gross domestic product, September 2007. 1

[31] Paul A. David. Clio and the economics of qwerty. *The American economic review*, 75(2):332–337, 1985. 35, 38, 40, 85

[32] F. D. Davis and V. Venkatesh. A critical assessment of potential measurement biases in the technology acceptance model: Three experiments. *INTERNATIONAL JOURNAL OF HUMAN-COMPUTER STUDIES*, 45(1):19–45, Jul 1996. 20

[33] Fred D. Davis, Rcihard P. Bagozzi, and Paul R. Warschaw. User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35(8):982–1003, 1989. 19, 20, 71, 94

[34] William H. DeLone and Ephraim R. McLean. Information systems success: The quest for the dependent variable. *Information Systems Research*, 3(1):60–95, March 1992. 3, 16, 19, 28, 69, 92, 94, 95

[35] William H. DeLone and Ephraim R. McLean. The delone and mclean model of information systems success: A ten-year update. *Journal of Management Information Systems*, 19(4):9–30, Oct 2003. 2, 3, 4, 16, 19, 28, 29, 69, 70, 92, 94

[36] William H. DeLone and Ephraim R. McLean. Measuring e-commerce success: Applying the delone and mclean information systems success model. *International Journal of Electronic Commerce*, 9(1):31–47, Jul 2004. 18, 19, 70, 77, 78

[37] Robert Dubin. *Theory Building*, volume 2nd revised edition. Free Press, February 1978. 26

[38] Thomas P. Van Dyke, Victor R. Prybutok, and Leon A. Kappelman. Cautions on the use of the servqual measure to assess the quality of information systems services. *Decision Sciences*, 30(3):1–15, Summer 1999. 70

[39] Nicholas Economides. The economics of networks. *International Journal of Industrial Organization*, 14(2):673–699, 1996. 22, 23, 31, 32, 35, 36, 37, 40, 42, 83

[40] Nicholas Economides and Katsamakas Evangelos. Two-sided competition of proprietary vs. open source technology platforms and the implications for the software industry. *Management science*, 52(7):1057–1071, 2006. 23

[41] T Eisenmann. Strategies for two-sided markets. *Harvard business review*, 84(10), 2006. 21

[42] Joseph Farrell and Garth Saloner. Standardization, compatibility, and innovation. *The Rand journal of economics*, 16(1), 1985. 35, 38, 42, 43, 85

[43] Stefan J. Fountain and Efhtymios Constantinides. Web 2.0: Conceptual foundations and research agenda. Submitted for pucliation to the Journal of Direct, Data and Digital Marketing Practice, 2007. 1, 10

[44] Francis Fukuyama. *Trust*. Free Press, 1995. 23, 47, 49

[45] Suzanne Garcia and Richard Turner. *CMMI Survival Guide*. Addison-Wesley, 2007. 14

[46] Jesse James Garrett. *The elements of user experience*. New Riders, Indianapolis, USA, 2002. 7, 12

[47] Edward J. Garrity, Bonnie Glassbergb, Yong Jin Kim, G. Lawrence Sanders, and Seung Kyoon Shine. An experimental investigation of web-based information systems success in the context of electronic commerce. *Decision support systems*, 39(3):485–503, 2005. 1, 94

[48] Edward J. Garrity and G. Lawerence Sanders. Dimensions of information systems success. pages 13–45, 1998. 16, 18, 71, 77, 78, 94

[49] D. A. GARVIN. Product quality - an important strategic weapon. *Business horizons*, 27(3):40–43, 1984. 13, 15

[50] D. A. GARVIN. What does product quality really mean. *Sloan management review*, 26(1):25–43, 1984. 13

[51] David Gefen. E-commerce: the role of familiarity and trust. *International Journal of Management Science*, 28(6):725–737, 2000. 57, 88

[52] David Gefen, Elena Karahanna, and Detmar W. Straub. Inexperience and experience with online stores: The importance of tam and trust. *IEEE transactions on engineering management*, 50(3):307–321, August 2003. 71

[53] David Gefen, Elena Karahanna, and Detmar W. Straub. Trust and tam in online shopping: An integrated model. *MIS quarterly*, 27(1):51–90, March 2003. 57, 71, 87

[54] R Geist. Computing research programs in the us. *Communications of the ACM*, 39(12):96–99, 1996. 27

[55] George Gilder. Metcalfe's law and legacy. *Forbes*, 1993. 33

[56] Robert L. Glass, V. Ramesh, and Iris Vessey. An analysis of research in computing disciplines. *Communications of the ACM*, 47(6):89–94, June 2004. 27

[57] Google. Google to acquire youtube for usd 1.65 billion in stock, September 2007. 1

[58] S. Grabner-Krauter and E. A. Kaluscha. Empirical research in on-line trust: a review and critical assessment. *INTERNATIONAL JOURNAL OF HUMAN-COMPUTER STUDIES*, 58(6):783–812, Jun 2003. 48, 49, 50, 53, 57, 87

[59] Paul Graham. The power of the marginal. *Change This Manifesto*, 26, Sep 2003. 1

[60] D Grewal. Internet retailing: enablers, limiters and market consequences. *Journal of business research*, 57(7):703–713, 2004. 1, 24, 48

[61] David Heinemeir Hanssen and Jason Fried. *Getting Real*. 37signals, 2006. 1

[62] Lloyd C. Harris and Mark M.H. Goode. The four levels of loyalty and the pivotal role of trust: a study of online service dynamics. *Journal of Retailing*, 80:139–158, Jun 2004. 19, 24, 48

[63] http://blog.compete.com/2006/10/05/youtube-googlevideo-site-lonelygirl15-traffic-growth 2006/. Google video is no match for youtube!, October 2006. 44

[64] http://blogs.zdnet.com/web2explorer/?p=284. Youtube may be the fastest growing website ever!, October 2006. 44

[65] IDC. Idc report on internet usage 2007, September 2007. 1

[66] Juhani Iivari. An empirical test of the delone-mclean model of information system success. *SIGMIS Database*, 36(2):8–27, 2005. 4, 18, 69, 76, 77, 78

[67] M. L. Katz and Carl Shapiro. Network externalities, competition, and compatibility. *The American economic review*, 75(3), 1985. 37, 38, 43, 84

[68] Micheal L. Katz and Carl Shapiro. Technology adoption in the presence of network externalities. *The journal of political economy*, 94(4), 1986. 43, 84

[69] Micheal L. Katz and Carl Shapiro. Systems competition and network effects. *The journal of economic perspectives*, 8(2):93–115, 1994. 6, 31, 32, 35, 37, 40, 42, 43, 84

[70] T.K. Keat and A. Mohan. Integration of tam based electronic commerce models for trust. *Journal of American Academy of Business*, 5(1):404–410, 2004. 6, 56

[71] W. J. Kettinger and C. C. Lee. Perceived service quality and user satisfaction with the information services function. *Decision Sciences*, 25(5–6):737–765, 1995. 70

[72] Davis Kho. Networking opportunities: Social networking for business. *Econtent*, May, Jul 2007. 21, 22

[73] K. M. Kimery and M. McCord. Third part assurances: Mapping the road to trust in e-retailing. *Journal of Information Technology Theory and Application*, 4(2):63–83, 2002. 6, 56

[74] S. Klepper. Entry, exit, growth, and innovation over the product life cycle. *AMERICAN ECONOMIC REVIEW*, 86(3):562–583, Jun 1996. 66

[75] Chulmo Koo, Jaeki Song, Yong Jin Kim, and Kichan Nam. Do e-business strategies matter? the antecedents and relationship with firm performance. *Information systems frontiers*, 9(2-3):283–296, 2007. 2

[76] Philip Kotler and Kevin Lane Keller. *Marketing management*. Prentice Hall, 12th edition, 2006. 8, 10

[77] Huei-Huang Kuan and Gee-Woo Bock. Trust transference in brick and click retailers: An investigation of the before-online-visit phase. Feb 2007. This study very important in regards to its reasoning about trust. Much is said in regards to offline and online trust, yet not in regards to other factors that influence online trust. 1

[78] K. Lassila. Adoption and utilization of commercial software packages: Exploring utilization equilibria, transitions, triggers, and tracks. *Journal of management information systems*, 16(2):63–90, 1999. 18, 70, 77, 94

[79] Younghwa Lee and Kenneth A. Kozar. Investigating the effect of website quality on e-business success: An analytic hierarchy process (ahp) approach. *Decision Supoprt Systems*, (42):1383–1401, 2006. 2, 18, 77

[80] Timothy C. Lethbridge and Robert Laganière. *Object Oriented Software Engineering*. McGraw Hill, UK, 2001. 69

[81] XT Li. Cheap talk and bogus network externalities in the emerging technology market. *Marketing science*, 24(4):531–543, 2005. 1, 81

[82] S. J. Liebowitz and Stephen E. Margolis. Path dependence, lock-in and history. *The journal of law, economics, & organization*, 11(1):205–226, 1995. 40, 83

[83] Stan J. Liebowitz and Stephen E. Margolis. Are network externalities a new source of market failure? *Research in Law and Economics*, 17(1):1–22, 1995. 6, 31, 83

[84] Rensis Likert. A technique for the measurement of attitudes. *Archives of Psychology*, 140:1–55, 1932. 41

[85] Kai H. Lim, Choon Ling Sia, Metthew K.O. Lee, and Izak Benbasat. Do i trust you online, and if so, will i buy? an empirical study of two trust-building strategies. *Journal of Management Information Systems*, 23(2):233–266, Jul 2006. 1, 24, 48

[86] Hsiu-Fen Lin and Gwo-Guang Lee. Determinants of success for online communities: an empirical study. *Behaviour and Information Technology*, 25(6):479–488, November - December 2006. 18, 21, 22, 76

[87] C. Liu. Exploring the factors associated with web site success in the context of electronic commerce. *Information & management*, 38(1):23–33, 2000. 94

[88] H. Lou, W. Lou, and D. Strong. Percieved critical mass effect on groupware acceptance. *European Journal of Information Systems*, 9:91–103, Aug 2000. 21, 22, 38, 42, 82

[89] N. Luhmann. *Vertrauen. Ein Mechanismus der Reduktion sozialer Komplexit*. Enke, Stuttgart, 1989. 49, 50, 51

[90] Thomas W. Malone, Peter Weill, Richard K. Lai, Victoria T. D'Urso, George Herman, Thomas G. Apel, , and Stephanie L. Woerner. Do some business models perform better than others? *MIT-Sloan School of Management*, Jul 2006. 18, 77

[91] R. C. Mayer, J. H. Davis, and F. David Schoorman. An integrative model of organizational trust. *ACADEMY OF MANAGEMENT REVIEW*, 20(3):709–734, Jul 1995. 6, 48, 50, 51, 52, 53, 55, 57, 89

[92] Survey McKinsey. How businesses are using web 2.0: A mckinsey global survey, March 2007. 1

[93] D. McKnight, Larry L. Cummings, and Norman L. Chervany. Initial trust formation in new organizational relationships. *The Academy of Management review*, 23(3):473–490, 1998. 55, 57, 89

[94] D. Harrison McKnight, Vivek Choudhury, and Charles Kacmar. Trust in e-commerce vendors: a two-stage model. In *ICIS '00: Proceedings of the twenty first international conference on Information systems*, pages 532–536, Atlanta, GA, USA, 2000. Association for Information Systems. 9, 51, 57, 58, 64

[95] D. Harrison McKnight, Vivek Choudhury, and Charles Kacmar. Developing and validating trust measures for e-commerce: An integrative typology. *Information systems research*, 13(3):334–359, 2002. 22, 49, 50, 51, 53, 55, 57, 58, 88

[96] D. Harrison McKnight, Vivek Choudhury, and Charles Kacmar. The impact of initial consumer trust on intentions to transact with a web site: a trust building model. *The Journal of Strategic Information Systems*, 11(3-4), 2002. 49, 51, 54, 55, 57, 88, 94

[97] P. T. Meade and L. Rabelo. The technology adoption life cycle attractor: Understanding the dynamics of high-tech markets. *Technological Forecasting and Social Change*, 71(7):667–684, Sep 2004. 66

[98] Alemayehu Molla and Paul S. Licker. E-commerce success: an attempt to partially extend the delone and mclean's model of is success. *Journal of Electronic Commerce Research*, 2(4), Dec 2001. 4, 16, 18, 19, 24, 57, 76, 77, 88, 92

[99] Daniel L. Moody. *Lecture notes Information Systems Research Methods*. University of Twente, April - July 2007. 26

[100] Daniel L. Moody and Graeme G. Shanks. Improving the quality of data models: empirical validation of a quality management framework. *Information Systems*, 28:619–650, 2003. 4

[101] Gary C. Moore and Benbasat. Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information systems research*, 2(3), 1991. 71

[102] Geoffrey A. Moore. *Crossing the chasm: Marketing and selling disruptive products to mainstream customers.* HarperBusiness, 1991. 66

[103] Goeffrey A. Moore. *Inside the Tornado.* Harper Business Books, New York, 1999. 44, 66

[104] R. M. Morgan. The commitment - trust theory of relationship marketing. *The Journal of Marketing*, 58(3):20–38, 1994. 22, 56

[105] M. O'Neill. Disconfirming user expectations of the online service experience: inferred versus direct disconfirmation modeling. *Internet research*, 13(4):281–296, 2003. 58

[106] J. W. Palmer. Web site usability, design, and performance metrics. *Information systems research*, 13(2):151–167, 2002. 1, 2, 92, 94

[107] A. Parasuraman, Valarie A. Zeithaml, and Leonard L. Berry. Servqual - a multiple-item scale for measuring consumer perceptions of service quality. *Journal of retailing*, 64(1):12–40, 1988. 70

[108] A. Parasuraman, Valarie A. Zeithaml, and Leonard L. Berry. Refinement and reassessment of the servqual scale. *Journal of retailing*, 67(4):420–450, 1991. 70

[109] Geoffrey G. Parker and Marshall W. Van Alstyne. Two-sided network effects: A theory of information product design. *Management science*, 51(10):1494–1504, 2005. 81

[110] Shaun Pather, Geoff Erwin, and Dan Remenyi. Measuring e-commerce effectiveness: A conceptual model. Aug 2003. 6, 19

[111] P. A. Pavlou. Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model. *INTERNATIONAL JOURNAL OF ELECTRONIC COMMERCE*, 7(3):101–134, Spr 2003. 48, 50, 53, 57, 87, 94

[112] Chad Perry. A structured approach to presenting theses. *Australasian Marketing Journal*, 6(1):63–86, 1998. 5

[113] L. F. Pitt, R. T. Watson, and C. B. Kavan. Service quality: A measrue of informatino systems effectiveness. *MIS Quarterly*, 19(2):173–188, 1995. 70

[114] Prabhakar Raghavan. Social networks from the web to the enterprise. *IEEE Internet Computing*, 2002. 21

[115] R. Kelly Rainer and Mark D. Miller. Examining differences across journal rankings. *Commun. ACM*, 48(2):91–94, 2005. 27

[116] Shivaram Rajgopal, Mohan Venkatachalam, and Suresh Kotha. The value relevance of network advantages: The case of e-commerce firms. *Journal of Accounting Research*, 41(1):135–162, Jan 2003. 21

[117] David P. Reed. That sneaky exponential. *Context magazine*, Spring 1999. 34, 38, 40, 42, 82

[118] Carol A. Reeves and David A. Bednar. Defining quality - alternatives and implications. *The Academy of Management review*, 19(3):419–445, 1994. 15

[119] Frederick F. Reicheld and Phil Schefter. E-loyalty: your secret weapon on the web. *harvard Business Review*, 78:105, Jul 2000. 18, 19, 24, 48, 77

[120] N. Rescher. *Cognitive Systematization*. Basil Blackwell, Oxford, 1979. 29

[121] Jean-Charles Rochet and Jean Tirole. Platform competition in two-sided markets. *Journal of the European Economic Association*, 1(4):990–1029, 2003. 36

[122] Jean-Charles Rochet and Jean Tirole. Two-sided markets: a progress report. *The Rand journal of economics*, 37(3):645–667, 2006. 36

[123] Julian B. Rotter. A new scale for measurement of interpersonal trust. *Journal of personality*, 35(4), 1967. 50

[124] D. M. Rousseau, S. B. Sitkin, R. S. Burt, and C. Camerer. Not so different after all: A cross-discipline view of trust. *ACADEMY OF MANAGEMENT REVIEW*, 23(3):393–404, Jul 1998. 55

[125] F. David Schoorman. Integrating trust perspectives: Foundations for a revised integrative model of organizational trust. In *Discussant at symposium during the Annual meeting of the Academy of Management*, Denver, 2002. 56

[126] F. David Schoorman, Roger C Mayer, and James H. Davis. An integrative model of organizational trust: Past, present and future. *Academy of Management Review*, 32(2):344–354, Jul 2007. 22, 55, 57, 64, 86

[127] W. Richard Scott. *Organizations: rational, natural and open systems*. Prentice Hall, New Jersey, USA, 1981. 5

[128] SEA 2003. *ISO/IEC SQuaRE. The second generation of standards for software product quality*, Marina del Rey, USA, November 2003. IASTED. 13, 14

[129] Peter B. Seddon. A respecification and extension of the delone and mclean model of is success. *Information systems research*, 8(3):240–253, 1997. 16, 18, 19, 78

[130] Carl Shapiro and Hal R. Varian. *Information Rules: A strategic guide to the network economy*. Harvard business school press, 1999. 22, 30, 31, 32, 35, 42, 43

[131] Eleanor Shaw and Lindsay Stringfellow. Book review: Networks, trust and social capital. *International Small Business Journal*, 24(4):424, Jul 2006. 19, 76

[132] Oz Shy. *The Economics of Network Industries*. Cambridge University Press, 2001. 19, 21, 22, 30, 33, 37, 38, 42

[133] Ramanathan Somasundaram. Operationalizing critical mass as the dependent variable for researching the diffusion of emarketplaces. *17th Bled eCommerce Conference*, 2004. 22

[134] B.H. Sun. Product strategy for innovators in markets with network effects. *Marketing science*, 23(2):243–254, 2004. 4

[135] James Surowiecki. *The Wisdom of Crowds: Why the Many Are Smarter Than the Few and How Collective Wisdom Shapes Business, Economies, Societies and Nations.* Little, Brown, 2004. 38, 40, 82

[136] Don Tapscott and Anthony D. Williams. *Wikinomics, How Mass collaboration Changes Everything.* Portfolio, 2006. 1, 17, 38, 40, 42, 77, 81

[137] S. Taylor. Understanding information technology usage - a test of competing models. *Information systems research*, 6(2):144–176, 1995. 18, 71, 77

[138] C. Tomkins. Inter-dependencies, trust and information in relationships, alliances and networks. *ACCOUNTING ORGANIZATIONS AND SOCIETY*, 26(2):161–191, Mar 2001. 49

[139] Hans van der Heijden, Tibert Verhagen, and Marcel Creemers. Understanding online purchase intentions: contributions from technology and trust perspectives. *European Journal of Information Systems*, 12(1), 2003. 57, 87

[140] Jos van Iwaarden and Ton van der Wiele. A study on the applicability of servqual dimensions for websites. *Erasmus Research in Management*, pages 1 – 31, 2002. 70

[141] P. R. Varadarajan. The journal of marketing, 1993 to 1996. *The Journal of marketing*, 60(4):1–2, 1996. 4

[142] V. Venkatesh and F. D. Davis. A model of the antecedents of perceived ease of use: Development and test. *DECISION SCIENCES*, 27(3):451–481, Sum 1996. 20

[143] V. Venkatesh and F. D. Davis. A theoretical extension of the technology acceptance model: Four longitudinal field studies. *MANAGEMENT SCIENCE*, 46(2):186–204, Feb 2000. 20

[144] Viswanath Venkatesh, Micheal G. Morris, Gordon B Davis, and Fred D. Davis. User acceptance of information technology: toward a unified view. *MIS Quarterly*, 27(3):425–478, September 2003. 3, 20, 21, 37, 42, 71

[145] Bronis Verhage. *Grondslagen van de marketing.* Stenfert Kroese, 5th edition, 2001. 9, 10

[146] Weber. The problem of the problem. *MIS Quarterly*, 27(1):iii–ix, March 2003. 26

[147] Weber. Theoretically speaking. *MIS Quarterly*, 27(3):iii–xiii, September 2003. 26

[148] R. Weiber and J. Adler. Informations okonomisch begr. undete typologisierung von kaufprozessen. *Schmalenbachs Zeitschrift f .ur betriebswirtschaftliche Forschung*, 47(1):43–65, 1995. 49

[149] A. C. Wicks, S. L. Berman, and T. M. Jones. The structure of optimal trust: Moral and strategic implications. *ACADEMY OF MANAGEMENT REVIEW*, 24(1):99–116, Jan 1999. 49

[150] R. J. Wieringa, N. A. M. Maiden, N. Mead, and C. Rolland. Requirements engineering paper classification and evaluation criteria: A proposal and a discussion. *Requirements Engineering*, 11(1):102–107, March 2006. 4

[151] Roel Wieringa. *Design methods for reactive systems.* Morgan Kaufmann, 2003. 11

[152] Witt. "lock-in" vs. "critical masses" - industrial change under network externalities. *International journal of industrial organization*, 15(6), 1997. 36, 38, 40, 42, 82

[153] Evans Witt. A matter of trust: What users want from web sites. *Princeton Survey Research Associates*, Apr 2002. 1

[154] Valarie A. Zeithaml, Leonard L. Berry, and A.Parasurman. The behavioral consequences of service quality. *The Journal of marketing*, 60(2):31–46, 1996. 70

[155] Xianfeng Zhang and Qin Zhang. Online trust forming mechanism: approaches and an integrated model. In *ICEC '05: Proceedings of the 7th international conference on Electronic commerce*, pages 201–209, New York, NY, USA, 2005. ACM Press. 57, 87

[156] Xiaoni Zhang and Victor R. Prybutok. A consumer perspective of e-service quality. *IEE Transactions on engineering management*, 52(4):461–477, Oct 2005. 1

[157] K. Zhu and K. L. Kraemer. e-commerce metrics for net-enhanced organizations: Assessing the value of e-commerce to firm performance in the manufacturing sector. *INFORMATION SYSTEMS RESEARCH*, 13(3):275–295, Sep 2002. 2

[158] L. G. Zucker. Production of trust: institutional sources of economic structure. *Research in Organizational Behavior*, pages 1840–1920, 1986. 50