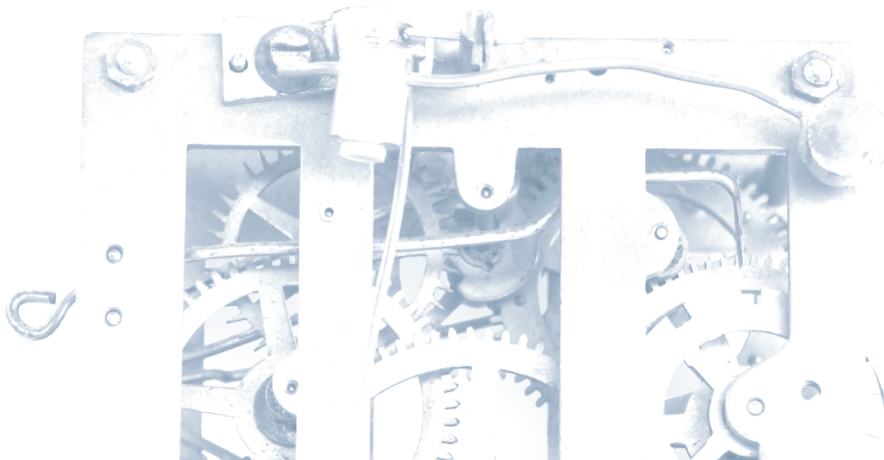


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Preface

Electronic markets have been a prominent topic of research for the past decade. Moreover, we have seen the rise but also the disappearance of many electronic marketplaces in practice. Today, electronic markets are a firm component of inter-organisational exchanges and can be observed in many branches.

The Research Symposium on Emerging Electronic Markets is an annual conference bringing together researchers working on various topics concerning electronic markets in research and practice. The focus theme of the 13th Research Symposium on Emerging Electronic Markets (RSEEM 2006) was “Evolution in Electronic Markets”. Looking back at more than 10 years of research activities in electronic markets, the evolution can be well observed. While electronic commerce activities were based largely on catalogue-based shopping, there are now many examples that go beyond pure catalogues. For example, dynamic and flexible electronic transactions such as electronic negotiations and electronic auctions are enabled. Negotiations and auctions are the basis for inter-organisational trade exchanges about services as well as products. Mass customisation opens up new opportunities for electronic markets. Multi-channel electronic commerce represents today’s various requirements posed on information and communication technology as well as on organisational structures. In recent years, service-oriented architectures of electronic markets have enabled ICT infrastructures for supporting flexible e-commerce and e-market solutions.

RSEEM 2006 was held at the University of Hohenheim, Stuttgart, Germany in September 2006. The proceedings show a variety of approaches and include the selected 8 research papers. The contributions cover the focus theme through conceptual models and systems design, application scenarios as well as evaluation research approaches.

I would like to thank the PC members as well as the members of the organising committee for their support and commitment.

Mareike Schoop, University of Hohenheim, Germany
Conference Chair

Voice over IP – Infrastructure vs. Market Service?

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Abstract: Voice over IP is a new communication technology. Today it is mainly utilized as a new infrastructure for telephony. It can be integrated in services, adapted to support business processes. In this paper we analyze the adoption and diffusion process of VoIP technology. Our goal is to find out whether Voice over IP is “just another infrastructure” or a new service to be integrated with other services. The research is case study based and the result is a set of hypotheses for further empirical research.

1 Introduction and Motivation

Voice over IP (VoIP) is a relatively new communications technology. From a consumer perspective it is typically associated with the promise “telephone for free”. Skype is the most prominent example of a VoIP application and community sites like OpenBC or eBay integrate Skype into their sites to offer a new kind of connectedness and telephone for free for their communities. From a business perspective its lower communication and lower infrastructure costs, as well as its promising new design possibilities for business processes, seem to distinguish this technology.

We are interested in how this technology is currently being utilized by consumers and organizations. Furthermore, we are interested in the drivers of the technology adoption by consumers and organizations. We ask the following questions:

- Is this technology “just” another telecommunications technology and basic infrastructure for electronic markets or intra- and interorganizational systems?
- Does VoIP technology have the potential of being integrated as an electronic service among other business services?

In our research we analyze the adoption and diffusion process of VoIP technology. We analyze the factors that drive technology adoption and diffusion as well as the impact of this technology for existing business models, on the intra- and inter-organizational level.

Our research is exploratory and our results are research hypotheses. We begin with a brief outline of the theory that guides our research (Sect. 2). We provide a brief introduction to VoIP technology (Sect. 3) and an overview of the method (Sect. 4). To gain the necessary data for our analysis we conducted four in-depth interviews on the use of VoIP within organizations and two case studies on the usage of VoIP in the consumer sector. Based on this empirical data we analyze the current state of the adoption and diffusion of VoIP in the market and its potential for business model innovation and summarize the new findings (Sect. 6). Our result is a collection of hypotheses on adoption and diffusion of VoIP technology and its impact on electronic markets. A discussion and an overview of future work conclude the paper.

2 Theory Background

The objective of this paper is to analyze the diffusion of VoIP technologies and the impact of this diffusion on electronic markets. Our analysis is based on

- Rogers universal theory on innovation diffusion and its adoption,
- Shapiro’s and Varian’s theory on network and feedback effects specific for ICT innovation diffusion,
- Timmer’s and Stähler’s theory on business models and its innovations.

We refer to Rogers standard work on Diffusion of Innovations because of its relevance for the innovation research field. We access Shapiro’s and Varian’s theory on network and feedback effects in order to find patterns specific for ICT. Finally we adopt Timmer’s and Stähler’s theory on business models and its innovations for relating technological with business centered aspects.

Diffusion and Adoption of Innovation

Rogers describes Innovation Diffusion in his standard work on Diffusion of Innovations as a “process in which an innovation is communicated through certain channels over time among the members of a social system”. According to Rogers “an innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption” [Ro95]. Therefore an innovation does not necessarily need to be invented by the adopter to call it innovation. VoIP, which has existed for several years now, is still considered an innovation by many companies because they have chosen not to adopt this technology.

Rogers identifies 5 attributes of an innovation which have direct impact on the level of innovation diffusion: relative advantage, compatibility, complexity, trialability, and observability [Ro95]. VoIP will likely be adopted by a firm when it is perceived better than the technology to be replaced, compatible with the existing IT infrastructure, less complex than other competing technologies, easily approachable and testable, or able to produce results quickly.

For Rogers, different communication channels play different roles in supporting the innovation diffusion process. Mass media channels, such as radio, television, or newspapers, inform a large audience rapidly about innovations and therefore are able to change weakly held attitudes. In order to change strongly held attitudes and to give in-depth information on innovations, interpersonal channels (such as personal meetings) are needed. Rogers also distinguishes between cosmopolite channels, which enable members of a social system to meet outsiders, and localite channels, which only permit contact within a social system. Cosmopolite channels are needed to diffuse innovations across social system boundaries, whereas localite channels are important in the innovation-decision process within a social system [Ro95]. Therefore a decision maker concerning ICT will typically hear about VoIP for the first time through cosmopolite mass channels, will then get his in-depth information on it through cosmopolite interpersonal channels, and will finally use localite mass media or personal channels for the innovation-decision process inside the firm.

Rogers associates two sub processes with the factor time in innovation diffusion:

- (1) The innovation-decision process, which describes the stages lead to the decision for or against the adoption of an innovation. The stages of the innovation-decision process are; knowledge, persuasion, decision, implementation, and confirmation.
- (2) the adoption rate, which describes the spread of an innovation in a social system over time. The adoption rate is typically an S-shaped curve [Ro95].

Following this theory, an ICT decision maker first gains knowledge about VoIP by studying cosmopolite mass media channels. Then she forms a favourable or unfavourable attitude towards this technology. Based on his attitude the decision maker decides to adopt or reject the VoIP technology. If he adopts the technology the implementation stage starts resulting in either confirmation or reversal of the new communication technology.

Rogers stresses the importance of the structure of the surrounding social system for the innovation diffusion process. Involving strong opinion leaders and convincing change agents are critical for the success of adopting an innovation [Ro95].

Rogers points out that organizations, such as firms, are characterized by a specific innovativeness different than that of individuals. Organizations have predetermined goals, prescribed roles, authority structure, rules and regulations, and informal patterns which make them often use authority innovation-decisions. Furthermore, not only the previously mentioned innovation attributes have an impact on the diffusion rate, but also internal characteristics of the organizational structure such as centralization, complexity, formalization, interconnectedness, organizational slack, and size [Ro95].

The innovation process in organizations consists typically of the stages; agenda-setting, matching, redefining/restructuring, clarifying, and routinizing [Ro95]. The agenda-setting for VoIP takes place when the existing communication infrastructure no longer fits the needs of the firm. The next step is to match an innovation, in this case the VoIP technology, with the existing lack of sufficient infrastructure. When the firm has made the decision to adopt VoIP it will most likely modify and re-invent the technology to fit the organization. Additionally, it might also change its internal organizational structures to make the technology fit better. During the clarifying stage the firm will define its relationship towards the VoIP technology more clearly. In the end VoIP has become an ongoing element in the firm and therefore has lost its identity as an innovation.

In addition to Rogers theory [Pe83; Fr91] distinguish incremental and radical innovations and [HC90] modular innovations, that have impact only on a component of a product or service from architectural innovations that have impact on components and the way the components interact. Modular innovations tend to be incremental and sustaining while architectural innovations tend to be radical and disruptive. These two kinds of innovations capture the technological innovation. Note that technology or infrastructure is considered part of the architecture components of a business model and technology innovation is therefore typically an architectural innovation. Our analysis later discusses whether the technology innovation brings about innovations in all three main components of our unit of analysis, the business model.

Innovation, Adoption and Diffusion of Communications Technology

Various authors have pointed out that adoption and diffusion of communication technology follows particular patterns.

The theory of network and feedback effects of Shapiro and Varian [SV98] is seminal in this field. Shapiro and Varian describe when the value of a product to one user depends on how many other users there are economists say that this product exhibits network externalities or network effects. Technologies subject to strong network effects tend to exhibit long lead times followed by explosive growth. The pattern results from positive feedback: as the installed base of users grows, more and more users find adoption worthwhile [SV98].

“Network effect theory deposits that the benefits that adopters derive from a network technology are positively associated with the size of the network.”[ZK+06] following [KS86] and [SV98].

Network economies lead to demand side economies of scale and positive feedback [SV98]. Thus, the success of communication technology is based on network size, compatibility and conformity issues whereas success is not necessarily rooted in superiority of technology. Standards in video technology, browser, programming languages exemplify this.

Maerki and König sketch the innovation cycles communication technologies in a stack of open protocols. International diffusion took 100 years for telephony, 10 years for Internet and only 3 years for VoIP [MK06]. For Napster it took less than 7 months to reach more than 50 million users [HL01].

The adoption of (open source) standards in an interorganizational (trading) network is positively related with the network effects (based on peer adoption and the trading community adoption), the expected benefits and the adoption costs, (based on financial costs, managerial complexity, transactional risk, and legal barriers) as well as the path dependency (the prior use of related technologies) [ZK+06]. The expected benefits include cost deduction, market expansion, and value chain coordination [ZK+06]. The degree of adoption is captured in terms of breadth, depth and volume [ZK+06].

Business Model Innovation

Our analysis is guided by Timmer’s and Stähler’s concept of a business model [Ti98; St01]. According to Timmers and Stähler the main components of a business model are its

- (1) value proposition, i.e., the value proposition for customers and for partners
- (2) value architecture with internal and external architecture and sustainability of the architecture, and
- (3) revenue model.

For Timmers and Stähler, each business model describes the common attributes and processes of similar business systems. Following this seminal definition we understand the business model as a tool for analysis on which strategies can be based. A business system is therefore an instance/object of a business model. A group of similar business systems form a business model [St01].

Business model innovation is possible for all three components: value proposition, architecture and revenue model. Stähler distinguishes value innovation, architecture innovation and revenue model innovation. Note that typically a sustainable and commercially successful innovation has impact on all three components [St01].

The relation between technological innovations and business model innovations is relevant for the analysis whether a technology has the potential to change business models of an industry or not. According to the theory of [Ch97], disruptive innovations are distinguished from sustainable innovations according the impact they have on a company’s customer relationship:

- Sustainable innovations strengthen the added value an organization provides through customer related products or services,
- Disruptive innovations introduce a new added value, for both old and new customer groups

The concept of sustaining and disruptive innovations explains the impact of technological innovations, and particularly ICT related innovations, on business models and markets.

3 VoIP in a Nutshell

Voice over Internet Protocol, also called VoIP, IP Telephony, Internet telephony, Broadband telephony, Broadband Phone, and Voice over Broadband are all synonyms for routing voice conversations over the Internet or any other IP-based network. Protocols which are used to carry these voice signals over the IP network are called Voice over IP or VoIP protocols. They may be viewed as commercial realizations of the experimental Network Voice Protocol invented in 1973 for the ARPANET. Voice over IP traffic can be deployed on any IP network, including local area networks which are lacking a connection to the Internet [Vo06].

In general, it is possible to integrate VoIP with all kinds of business processes. One of the most popular VoIP applications is Skype. Skype offers free telephone connections between Skype users. Premium Skype users are able to establish telephone connections with traditional telecommunications networks. In addition to that Skype users can obtain themselves ordinary telephone numbers. This allows them to be called from any 'normal' telephone. Other services which Skype offers are conference calls, mailbox functionality and an awareness function which allows other Skype users to see someone's online status.

With eBay and openBC two popular sites began to integrate the VoIP application Skype into their services. At eBay buyers are able to call sellers, who publish their Skype "telephone" numbers, from within the working environment. This service is intended for increasing the trust level between buyers and sellers. "Buy and sell with confidence!" and "Get the information you need, when you need it" describe the value proposition of the integration of Skype into eBay. A Skype connected seller can be contacted by chat or call. Skype is available in selected eBay-categories. In September 2005 eBay announced the acquisition of Skype for a total of 2.6 billion dollars. eBay chief executive Meg Whitman commented this transaction by saying that "Communications is at the heart of e-commerce and community" [BB05]. Skype ids can be also part of the user profile at openBC. Similar to eBay, openBC community members are able to call each other without leaving the working environment on a computer. The Skype-Id is part of the profile and one click enables the members to contact other users through the Skype application.

We observe that organizations and internet service providers are somewhat hesitant to the usage of this new technology. Some internet service providers, organizations, or public wireless LAN providers even exclude VoIP from their supported list of services. We think that this is due to the fact that the missing of data security and safety standards is currently discussed by the European Union.

The European Telecommunications Standards Institute (ETSI, <http://www.etsi.org/>) and the International Telecommunication Union (ITU, <http://www.itu.int/>) are working on such a standard. There are a lot of aspects which are hard to bundle within only one standard. The reason for this is for example the lack of one common communication protocol. Examples for this heterogeneous protocol landscape are the Skype protocol or the Session Initiation Protocol (SIP)¹ used by special SIP-servers. Additionally the usage of different hardware and software platforms have to be taken into consideration. It is also possible to use different kind of end devices. There are hard phones which are very similar to traditional phones. These are easier to handle by the majority of users. Then there are soft phones which in most cases are headphones that are connected to a PC or Laptop and then operated by a program. Soft phones are generally better integrated into common IT infrastructure.

The reasons why organizations adopt or do not adopt VoIP are manifold as our interviews show. The value, which is added by this technology for organizations, varies throughout the cases we have analyzed. There are still many open questions concerning legal, organizational and business aspects of this technology. To conclude, the remaining question is, whether VoIP will become just another communication infrastructure or be part of the electronic market services.

¹ <ftp://ftp.rfc-editor.org/in-notes/rfc3261.txt>

4 Method

We started our research by analyzing available VoIP technologies, suppliers with a complete VoIP portfolio (infrastructure & services), and cost structures involved with VoIP. We then conducted our first semi structured interview with the Linux business consultant company GONICUS GmbH. In this interview we asked questions concerning the state of the art of VoIP implementation, customization, and utilization. We also asked questions on the impact of VoIP on business processes. We conducted this interview in an explorative way [SH99] with a weakly structured guideline. The guideline was based on aspects necessary for understanding VoIP technology. Our interview results were reviewed and released by our interview partner. One important result of this interview is a model describing three different utilization levels of VoIP adoption. We will explain the model later in this chapter. The remaining results provided us with ideas for further interview questions concerning

- reasons for organizations to adopt VoIP,
- benefits expected through VoIP adaption,
- aspects of the VoIP implementation process,
- VoIP utilization level,
- impact of VoIP on business processes,
- importance of open standards and free software in this field of VoIP,
- security and privacy issues.

Following Eisenhardt [Ei89], we chose case studies as the next step to explore different perspectives and to identify common patterns in a cross case analysis. In this way we were able to study the adoption and diffusion of VoIP and its impact on electronic markets. We chose companies for case studies with strong IT-core competencies. Our hope was that companies with such a strong background would have an innovative VoIP installation with lots of interesting VoIP services.

We developed a second questionnaire based on the results of our technology analysis, the previously mentioned model, and our first expert interview. This second questionnaire contains question concerning

- (1) the situation of the organization prior to VoIP implementation,
- (2) the expectations of the company concerning the benefit of VoIP utilization for business processes,
- (3) the level of VoIP adoption,
- (4) the IT-infrastructure and human resources prior to the implementation,
- (5) the technical features of the evaluated VoIP system, such as hardware, software, bandwidth, functionalities and quality,
- (6) security and privacy issues,
- (7) the maintenance of the VoIP system,
- (8) the impact on business processes, organization and human resources,
- (9) the results provided by the evaluation,
- (10) further plans related to VoIP adoption.

We then used this questionnaire for our case studies which we conducted from December 2005 to March 2006. The case studies consisted of four in-depth semi-structured and guided interviews with business consultants, computing centres and organizations of different sizes and businesses.

The interviews were done by two persons: one person was the interviewer; the second person took notes during the interview. The transcripts of the interviews were reviewed and released by the interview partners.

The Model of VoIP utilization

The three-level model of the degree of adoption of VoIP (see fig. 1) is based on the results of the expert interview and the two dimensions , breadth and depth in technology adoption, provided by [ZK+06].

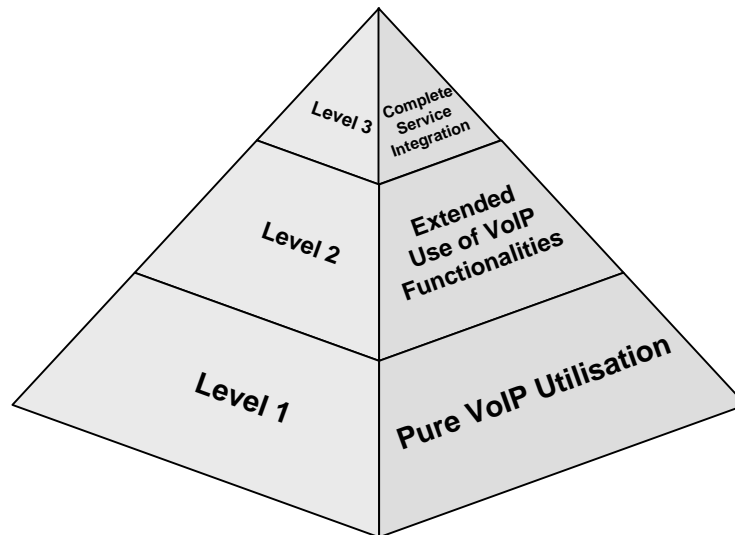


Figure 1: 3-level pyramid of degree of VoIP utilisation

Subsequently, the three levels of VoIP utilization are explained in detail

- (1) The first level is the pure VoIP utilisation. It is mainly a simple system used by private users. For organisations this means that only the traditional way of telephony is substituted by the use of VoIP.
- (2) The second level of utilisation of VoIP is an extended use of VoIP functionalities. This covers the connection of different locations of an organisation with one central configuration of the VoIP solution, use of answering machines, forwarding of incoming calls, the configuration of direct dialling-in numbers, virtual conference rooms and conference calls etc.
- (3) The third level of utilisation of VoIP is the complete services integration within VoIP. The integration with different kinds of applications (e.g. CRM, SFA, Office software etc.). Dialling from an application like a CRM program, sending all the relevant information to the screen of an employee with incoming calls are just two scenarios for this level of usage.

5 Case Studies

We selected four companies with strong IT-background and experience with VoIP for the case studies.

sd&m

sd&m is an IT service provider and seated in Munich. The company offers IT development, integration, and consulting services. It has a regional organization with branches in various cities in Germany. Furthermore, sd&m offers near shoring through its near shore centre in Wroclaw, Poland. All services provided by sd&m are project-based. The project teams consist normally of sd&m and customer employees.

Out of all case studies, sd&m is the only company which rejected VoIP technology and re-invested into ISDN technology. When the company moved its headquarters in 2003 within Munich, it evaluated VoIP technology for possible use. According to Mr. Schild, who is managing consultant of sd&m and responsible for the evaluation, sd&m based its rejection on the following reasons: high costs for sufficient bandwidth and equipment, non existing advantages over ISDN technology, and missing benefits of its usage due to lacking internal telephone traffic.

Mr. Schild points out that this decision was based upon broad knowledge of VoIP technology and its possible vendors:

- In 2003 sd&m saw no real advantages of VoIP over ISDN technology: sd&m employees usually work at sd&m or on the customer's site, sd&m had and still has very good conditions with its mobile phone provider, the quality of video conferencing based upon ISDN was better than the VoIP equivalent, ISDN-based call forwarding was sufficient for sd&m needs, the necessary prioritization process involved with VoIP usage was perceived as too complex and sd&m had no real need for CTI functionality.

- The evaluation showed further that even though administration costs would be roughly the same for both technologies (ISDN versus VoIP) ‘intelligent’ VoIP equipment would be much more expensive than ‘normal’ ISDN phones. Both vendors, which were involved in the evaluation process, offered the VoIP telephone system for a price which was double or quadruple the price of an ISDN based telephone system.
- Although internal data security is not a big issue for sd&m, it is the opinion of Mr. Schild that the higher complexity of a VoIP based telephone solution would weaken its resistance against hacker attacks.

Today, after having successfully installed the new ISDN telephone system, sd&m is planning to re-evaluate VoIP technology in 2007. According to Mr. Schild the reasons for this re-evaluation are the drop in cost for high bandwidth VoIP, the higher configuration flexibility compared to ISDN technology and the aimed integration of sd&m with its parent company, Capgemini, which has been using VoIP technology for a while now.

German Automotive Manufacturer

The headquarters of a German Automotive Company are seated in Munich. Its product range focuses on the premium segment of motorcycles, limousines and sport utility vehicles. The company presents itself as sportive, high-tech and technology-savvy and it sponsors, e.g., formula 1 teams, golf events and yacht races. According to its website, the company has 5 design and research centres in three countries and 23 production facilities in seven countries. The company opened a new plant in Leipzig with modern telecommunications infrastructure in 2005. Agile production processes to produce any model on any production line with little switching costs are considered to be a competitive advantage of the company.

The company has been switching to VoIP since 2005. The VoIP system is a hybrid solution and the company utilizes a variety of VoIP technologies. The previous telecommunications system was a conventional Siemens telecommunications system and GSM was used for field work.

The reasons for evaluating and adopting VoIP were:

- the need to enhance the connections between the sites,
- the need to improve knowledge management and, in particular, knowledge distribution within the company,
- the need to optimize the business processes, protect investments and provide value added services onsite. The interview partner mentioned that business process optimizations have not been a main driver for the adoption in VoIP.
- cost reduction.

The implementation of VoIP in the company is an ongoing and decentralized process. The company developed the internal knowledge about this technology for more than five years prior to implementation and conducted several internal pilot studies. The decision process involved several working groups, committees and the board. The decision for VoIP was done under the premise that the VoIP solution could eventually be dismantled within 2-3 weeks. The implementation of VoIP took about one year at the plant in Leipzig and 1-2 years for other sites. The implementation was done by external service providers.

In Leipzig, bandwidth was not an issue, since all workplaces had already 100MB connection and since there were enough IP addresses available. Standardization and harmonization of VoIP standards are an issue since each site did an independent implementation and thus, technology differs between the sites.

The implementation was organized as a project with its own budget. The project was on budget and on time. Major items in the budget were components for prioritization and the infrastructure (power and cooling) for those components, costs of security checks, and additional servers for the updates of the new VoIP telephones. Not included in the budget were the costs the long transition phase is perceived to have caused and service integration. Overall, the implementation of VoIP stayed within the budget. Cost savings were expected in particular for the site in Leipzig due to the Infrastructure already being in place.

The functionalities of the VoIP system include all the functions (answering machine, call queue) of the previous system. With instant messaging and collective call exist only in parts of the company and Voicemail is hardly used and will eventually be discarded in the future. The current implementation has access to the Outlook directory and the Outlook calendar.

The interview partner named several advantages of the VoIP system compared to the previous ISDN system:

- VoIP was found to be effective for small project teams and in offices buildings that are rented for a short time. Here, VoIP was found to be more cost and time effective than conventional telephony
- Easy-to-handle communication,
- Improved knowledge diffusion,

- Mobility of telephone numbers when employees move with their office
- VoIP increased availability since telephones reroute in case of failures and availability. VoIP, VPN and GSM together ensure mobility of the workforce.

However, functionalities such as booking meeting rooms or access to the cafeteria menu are perceived to be too expensive to be implemented. Note that maintenance and operations are done in an “out-tasking model” by service providers that have staff on-site.

The cost and savings of this project

- There are hardly any savings with telecommunications costs since the costs for calls within Germany are already low and since there were dedicated lines to connect the sites of the company.
- Cost savings were expected for the site in Leipzig, since telecommunications infrastructure with the necessary bandwidth was already in place.
- A single service centre can now take care of communications for the whole company.
- The information desk has less work to do since all telephone numbers are now up-to-date and available.

The automotive manufacturer considers this to be a first implementation phase of VoIP and has plans to extend and enhance VoIP. The focus of this first implementation phase was on infrastructure – not (yet) on value added services. All sites will move at least to a hybrid VoIP system. The workplaces of tele-workers, which are equipped with ISDN-telephones are to be equipped with soft phones. Note that the telecommunications strategy changed with VoIP from site strategies to a company wide strategy.

The interview partner mentioned that the hybrid, proprietary system is still very rigid and has limitations. It is frequently necessary to obtain licences and special licenses from the system provider. Lack of standards is an issue in this case since all sites implemented VoIP with individual service providers. Privacy and security are not a main concern with VoIP technology since the devices do all the encryption/decryption and dedicated lines between the sites ensure security of the communication within the company. Service contracts in the telecommunications sector used to be long term and a trend for shorter service contracts makes the handling of external providers and switching to a new technology less risky. The quality of VoIP is very good and the employees adopted this technology reluctantly. The interview partner recommends a step-by-step rollout compared to a big-bang implementation. Overall the project is considered to be a success within the company.

Leibniz Computing Centre

The Computing Centre L provides services to the scientific and academic communities in Bavaria and especially to Munich. The services cover general IT-services for the universities in Munich, communications infrastructure, a competence centre for data communication networks, archiving and backup of large amounts of data on extensive disk and automated magnetic tape storage, and a technical and scientific high performance Supercomputing Centre for all German universities.²

Because of the fact that the Computing Centre L is a computing centre for all research facilities and universities of Bavaria it some of the questions that cover business activities were not applicable. The interview partner was part and responsible for the evaluation and implementation process of VoIP. The implementation of VoIP was done by the Computing Centre L itself. The Computing Centre L had the necessary core competencies for this project and considered it a must to build knowledge and competence in that field.

Before implementing VoIP the main arguments to evaluate VoIP were that VoIP provides a better usage of the available network infrastructure and a relocation of the Computing Centre L to Garching. So the implementation of VoIP at the old location was done provide experiences with this type of technologies by setting up extensive test scenarios. Another reason was to create an own knowledge base in the handling of VoIP. As the Computing Centre L provides services and VoIP might be a technology that is of interest for their customers, it is a necessity to setup such a knowledge base.

Before the implementation of VoIP was done, the Computing Centre L used a traditional telephony solution based on ISDN technology. The Computing Centre L started to use VoIP in 2000 by using a Cisco based solution. In 2004 the switched to an Asterix based solution. Each workplace in the new location is connected by 100MBit bandwidth that is more than sufficient to use VoIP. The budget for VoIP was part of the general IT budget. In the new location there are 265 VoIP slots, while 100 slots are connected to fixed work places and the rest can be handled flexible.

² <http://www.Computing-Centre-L-muenchen.de/wir/intro/en/>

As hardware solution Cisco Gateways and Hard phones were implemented. As software solution Asterix and Soft switches were installed. The only problems while implementing VoIP are based by some coding errors within Asterix. All of them were fixed and not mission critical. Less effort is needed to administrate the new system.

Data protection and data integrity is from the perspective of Computing Centre L translated into action. The complete network is switched and monitored. Telephone calls between the different locations are done by the traditional telephony networks. Tele workers use a complete encrypted network to connect. The training of employees within Computing Centre L is done by Computing Centre L itself. There was no need to retrain anyone within the Computing Centre L, even the ones that have to take care about the VoIP system.

Reflecting the business processes there are just small improvements. The only value add of the VoIP system reported by the interview partners was that setting up and handle a telephone conference is easier with the new VoIP system. Additional services are not used. The employees would appreciate to have an automatic recall if a line is busy. That feature seems to be rather hard to implement. There was no need to change anything in the structure of the organisation and employees.

Overall everything went as expected. The employees do not have any problems with the new system and some of the features are really common (e.g. the new answering machine). At the beginning the quality of speech was not that good but in the meanwhile everything seems to be fine.

From the perspective of Computing Centre L it was a successful project which brought them forward from a technology point of view. Note that there are no plans for further integration or developments of new services.

Company I

The Company I GmbH provides network-infrastructure and high reliability, high security solutions. In June 2004, VoIP was implemented by an external service provider that was licensed by Cisco systems and two employees of Company I. In 2004, Company I moved to new offices and the leasing contract of the Siemens telephony system was about to be finished and thus, Company I has been looking for a new solution. The decision to move to VoIP was more or less spontaneous and not mainly driven by rational evaluation criteria. The objectives for VoIP implementation were

- to build up new competencies within Company I,
- to advance Company I's technological infrastructure and
- to make the telephony system more independent.

Note that Company I did not have a reengineering of the business processes in mind.

The implementation was a stand-alone project. The budget was approximately EUR 30.000 and the project was on budget. The VoIP installation includes 50 IP telephones of which 25 are WLAN telephones. The system is based on Cisco and IBM components. The soft phones on the Laptops were installed by Company I itself. Problems in implementation were the integration of the old, Fax-machine and several desired functions could not be implemented by external technicians. The VoIP telephones lack quick dialling and the ergonomic design of the devices is perceived to be not very well done. Company I encounters sporadic system breakdowns of IP-telephones due to faulty firmware and considers this dependency of (faulty) firmware to be a disadvantage of this technology. Initial problems with quality of speech were overcome with updates.

Maintenance of the telephone system was done by an external provider during the first year and is done now by Company I itself. This includes system updates, hardware and user administration. The overall cost is low. Comparison to the previous TK system is not possible since administration and maintenance have been done by a service provider for the old system. The main cost savings occur because maintenance is done now internally and we do not have monthly costs any more (maintenance and leasing). A hardware failure caused extra costs for Company I. Savings in telephone costs have not been accounted for.

The advantages of the new system for the users include: more comfort, integration to existing systems is easier to implement and dialing from an application is very comfortable. Employees of Company I accepted the new technology reluctantly. The integration of services is not in the focus for Company I and the integration with Company I CRM system is under preparation. Company I does not offer home office to its employees but the interview partner was aware of the advantages of VoIP telephones for home office. VoIP had no effect on business processes nor the organization of Company I. It is considered to be an advantage to dispose of the knowledge of VoIP technology to be able to provide the knowledge to the customers.

Privacy and security were hardly considered issues since the network of Company I has been considered secure and since network access is being monitored. The data protection officer of Company I had been involved in evaluation and implementation of VoIP. The interview partner concluded that there are no clear advantages for VoIP and there Company I does not observe a trend towards IP in its customer base,

Summary

The following table summarizes key findings of our case studies:

Category	sd&m	German Automotive Manufacturer	Computing Centre L	Company I	
Industry	IT Service	Automotive	IT Service	IT Service	
VoIP Utilization Level	-	Layer 2, partly Layer 3 (integration of LDAP service)	Layer 1	Layer 2, CRM Intergration (Layer 3) is planned	
Year of Evaluation/Adoption	2003/-	2000/2005	2000/2004	-/2004	
Innovation Decision Process	Familiarity with VoIP	Broad knowledge of VoIP technology and its vendors.	Gathering of VoIP know-how since 2000	Knowledge due to employee skills	Customers provided knowledge/experience
	Goals of the Evaluation/Adoption	Investment in modern technology	Better linkage of offices/factories, process optimization, investment protection, cost savings	Better usage of existing infrastructure, gathering knowledge on VoIP technology,	Broaden existing technology know-how, enhance existing infrastructure, gain independence from telecommunication providers
	Events triggering Evaluation	Relocation of HQ	Opening of new factory	Relocation of HQ	Relocation of HQ, expiry of leasing contract for existing technology
	Reasons for Rejection	high capital cost, high complexity, no advantages to existing technology.	-	-	-
	Reasons for Adaption	-	Technology expectations satisfied, high acceptance by employees, lower costs compared to existing technology, good voice quality, higher flexibility with service provider contracts	Evaluation expectations satisfied, acceptance by employees, technology improvement	Evaluation expectations satisfied, acceptance by employees, improvement of infrastructure, acquirement of VoIP know-how for customers.
Perception of Innovation Attributes	Advantages	Higher configuration flexibility	Benefit is higher for small project groups to due improved flexibility, employees can fix problems on equipment without external help, higher availability, centralized administration process, simplification of processes	Low administration costs, easy handling of conference calls, highly accepted mailbox functionality,	More comfort, enhanced IT infrastructure, easy integration with existing infrastructure, dialing from application is easy
	Disadvantages	Lower quality of video conferencing, too complex prioritization process, same admin costs, more expensive VoIP equipment, high complexity in technology, need for high bandwidth	High administration effort needed for bigger amount of employees, at the beginning malfunctioning of protocol missing technology standard, service integration is too expensive	At first bad voice quality, lacking of some previous used functionality	Lower voice quality, difficulties with integration of fax machine, malfunctioning IP telephones, several requirements were not implementable
	Security & Privacy Compliance	No security/privacy requirements for internal data	Compliance with high company standards is given: segmented networks, separation of 'normal' data and VoIP data, terminal based encryption, own WAN infrastructure	Low prioritization of security & privacy: switched network, monitoring, calls between offices are still based on classic telecommunication infrastructure, data encryption in case of home office	Compliance with high company standards is given: internal network is protected from outside hacker attacks, authentication of clients, communication channels are secured by network technician
Hardware Supplier	-	Hybrid telephone system, all hardware offered by Siemens	Cisco gateways & hard phones	Cisco, IBM	
Software Supplier	-	Soft phones including headsets	Asterisk, soft switches	Cisco Software, soft phone installation was done by Inotronic	
Installation done by	-	Siemens	LRZ employees	1 Cisco certified expert, 2 Inotronic employees	
Cost Driver	VoIP Equipment	Components needed for prioritization, power supplies, air conditioning, requirements of security standards	-	VoIP hardware, hardware malfunction	
Operations/Maintenance done by	-	External service provider who is permanently on shore	LRZ employees	first year: external provider, since then: Isotronic employees	
Impact on Business Model	Integration of VoIP with Business Processes planned	-	-	-	
	Impact on Value Proposition	-	Better know-how diffusion	VoIP know-how for customers has improved	VoIP know-how for customers, no impact on business processes
	Impact on internal & external architecture	-	higher flexibility of project team set up, standardized and centralized administration process for telephoning	-	CRM integration is planned, no further service integration (home office, ...), no impact on organization
	Impact on Revenue Model	-	Lower costs	-	Lower maintenance costs
Observed Network Effects	re-evaluation in 2007 due to aimed integration with parent company	In order to improve linkage of factories, further adoption of VoIP is planned	-	-	

Table 1: Key findings of our case studies

The key findings are according to the following structure:

- General information such as business area, utilization level of VoIP, year of technology evaluation and adoption.
- Information on the innovation decision process: familiarity with VoIP, goals of the evaluation process, events which triggered the evaluation time, reasons for rejection or adoption of VoIP.
- The perception of innovation attributes: advantages and disadvantages of VoIP, security/privacy compliance.
- Information on the specific VoIP infrastructure: hardware and software supplier, responsibility for installation and maintenance and cost drivers during the evaluation/adoption phase.
- Impact on business model attributes: strategy for business process integration, value proposition, internal & external architecture, revenue model.
- Information on observed network effects.

6 Hypotheses

Our objective is to analyze the innovation and diffusion of VoIP technology and its impact on electronic markets. The previous sections provided an overview over theories and models concerning diffusion and adoption of information and communication technologies. These theories served us as basis for the case studies and our analysis. The results of our explorative research are hypotheses on diffusion and adoption of VoIP and its impact on electronic markets.

In order to derive hypotheses we choose a mixed approach:

1. We examine the key findings for patterns which are either supportive of or contrary to the theories stated in chapter 2. If we find contradiction we try to explain the reasons for it and generalize these conclusions in terms of hypotheses.
2. We analyze the remaining data and the theory for further patterns which could be generalized into hypotheses.

First we analyze our research data according to its compliancy to Rogers's theory on innovation diffusion. Then we examine the VoIP related network effects which were reported by our interview partners. In the third section of this chapter we try explain the observed impact of VoIP on the business models of our interview partners. Finally we analyse the remaining data for patters which could be generalized into hypotheses.

Diffusion of innovation

This first part of our analysis relates the case studies mainly to the theory of innovation and diffusion by Rogers [Ro95]. We consider innovation attributes, the innovation-decision process, and the adoption rate. At first we look at Rogers 5 innovation attributes which have a direct impact on the level of innovation diffusion and therefore technology adoption: relative advantage, compatibility, complexity, trialability, and observability [Ro95]:

- One company rejected VoIP due to high cost, high complexity and missing advantages compared to existing technology.
- Three companies adopted VoIP because their evaluation expectations were satisfied, the technology was accepted by the employees and a technology improvement was examined. The technology has a relative advantage compared to the ISDN telephony, is compatible with existing communication standards, has little complexity, and is triable and observable by the adopting organizations.
- The perceived advantages of VoIP are manifold and specific to the companies. Common mentioned disadvantages are high configuration and administration complexity, temporary bad voice quality, and lacking of some previous used functionality. None of the common mentioned disadvantages has severe impact on the 5 attributes.

These findings support Rogers hypotheses concerning the 5 innovation attributes, i.e., the five attributes are relevant for describing the adoption of VoIP technology.

We examine the innovation-decision process, which describes the stages that lead to the decision for or against the adoption of an innovation. According to Rogers, the stages of the innovation-decision process are knowledge, persuasion, decision, implementation, and confirmation [Ro95]:

- All four companies stated that their VoIP know-how was sufficient enough for the evaluation process.
- One company rejected after its evaluation results showed no advantages to the existing company.

- The three companies that adopted VoIP built up internal knowledge for considerable time.
- Concerning confirmation. One company made sure that an eventually unsuccessful implementation could be dismantled and all companies enhanced and improved the initial implementation. All have plans or at least evaluate ways to increase breadth and depth of the innovation.
- In all four cases, either the relocation of the HQ or a newly build facility was the reason for the companies to evaluate VoIP.
- All four companies stated that the evaluation project was a success.

We observe all phases of the innovation diffusion process of Rogers. However, all three companies that adopted VoIP mentioned an event like relocation or development of facilities that triggered the evaluation and implementation process or at least the transition from building knowledge to the persuasion phase. *Rogers theory does not account for such an external trigger as prerequisite for innovation adoption.*

H1 VoIP evaluation and implementation will not be a stand-alone project. VoIP evaluation and implementation will be part of a larger project.

H2 VoIP evaluation and implementation will be triggered by relocation or by development of facilities.

The technology and its characteristics have an influence on the ways a technology can be adopted.

- According to the first expert interview, we distinguish three different levels of adoption (1) It as mere telephone infrastructure – we consider this to be VoIP utilization level 1 (2) with enhanced, typically programmable functionalities (VoIP utilization level 2) and (3) integrated with other business services (VoIP utilization level 3) (cf. Fig. 1).
- One company has VoIP utilization level 1 and two companies have VoIP utilization level 2 established. The car manufacturer has integrated its LDAP service with VoIP and therefore partly archived VoIP utilization level 3. Company I plans to establish level 3 by implementing CRM integration.
- Evaluating and implementing VoIP seems to be a relatively standard project. New services and service integration is not part of the projects
- The three companies that adopted VoIP report that they will implement new services or an integration in the future.

H3 The adoption of VoIP as a infrastructure, for enhanced services and as integrated services will follow different patterns.

Let us discuss this hypothesis more in detail. We analyze the adoption rate which Rogers describe as being typically an S-shaped curve [Ro95]:

- The rejection of VoIP by sd&m took place 2003. Both, Leibniz Computing Centre and Company I, adopted VoIP in 2004. The automotive company adopted VoIP in 2005.
- All companies have a strong IT-background and IT-competences are critical resources for those companies.

The companies of our case studies seem to belong to the early adopters in Rogers S-curve. There are more indicators for this. In VoIP implementation they rely on companies that have experience with this kind of technology, i.e., the companies we analyzed are not the innovators that first adopt a technology in the market. The companies that adopted VoIP reported that they want build knowledge and competence to be able to provide this service later for their customers. I.e., they see a market for these services – the part of the curve named early and late majority. The companies reported that the VoIP implementations as infrastructure were organized as a project and these projects were on budget and in time with initial problems being solved fairly quickly. So the implementation of this technology as infrastructure seems to be well understood and mature for a larger market. This does not apply for enhanced services and service integration of VoIP. This supports the hypotheses for the need to differentiate between the three levels of VoIP utilization.

Note that the three levels of utilization describes different levels of breadth, volume and depth in the adoption of innovation according to the model of [ZK+06].

What is the typical adoption path for the VoIP technology?

- The three companies adopt the technology first as infrastructure and only later plan to enhance functionality and integrate it into their existing IT-infrastructure.

From the typical adoption patch and the differentiation of levels of VoIP utilization, we conclude:

H4 VoIP evaluation and implementation will follow three S-shaped curves: for VoIP as infrastructure, for enhanced functionalities and for integration into services. Companies will adopt the technology gradually.

In the next step, we have a look at the organizational innovation process. We analyse whether a typical organizational innovation process exists. Rogers describes the stages of this process as agenda-setting, matching, redefining/restructuring, clarifying, and routinizing [Ro03]:

- All four companies set up a project and defined the results to be produced by this project.
- Three of the companies came to the conclusion that their original goals are implemented by VoIP and therefore adopted the technology.
- These companies also had to redefine some of their requirements during the adoption phase.
- Finally in all of these 3 companies VoIP has become a commodity.

In our opinion all 4 facts document the existence of a typical organizational innovation process for VoIP technology.

To conclude – the adoption of VoIP seems to support the theory of Rogers on innovation diffusion. Next we look into the properties of VoIP as communication technology and the typical patterns in diffusion of communications technology

Network effects, Innovation and Diffusion of Communication Technology

The first part of our analysis focused on innovation and diffusion of innovations in particular. This part of the analysis deals with the patterns and adoption and diffusion of innovation follows. We utilize mainly network theory as basis for our analysis.

As VoIP is a communication technology, we expected according to the network theories of Shapiro and Varian [SV98] clear indicators to network effects of the VoIP network.

- None of the companies reported that their adoption is related to the adoption rate of their competitors or customers. We were not able to identify direct network effects at the intra-organizational level.
- One company, sd&m eventually jumps on the bandwagon – provided the technology becomes cheaper.
- Companies try to switch to VoIP as a whole. The automotive company has a decentralized and ongoing process and for the software company, the adoption of VoIP by the mother organization is expected to be an important reason for VoIP adoption in the next evaluation.
- We observe indirect network effects as companies benefit from quality improvements in hardware, software, speech quality, knowledge and the open standards and open source software in the field. sd&m eventually benefits from those indirect network effects as it plans to re-evaluate technology, since the costs for hardware and software went down.

H5 Direct network effects will play a minor role in the adoption and diffusion process of VoIP. VoIP adoption and diffusion will benefit from indirect network effects.

Note that these observations are to some extent in contrast to the findings of [ZK+06] for adoption of open standards of interorganizational systems and to the many case studies of Shapiro, Varian et al on network effects of communication technology [SV98]. It seems that VoIP does not have the rapid adoption of many communication technologies that belong to the IP stack. One example for technologies that have such an extreme adoption curve are file sharing systems, like e.g. Napster. Napster reached 70 Mio users in a couple of months, it took 100 years for the telephone and 10 years for Internet to reach approx 10 years [MK06]. Thus, VoIP technology seems to follow different patterns.

Let us have a more detailed look on the relation between technology and its properties, the benefit of VoIP adoption and the diffusion of innovation. We follow for the relation between benefit and diffusion the model interorganizational adoption of IT standards of [ZK+06].

The compatibility of VoIP with existing telephony standards and seamless integration into the existing telephony infrastructure standards are remarkable properties of this technology

- Voice-over IP is compatible with existing telephony standards.
- All interview partners mentioned that almost all services and all the relevant services of ISDN were implemented in the VoIP system.

- Telecommunication costs go down and thus, the price difference between VoIP to VoIP compared to VoIP to Conventional telephony and Conventional – to – conventional telephony is slim and decreases.

We think the smooth integration of today's VoIP technology with classical telephony is one reason for the lack of network effects. VoIP is not perceived to build a network that is different to the existing telephone network by organizations.

H6 Today's smooth integration of VoIP technology with classical telephony abandons network effects for this infrastructure.

When we differentiate the different levels of VoIP utilization, we might observe a different picture. Novel VoIP services can contribute to barriers between traditional telephony and VoIP and the perception of VoIP building a network with its own network and feedback effects.

H7 Where VoIP integration results into new e-services, network effects will be drivers for VoIP technology and the services.

Let us analyze the role of the benefits of a technology for the adoption. Following the argumentation of [ZK+06] in the open standard adoption for Interorganizational IS systems, we observe a positive correlation between adoption costs and the expected benefits from VoIP adoption.

- All three VoIP adopters reported relatively low costs for the VoIP implementation and the project were within the budget and on time – concerning the implementation of VoIP as infrastructure.
- None of companies reported that their decision was influenced by adoption of the technology by other companies (competitors and trading community).
- One company dismissed VoIP because the costs were higher than the expected benefits.
- The others saw in the adoption of VoIP the benefit to be able to pass on this technology to their customers or clients.

We summarize

H8 The low adoption costs for VoIP will positively influence a firm's expected benefits from the technology. (adapted from [ZK+06])

Low adoption costs are positive for the benefit a company has in adoption. Let us analyze whether low adoption costs benefit the diffusion of a communication standard. [ZK+06] following [ZDH73] argue that adoption costs are negatively correlated with standard adoption. A company that adopts an "expensive" standard would actively lobby for others to adopt the standard such that the investment eventually pays off. For a cheap-to-adopt standard with relatively small benefits such a lobbying among the interaction partners makes less sense. This coincides with the case studies.

- None of the interview partners reported on actively promoting VoIP technology.
- The knowledge and experience with this technology is considered by the companies a competitive advantage – implementing VoIP currently seems to be a small commodity project – probably it is not worth advertising for this technology and making sure that the trading community is compatible to a standard.

H9 VoIP adoption will be negatively correlated with adoption costs. Low adoption costs will not benefit VoIP diffusion.

When we differentiate services and technology things eventually are different. Complex and expensive to adopt services, e.g. for knowledge management, coordination, probably on Interorganizational level would benefit this technology.

H10 Complex VoIP e-services will increase adoption costs and benefit the adoption and diffusion of VoIP technology.

What role do experience and the state of the infrastructure play in adoption and diffusion? The construct of path dependence of IT-technology captures the impact of previous experience, state of technology etc in the decision on whether to adopt or not to adopt a standard. Knowledge about technology and experience in implementing new technology positively influence the likelihood to adopt a communication standard. [ZK+06] observes a negative correlation between technology standard of an organization and likelihood to adopt a new standard. I.e., a company with an up-to-date ICT are often hesitant to adopt a technology, while companies that lag behind more reluctantly move to a new technology.

- The companies reported that the existing infrastructure and the knowledge about this technology played a role in their decision.
- In facilities that a modern network infrastructure with enough bandwidth at the workplaces the adoption of VoIP is expected to save costs.
- For sd&m the investment in bandwidth that would have been necessary with a VoIP implementation was too large compared to the cost savings.

H11 Companies with a modern telecommunications infrastructure have lower investments in VoIP adoption and will more likely adopt the technology than companies with a traditional telecommunications infrastructure.

To conclude we expected low costs and compatibility to drive the adoption and diffusion of VoIP. This however needs to be analyzed more in detail. There seem to be a difference between VoIP as infrastructure and VoIP as e-service. According to theory low costs, high compatibility and a lack of network effects do work in favour for VoIP diffusion.

Business Model Innovation

According to Stähler [St01] business model innovations are characterized by their impact on the value proposition, the value architecture, and/or the revenue model of a company's business model. In this section we will analyze the research data on VoIP evaluation/adoption for an indicator towards a business model innovation:

- None of the four companies planned any integration of VoIP with their business processes.
- The car manufacturer sees an impact on value proposition through better know-how diffusion. Both IT related companies which have adopted VoIP are now able to offer VoIP know-how to their customers. This can be viewed as an impact on their value proposition.
- The car manufacturer reports that VoIP adoption provides a higher flexibility for setting up project teams and a centralized administration process for telephoning. It therefore has an impact on its internal architecture. One of the adopting IT companies plans CRM integration with VoIP but sees otherwise no further impacts on their internal or external architecture.
- Two of the three adopters mentioned lower costs as the only impact which VoIP had on their revenues models. The third adopter could not state any impact of VoIP on its revenue model.

The above stated facts surprised us. After our first expert interview and after looking at examples such as eBay or OpenBC we expected a higher commitment of our interview partners to business process integration with VoIP. Therefore we were surprised that none of them planned or plans to archive any business process integration. Consequentially the companies only reported minor impacts on their value proposition, their internal and external architecture, and their revenue models. This shows us that there are no synergies possible with VoIP in their business areas. In contrast to eBay or OpenBC the business models of these four companies are not based on e-services. This and the fact that the only reported revenue model benefit is lower costs indicates to an infrastructural investment.

We conclude:

H12 For non e-services related businesses VoIP is merely an infrastructure investment, which will be considered during relocation or development of facilities.

H13 Where VoIP is considered an infrastructure investment the expectation of lower cost will motivate the adoption of this innovation.

For e-service entered business models the impact of VoIP integration seems to differ. In these business areas VoIP does not only enhance communication but is also being integrated with the e-service based business process. Contacting a member of these services through VoIP is already possible. Here VoIP telephony adds value to the underlying business model which helps to distinguish the company profile from those of the competitors. The business models of OpenBC and eBay mainly focus on e-services where integration with VoIP represents an added value for customers.

We conclude:

H14 VoIP will have an impact on e-service centred business models such as OpenBC or eBay.

Further findings: Privacy, Security and Legal Aspects, Standardization

In this section we analyse the remaining data for patterns which can be conducted into further hypotheses.

VoIP security and privacy issues were important topics in the IT press. We therefore expected that security and legal issues play an important role during the evaluation stages. Our findings are:

- Two of the three IT service companies have no additional security and privacy requirements. The existing technologies were rated as sufficient for the company's security and privacy needs.
- The car manufacturer and the IT service company, which offers security solutions, have high security requirements. These companies had special attention on security and privacy compliance during the evaluation stage. At the end all security and safety requirements could be fulfilled by existing technologies.

We conclude:

H15 Security and privacy will be important issues for the adoption of VoIP. The existing IT-infrastructure and security standards of software and hardware will suffice.

Even though lacking empirical data on this topic we expect open standards and open source software to be a major driver for VoIP adoption. We think that level 3 utilization of VoIP is only possible if the underlying software can be easily integrated with existing e-services. Most of today's e-services are based on proprietary software like SAP, Siebel, etc. In our opinion only the open source community will be able to integrate this vast portfolio of proprietary e-business related software. Furthermore, an open standard concerning the protocols will assure the interoperability of the different VoIP hardware solutions.

We finally conclude:

H16 Open standards concerning communication protocols and the open source community will be important drivers for VoIP diffusion and adoption.

7 Conclusions

We started this paper by asking whether VoIP is just another infrastructure or a new service to be integrated with other services. We conducted four case studies on this topic in order to gather empirical data. We then analyzed this data for possible hypotheses concerning our research topic.

The most findings are:

- Today's available infrastructure is sufficient for VoIP and therefore does not represent any technology barrier.
- VoIP will have an impact on e-service centred business models such as OpenBC or eBay.
- For non e-services related businesses VoIP is merely an infrastructure investment, which will be considered during relocation or development of facilities. For these businesses the expectation of lower cost will motivate the adoption of VoIP.
- VoIP as infrastructure, as enhanced service and as integrated service will follow different adoption and diffusion patterns.

We can provide a preliminary answer to our initial question: whether VoIP is just considered another infrastructure or a new service to be integrated with other services depends on the business model of the analyzed case. E-service related businesses will be able to integrate VoIP with their business processes whereas non e-service related businesses will consider VoIP merely an infrastructure investment.

In order to consolidate this theory further research is needed. We intend to verify our hypotheses by conducting a sufficient large quantitative empirical analysis. These results will then show the truth of the answer we gave ourselves concerning whether VoIP is just considered another infrastructure or a new service to be integrated with other services.

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Designing controls for e-government in network organizations³

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Abstract: Electronic markets are no longer limited to commercial businesses (e.g., B2B); currently, they also spread to the governmental sector. The governmental sector can benefit from collaborating and forming Network organizations (NOs) with businesses, for example in developing new Customs procedures for international trade. The EU is now realizing the potential benefits of G2B collaboration on e-Customs. An existing dilemma however, is that European governments would like on the one hand to increase security and control and on the other hand to reduce the administrative burden for businesses. In this paper, we apply the e³-control design approach to a case study concerning the export of beer to investigate how Customs procedures can be redesigned while coping with business and administrative challenges. We extend e³-control by proposing a combined approach including both value-base and process-based modeling during redesign.

1 Introduction

With the tremendous development of information and communication technology (ICT), many companies set up or joined network organizations (NOs) and electronic-based supply chains. Internet-based network organizations provide competitive advantages (e.g. new markets, cost saving and improved efficiency) that a single company can hardly achieve [PM95]. Electronic markets are no longer limited to the business field (e.g., B2B). The governmental sector can benefit from collaborating and forming NOs with businesses. Potential benefits are already clearly visible. For instance, electronic invoicing in Denmark saves taxpayers €50 million and businesses €50 million a year. If this could be introduced all over the EU, annual savings could add up to over €50 billion [EU06]. However, such NOs are only sustainable when all participants benefit from the network. Especially, when the governmental sector is involved, not only financial costs and benefits are considered, but also control and security issues should be addressed. To achieve the sustainability of NOs in the context of G2B interaction, a good governance structure is essential. Nevertheless, current government procedures create a barrier to this G2B interaction, as very often government documents are still paper based and various government procedures are still not harmonized. To this end, it is necessary to redesign government procedures, using ICT instead of paper-based solutions.

A good example for such interactions between governments and businesses is e-Customs. We investigate how Customs procedures can be redesigned while coping with business and administrative challenges. For example, for a single container crossing borders in international trade, on average about 30 documents/signatures are involved [Do06]. This is a significant administrative burden for both Customs and businesses. Simplified and paperless Customs procedures, based on innovative information technologies, are desired and will improve the efficiency as well as lower the cost/burden for both Customs and business. Such redesign efforts may lead to changes in the roles and the linkages of the actors in the network [KS94]. When we redesign procedures we must make sure that everything is still in control – duties are collected, smugglings are prevented and security is ensured. To this end, we need a Customs procedure redesign approach that incorporates detective and preventive anti-fraud control mechanisms in international trade.

In this paper, we use an extensive case study in the beer industry to study the e³-control design approach [KGT05, KT05] in a G2B network context. Our research is in line with action research studies [BP99, HL80], which demonstrates the applicability of a theory in a complex real-world situation, where researchers are actively involved in a business context, influencing it and observing the changes. Some changes are simulated (as the nature of the study is exploratory, involving future technologies), while other changes are actually implemented.

³ This research is part of the ITAIDE project. ITAIDE (Information technology for adoption and intelligent design for e-government) project (nr. 027829) is funded by the 6th Framework Information Society Technology (IST) Program of the European Commission, see www.itaide.org.

This study yields results and contributions for both theory development and real domain applications. The general use of e^3 -control has been discussed by [KGT5]. While so far e^3 -control has used a value perspective for designing controls, in this paper we posit that the value perspective is not sufficient, and it must be combined with an operational view: a process perspective. We demonstrate our combined approach in a concrete e-government domain, namely e-Customs. Customs controls are a pre-requisite for the sustainability of network organizations for international trade. To continue our study, we currently engage in implementing innovative information systems and technologies by three major parties: BeerCo NL, TRECPro (acting as a technology provider) and DTA (the Dutch Tax and Customs Administration). The application of new information systems and technologies will reshape the way of collaboration between trading partners and Customs. We show how such innovations can replace human-based procedures, and result in an improved degree of control.

By applying a two-perspective based e^3 -control to the beer case we (1) gain insights into the control problems in this study, (2) assess possible new e-Customs procedural solutions to cope with these control problems and (3) demonstrate how business networks change when they are extended with control mechanisms. The remainder of the paper is organized as follows. First, in Section 2, we discuss how to achieve an acceptable redesign for network organizations in a governmental context. Next, in Section 3 we present our research approach, and argue for extending the value-perspective based e^3 -control with a process perspective. In Section 4, a case study on Customs procedure redesign for beer export is discussed in detail. Finally, in Section 5 conclusions and further research recommendations are given.

2 Procedure redesign for e-government in network organizations

The network organization (NO) is an emerging new organizational structure. It can be seen as “a collection of autonomous firms or units that behave as a single larger entity, using social mechanisms for coordination and control” [Bo01]. Many companies have already set up their NOs: they send e-invoices along electronic supply chains and do B2B transactions directly through the Internet [KH98, KS94]. Beside benefits such as transaction cost saving and improved efficiency, ICT-based NOs enable collaborations that were not possible in the past [KS97].

When NOs involve international trade, governments become a key player, collecting duties and handling import/export procedures. However, as most government documents are still paper based and various government procedures are not yet harmonized, the original electronic-based business networks are hampered by governments. Recently the EU has realized that Customs administrations should team up with businesses as partners in international trade: Customs can join NOs with business partners. Efforts in this direction have been made by various e-government projects within the EU. E-government (electronic government) refers to “government’s use of technology, particularly web-based Internet applications to enhance the access to and delivery of government information and service to citizens, business partners, employees, other agencies, and government entities” [LL01]. Nevertheless, these NOs are only sustainable when all participants benefit from the network. Hence, to achieve sustainability of NOs a good governance structure is essential.

A dilemma faced by EU governments is how to reduce the administrative burden and at the same time increase the control and security for international trade. A key enabler for solving this dilemma is the use of innovative information technology. Technological solutions are currently being developed by governments as well as commercial businesses to facilitate cross-border trade.

Although technological solutions have the potential to solve administrative and business challenges, technology itself is not enough. More factors need to be taken into account when redesigning procedures and business processes. [DS90] define Business Process Redesign (BPR) as “the analysis and design of workflows and processes within and between organizations”. Information technology is a key enabler for BPR, however “the process of ‘reengineering’ involves the breaking of old, traditional ways of doing business and finding new and innovative ways” [Ha90]. BPR requires a broader view on activities and IT, and that IT should be viewed not only as a means for automation but also as a mechanism to fundamentally reshape the way of doing business [Ha90; DS90].

Interesting insights on how to arrive to an acceptable (re)design of network organizations are provided by [KS97] who propose a number of steps for redesigning processes. They emphasize the importance of modeling in the redesign process where multiple parties are involved. They argue that modeling plays a key role in both individual analysis (to capture the view of an individual actor on the redesign) and in the participatory requirements analysis (to allow for identification of potential differences in the perceptions of the redesign by the different actors).

[KS97] do not explicitly take into account the complex interplay between public and private organizations in the redesign, which is the case in e-government in the cross-border trade context. While it is not the goal of this paper to make an analysis of the differences between the public and private sector, studies as [RBL76] have observed fundamental differences between the two such as; environmental differences, internal differences and differences in organizational/environment transactions. These differences need to be taken into account in redesigns involving the private as well as public sectors [TYS00].

3 Research approach: combining value and process perspectives

Extensive research has been done in developing theories for designing internal and inter-organizational control mechanisms [e.g. [AL99, BLW99, CL92, CO92, RS03]]. The common focus of former research is on the process level. Gordijn et al. [GA00a] discuss in detail the differences between value-based business modeling and process modeling. They argue that a process model shows how a particular business case should be carried out, while a value-based business model focuses on what is offered by who to whom and why rather than how these offerings are selected, negotiated, contracted and fulfilled operationally. Kartseva et al. [KGT05] propose that the design of control mechanisms should focus on economic value exchanges (transfers) between NO participants. A value perspective helps understand the primary purpose of control mechanisms and ensure that one does not “digitize” existing paper documents without considering fundamental changes of custom practices. Therefore, a value-based “ e^3 -control” conceptual modeling approach is presented to design inter-organizational control mechanisms [KGT05]. “ E^3 -control” is an extension of the e^3 -value⁴ business modeling approach [GA01]. It takes into account the economic interests of all the partners of a network, and control mechanisms to safeguard these interests, such that partners can reasonably expect to reap the benefits of their participation in the network. [KGT05] suggest that design of inter-organizational controls should include three steps:

- (1) Design of the ideal situation of business networks using a value perspective, assuming that network participants always fulfill agreements and contracts;
- (2) Control problem analysis, or the analysis of possible sub-ideal situations with possible control flaws (e.g. fraud and opportunism);
- (3) Design of inter-organizational control mechanisms (IOCs), to detect and prevent these fraud and opportunism cases.

These three steps can be iterated in cycles as shown in the Figure 1.

Kartseva et al. [KGT05] adopt a value perspective in “ e^3 -control” as their starting point. Two arguments support this choice. First, control mechanisms are safeguards, in the sense of Transaction Cost Economics, to guarantee that an exchange of economic values between organizations takes place as agreed upon (e.g., in a contract) without faults (intentional fraud or unintentional mistakes) (see also [Wi79]). In other words, we need control mechanisms in order to ensure that value transfers – exchanges of objects of economic value – take place correctly. Second, as models are used to identify differences in the interests of the parties involved in the procedure redesign, value-based modeling approaches are useful to analyze whether a win-win situation is achieved in a multi-actor setting.

⁴ For further explanation on e^3 -value see Figure 3.

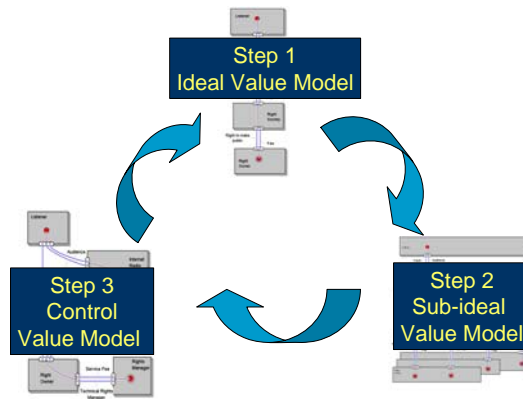


Figure 1: The e^3 -control design approach. Adopted from [KT05]

However, we argue that while the value perspective is important and valuable, no single perspective is rich enough to analyze control problems and redesign procedures. We posit that designing control procedures and mechanisms requires that we add a process perspective to the approach proposed by [KGT05]. First, the existing knowledge base on control (scientific research as well as best practices from the auditing and accounting fields) is based on process level [e.g.[AL99, BLW99, RS03]]. Second, in our experience with domain experts, they are more familiar with and have better knowledge at the process level than the value level. Third, the two perspectives address different issues, both of which are required. A value perspective describes *which* value transfers should be safeguarded by control mechanisms. However, as it does not describe *how* these values are exchanged/transferred (which are process elements), it is not suitable for describing and designing operational solutions, i.e., control mechanisms.

We therefore conclude that to apply domain governance and control, we have to look into the detailed process level. Our approach combines analyses at both levels of abstraction: a value perspective (focusing on who provides what to whom and why in a network) and a process perspective (focusing on how the above is realized). First, we assume a value perspective to design an initial business model in an ideal situation. We analyze which economic values are being exchanged by which actors involved in a network, and interview domain experts to identify the *critical* value transfers that should be warranted by means of control mechanisms. In the next step, we focus on the process level analysis. In step 2, with the help of domain experts we investigate the business processes that realize the earlier identified *critical* value transfers (rather than the whole business model). We study how current controls are applied in a network to safeguard these values transfers, and identify flaws in the current situation by applying process-based control principles from the auditing and accounting literature to the current processes. Process based UML activity diagrams are drawn to show specific control problems in the AS-IS situation. Further, in step 3, we add/change control mechanisms according to auditing and accounting control principles at the process perspective, resulting in redesigning the business process. Having introduced new controls may have changed the related business model, as often control mechanisms are offered as commercial services. Therefore we finally draw the new business model, and evaluate it from a value perspective, to investigate financial feasibility. The combined redesign approach is described in Figure 2 below. We will discuss the application of this approach in detail in Section 4.

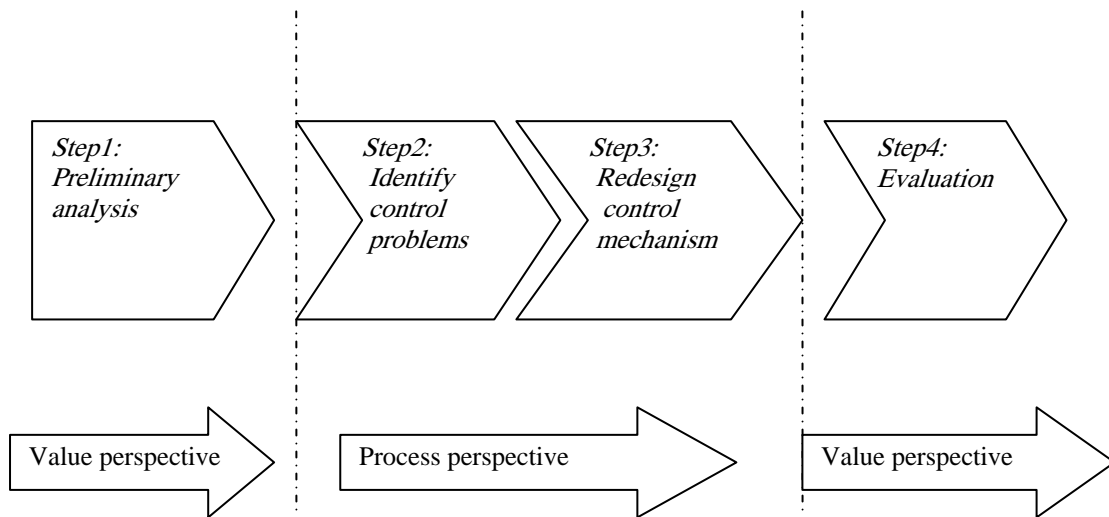


Figure 2: Redesign approach (Value & process perspectives combined)

We use visualizations of business models (value perspective) and process models to communicate with domain experts. We visualize step 1 and 4 with the value based e^3 -value business modeling notation [GA01] and illustrate step 2 and 3 with process based UML activity diagrams [FS97]. We assume readers to be familiar with the UML notation⁵. Figure 3 shows an example of an e^3 -value model in a case that a buyer who purchases goods from a seller and offers a payment in return. According to the law, the seller is obliged to pay value-added tax (VAT). This can be conceptualized with the following e^3 -value constructs (in bold). **Actors**, such as the buyer, seller, and the tax office are economically independent entities. Actors transfer **value objects** (payment, goods, VAT) by means of **value transfers**. For value objects, some actor should be willing to pay, which is shown by a **value interface**. A value interface models the principle of economic reciprocity: only if you pay, can you obtain the goods (and vice versa). A value interface consists of **value ports**, which represent that value objects are offered to and requested from the actor's environment. The scenario starts with a start stimulus, in most cases presents as **consumer need** of an actor, which, following a path of **dependencies** will result in the transfer of value objects. Transfers may be dependent on other transfers, or lead to a **boundary element** (end stimulus), which finalizes the scenario.

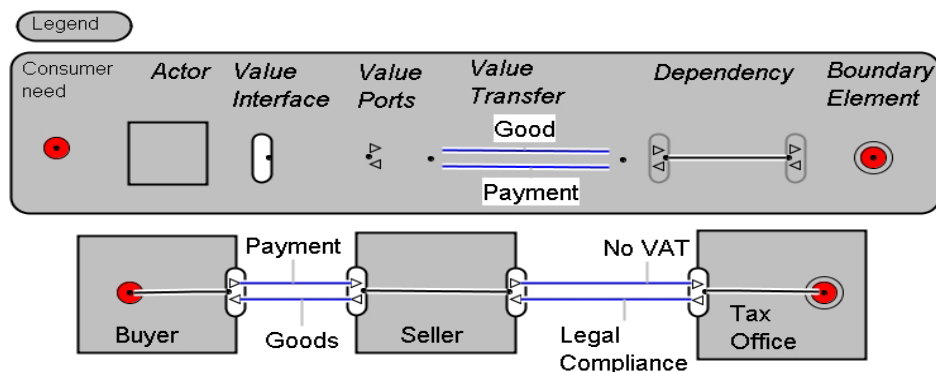


Figure 3: Example of an e^3 -value business model of a purchase with tax payment

4 Case study: Customs procedure redesign in the beer industry

Our case covers an intensive study in the beer industry, which aims to investigate how to introduce e-Customs for handling procedures concerning excise goods in cross-border trade instead of the current paper-based procedures. For the current paper, we examine the export of beer from the Netherlands to the UK. This case study is conducted in the EU-funded integrated project ITAIDE (www.itaide.org). When excise goods (e.g. alcoholic beverages, cigarettes) are sold, excise duty must be paid. In principle excise only has to be paid in the country where the beer is actually consumed. Hence, a Dutch beer producer can export beer to a retailer in the UK without paying excise in the Netherlands. Yet, to obtain exemption from excise payment in

⁵ For detailed UML explanations, please refer to Fowler, M. and Scott, K [FS97]

the Netherlands, the Dutch beer producer needs to prove that it has indeed exported the beer outside the country. The questions are (1) how can the Dutch authorities ensure that excise is paid whenever it is due, and (2) how can an evidence of export be provided. Other control problems exist in this beer export scenario; what are they, and how can they be tackled?

The following actors are involved in this scenario:

- BeerCo NL: A large Dutch producer of beer.
- BeerCo UK: The UK branch of the Dutch beer producer. Functions as an intermediary between BeerCo NL and retailers in the UK.
- BeerCo Holding.: The mother company of Beer NL and Beer UK.
- Carrier: A transport company that physically ships the beer from The Netherlands to the UK in containers.
- Customs NL: The Dutch Customs
- Customs UK: The British Customs
- Retailer: A UK-based company that buys Dutch beer from BeerCo UK.
- Excise Warehouse (EW): An excise warehouse is a warehouse which has been certified by the authorities for the deposit without payment of duty of goods liable to excise duty.
- Supermarkets UK: Resellers that buy beer from the retailer, and sell it to end consumers.
- Consumers: Any John Doe who wants to buy beer.

Currently, the core document for excise-free shipment is the paper based Administrative Accompanying Document (AAD). This document is signed by the excise warehouse in UK and then sent to the UK Customs. The UK Customs then signs the AAD document as a proof that the goods have arrived in the warehouse in the UK. Finally, the signed AAD is returned to the Dutch beer producer as proof that the goods have arrived in UK and will be presented to Dutch Customs on request. It typically takes up to three months before the AAD is received back by the shipper, and in many cases the AAD contains incorrect data. These incorrect excise data have to be corrected manually by the business as well as the Customs agencies. Hence, the AAD leads to much administrative burden and possible fraud (in 1998 alcohol-related excise fraud in the EU amounted up to €1.5 billion yearly [EU06a]). Therefore the EU has started an initiative to introduce e-Customs for excise goods, replacing paper-based control procedures for excise handling in cross-border trade by electronic procedures. The European Commission has initiated a new information system to replace the paper AAD, the so-called Excise Movement and Control System (EMCS). The basic idea behind EMCS is as follows. Every EU member state will implement its own EMCS. When a company from one EU member state ships excise goods to another EU member state, the sending party declares the excise free transaction in the national EMCS, and the receiving party declares it in its national EMCS. Both Customs administrations can then compare declarations to validate exemptions from excise duties. However, our analysis shows that EMCS is not a complete paperless solution, as a reference number (printed on another paper document) is still needed to facilitate physical controls of shipments, which means the paper based AAD will still be used as “stop” function when cargos are stopped and checked en route. We illustrate that the EMCS solution can be made completely paperless and more efficient if it is combined with, or even replaced by ICT-based container security technology.

Achieving such a paperless solution is not as straightforward as it appears at first sight, we will discuss it in detail in the later sections. Furthermore, we show how innovative technologies can replace human-based procedures, and result in a much higher degree of control. Typically, in the current situation (using paper documents and human-performed procedures) about 2% of shipments are physically inspected. In the new situation, that takes into account new technologies to support electronic documents and automated processes, up to 100% control of export evidences is possible. These and similar insights have been gained by applying our modeling approach.

4.1 Step 1. Value perspective - Preliminary analysis

We take the value based business model (e³-value) as our first step of the redesign. The value model shows the essentials of the way of doing business in terms of stakeholders creating and exchanging value objects with each other. The main goal for the value based preliminary analysis is to answer the question “*who* is offering *what* to *whom* and expects *what* in return”. The main design questions relevant for the value model are [GA00a]:

1. Who are the value adding actors involved;
2. What value-creating or adding activities do these actors perform;
3. Which offerings are produced and consumed by these activities;
4. To whom are these offerings offered;

With the value based business model it is easy to reach a common understanding between stakeholders regarding *who* is offering and exchanging *what* with *whom* and expects *what* in return. We performed interviews with business experts to explore which value transfers in the business model may be violated, and what the severity of such violations is. By doing so we identified *critical* value transfers; these are value transfers for which control problems should be analyzed and handled. In the current paper we focus on the risk that BeerCo NL will sell beer in the Netherlands, and declare it as exported in order to obtain exemption from excise duties in the Netherlands. In our beer case, when BeerCo NL can prove excise free delivery outside the Netherlands, it is exempted from excise duties in the Netherlands and is considered compliant with the law (see exchange between BeerCo and Customs NL in Figure 4). BeerCo UK sells the beer to a Retailer with EW: a retailer licensed for the excise warehouse function. The retailer with EW sells the beer to UK supermarkets, for a price that includes the excise, and pays excise to Customs UK. The current (AS-IS) business model deviates from the ideal situation because it already includes control mechanisms to safeguard value transfers; in contrast, [KGT05] assume that no errors or fraud can occur in an ideal model, and hence an ideal model does not require control mechanisms. In fact, an EW is a control mechanism, to enforce excise payment. Also the earlier mentioned AAD is a control mechanism. However, to see how these controls are applied we need to move to the next step – a process level redesign.

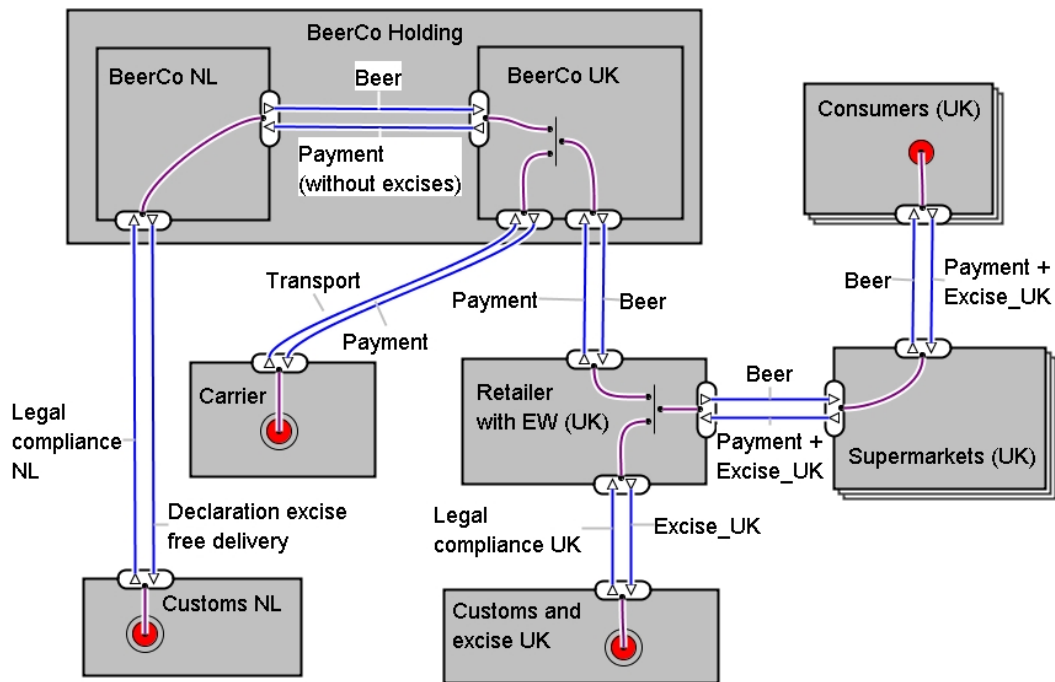


Figure 4: Ideal business model for beer export

[Note, the notion AND and OR connection elements are used here, which are illustrated as below:

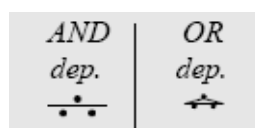


Figure 4.1: AND and OR connection

AND and OR connection elements. An *AND fork* connects a dependency element to one or more dependency elements, while the *AND join* connects one or more dependency elements to one other dependency element. An *OR fork* models a continuation of the scenario into one direction, to be chosen from a number of alternatives. The *OR join* merges two or more sub-scenarios into one scenario.]

4.2 Process perspective – Problems identification and control mechanism redesign

A separation of concerns regarding value perspective and process perspective is needed here. Unlike value modeling, process modeling (UML activity) is workflow-oriented, and it shows *how* a particular business case can be carried out. Although value-based business modeling provides us a good starting point for identifying different requirements of stakeholders in the network, it could not give satisfactory answers of how these requirements are selected, negotiated, contracted and fulfilled operationally. Especially, when designing control mechanism for e-government in NOs, we are required to look into the detailed process level identifying control problems and redesigning control mechanism.

4.2.1 Step 2. Identify control problems

Domain experts enumerated several main deficiencies of the current paper-based procedures, including (1) timeliness (procedures require long periods, which is misused by fraudsters), (2) high costs, (3) errors, (4) no sharing of information between national Customs administrations and (5) inability to perform efficient and effective physical checks, resulting in too weak security and too much possibility for fraud. Figure 5 shows a partial process model that corresponds to the AS-IS business model. Currently, the core document for excise-free export is the paper based Administrative Accompanying Document (AAD). There are two roles performed by the ADD as we discussed before, (1) to identify a shipment for a physical check en route (so-called “stop” function), and (2) – once it has been signed in the country of destination – as a proof of export, for exemption from excise payment at the country of origin. However, the current AAD solution leaves much administrative burden for both sides of Customs and Business, yet it can not provide satisfactory Customs control.

Six principles should be followed when control is applied inter-organizationally [BLW99, CL92]:

- 1. If an operational task exists, its corresponding control task should exist as well and should always follow the operational task.*
- 2. If a control task exists, it must be furnished by supporting documents. These supporting documents should be the result of a previous control task that directly witnesses the activity to be controlled.*
- 3. Supporting documents should be generated by a source independent of the source which generates the document to be verified.*
- 4. If a control task uses a supporting document, this should be transferred directly from the control task which verified it.*
- 5. An operational task and its corresponding control task should be segregated into two different positions and into two different agents.*
- 6. The agents responsible for the operational task and its corresponding control task should be socially detached.*

Applying above principles to the export of beer from the Netherlands to the UK (see Figure 5), following rules need to be applied:

- 1) The supporting documents must be provided by a party *independent and socially detached* of BeerCo NL. The reason for these criteria is to prevent BeerCo NL to manipulate the evidence.
- 2) The supporting documents have to be based on a *witnessing activity*, executed before the “Verify excise” activity. The most elegant case would be the witnessing of the export is performed by Customs NL, a party who has a direct interest in this control. However, Customs NL is not always able to direct witness the export either apply 100% checking, as the AAD is not returned back to Customs NL (the AAD is returned by shipping company to BeerCo NL), unless Customs NL asks for it from BeerCo NL for audit purpose.

3) Finally, the signed AAD (supporting document) should be transferred directly from the activity which generates it to the activity which intends to use it. Direct transfer of documentary evidence is crucial for avoiding possible tampering by intermediary agents.

From the process based model (Figure 5) we can clearly see that the current AAD solution violates principle 2 and 4 of control principles. The AAD document should be directly transferred to Customs NL without passing through BeerCo NL, who may possibly falsify the document. And Customs NL should be able to directly witness and have possible 100% check of export activities of BeerCo NL. Instead, Customs UK stamp the AAD, which is in fact an export witnessing activity.

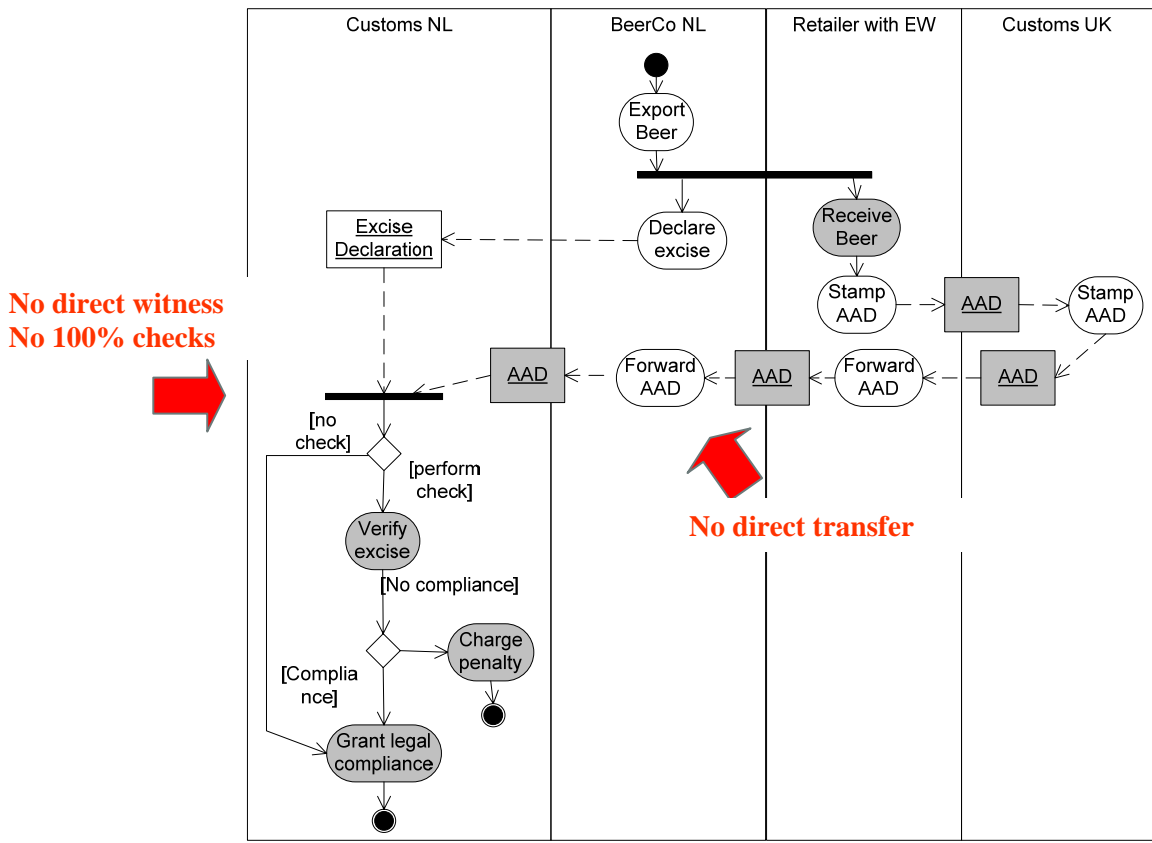


Figure 5: AS-IS model with AAD (Export to the UK)

[Note: for detailed UML explanations, please refer to Fowler, M. and Scott, K [FS97]]

4.2.2 Step 3. Redesign control mechanisms

Governmental and commercial organizations are currently developing IT-enabled solutions to cope with these and other deficiencies and control problems. Examples are the earlier mentioned EMCS, and the TREC technology of IBM. TREC (Tamper-Resistant Embedded Controller⁶) is a container-mounted device that can detect whether and when a container is opened and whether the opening is authorized or not. It is intended to reduce fraud and increase security. By monitoring a container's position coordinates, a message can be automatically sent by a TREC device to the carrier and to Customs NL when the container actually leaves the Netherlands, or deviates from its predefined route. TREC devices could therefore replace the AAD's functionality to provide evidence of export.

We developed a number of scenarios, reflecting various NO designs using different procedures to solve the problems described in the previous section, and discussed them with experts in workshops. One such scenario is the use of the earlier mentioned EMCS to report transactions with excise goods. Another scenario involves the TREC technology, and a third scenario combines EMCS and TREC. Our analysis showed that when TREC technology is used, EMCS is superfluous. We therefore focus here on the scenario based on TREC only.

⁶ Further information on TREC is available at <http://domino.research.ibm.com/odis/odis.nsf/pages/board.06.html>

Using TREC technology, we consider the following procedure for international trade in excise goods. As soon as a container with beer is closed at the premises of BeerCo NL, the TREC device on that container triggers sending a message from the ERP system of BeerCo NL to some database or information system of the carrier, and a notification is sent to Customs NL. This system could be EMCS, but we are currently assessing also a visionary solution, where such a message will be used not just for excise purposes, but also for VAT, export declaration and national statistics declarations. Hence, the data are not just sent to excise systems, but are available for all government systems related to export data processing. In such a case, EMCS becomes obsolete. For the sake of the current discussion, we shall call this database/information system the EPCIS⁷ without discussing it in detail. As soon as the container physically leaves the Netherlands, the GPS-based TREC device sends a message to the EPCIS, providing digital export evidence for this shipment. Furthermore, if the shipment is physically inspected en route, Customs officers can use handheld devices to obtain access – via the secure TREC devices – to the commercial information identifying this shipment in EPCIS.

Figure 6 shows a partial process model of this envisioned scenario, which can be used for intra-EU deliveries as well as for export outside the EU. As EPCIS can be seen as part of the TREC application, we omit the EPCIS from this figure for brevity. As shown in the figure, a new actor has to be introduced: a TREC service provider. This is not necessarily the hardware producer; it can theoretically be the carrier or a third party. Crucial for the scenario's success is that the TREC service provider is trusted by the Customs administrations, as required by the control principles of [AL99, BLW99, CL92, CO92, RS03]. Such trust is typically achieved by means of certification.

The idea of “TREC only” application is to replace the paper based AAD with electronic TREC messages exchanged from the TREC device placed on the container. The TO-BE scenario improves the witnessing activity (direct and 100% check – control principles 2 & 4). It allows making a statement about export when the fact of crossing the border actually happens. The TREC device will send an electronic message (with arrival and departure information), which has a role of supporting document, directly to Customs NL when containers actually cross the border. The role of TTP (trusted third party) is now taken by the TREC provider (this provider should be trusted by all the parties in the trade). This scenario alters the location of the “Witness export” activity as well as the way the witnessing is executed.

The TREC device can be accessed by Customs officers en route, using a handheld device. This enables Customs officers to obtain information on the contents of a container in case of a physical check (“stop” function). Besides, the TREC also performs real-time “Witnessing” when sending a message to Customs NL as soon as the container has left the Netherlands. This evidence of export can be directly sent to Customs NL by TREC, without possible manipulation of the intermediate party. At last, it supports 100% check of excise-free declarations of Customs NL. However, in order to make all this possible one issue needs to be specially emphasized: the TREC provider, which acts as TTP, has to be independent and socially detached from BeerCo NL.

⁷ The EPC Information Service [EPCIS] is a specification for a standard interface for accessing EPC-related information. Because an Electronic Product Code (EPC) gives each object a unique serial number, each individual object can be tracked independently and fine-grained real-time information about each individual object can be collected, stored and acted upon. For further information, please refer to <http://www.ifm.eng.cam.ac.uk/automation/research/epcis.html>

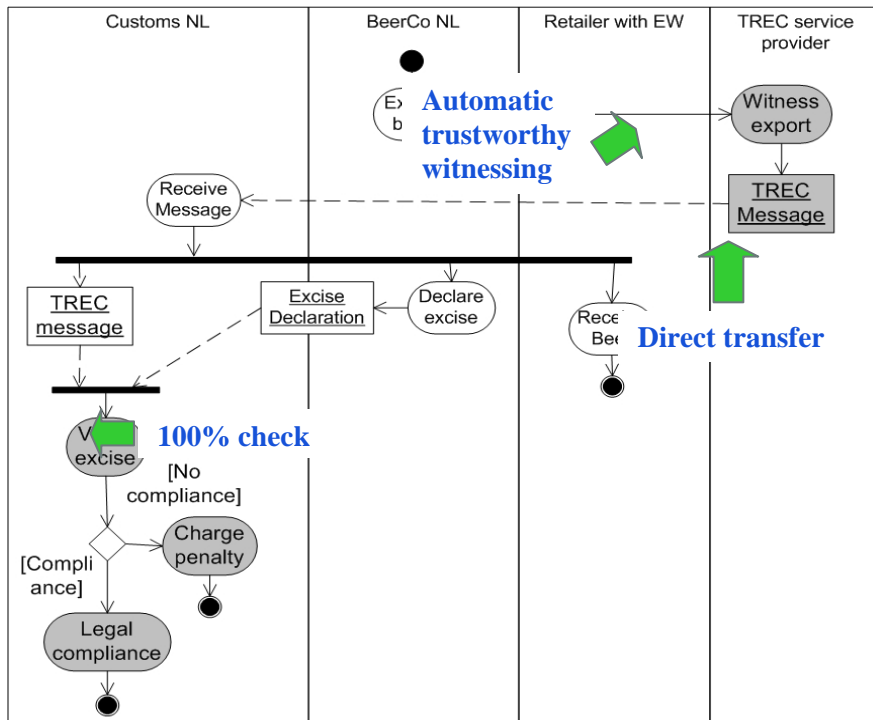


Figure 6: TO-BE process model: with TREC

4.3 Step 4. Value perspective - Evaluation

With the above scenario, the AAD and even EMCS lose their function of providing export evidences. TREC technology can deliver the same evidence in a simpler way. The new actor and change of value transfers can be seen in the value-based business model depicted in Figure 7.

The scenario sketched here is far from complete, as is often the case in explorative studies. For example, open questions include (1) to whom would the TREC device send a message when an unexpected event occurs (e.g. unauthorized container opening), (2) who would offer the TREC services, (3) how is the device's security managed and more. In the new business model the TREC device is used to facilitate the access to commercial information concerning the goods, as well as movement information. This is opposed to the current situation, where information flows from BeerCo's ERP system to Customs NL provide commercial information on the goods, while the paper-based AAD provides movement information. EMCS is no longer required, because the TREC pro-actively provides the same export evidence that EMCS would provide. Therefore the same control is achieved without the need to implement the less efficient EMCS. Furthermore, while EMCS is intended to handle excise duties only, the TREC-based procedure facilitates handling any governmental procedures concerning the same goods: excise, VAT, export/import declarations and more.

From the perspective of Customs NL, the TREC technology and related services are used as a control mechanism, to verify BeerCo's excise declarations. The uniqueness of this business network is seen in the fact that when a control is performed by an external commercial party combined with ICT solutions, a much higher degree of control is achieved than when the Customs would perform the control themselves. From BeerCo's perspective, the TREC technology enables more control on the supply chain. Namely, using TREC devices (1) BeerCo can always tell where exactly its shipments are, and (2) theft and smuggling are prevented or detected immediately by detecting unauthorized container openings.

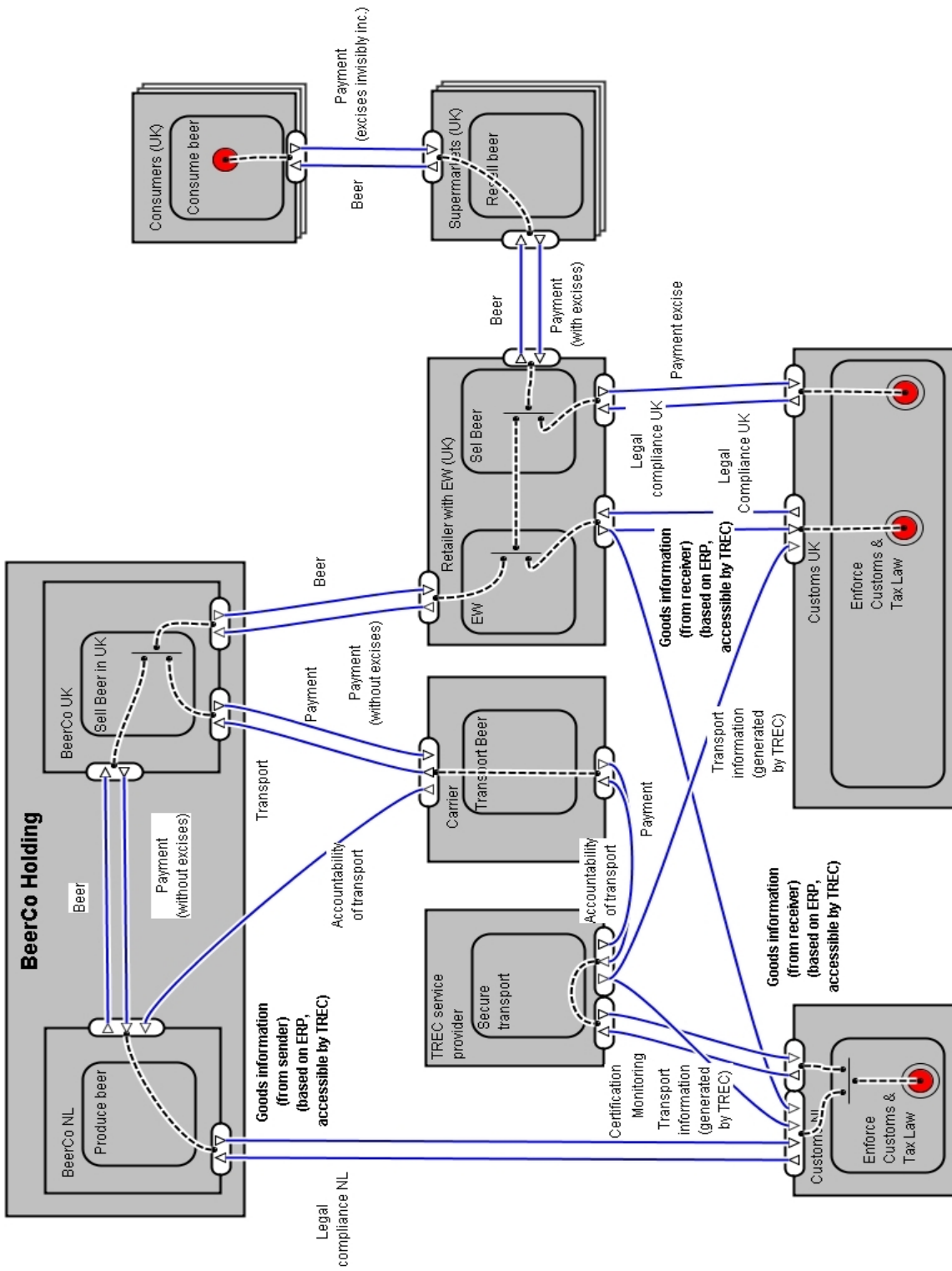


Figure 7: TO-BE business model: with TREC.

The value-based business model in Figure 7 can be used to evaluate the financial feasibility of the above scenario. Feasibility of the redesign means that all actors involved can make a profit or increase their economic utilities. Value-based business models enable us to see how NOs create values through ICT-based solutions. Naturally the services of using TREC devices have a price tag, and BeerCo NL will have to pay a fee for using the device for every shipment. In the new scenario, the new actor –TREC provider– will increase their profit through charging for the services, and Customs NL will enjoy a better control of the excise payment. As to the other main actor –BeerCo– will get the simplified Customs procedure and thus reduced administrative burden. However, BeerCo will still need to pay for (indirectly) services provided by TRECPro. Although the price for using the TREC device per shipment is not yet known, bearing in mind that BeerCo NL exports great volumes of beer per year, it is highly likely that the costs will be significant. Thus some incentive is required for BeerCo to justify these costs. This incentive can be provided by another partner in the network: Customs NL (government). More specifically, currently the EU is shaping the concept of Authorized Economic Operator (AEO). The idea of AEO is that each Customs administration will establish a partnership with the private sector in order to involve it in ensuring the safety and security of the international trade supply chain. The main focus is to create an international system for identifying private businesses that offer a high degree of security guarantees in respect of their role in the supply chain. These business partners should receive tangible benefits in such partnerships in the form of expedited processing and other measures. Typically, companies that use TREC or similar technologies have a better control of their supply chain, and therefore will be allowed by the Customs offices to use simplified Customs procedures, relieving some administrative burden. The introduction of the new actor (TREC provider) may change the roles-linkage among original actors of the NOs and result in change of the structures of the business network [KS94]. Value-based business models increase the understanding of the complexity of the networks and could provide useful information for top level management and policy makers.

5 Conclusions and recommendations for future research

A number of approaches exist for designing business models of network organizations, including BMO [Os04], value webs [TLT00] and e^3 -value [GA01]. They all assume a value perspective, namely they focus on issues as value transfer, value propositions and revenues. These are all very typical concerns for a business analysis involving commercial businesses, but when governmental organizations join NOs, they have other concerns than financial gains. Customs administrations are concerned with collecting duties, but also with security and safety. Mainly, Customs administrations control supply chains and international transaction to ensure that their goals are achieved. As a result, we claim that business analyses for NOs involving the governmental sector must explicitly handle inter-organizational control.

Control, however, is typically of operational nature. A value perspective only is therefore not sufficient for performing the required business analysis. We therefore suggest extending value-based business analyses with an operational view, namely a process perspective. The value perspective is used to understand the core business model and to pinpoint the values that must be safeguarded by control mechanisms. Next, the process perspective is used to understand how the above value transfer violations may occur, and build controls into existing or new business processes that realize the underlying business model. Once this has been done, we return to the value perspective to investigate how the newly introduced controls affect the business model in NOs, and to assess the financial feasibility thereof.

We propose to combine both perspectives in the e^3 -control approach. In the current paper we investigated how this approach can be applied in a large case study concerning the export of beer. At the same time, we use this and other case studies to further develop the e^3 -control approach into a sound methodology. Our future research efforts will focus on (1) deriving control problems in a given business model, (2) the relation between business models and process models, (3) designing control mechanisms to solve the earlier identified control problems and (4) how the above is different in the public sector compared to the private sector.

From the business domain perspective, our model-based approach showed to be useful for redesigning Customs procedures. Visual models capture business intricacies and show clearly power structures in a network organization. They therefore serve as a facilitating tool in discussions and workshops aimed at eliciting knowledge from business experts and exploring possible procedure redesigns.

From a research perspective, the value-based models enable us to identify where in a business model exist value transfers that must be safeguarded. Next, process level models enable us to analyze and demonstrate how to add control mechanisms into business process. And at last, we assume a value perspective again to evaluate the financial feasibility of the redesign and explore the role/value changes of the network organization.

We are currently implementing in the ITAIDE project the e-Customs procedure sketched here in a real-world setting. We intend to test it by shipping real containers of beer, and to verify whether and how control can be maintained using our e-Customs procedure.

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The evolution of an intersectoral b2b-marketplace for SME: past selections and new variations

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Abstract: The increasing importance of interoperability and interorganisational integration by means of ICT and the lagging adoption of appropriate electronic exchange standards and technologies by SME call for specific approaches to help SME realize the potentials of electronic transaction support and data integration as identified in the literature. In the following, the characteristics of an intersectoral b2b-marketplace that is aligned to the business needs of SME are outlined. Furthermore, the initial steps towards the marketplace's evolution to a collaboration infrastructure for SME are presented. These are designed to promote the diffusion of electronic data interchange with SME by connecting the marketplace to ERP systems and to provide the participating SME with a convenient way to benefit from economic as well as data integration.

1 Introduction

The core idea of any marketplace is to leverage the transactions between its participants by matching supply and demand. The widely discussed 'electronic' marketplaces [Ba91, Sc93] further this idea by making use of information and communication technologies to reduce the costs involved in generating and realizing transactions as well as in matchmaking. However, the adoption of business-to-business electronic marketplaces, particularly as regards small-to-medium sized enterprises (SME), has not met the expectations raised. Slow diffusion of innovation is usually made responsible for this fact [A105, SG03, WR05, DWM02], but there are also authors that question the underlying principles of several electronic marketplaces that – frequently – alter the terms of trade of an industry substantially and neglect the specific needs of SME [SS04]. Especially in situations where dominant business partners try to initiate an electronic marketplace for their supply and/or demand, companies act with caution as specific investments and dependencies have to be made with direct consequences on the (supplying) company's terms of trade when entering the marketplace. Nevertheless, slow diffusion is not solely an issue of direct dependency.

Generally speaking, electronic cross-industry exchange procedures and/or communication standards that provide companies with a single interface to do business electronically (irrespective of a specific partner) have not been adopted on a discernible scale so far. In this respect, business-to-business transactions between SME would once more be a case in point.

2 Empirical background

In 2004, EC3 (E-Commerce Competence Center) conducted a survey on the attitude of Austrian companies towards b2b-marketplaces [JTG04]. The results indicated that there (still) is an interest in intersectoral and internationally oriented electronic b2b-marketplaces (or more generally 'collaboration infrastructures') that ideally support the integration of the participant's electronic resource planning (ERP) system into the marketplace and provide technical and transactional assistance. This interest is mainly driven by expectations concerning market expansion, savings in process time as well as in costs.

However, uncertainties concerning the consequences on the business model or the terms of trade of the specific business dominate the unwillingness to participate, which is also influenced by a fear of unfavourable pricing mechanisms and disadvantageous transparency. While confirming the findings of some other studies and assumptions made on this topic, the results of this empirical study reaffirmed the importance of further initiatives that aim at the realization of (certain) potentials of electronic marketplaces (and collaboration infrastructures in general), allowing for the crucial characteristics that were distilled. Thereby, the realization of potentials stemming from – by means of ICT – improved transactions between SME along with the goal to increase (regional) integration were detected as key issues. In order to tackle these issues, abc markets [Ab06], an Austrian b2b-marketplace focusing on SME, was identified as a promising partner and allured for further research and joint implementation activities.

3 A b2b-marketplace tailored to SME needs

By taking insights into the emergence and experience of abc markets, the specific evolution of an infrastructure for business collaboration can be retraced. Abc markets started as a business club two decades ago and had long been available in form of an intranet solution until it made use of the Internet to open up to the general public. Thereby, the company turned into a fully-fledged electronic marketplace that offers bartering functionality in addition to standardized shops at varying levels as well as matchmaking services.

The optional bartering functionality is specifically tailored to the liquidity needs of SME and is backed by a bank guarantee of each bartering participant. It helps to ensure trust between supply and demand and can also be seen as a means for SME to save costs by reduced or avoided interest. Bartering is commonly used to clear a transaction up to a certain rate that has been agreed upon. All bartering purchases have to be balanced through a respective bartering sale within a specified period, otherwise the balance has to be paid in cash.

The shops provide features such as single-sign on, shops spanning purchasing lists as well as carts with invoice and shipping address split, cross- and up-selling as well as customer specific price and condition setting.

As abc markets evolved from a traditional business context, it still has a strong foothold in the non-virtual world. The marketplace makes use of a franchise system and currently covers Austria, southern Germany, and some parts of Hungary. The franchisees are responsible for the promotion of the marketplace at a regional level and act as ‘social matchmakers’ or ‘personal traders’ that foster the business of the participants, thereby complementing the centralised and in large part automated matchmaking and integration activities of the marketplace. Advantages of this combination of virtual and real world aspects are:

- (i) the marketplace becomes apt to lower the barriers for many SME to take part in an electronic marketplace and
- (ii) the (regional) linkages between businesses can be strengthened. Moreover, this approach leads to no direct dependency on a specific business partner. The business model is based on an annual subscription fee that is suited to attract SME.

4 Data integration for SME

Aside from mere economic integration, data integration is a key issue in ICT-supported value chains. Electronic data interchange initiatives have provided different proposals for cross-industry communication standards such as traditional EDI, semi-automated WebEDI or fully automated XML/EDI [LTC01, WHB01, BLW01, BWK05], but, again, the diffusion of these proposals is minor, particularly with SME. Still, many companies lack the technical preconditions and skills required and make, at best, use of fax machines for handling and simplifying their transactions with business partners. This brings up the quest for practicable and acceptable solutions to improve data integration with SME. Basically, this quest is similar to the problems of economic integration of marketplace participants, but it differs in the fact that the interventions in the business processes are even more profound.

Evidently, a range of technical solutions and proposals for standardization exist to solve this matter, however, the core question does not concern technical feasibility. In fact and as can be learnt from b2b-marketplaces such as abc markets or from recent literature on this topic [SS04, Ch01], for realizing electronic data exchange or translation between SME as well as between SME and larger enterprises, a specifically designed proposal should be made to SME that features primarily benefits of economic relevance, while considering the typical technical characteristics of this type of company.

Abc markets is a working example for this idea and obviously could be extended to ‘data integrate’ SME. For this purpose, a project has been set up that aims at providing electronic procurement to the participants of the marketplace. Starting as a prototype, a link between the marketplace and one or more ERP systems is going to be established in order to make transactions through the ERP system on the marketplace. Thereby, marketplace participants are enabled to exchange data more efficiently, even if they do not have an ERP system, and benefit from increased data integration in case they already make use of electronic resource planning. Moreover, particularly small and medium-sized enterprises that have not been incorporated into any electronic supply chain could be allured by a platform that addresses their business and financial needs, while lowering the entry barriers to electronic data integration without major (and specific) investments.

As could be confirmed by the experience of abc markets, potentials for further data integration – still – arise from:

- high throughput time involved in transactions, e.g. due to delays during collection of documents requested,
- unnecessary efforts caused by manual handling of business communication, e.g. when comparing bids,
- lacking system integration and support,
- insufficient use of ICT-standards, and
- inadequate workflow support in general.

Based on the alignment of the marketplace to SME needs, further enhancements of its functionality to improve data integration of the participants can help to realize these potentials for SME. The prototype is designed to automate procurement procedures substantially, and can thereby avoid media disruption and minimize various source of errors. The minimum requirement for participation will be to hold a shop on the b2b-marketplace and to transmit data to the electronic catalogue. Participants with ERP will be able to integrate their system and select the offerings of the shops on the intersectoral marketplace using enterprise resource planning. In particular – but not solely – larger companies that use ERP systems for procurement could be additionally attracted, as they obtain a favourable way of making transactions with SME in various sectors. According to the envisaged extension of the functionality of the marketplace, competitiveness and (future) market potentials for participating SME should be strengthened, by

- providing a possibility for SME to interact electronically with other, possibly bigger, companies that make use of ERP,
- and consequently by an
- extended scope of marketplace participants (without direct dependency) as well as an
 - improved information base.

5 Conclusion

Encouraging the diffusion of electronic data integration among SME is the main goal of this effort that does not provide a particularly new technical solution [Ra01, WHB01], but tries to validate the assumptions made and lessons learned so far, both from an empiric and theoretic perspective on electronic markets. Increasing and facilitating the transactions between the participants of a marketplace still is the core idea behind this new variation in the evolution of the SME marketplace presented and can best be understood through learning from the past selections that were largely due to social and economic processes. EC3, as the scientific partner and co-founder of the project, tries to contribute in answering questions on the diffusion of electronic integration with SME as well as the strategic implications and opportunities involved for SME.

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A Concept for a Peer-To-Peer Negotiation and Contracting System for SMEs

Extended Abstract

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1 Motivation

Negotiation and Contracting are crucial components of electronic markets. As a result various solutions have been developed and proposed to support these processes. However, up til present such systems have not achieved broad acceptance in particular among SMEs. Some of the most important reasons for that are: Negotiation and contracting systems are mostly part of electronic market platforms and in many cases not available for free. As a result they are too complex and too expensive for SMEs.

Negotiation and contracting systems are part of platforms controlled by big companies. Negotiation and contracting systems do not provide full support for the requirements of SMEs, in particular for building virtual organisations and negotiating complex products and services among a group of SMEs.

In order to overcome the above drawbacks, a concept for a peer-to-peer, decentralized negotiation and contracting system for SMEs will be proposed.

2 Research Approach

In a first step negotiation processes among SMEs related to complex products will be analysed through case studies. The in-depth analysis will provide insights into negotiation procedures, decision making processes as well as related documents. It will also provide insights with respect to specific requirements related to security, identity management and trust.

Based on the findings in the first step, specific negotiation activities will be extracted and their suitability for a peer-to-peer solution assessed.

In a third step existing approaches for centralized and peer-to-peer negotiation and contracting solutions will be analysed. Through decomposition again components and activities suitable for a peer-to-peer concept will be identified.

Finally, based on the principles of design science, a peer-to-peer concept in terms of architecture, processes and communication patterns will be developed. The concept will be implemented with research partners within the European project ONE - Open Negotiation Platform and tested with several SMEs.

3 Summary of Interim Results

At the RSEEM the interim Results of the state-of-the art analysis and the first version of the concept will be presented.

Interim Results of the State-Of-The-Art Analysis

In most commercial negotiation environments the network of intermediaries/suppliers is static and centrally regulated. New entrants must strictly adhere to the centrally defined business rules and data formats of the technological infrastructure. SMEs cannot innovate in the service offer or independently establish relationships with network members. In fact, current solutions (like the “marketplace”) are proprietary, managed and pushed by strong intermediaries or big suppliers, and typically squeeze the small independent ones. The small suppliers cannot enter the network as full members and are faced with a severe digital divide: they are basically left out of large markets.

Negotiation, Learning Techniques and Architectures

Negotiation is a process that is managed by a set of participants who co-operate to create a value. It is important to make a distinction between negotiations and auctions. In fact the last focuses on determining the value of products through a process that is managed by one side. A negotiation is typically more costly than an auction in terms of time and effort required to achieve a solution. What is important to negotiators is the ability to a) expand the communication channels, b) increase access to information and expertise, and c) strengthen their cognitive and analytical capabilities [Kersten and Lo, 2001]. To support humans involved in negotiations, two kinds of systems have been developed in the past: Negotiation Software Agents (NSA) and Negotiation Support Systems (NSS).

Negotiation software agents (NSA) are programs that carry out operations on behalf of a user with some degree of independence and autonomy [Maes et al., 1999]. Their purpose is to automate different negotiation tasks arising from buying and selling products over the Web [Guttman et al., 1998]. In these systems the use of negotiation methodologies is often over simplified and they are basically engaged in bidding or in simple-issue negotiations with predefined behaviour, strategy and tactics. With this respect, Machine Learning research in automated negotiation, has focussed on optimization methods to improve an agent bid policy, either based on genetic algorithms or on reinforcement learning approaches [Zeng and Sycara, 1997][Narayanan and Jennings, 2005]. Hence, in these approaches the goal is to identify the optimal action for an autonomous agent that is supposed to act on behalf of the user, and the agent is not concerned with interacting with the user (principal). More in general, machine learning in multi-agent interaction (e.g. coordination, negotiation) is an extremely complex topics and only simple two-players games with fairly reduced set of actions have been addressed so far [Shoam et al., 2003]. Hence, in order to build a practical solution in realistic context, as we aim in the ONE project, tradeoffs between optimality of the recommended negotiation strategy and feasibility of the approach must be considered.

As we noted above, negotiation software agents (NSA) may take over well-defined and structured activities in a negotiation but it is not necessary (and useful) for the agents to handle all the tasks [Kersten and Lo, 2003]. The ill-defined and ambiguous issues, decision regarding relationship between parties, modification of the rules and parameters are better left to the human negotiators (principals). For these reasons Negotiation Support Systems (NSS) have been proposed to facilitate the various phases of the negotiation process such as understanding the negotiation case, assigning preferences for negotiable issues, and setting reservation levels before the negotiation begins. NSS ranges from systems that help negotiators prepare for a negotiation, to mediation and interactive systems that restructure the way negotiation usually take place [Rangaswamy and Shell, 1997]. Process Support Systems are a particular type of NSS. They operate at the bargain table and can either provide a mediation function or an individual support function. In the ONE project we are particularly focussed on the individual support, which means (in general) to provide parties with analytical visualization tools and with communication facilities. In ONE we will extend these functions considering decision support, via recommender systems for negotiation task guidance. We note that none of previously developed NSS have used Machine Learning techniques to learn the system behaviour in support to the user. In classical NSS, the system behaviour is hard coded by the designer. Therefore, we now introduce the concept of recommender systems and recommender systems for multi-stage decision problems. These technologies are capable to learn an optimal behaviour for the recommendation agent, by analysing data related to previous interactions (recommendations) between the system and the user.

A recommender system helps the user to make choices when there is no sufficient personal experience of the available options. eCommerce web sites make use of recommender systems to suggest interesting and useful products and to provide consumers with information that is intended to support their decision process [Resnick and Varian, 1997] [Schafer et al., 2001]. Recommender systems have been applied, until now, for supporting simple (non-sequential) purchase decision tasks, mainly for b2c applications in electronic storefronts [Herlocker et al, 2004] or for matching a service request with a service offer (a functionality supported in DBE). In the ONE project, as the ultimate goal is to support human-to-human negotiations, we shall be mostly concerned with recommendation techniques that should support a more complex human-computer interaction. In ONE both the human negotiator and the recommender agent are facing a sequential decision problem. The negotiator must decide, for instance, in one stage of the negotiation, how to make a good offer, or in another stage, how to revise her preferences, having received some counter offers. The recommender must decide when and what strategic advice to give to the negotiator or when and what to provide an explanation or a description of the current situation. For this reason, the most relevant literature is that coming from the area of conversational recommender systems [Aha and Breslow, 1997] [Thompson et al., 2004] [Ricci et al, 2003] and mixed-initiative systems [Horvitz and Paek, 1999].

These approaches implement Instance-Based Learning and Bayesian Networks techniques [Mitchell, 1997] to learn basic system behaviour such as selecting context-dependent focussed questions or proposing personalised product options, to help the user to make a good decision. But still the goal is to support one single decision and not multiple sequential decisions as in a multi-stage and multi-agents negotiation process (workflow). Recommender systems supporting a sequential decision problem have been proposed only quite recently. In [Brafman et al., 2003] the authors propose a recommender system that, when making a recommendation for a product, considers the products previously recommended to the same user, in previous recommendation sessions. The goal in this case is maximizing the overall sum of sold products. [Boger et al., 2005] propose a system that actively monitors a user attempting a task and offers assistance in the form of task guidance (e.g., prompts or reminders) when it is most appropriate and in a form that will do the most good. In both papers the underlying model for the sequential decision process of the recommender agent is that of Markov Decision Process (MDP) and Partially Observable Markov Decision Process [Kaelbling et al., 1996] [Russell and Norvig, 2003].

About learning according to the paradigm of a computational ecosystem, although there is extensive work in the field of swarm intelligence and genetic algorithms, in their application to foraging, scheduling, and computational resource allocation, there is not so much in ecosystems, specially key works about measuring heterogeneity [Muñoz, 2002] [Balch, 1999], and few references of projects about universal information ecosystems that were promoted in the FET programme in 1999 with few more theoretical results.

Identity Management

Digital Identity Management is one of the most crucial issues related to the new generation of distributed applications and services. Digital Identities represent individuals' sensitive information and serve as a starting point when these individuals introduce with each other.

Considering the highly heterogeneous nature of distributed applications, pseudonyms are used to impersonate individuals when communicating in different application domains/environments. As so, pseudonymity "ensures that a user may use a resource or service without disclosing its identity, but can still be accountable for that use" [ISO, 1999]. Pseudonymity has a number of properties especially for achieving different levels of anonymity [Pfitzmann, A., 2005]. Accordingly, "linkability" is defined as a process of associating pseudonymity with its true digital identity.

There are a number of industrial approaches offering identity management solutions:

- OASIS Security Assertion Markup Language [SAML 2005] is an open XML-based security standard that provides a way of exchanging user authentication information.
- Microsoft .Net Passport⁸ is a centralized proof-of-concept user identity management infrastructure.
- Liberty Alliance project⁹ and WS-Federation [WS-Federation 2003] take a federation-based approach for cross-domain identity management. It enables a multilateral federation of partners sharing the same domain (circle) of trust. Each federation supports multiple identity providers and within a federation (circle of trust) a user may traverse all involve partners' services with a single authentication.

The main objective of digital identity management is building and maintaining trust relationships between remotely located entities by transferring credentials from one pseudonym to another pseudonym preserving privacy of the entities' sensitive information [Claub, S. and Kohntopp, M., 2001] and [Damiani et al., 2003].

Trust and Reputation

On top of the identity model, there is a pressing need of assessing in a measurable way the trustworthiness of agents in distributed systems. Broadly speaking, there are two main approaches to reputation-based trust, as researched in the context of agents.

⁸ www.passport.com

⁹ www.projectliberty.org

With the first approach, agents use trust models to reason about the reliability or honesty of their counterparts. With the second approach, agents calculate the amount of trust they can place in their interaction partners, and the likelihood for an agent to be selected as an interaction partner depends on the calculated trust. Either of the trust models aims at guiding agents to decide on how, when and who to interact with. However, in order to do so, trust models initially require agents to gather some knowledge about their counterpart's characteristics. This is achieved in three ways [Jøsang, A., Ismail, R. and Boyd, C., 2005]

- A presumption drawn from the agent's own experience. [Witkowski, M., Aritikis, A. and Pitt, J., 2001] and [Sabater, J., and Sierra, C., 2002] propose models where trust in an agent is calculated based on its performance in past interactions.
- Information gathered from other agents: Trust in this approach as advocated by [Abdul-Rahman, A. and Hailes, S., 1997], [Sepandar, D. et al., 2003] is drawn indirectly from recommendations provided by others. Since the recommendations could be unreliable, agents must be capable to reason about the recommendations gathered from the other agents.
- Socio-Cognitive Trust: Trust is drawn by characterizing the known motivations of other agents. This involves forming coherent beliefs about different characteristics of the agents and reasoning about these beliefs in order to decide how much trust should be put in them. An example of this approach is Falcone's work [Falcone, R. and Castelfranch, C., 2001].

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Reputation systems in online auction marketplaces – strategic differentiation or dominant design?

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Abstract: A reputation system aims at facilitating the emergence of trust between transaction partners in online auction electronic marketplaces. In this paper the reputation systems of the six largest online auction marketplaces in the German market are evaluated. To this end, a catalogue of criteria regarding design options for reputation systems was put together. Since eBay is widely criticized for shortcomings of its own reputation system, it was assumed that the five competitors will have a vital interest in distinguishing themselves in this important aspect of auction platform design. The results of the empirical analysis however point to the contrary. Reputation systems largely show a dominant design with only marginal deviations in detail. The reasons for this, the actual differences between the reputation systems, as well as general limitations and risks of online reputation systems are discussed.

1 Motivation and Background

1.1 On-line auctions as a form of distance trade

Online auctions have developed into a successful and widely used trade channel among consumers (C2C) as well as between businesses and consumers (B2C). It is widely acknowledged that online auction marketplaces like eBay have several advantages for trading partners like providing easy market access, transaction speed, the online auction experience, and price transparency. They enable transactions over spatial distances between largely anonymous actors [Dell03].

However, these advantages come at the cost of several risks and uncertainties especially from the perspective of the buyer, the most prominent being the lack of product experience and the risks of upfront payments. Transactions suffer from problems of asynchronicity: The buyer cannot see and evaluate the product and thus has to trust in the seller's accuracy and honesty when determining a bidding strategy. Furthermore, the buyer has to pay the seller upfront and thus to take the risk of being defrauded by not being delivered with the described product.

Besides, the auction platform provider is only responsible for running the platform but not involved in the actual transactions. Any transaction risks are borne by the trading partners, in particular by the buyers [RZFK00]. In order for successful transactions to actually happen in spite of the existing risks, some form of trust has to emerge between the trading partners. Auction platform providers have developed so-called reputation systems in order to facilitate trust emergence and to provide incentives for trading partners engage in positive trade behavior [Dell03].

1.2 The role of reputation systems in trust formation

A fundamental issue in facilitating trade in electronic marketplaces is the matter of establishing trust between the trade partners. In traditional business relationships trust originates from recurring personal contacts. In online platforms anonymous buyers and sellers most often meet for one off deals and go separate ways again afterwards. A reputation system functions as a mediator between buyers and sellers in that it allows for the emergence of the levels of immediate trust necessary to conduct a transaction [RZFK00, Dell00]. Also known as feedback systems, these systems collect, distribute, and aggregate feedback about the conduct of market participants [RZFK00].

In this sense, a reputation reflects the past behavior of a buyer or seller and serves as an indicator for the future behavior of the actor in interactions with other users ("shadow of the future") [FrRe99a]. A reputation originates from a collection of assessments of past transactions and manifests itself as a score and a list of comments which together are part of the so-called user profile. By doing so, reputation systems create a virtual form of word-of-mouth well-known from traditional markets: past experiences are shared and made available for all users in the marketplace as a form of public good [Dell04, Dell01]. The reputation of a seller can be seen as a measure of his trustworthiness [MeAL02, ShTa05] and as a level of service quality that has a direct influence on the price of the product that is being auctioned [MeAl02, LRBR00]. This is reflected in the willingness of buyers to pay a higher price for the same item in cases where the seller shows a better reputation [Koll99, RZSL06].

A functioning reputation system is not only of significant importance for the actual trading partners, but also for the market making activities of the auction provider whose aim it must be to achieve and maintain a critical mass of buyers and sellers who both have to trust in the functioning of the platform. Here, reputation systems maintained by the auction provider play a vital role. If sellers are motivated to behave cooperatively by a well-working reputation system this has a spill-over effect on the reputation of the entire platform. A platform with a good reputation is able to attract new users and thus to be successful.

Competition among sellers on the platform increases with the entrance of new users. Thus, sellers in turn have an even greater interest in a good reputation in order to differentiate from their competitors [Koll99]. Also, there is a positive correlation between an existing reputation and the incentive to further improve this reputation [CaHo05]. If sellers can look back at a positive feedback history, they are more interested in the future of their reputation. It gets obvious, that reputation has a positively self enforcing effect and a reputation system is a crucial component of an online auction marketplace.

To sum up, it can be argued that from the provider's point of view a functioning reputation system is vital to attract new users. For the trading partners, the reputation system reduces the uncertainty prevalent in transactions over distance. To this end, it provides mechanisms that negatively mark deceitful behavior and positively acknowledge cooperative behavior. Therefore, the mechanisms guide user behavior and set the general tone on the platform, be it positive and cooperative or the opposite. Besides, a seller with a long positive history becomes locked in to the provide, because he cannot transfer the user profile to another auction platform. Thus, the reputation and feedback history resemble switching costs from the user's point of view and thus increases customer retention. Hence, online auction providers should have an interest in the success of their reputation system.

1.3 Motivation to conduct the comparative study

Especially the reputation system of eBay.de as the market leader is criticized for a range of shortcomings. Firstly, it is comparatively easy for a seller with criminal energy to forge a reputation of positive feedback by setting up a large number of fake or very low priced transactions or by joining criminal feedback circles of users who exchange positive feedback among each other. Secondly, the eBay system allows the users to dish out so-called revenge assessments; it allows the seller to return to the buyer a negative rating out of spite even in cases where the buyer gave a legitimate negative feedback. This obviously opens the door for blackmailing or putting pressure on the buyer not to rate negatively. Finally, hijacking of a legitimate user's account by password hacking using spy ware software seems to be a considerable problem. This might potentially damage the reliability of the whole reputation system. Having established the fact that the eBay reputation system is all but perfect the question arises how other auction providers go about the design of their reputation systems. How do they differentiate from the incumbent player and which conclusions can be drawn from this for the improvement of the eBay platform?

To this end, the paper reports on an empirical evaluation of reputation systems in the German market for online auctions. Its main research question is: "How do competitors use their reputation systems to differentiate from eBay as the incumbent player in order to attract trading partners on the basis of a more advanced and secure reputation system?" This question is based on the assumption that competitors should have an interest to use their reputation systems in order to create a more trustworthy environment for potential users to conduct business and to win over change-willing users. In order to deal with this question, characteristics of reputation systems and requirements for their design had to be identified based on a combination of literature analysis and empirical investigation. In the following paragraphs a brief overview of these requirements is provided before the six platforms are presented briefly and results of the analysis are discussed.

2 Design requirements of reputation systems

2.1 The reputation process

The demands on the design of a reputation system are manifold. The buyer wants reliable and rich information that allows the identification of trustworthy sellers [ReRe01]. The reputation systems should ensure fairness in the rating process and encourage the seller to comply with the descriptions of the auction offering and to engage in cooperative behavior [Dell00]. The seller on the other hand wants the reputation system to distinguish between good and bad reputation in order to be rewarded for cooperative behaviour. Finally, from the auction provider's point of view the reputation system should encourage trustworthy behaviour and lead to a cooperative code of conduct on the platform. According to Resnick et al. two phases can be distinguished in the online auction reputation process. In the first phase, the rating phase, users are assessed by other users and the feedback of the trading partners is recorded and stored in a database. In the second phase, the usage phase, the condensed feedback of all past transactions of a user is presented as a profile to a user interested in the auction offering. Hence, this phase comprises the usage of the reputation profile in the decision process of a prospective customer. For the two phases different design aspects are important. The lists of aspects presented in the following paragraphs form the basis on which the six reputation systems have been evaluated in the empirical part of this study.

2.2 Rating phase: The actual feedback process

After ending an auction transaction users have to be motivated by the reputation system to actually rate their counterparts and to do this in a fair and honest manner. Platform providers can design the actual rating process in several ways. To this end, the following aspects should be taken into consideration:

- who is entitled to give feedback [Koll99]? In a bidirectional feedback process both parties have the possibility to rate the transaction. However, such an approach is prone to the before mentioned problem of revenge assessments.
- Does the platform provide incentives to give a feedback [ReZe01]? Here, it is a matter of avoiding the "free-riding" problem by which users benefit from positive ratings of other users but do not place assessments themselves. What does the platform provider do to point out the importance of giving feedback and for creating a sense of duty on the part of the users to engage in the rating process?
- Is the rating mandatory, i.e. are there sanctions for users otherwise?
- How is the assessment structured [Koll99], i.e. in which way is the feedback gathered, by selecting a judgment from a drop-down list, by allocating point values, by text comments etc.?
- How is a single feedback be integrated into the user profile? Is there a percentage value of positive feedbacks being calculated or other forms of aggregated values?
- Is it possible to make amendments to an existing feedback [Koll99]? In case of conflict does the provider offer the possibility to delete a feedback?
- Is it possible to comment on a feedback received from another user? This can be helpful in documenting a dispute openly and transparent for other users so that they can judge for themselves.
- Does the system encourage honest ratings [ReZe01, Dell03]? Which mechanisms are provided in this context?
- Can (single) feedbacks be hidden? Here the problem might arise that users can hide negative comments to guise their negative reputation.

2.3 Usage phase: The feedback use in the decision process

The design of the usage process is crucial, because the usefulness of a reputation system is determined by how good the buyer is supported in the decision process. Here, it is in particular a clear presentation of a seller's reputation profile, tailored to the needs of a potential buyer, that decides whether the buyer finds the system useful or not. In particular the following questions have to be answered:

- How are the feedback profile and the feedback score presented or visualised? Is the buyer able to immediately comprehend the reputation (feedback score) of the seller on the actual auction page?
- How can the buyer access additional information on the reputation of the seller?
- How is the feedback history presented [Koll99]? The sole presentation of a numeric value as a difference of all positive and negative ratings neglects the particularities of an online auction transaction. Therefore, it is important to access further information on the feedback history. What information is available here? What information on the person who gave the feedback is available?
- Is there a filter with which the buyer can search in the detailed profile of the seller or with which the presentation can be adjusted? Is it possible to filter for positive or negative feedback?
- A reputation profile might be accomplished with further data on the seller, e.g. information on the date the user registered with the platform or whether he is active as a commercial tradesman or acting as a private person.
- In addition, the platform provider can give users the possibility to undergo a specific registration process that incorporates an official identification to confirm the existence and identity of the user and thus to enervate the problems of anonymity.
- Finally, the question is whether the feedback profile is available for all users or only for sellers, e.g. is the reputation profile always displayed beside the user name, or only if the user is active as a seller [ReZe01]?

2.4 Additional provider-related aspects

Beside the actual design options which refer directly to the two phases of the reputation process some further criteria can be identified to characterize a reputation system:

- Is the tonality of the reputation system positive or negative [Koll99]? E.g. does the design of the reputation system lend itself to encourage more positive or negative feedback?
- How are (especially new) buyers informed about the feedback mechanism and its role in establishing trust? Where can information in greater detail be found that describe the functioning of the system and the code of conduct?
- Are there any other distinctive features that characterize the reputation system?

3 Reputation systems of six online auction platforms

Based on the criteria presented above the reputation systems of six German online auction providers were analyzed: eBay.de, Hood.de, Auxion.de, BesteAuktion.de, Ricardo.ch and Azubo.de¹⁰. A structured overview of this evaluation can be found in the appendix; in this paragraph all reputation systems are described briefly. To this end, eBay as the market leader is described in more detail, while for the competitors merely specific features and divergences are discussed.

3.1 eBay.de

Before a user can become active as a buyer or seller on the eBay platform he must register with his name and contact details. However, eBay merely examines the validity of the e-mail address, but not any other information. While it is possible for a user to have his identity officially confirmed using the PostIdent procedure of the Deutschen Post AG, only few users make use of this process. Hence, eBay identities are far from being non-problematic.

After completion of an auction both parties have a timeframe of 90 days to rate each another using the rating system, but they are not obliged to. In doing so, every assessment consists of a comment line as a free text plus a rating in the categories "positive" (+1), "neutral" (0) or "negative" (-1). A score is calculated by adding positive and subtracting negative ratings. Here, only one rating per member is incorporated in the overall score of a user. Hence, accumulating ratings from single users is not possible. The profile of a seller is always present on every one of his auctions and is easy to recognize for potential buyers. However, the profile is only shown on the actual auction page. It is not possible to use the reputation as a search or selection criterion in browsing for products. eBay makes available the following compressed data in a short profile vignette on the auction page:

1. The rating score as a difference of positive and negative ratings is displayed behind the user name, as well as a colored star symbol depending on the rating score (starting with a yellow star received with a minimum score of 10).
2. A percentage value of positive ratings in relation to the total number of ratings.
3. The date the user has registered with eBay and whether he acts privately or commercially, as well as
4. A link to a detailed profile page with all user comments and if necessary to a personal page ("me") or the seller's online shop.

The entire history of all past assessments can be found on a separate page. Here, eBay structures all ratings in a table distinguishing between positive, neutral and negative assessments and also by time, in weeks, months and six month periods. A list of the most recent user ratings contains detailed information like the overall judgment, the assessment comment, a short profile of the user giving the comment, whether it comes from a buyer or seller, the time, as well as a hyperlink to the underlying auction (this feature is active during the first 90 days). The user can carry out filtering of these assessments using time periods, as well as by the categories "from buyers" and "from sellers". A filtering for neutral and negative ratings is somewhat hidden by eBay, but nevertheless available after the user filters for a time period first.

An assessment and comment cannot be deleted once submitted; they are removed from eBay only when both parties agree and only after a formal form-based process. Nevertheless, a user can comment on assessments using one line of text to clarify his stand point. Besides, eBay allows the user to hide the assessment history from other users by declaring the profile as "private". Such a decision however always refers to the entire assessment history, not only single comments.

With regard to communications, eBay very intensely points to its rating system: In the help pages there is detailed information on the role of the system and concerning the appropriate behavior in the assessment process. A separate area of the eBay web site is devoted to user discussions regarding all aspects concerning the rating system. Also, users are reminded upon completion of a transaction not to forget the assessment. The philosophy of eBay's reputation system is inherently positive. This is reflected in the fact that whenever a user wants to hand in a negative or neutral assessment, a window appears, in which the user has to confirm the assessment. Also, he is urged to first of all search an agreement with the transaction partner and not to place a negative rating. eBay is interested very much in bringing the user to renounce any negative ratings.

¹⁰ Following recent statistics [May 2006] from www.auktionssuche.de these six are the six largest consumer-oriented auction providers in the market place; eBay features 15,000,000 auctions while the runner-up Hood.de only accounts for 900,000 auctions.

3.2 Hood.de

The reputation system on the Hood.de platform shows a great resemblance to the one designed by eBay. As with eBay.de both trading partners rate each other after a finished transaction using the three assessment categories "positive", "neutral" and "negative" with an additional short text comment. The rating score is calculated similar to eBay and star symbols are used to visually enhance the overall rating. However, in contrast to eBay the rating score is calculated from all assessments not just from only one by each user, so that a user is left with the problem that a seller might have built the reputation using only a few other users giving multiple assessments. Another difference is that on the detailed profile page users are not given the possibility to do any sensible filtering. Besides, Hood.de only provides very limited information on its assessment system, while eBay provides elaborate guidelines and rules of conduct.

3.3 Auxion.de

The Auxion.de reputation system also resembles very strongly the one provided by eBay: Buyers and sellers mutually assess each other using a judgment ("positive", "neutral" or "negative") and a comment. However, overall ratings are not condensed into a numerical value, but are displayed individually behind the user name; no symbol of any kind is used. The profile is only displayed if the user is active as a seller. Hence, the reputation of a user who is providing a rating is not made available with the comments on the detailed profile page. On the other hand, the user is able to easily filter for neutral and negative assessments, unlike on the eBay system. Also with Auxion.de rating is not mandatory. However, a rating is not lapsed; rather a positive judgment is always awarded by the system after a period of time. Auxion.de allows users to be identified with the help of a copy of the identity card; this is marked by a symbol in the user profile. Communication concerning the assessment system is not comprehensive and rates poorly in comparison to the other auction providers.

3.4 BesteAuktion.de

The reputation system of BesteAuktion.de differs from eBay merely in details. Here, the most striking difference is the absence of some features well known from eBay. As with eBay an assessment consists again of a judgment ("positive", "neutral" or "negative") plus a comment. These are displayed individually and all assessments are taken into account not just one by every member. One interesting feature is that, in contrast to all other providers, BesteAuktion awards a positive quarter point to the user as an incentive to place an assessment. On the detailed profile page the user can filter ratings by "neutral" and "negative" judgment, as well as by the actuality and time period. Nevertheless, no hyperlink is provided to the underlying auction and it is also not evident whether the assessment comes from a buyer or seller. Communication in regards to the reputation system is also quite limited and of poor quality. On the other hand, the BesteAuktion requires a valid telephone number for the transmission of an activation-PIN with the registration. Here, it is not as easy to set up a fake user account as is with eBay.

3.5 Ricardo.ch

The registration with Ricardo.ch presupposes a valid postal address to which an activation code is sent, which has to be entered to finalize the registration process. Ricardo.ch offers the user the possibility to submit an assessment with the help of an automated assistant. For every positive assessment one point (+1) is added to the rating score; for every negative assessment one point is deduced (-1). The representation of the profile is very similarly to eBay: A percentage value of positive assessments is calculated and accompanied with a symbol. On the detailed profile page filtering is possible for negative assessments, but not for time periods; also hyperlinks to the underlying auctions are missing. Similar to eBay, Ricardo.ch tries to bring the users to talk to each other instead of rating negatively. Ricardo.ch is quite active when it comes to communications, a lot of information is found on the assessment system.

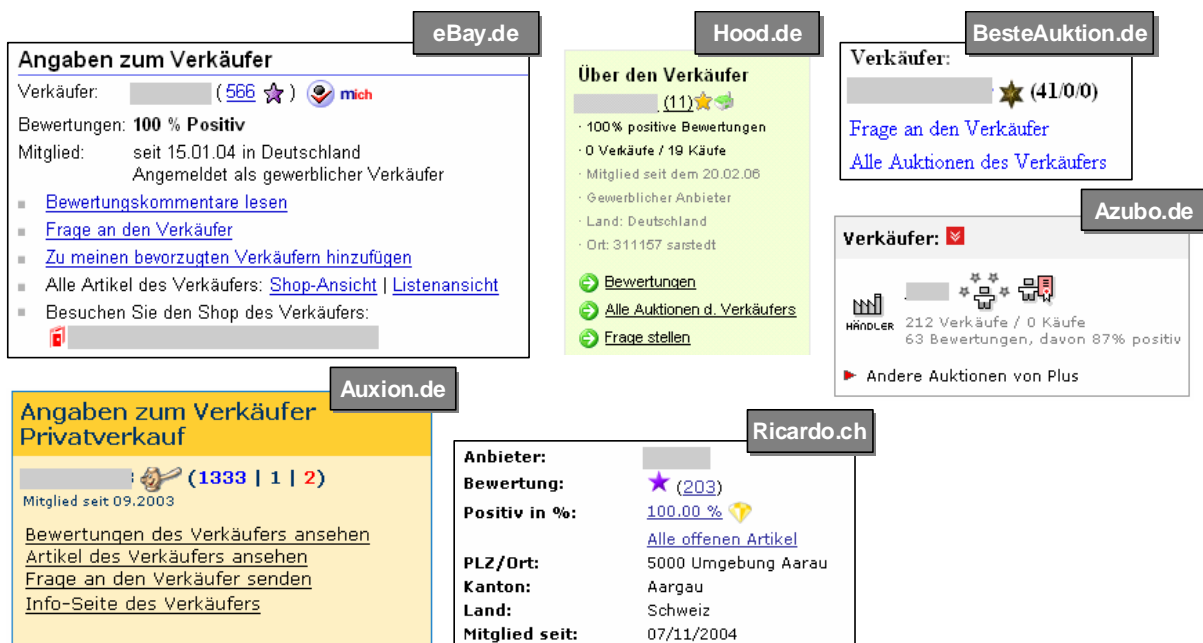
3.6 Azubo.de

Azubo.de differs from the other platforms by a particular form of organizing the assessment process: With the help of questions the satisfaction of the trading partners is determined in three distinct dimensions. The buyer assesses whether the condition of the product was described correctly, whether the delivery was made in an adequate period of time and how his overall satisfaction with the transaction is. The seller rates the buyer's paying behavior, the communication with the buyer and his overall contentment with the transaction. To answer these questions the categories "good", "indifferent", and "poor" can be chosen. Nevertheless, based on this process an integrated judgment using one of the well-known "positive", "neutral" and "negative" is again generated by the system, as well as one rating score and a percentage. Here, Azubo obviously tries not to deviate too much from the eBay way of providing rating information. On the detailed profile page a bar chart visualizes the ratio of the positive, neutral and negative ratings. A further filtering however is not possible. An identification of the user is made possible by Azubo by means of a small money transfer to the user's bank account.

4 Discussion of evaluation results

4.1 Reputation systems appear to follow a dominant design

The initial assumption of this study was that eBay competitors should have an interest in differentiating in the area of the reputation systems in order to both avoid a range of problems well-known from eBay.de and to gain a competitive advantage to attract new customers. However, this assumption cannot be confirmed after the evaluation of the six platforms. Rather, it turns out that the reputation systems show very strong similarities in nearly all design aspects. This holds true for both the design of the feedback phase, i.e. the process of eliciting user ratings, and the usage phase, i.e. the calculation of rating scores. This becomes also clear by looking at the visual presentation of short profiles on the auction page, as well as the organization of the detailed profile pages where the history of comments is presented. Figure 1 shows as an example the screenshots of all short profiles of the six platforms as presented in an actual auction. It becomes obvious that the representation of the short profiles generally follows the same patterns although of course the numerical values and the symbols vary slightly with most of the competitors showing less information than the incumbent eBay.



Picture 1: Screenshots of the short profiles on six auction platforms

Overall, the deviations between the platforms are limited to details and mostly manifest in the fact that the five competitors lack behind eBay in terms of range of features as well as their presentation. Only few features indicate some form of independent development by the competitors while wide parts of the systems seem to follow already known concepts introduced by eBay. By and large, we see a dominant design of reputation systems in B2C online auction marketplaces.

A dominant design of a product or a service exists when it permeates a marketplace to the extent that it forces all actors in the market to standardize, e.g. to adhere to the dominant design and engage in imitation processes [Aber78]. Players newly entering such a market feel immediately constrained in their design freedom while having to take over the established design features [Utte94]. If a dominant design has emerged, design variations only take place only within narrowly defined borders [Voss04]. Dominant designs often appear by way of imitation in cases where one dominant player controls the majority of the market [Voss04]. Clearly, this well-describes the market for online auction marketplaces. Moreover, with its transparency and openness the Internet lends itself to imitation processes making it easy for competitors to copy frontend features like reputation systems since the features and their design are well visible to the public.

Reasons for imitating the eBay reputation system by the competitors can lie on the one hand in significantly reducing design uncertainty; the auction provider need not experimenting with new mechanisms when the dominant player already demonstrates the successful functioning of design features. On the other hand, it can be assumed that eBay's dominance exerts a conditioning effect by which the customers have already learned and are accustomed to the interaction with the particular design eBay has chosen for its reputation system.

If the competitor wants to deviate significantly from the dominant design, he risks not being able to connect with the established interpretations and customs inherited by customers and thus might lose the ability to attract customers otherwise willing to switch over platforms from eBay. In line with this interpretation, the six reputations systems are found to follow design patterns dominated by eBay with rather marginal differences within the borders of an otherwise uniformly interpreted reputation systems design.

4.2 Design differences between the platforms

Drawing from the examples in table 1 it can be argued that eBay is one step ahead of its competitors in some important details of reputation systems design. This can be seen as a typical for a market leader. eBay provides the most comprehensive set of features for buyers to evaluate the past behavior and transaction history of a seller. Only a combination of various types of information about the seller and his activities puts the buyer into a position to comprehend the level of seller reputation, to make an informed decision, and hence to avoid unpleasant surprises. The short profile and rating scores is only one source of information which has to be complemented with information on the type and value of products of the underlying auctions the seller received positive feedback for and the reputation of the users who gave their feedback. Only then is the buyer able to detect cases, where users tried to artificially enhance their profiles. In regards to these features the five competitors all show significant room for improvement. This holds also true for the ways in which the reputation system and its features, the ways of using the system, and means of avoiding problems are communicated by the platform provider (for details results please refer to the appendix).

While the incumbent is clearly leading the way in most areas of reputation systems design, some of the differences between the platforms nevertheless reflect some ideas with which eBay could clearly improve its reputation system (see table 2). Here, in particular the specific filtering options on the detailed history pages are to be mentioned. These filters allow the user to quickly find out about negative assessments; a feature that eBay lacks that could further improve the buyers situation in gaining comprehensive seller information. Another feature that could reduce fraud on the platform is a mandatory user identification process by means of postal address, telephone number or passport photocopy; such a feature would significantly increase the cost of setting up fake identities. Finally, Azubo's compulsory and sophisticated feedback mechanism might inspire eBay to move towards a more differentiated way of eliciting feedback in order to give the user a mechanism to utter dissatisfaction with particular seller actions without having to place an overall negative assessment. Without such a mechanism negative conduct might go uncovered since user's might simply follow the path of least resistance and place a positive feedback. This might especially be the case when the buyer has to fear negative revenge assessments. However, no competitor had any mechanism in place to prevent such behavior.

Design aspects	Explanation
Assessments are counted only from different users (only one per user)	This is an important precondition to prevent problems of friendly assessments with the intention to construct a positive reputation profile. Nevertheless, for smaller auction providers with only few active users in particular product groups of the platform the problem arises that profiles are built much more slowly. This may significantly delay the achievement of a critical mass of users.
Underlying auction can be accessed from the comments list in order to learn about the product and its value	The value and type of products sold by a seller in the past gives a good account of his activities: Were many cheap items purchased or sold to quickly build up a profile? Did the seller auctions a different type of product in the past and recently switched to another branch? This can be an indicator for an account that has been hijacked by someone else or for dishonest intentions of the seller (e.g. seller switching from baby clothes to high value tech items).
Profile of the assessing user is displayed in the list of ratings (on the history page)	By doing so, it becomes obvious if a seller receives a lot of assessments of newly registered user that were only set up to artificially improve the profile. Besides, the buyer can see in the profiles of other users if it is likely that the seller will engage in revenge assessments once a problem occurs and the buyer places a negative rating.
Number of withdrawn bids is displayed	How does the seller behave as a buyer? This additional context information can be a valuable jigsaw piece to judge the seller as a person.
Detailed rules of conduct and information on the assessment system available	Education of the users is an essential precondition to avoid cases of misconduct, deception, and fraud. Here, eBay as the market leader is at the center of user fraud and thus is confronted with the majority of security problems. Hence, eBay is very active in the communications department.

Table 1: Areas in which eBay is ahead of most of the competitors

Design aspects	Explanation
Mandatory user identification by mail, phone or bank account	A secure identification of the users can help to prevent multiple identities and to expel dishonest users permanently from the platform. However, for a market leader like eBay this can lead to considerable expenses and in the short term might hamper platform growth.
Possibility to fast and easily filter for negative ratings	This is an important feature to get a comprehensive picture of the seller and his activities. In combination with an easy access to the profile of an assessing user this helps uncovering sellers who engage in revenge assessments.
Differentiation of the judgment in several dimensions (see Azubo.de)	A differentiation in behavior of the seller (communications and shipment) and the product quality allows a better evaluation of a seller. It also allows handing in critical judgments without having to place an entirely negative assessment, which most users want to avoid. Hence, this feature might lead to a more honest rating behavior and richer information.
Incentives to place assessments quickly	The more time elapses until users hand in their assessments the longer can seller misconduct go uncovered. Timely information is essential to limit fraud.
No time restrictions for handing in assessments	An artificial time restriction leads to unwanted tactics like users waiting up to the last second to place negative assessments in order to not having to fear a revenge assessment.

Table 2: Measures of (single) competitors that go beyond the features of eBay

4.3 Risks and limitations of existing reputation systems

The dominant design of reputation systems reflected in all six platforms shows important limitations and risks some of which were already mentioned at the beginning of the paper using eBay as the example. A comprehensive list of all possible problems would go beyond the scope of this paper; some typical problems however became obvious during the course of our enquiry.

The possibility to create multiple user identities caused by weak spots in the eBay registration process is frequently mentioned in the literature as a typical weakness [FrRe99]. This problem however is also prevalent in most of the other platforms although some of these offer some form of mandatory identification. Another typical problem mentioned in the literature is the artificial creation of positive profiles by means of so-called ‘profile baking circles’ in which users exchange positive assessment based on low-value transactions deliberately setup for this purpose [Dell00, BhGo05]. In order to raise the cost for this kind of tactics eBay only counts one assessment per user in calculating rating scores. The competitors however did not follow this measure so far; one reason might be that this would significantly limit the growth of feedback profiles, which is a problem for smaller platforms with only limited numbers of users.

Another problem is that the current profile might not truly reflect a seller’s actual behavior and expected service quality at any given point in time, reason being that there is a time lag between the end of a transaction and the buyers handing in their feedback. In addition, the formal clarification process demanded by the providers in case of a dispute between buyer and seller also delays the publication of negative assessments to the user community on the platform. One way to speed up the feedback process is to give incentives for timely assessments, e.g. in terms of an extra quarter point added to the score.

Another significant problem of all reputation systems evaluated in this study lies in the possibility of giving unwarranted revenge assessment. While all providers permit commenting on a negative feedback using a short statement, a deletion of unwarranted assessments nevertheless is tedious, only possible in special cases, and only after mutual consent of both parties, which in the end might even reward a seller for putting pressure on a buyer who placed a justified negative feedback. Hence, the risk remains that buyers are blackmailed or that sellers have their reputation damaged by competitors who setup an account to bid on the seller’s auction in order to deliberately harm their reputation [Dell00]. Revenge assessments can be prevented by means of making the assessments available to the public only when both parties have already submitted their feedbacks with the reputation system. Of course, this should be combined with a mandatory and timely feedback process in order not to put users in the position to be able to prevent the other party’s feedback from being published by not submitting their own feedback.

5 Conclusions

The contribution of this study is twofold. Firstly, based on a literature review a catalogue of requirements for the design of online auction reputation systems has been identified. Secondly, the empirical evaluation of six online auction platforms in the German market points to a dominant design of reputation systems that is shaped and dictated by eBay as the incumbent player. Not only that the competitors are not able to differentiate from eBay in this important area of their platform design, they even stay behind eBay as the incumbent in terms of range as well as quality of features. Hence, eBay is not only able to demonstrate market leadership in economic terms, e.g. in turnover and transaction volumes, but also in the design of crucial aspects of the trading platform. Here, studies have shown that most customers are comfortable trading on the eBay platform and have trust in the functioning of the reputation system [RZFK00, ReZe01]. It can be argued that, albeit the problems discussed above, eBay’s reputation system is up to the task and fulfils customer needs to a satisfactory level. Hence, eBay is seen as a reliable mediator in facilitating online auction trade. Last but not least this is reflected in the adoption and growth rate of the eBay platform. However, online reputation systems still have certain limitations in simulating trust mechanisms well-known from traditional off-line markets [BoKO04]. As we have argued above, there is still considerable room for improvement to tackle some of the most prevalent problems that allow or even abet online auction fraud. In line with this Cabral and Hortacsu state the following: “Obviously, the fact the reputation system has bite does not imply that it’s current structure is optimal. In fact, we believe an exciting area for future research is precisely the design of an efficient reputation mechanism“ [CaHo05].

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Appendix

	eBay.de	hood.de	auxion.de	BesteAuktion	ricardo.ch	azubo.de	
Feedback phase	Who is eligible to give feedback?	Buyer and seller	Buyer and seller	Buyer and seller	Buyer and seller	Buyer and seller	
	Is there an incentive/compensation for giving feedback?	no	no	no	yes, user gets a quarter scoring point	no	
	Is giving feedback mandatory?	no	no	Yes. When buyer does not give feedback, the seller automatically receives a positive rating.	no	no	
	Structure of the feedback?	Three categories (positive/neutral/negative) plus short comment.	Three categories (positive/neutral/negative) plus short comment.	Three categories (positive/neutral/negative) plus short comment.	Three categories (positive/neutral/negative) plus short comment.	Three categories (positive/neutral/negative) plus short comment.	Answering of three questions regarding seller user behavior (Answers good/med/poor)
	How is a rating incorporated in the profile?	A score is calculated by adding positive and subtracting negative ratings; only one rating per member is counted.	Like eBay, but all ratings are counted.	Number of positive, neutral and negative ratings are added up as scores; all ratings are counted.	Number of positive, neutral and negative ratings are added up as scores; all ratings are counted.	A percentage of positive ratings in relation to all ratings is calculated	Answers to the three questions are calculated into a score for the three categories pos/neutr/neg.
	Is it possible to modify or delete an existing feedback/rating?	no, deleting a comment is only possible in special cases and when both parties agree	no, deletion is only possible in special cases (offensive ratings, advertising)	no	no	no, deletion is only possible in special cases (offensive ratings, advertising)	no
	Comments on feedback possible?	yes	yes	yes	yes	yes	yes
	Feedback guidelines: how is fairness and honesty be encouraged?	Detailed guidelines and rules of conduct	Detailed guidelines and rules of conduct	Very limited / no information	Very limited / no information	Detailed guidelines and rules of conduct	Detailed guidelines and rules of conduct
Usage phase	Is it possible to hide ratings or comments?	No, a user can only declare his profile private and hide ALL ratings.	no	no	no	no	
	How is the rating score visualised?	Score value, plus coloured star symbol (starting with a score of 10). Powerseller symbol for high volume sellers.	Score value, plus up to 7 stars depending on number of positive ratings (starting with 5), plus percentage value.	Number of positive, neutral and negative ratings are displayed as scores.	Number of positive, neutral and negative ratings are displayed as scores, plus star and crown symbols in gold, silver, bronze depending on number of positive ratings	Percentage value plus a number of up to 4 stars, displayed in 5 different colours. Diamant symbol in addition, when score > 99%.	Score value plus up to 5 stars in 3 different sizes (starting with 5 positive ratings).
	How can further information be accessed?	By clicking on the score value or a dedicated link a page with a detailed profile can be accessed	By clicking on the score value or a dedicated link a page with a detailed profile can be accessed	By clicking on a dedicated link a page with a detailed profile can be accessed	By clicking on the user name a page with a detailed profile can be accessed	By clicking on the user name a page with a detailed profile can be accessed	By clicking on the user name a page with a detailed profile can be accessed
	How is the feedback history be presented?	Table with number of pos/neutr/neg ratings in different time periods / List of ratings, user comments with short profile of this user, date, and link to the resp auction, and whether user was buyer of seller	Table with number of pos/neutr/neg ratings in different time periods (plus visualization as bar chart)/ List of ratings, user comments with short profile of this user, date, and link to the resp auction, and whether user was buyer of seller	Number of pos/neutr/neg ratings / List of ratings, user comments, date, and link to the resp auction, and whether user was buyer of seller (profile of user cannot be accessed)	More or less a list of ratings with comments and short profile of this user (no link to auction or info whether user was seller or buyer)	Table with number of pos/neutr/neg ratings in different time periods / List of ratings, user comments with short profile of this user, date, and whether user was buyer of seller (no link to the auction)	Bar chart visualisation of pos/neutr/neg ratings and using the rating questions / List of ratings, user comments with short profile of this user, date, and whether user was buyer of seller (but no link to auction)

Table 3: Detailed evaluation results, part 1.

	eBay.de	hood.de	auxion.de	BesteAuktion	ricardo.ch	azubo.de	
Usage phase	Is there a filter to search for positive or negative feedback or to change the appearance of the profile?	Filtering for seller/buyer comments and for different time frames (filtering for negative ratings is only accessible when filtering for a time period)	no filter, only one listing	Filtering for pos/neutr/neg ratings and for received and given ratings	Filtering for pos/neutr/neg ratings.	Filtering for pos/neutr/neg ratings and listing of own ratings given by the user.	no filter, only one listing
	What additional user information is available?	"Registered since", "commercial/private", "my page", plus icon for verified users.	"Registered since", "commercial/private", "my page".	"Registered since", "my page", "ratings by this user", plus icon for verified users	None	"Registered since", but only accessible in detailed profile	"commercial/private", "my page".
	Is there a user identity verification?	optional, using the PostIdent by Deutsche Post AG	no, only verification of email address	optional, using passport photocopy	mandatory, by receiving a PIN number over the phone	mandatory, activation code received by post	optional, using a money transfer of one cent to the users bank account
	Is the profile always presented or only for sellers?	always	always	Profile is only shown for sellers, and only in an auction.	always	always	always
Additional criteria	Is the tonality of the system positive or negative?	Positive; user has to double confirm the posting of a non-positive rating. User is urged not to rate negatively but to collaboratively solve problems.	More positive, user is urged to collaboratively solve problem before rating negatively.	More positive, automatic positive rating after a certain period of time.	neutral	Provider urges members to communicate and wants to prevent negative ratings.	neutral
	Where can information regarding the reputation system be found?	Following the link "help" and "ratings" detailed information can be found	Like eBay, but information is quite limited	Only limited information, hidden somewhere in the "help" pages.	Following the link "help & hints" and "other" information can be found (but very limited)	Following the link "help"; information is quite detailed	Following the link "help" - "extra" - "rating system"; information is very limited
	Particularities and special characteristics of the reputation system.			Is able to import user profiles from 3 other auction providers (not eBay). / When a buyer doesn't transfer the money a symbol is displayed to denounce the user; account is closed after the second time. When a seller doesn't ship the item, the account is blocked temporarily.		Without activating the account using the posted code only one auction can be bid on.	

Table 4: Detailed evaluation results, part 2.

Document-centred electronic negotiations

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Abstract: Negotiation Support Systems (NSS) focus mainly on support of decisions or communication in the context of negotiations between human negotiators. A document orientation can be found in some of the approaches but the support for negotiating about the document elements is rather simplistic or restricted to the core bargaining in terms of values to be filled into forms representing a contract template. This paper proposes an extension of an existing NSS (Negoisst) by extending the negotiation regarding the elements of a contract document.

1 Introduction

Negotiation Support Systems (NSS) support different aspects of negotiation. For example, they can support the decisions made by the negotiators by giving analytical support [Ra82], they can support the negotiators in their communicative exchanges during the negotiation process, or they can provide support for contract management.

Examples for NSS are Inspire [KN99], SmartSettle [TS03], Agora [Ce98], and Negoisst [SJL03]. While the decision support and communication support is well advanced, document management is rather limited. For example, de Moor and Weigand mention that “it is interesting that in most perspectives, negotiation is only viewed as a dialogue - a process in which messages are exchanged - whereas in practice the collaborative drafting of texts often plays an important role – since the results of the negotiation can easily be lost if they are not recorded in some permanent form” [MW04]. Similar arguments have been made by practitioners who state that existing contracts are used as the basis for new negotiations and that in particular legal experts deal with the formulations of clauses, their dependencies, and relationships to existing and related law.

Many conceptual negotiation definitions or negotiation meta-models have a very simple definition of the contract document or reduce it mainly to the negotiation agenda [KSS05, SSK06]. In an NSS, usually a simple kind of contract template or a negotiation agenda is set up before the negotiation starts. In many systems, this has to be done even outside the negotiation process. Thus, there is already a fixed contract in the pre-negotiation phase and some systems also start with a fixed set of negotiation attributes (e.g. Inspire [KN99]). Other approaches (e.g. SmartSettle [TS03], Negoisst [SJL03]), offer the possibility to set up the agenda during the negotiation. In Negoisst, it is also possible to have a negotiation (called ontology negotiation) about the terms used in order to have a common understanding of the negotiation agenda [SJ04]. Negoisst has a document orientation in that way that each negotiation message leads to a new (contract) document. A document is seen as an essential part of the negotiation. Nevertheless, the contract document representation itself such as the paragraphs or the terminology can usually not be changed or these changes are not integrated with the negotiation itself.

In order to overcome these shortcomings, there is need for an extension of the existing negotiation communication of Negoisst to enable direct collaborative authoring of contract elements and the negotiation about them. The aim of the current work is thus to extend the existing negotiation communication.

2 The Contract Document

The contract document is an essential part of a contract-based negotiation. The communication coverage depends on the elements of a contract document. There are, on the one hand, human negotiators who manipulate the document by exchanging their negotiation messages and, on the other hand, there is the system that also needs to understand what is expressed in the contract in order to assist the human negotiators. So the contract document has to be modelled taking into account both the human view and the machine view. These two views have to be synchronised in order to express the same meaning of the contract.

[Gi00] formulate some legal requirements regarding electronic contracts. It has to clearly identify the contracting parties and the subject. The time period of contract validity has to be indicated as well. They also mention valid signatures as important. The fifth requirement is non-repudiation. The last two aspects are not in focus of our work.

2.1 Negoisst contract structure

In the existing Negoisst version that allows negotiation also about the negotiation ontology [SJ04, S05b], a contract is represented in the computer readable form by ontologies defining the hierarchy of the contract and negotiation attributes and their values. Rules can be expressed using RuleML (<http://www.ruleml.org>) which is an XML-based language for modelling rules. What is missing is an explicit concept that integrates contract terms, their types and their corresponding formulations of contract clauses. A contract consists of a detail section, a contract section, and contractual conditions (figure 1). The detail section defines contract status, parties, and roles. The contract section consists of order subjects to specify the goods and services which are negotiated and of a supplier and a client section associated to actions that have to be carried out. The contractual conditions capture the definition of alternative behaviour for contract fulfilment.

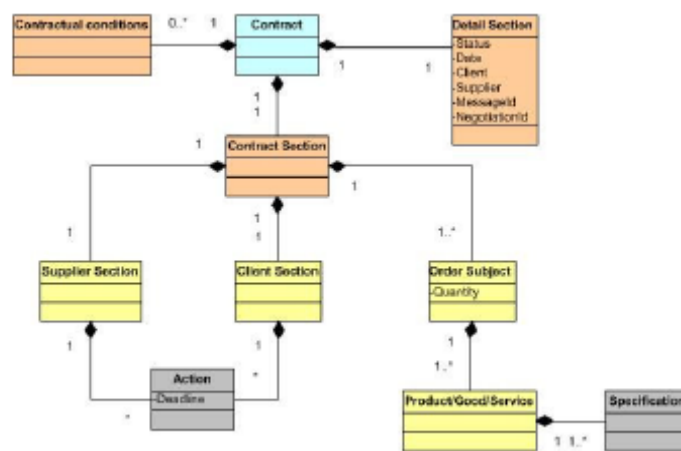


Figure 1: Negoisst contract model [JS05b]

As a first result it can be seen that the contract elements are mainly used either for the bargaining or for the ontology of used concepts. The human readable contract document is created from each message using the values for contract attributes specified in the message as well as clauses from a contract template. For new negotiation attributes, a general primitive clause is used to associate the value to the concept. The strict distinction between contractual conditions and the contract section should be changed.

2.2 Related research on contract structure

There are several approaches dealing with structures of (electronic) contracts. Burgwinkel proposes a model for standardising and introducing digital contracts [Bu04]. He analyses factors for successful contracts from four different views, namely the community view, the process view, the service view, and the infrastructure view. A conceptual model for digital contracts based on XML is then presented. The contract structure (for example LegalXML) includes a clause model, roles, and rules. The rules also cover dependencies between clauses in a way that, for example, special types of clauses require the usage of special other clauses. Other rules are mentioned for modelling the relation of clause types to clause texts (perhaps restricted by conditions), dependencies regarding frame contracts, language versions, the specifications of objects of agreement or the history of clauses.

Another general approach to model contracts has been developed in the COSMOS Project [MGB99]. A contract consists of terms which deal with three main aspects: Who has to do what and how (figure 2). The “how” addresses the work flow of the transaction and thus the dependencies between different obligations.

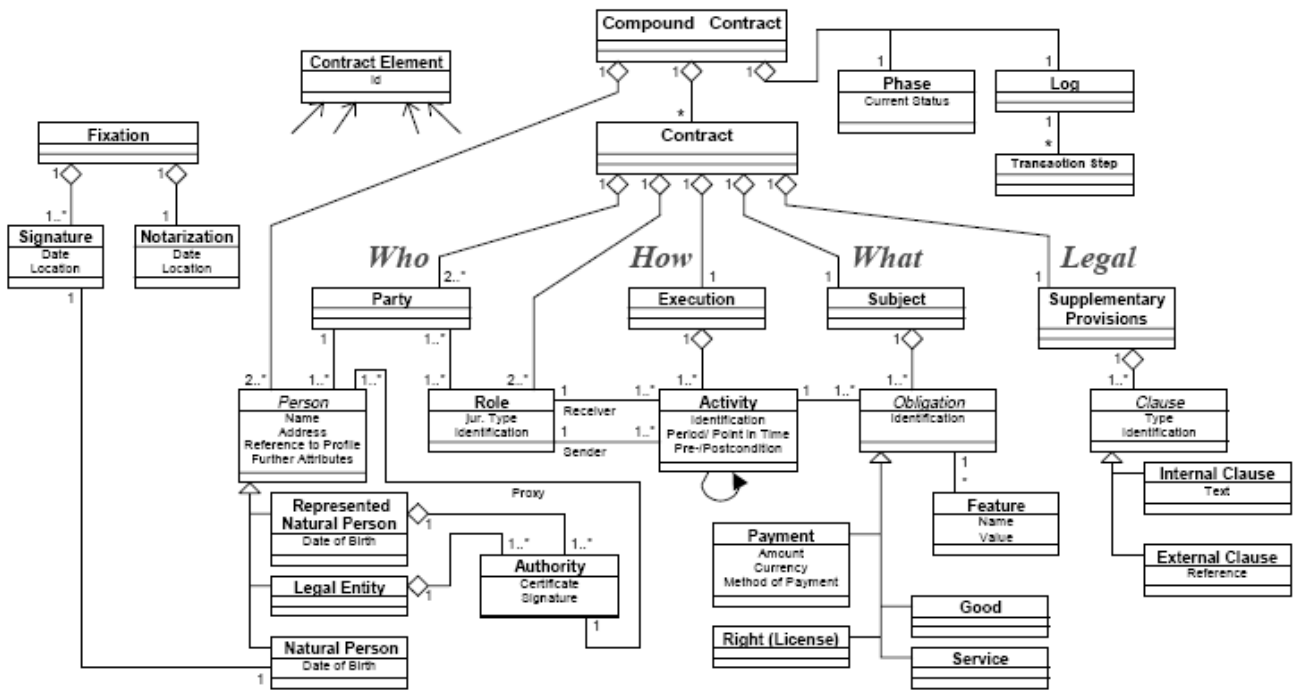


Figure 2: COSMOS contract model [MGB99]

There is also a legal perspective integrated. A contract consists of provisions addressing general terms and conditions where typed clauses are either text-based or references to for example external contracts. [PDK05] propose a logic-based framework for management of a specific type of contracts, namely so-called Service Level Agreements (SLAs). The focus is on the explicit modelling of the different kinds of rules that are inherited in such contracts by the use of specialised logics and reasoners. Four types of rules are identified:

- Graduated rules specify ranges for SLA parameters
- Dependent rules are used to capture quality of service
- Dynamic rules define special events in the environment, exist or are added dynamically
- Normative rules define rights /obligations and corresponding violations and exceptions

In order to represent these different types of rules, different types or aspects of logics are integrated:

- Derivation rules (horn rules, negotiation as failure)
- Event-Condition-Action rules
- Event Calculus for temporal reasoning
- Defeasibility / Courteous logic for allowing conflict detection and priorities
- Deontic Logic for representing obligations etc.
- Description Logic for including ontologies
- Object oriented / typed logic to optimize search space

The implementation is done by an extension of the Mandarax rule engine (<http://mandarax.org>). The syntax is similar to RuleML (<http://www.ruleml.org>) and can be mapped to it.

The OASIS initiative (LegalXML [Le03]) with the aim to define a structure to represent contracts electronically based on the XML standard. The mission of the OASIS initiative for example is the “efficient creation, maintenance, management, exchange and publication of contract documents and contract terms” [Me05]. It makes use of a text which is annotated to express semantics. The definition of the structure is given by means of a DTD. A simplified short example for such a LegalXML document is as follows:

```

<?xml version="1.0" encoding='UTF-8'?>
<!DOCTYPE Offer SYSTEM "xmlcontract2.dtd">
<Offer ID="I003">
  <PartyList>
    <Party ID="P001" type="Offeror">
      <Actor ID="ACT001"><Name ID="NAME001">
        <Entity Type="Company">
          <FullName>Acme Pizza
        </FullName></Entity>
      </Name></Actor>
    </Party>
    <Party ID="P002" type="Offeree">
      <Actor ID="ACT002"><Name ID="NAME002">
        <Entity Type="Person"><FullName>
          Joan Smith</FullName></Entity>
        </Name></Actor>
      </Party>
    </PartyList>
    <Clause ID="C001">
      <Implication><Condition>not raining April 10th</Condition><Then>
        <Clause ID="C002">
          deliver ten boxes Piz-za</Clause></Then></Implication></Clause>
        <Clause ID="C003">Pay $80.00</Clause>
      <LawsuitTo><CourtInformation><Location><LocationId>
        Court 1</LocationId><LocationFunction>N.A.
      </LocationFunction></Location>
    </CourtInformation></LawsuitTo>
    <ApplyLawOf>NY</ApplyLawOf>
    <EffectiveDate><Date>20000413</Date></EffectiveDate>
    <ResponseDate><Date>20000415</Date></ResponseDate>
  </Offer>

```

It is also possible to use descriptions which are human readable. For example, there are references to the definitions of special values which can then be substituted:

```

<Text>
Ship @Q1 of Part @PN2 as specified by catalog @PN1
whose item description is @PN3.
Use @T1, @T2 via Carrier @T3.
</Text>

```

2.3 New contract model

The discussed approaches fall into two categories. Firstly, there are static contract models representing structures. Secondly, there are exchange formats representing data and information exchange. There is no approach combining the two for explicit document negotiation which requires a rigorous contract model as the basis for communication exchanges about details of the contract that is represented in a form useful for machines and humans. This is what will be done in our approach.

The approach is based on two layers. Firstly, the semantic representation of the agreed duties is modelled. Secondly, human readable clause texts need to be integrated. Therefore, a semi-structured approach is used. The contract consists of contract clauses which in turn consist of free text. Special text fragments which are required values for a semantic representation are marked (similar to the LegalXML approach).

For the semantic part a contract consists of clauses. There are different (content) types of clauses:

- Obligation / Permission / Prohibition
- Description
- Exceptions
- Penalty
- ...

Obligations, for example, consist of actions, obligors, and obligees. The action can contain a further object which is part of the action or can measure it. Thus, there has to be a link to the description. This could be for example a description clause which consists of concept/value pairs or further sub-descriptions. Exceptions and penalties consist of rules with requirements and consequences. In the semi-structured document, the rule is a special sub-element and will be represented in a logic language comparable to RuleML or the SLA language of Paschke. For the values used in the rules, references to special marked items in the human readable text are used. There is also the possibility to build more complex clauses using rules. As mentioned, some of the clauses already require a rule, e.g. exceptions or penalties. Obligations can also be linked to rules.

In the variables for clauses values of different types can be used:

- Participants
- Concepts
 - Numeric
 - Free text
 - Enumeration
- References
- Actions
- Time
- Document references

All the clauses, concepts, and values are part of the related ontologies. Different ontologies can be used to define the contract type, the domain (e.g. goods and service descriptions) or the current negotiation.

The contract ontology is used to define some kind of contract template. It is also useful to have standard contracts consisting of the ontologies and a contract partly filled in.

Negotiation about clauses and negotiation about values needs to be linked. For example, consider the following part of a message: “We will only accept this clause if the payment date is set to two weeks after delivery”. Bargaining is integrated with negotiation about specific paragraphs or formulations of a contract.

3 The Communication Model

Although in many cases a standard contract document can be used which results in only having a core negotiation, it is also the case that something is added or changed in the formulations. For this reason, negotiation communication deals with three domains:

- Core negotiation (Bargaining)
- Ontology negotiation
- Document negotiation

Bargaining deals with reaching an agreement about the values of a list of negotiation attributes. The ontology negotiation deals with a common understanding of the concepts used in the negotiation, the negotiation domain or the contract (for example the contract terms) and their relationships. The document negotiation deals with negotiation about (parts of) documents as discussed in the previous section.

3.1 Requirements for the extended communication

First of all, the structure of the contract document has to be considered since it will be affected by the communication or negotiation about formulations in the contract. In general, the contract can be seen as a formal process description [KDK01]. For example, there might be temporal dependencies between different obligations such as “Delivery is done no later than 10 days after payment has been received”; there might be inconsistencies in the contract clauses; there might be relations and inter-dependencies between different contract clauses etc.

Requirements regarding the document itself are also affecting the communication about it. According to [JS05a], important requirements are interpretability, extensibility, and executability. Interpretability necessitates a human readable contract document as well as its formal representation. The latter allows reasoning, for example, about the relationships or dependencies during the execution of the contract. As standard contract templates can be important but are often only used as a basis, the contract needs to be extensible. Therefore, communication about what to add and how is needed to do so.

A contract clause is usually linked also to some negotiation attributes and their proposed values in the core negotiation. Therefore, the integration of formal document management and of communication management is required due to the dependencies.

Additionally, there has to be a linkage between ontology concepts and contract paragraphs for two reasons. Firstly, there must be a clear understanding of the contract elements formalised in the ontology. Secondly, the ontology is used to derive paragraphs defining contractual terms.

Looking at the requirements for the communication itself, it has to cover the different aspects of contract structure, contract formulations, negotiation attributes and their values, the different types of rules behind special terms, concepts in the negotiation or domain ontology and the relationships between them.

Transparency during the communication is of prime importance. The consequences of a message for the negotiation partners as well as the contract and ontologies must be clear.

3.2 Existing communication in Negoisst

Based on communication theories of Searle [Se69] and Habermas [Ha81], Negoisst has a strong focus on the support of communication. For example, one quality aspect of effective communication is the understanding of intentions. Therefore, an explication of intentions is desirable. In Negoisst this is implemented on the level of messages. Each message is associated with a message type carrying and explicating the illocutionary point. In order to support an appropriate communication, a communication protocol is defined controlling the sequences of message types (see figure 3).

Especially important for the contract manipulation are the message types or intentions “request”, “offer”, and “counteroffer” since they lead to new contract document versions that are consisting of the new proposed values of negotiation attributes in the corresponding contract paragraphs. The green and the red area define whether the statements are binding (red area) or informal (green area). For example, an offer in the green area does not lead to a new contract version.

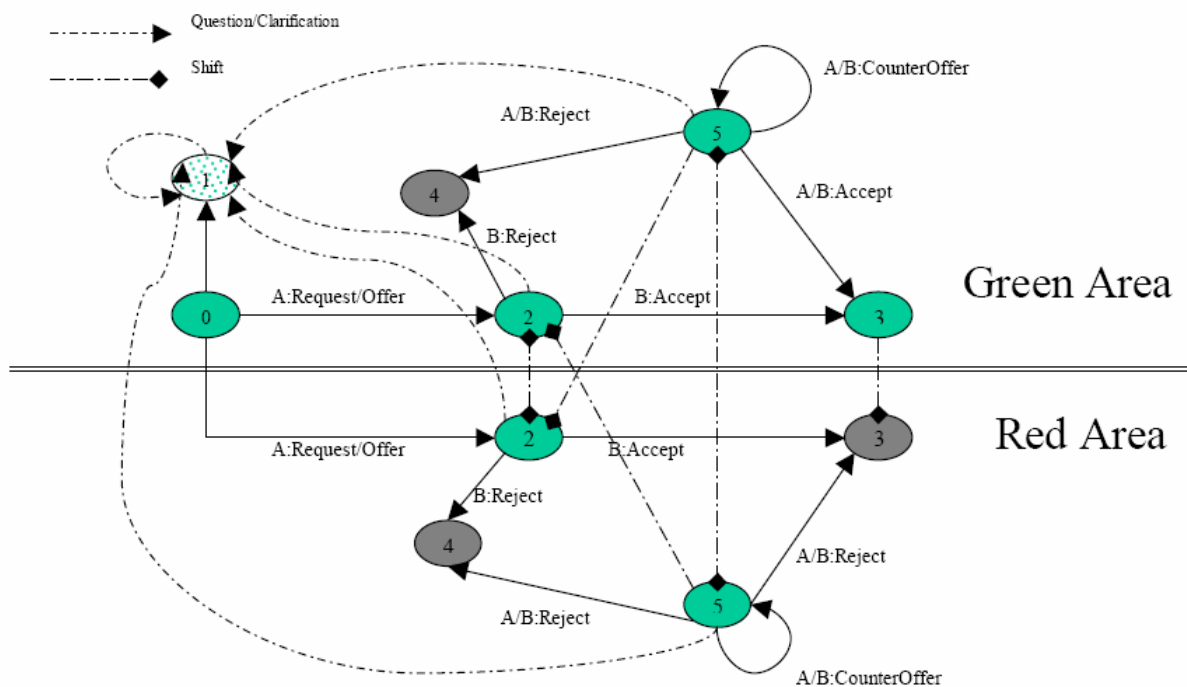


Figure 3: Negoisst negotiation protocol [SJJ03]

For the ontology negotiation, a simpler protocol is used. If the desire arises to add a new aspect or concept for the negotiation and the contract, it is possible to propose such a change to the other side. The negotiation partner can then either accept or reject this change. The content consists on the one hand of the new ontology and the changes and on the other hand of free text content for giving arguments.

3.3 Related research on cooperative authoring

There are other research approaches dealing with related topics of collaborative writing of documents. For example CSCA (Computer Supported Cooperative Authoring) as a special form of CSCW (Computer Supported Cooperative Work) looks in general at the support of authoring documents.

Requirements engineering is also a collaborative process and its support also deals with communication support for authoring the requirement descriptions. For example, [ALC98] propose a collaboration model. It relates different communication actions like questions, reasons or answers to each other but it is not a communication protocol.

[Ca01] developed a general data schema for collaborative editing and therefore built a list of possible actions for the collaborators. For example for sections inside a document it is possible to add, remove or change it. It is only a static list of actions. Dependencies between them or a protocol of their usage is not given.

Another related discipline is the field of knowledge management for example if a group of people wants to fix knowledge aspects of a domain, e.g. by collaborative ontology engineering [SEA02]. There has to be some kind of communication protocol in order to agree upon, for example, adding a special concept and the relationship to other concepts. On the one hand a contract could be seen as a special type of knowledge for example about a process of exchanging goods and services. Ontologies also have their application in NSS as in Negoisst [JS05b]. For example they can define the domain knowledge, the legal knowledge, or the negotiation knowledge. The NSS Agora [Ce98] is also document-centred but uses only a very simple protocol according to a contract model based on a textual structure (paragraphs, headings etc.).

[ZHE99] developed a tool for distributed web authoring and publishing. For the collaborative process they distinct different roles and related actions. Examples of such actions are replacing of documents, modifying documents, or removal of documents. But they are rather general. All changes are associated to the users that conducted the change.

[KA01] developed a collaborative report writing editor. They solved the problem of interaction by a simple locking mechanism.

[LHG05] deal with synchronous collaborative document editing systems. They developed an algorithm for managing the insertion of characters into documents. It does not make sense to use this aggregation level for the contract negotiation. An asynchronous communication is already in the focus of the Negoisst system so this real-time functionality is not required.

Most of the approaches and systems work with a locking mechanism for document management in order to synchronise changes. However, there has to be an explicit agreement about the contract terms in a negotiation which means that this has to be considered in the communication protocol.

3.4 Communication Extension

The contract clauses as the sub-elements of a contract might be changed in different ways. The communication about changing elements of a contract is similar to once concerning ontology changes but it is more detailed because of the different kinds of elements. It is possible to add a new paragraph, to delete one, or to change it. Furthermore, it is also possible to add dependencies or more complex rules to define the semantics of the paragraph, to add responsibilities or obligations, to relate paragraphs or words to ontology concepts, and to express special parts (which are then also concepts in the ontology) to be negotiable in the core negotiation. The content depends on the type of change.

According to speech act theory communication itself can be seen as an action. Regarding the communication about the contract itself and especially the clause many different communicative actions can be used:

- Add /Delete clause
- Change clause text
- Change clause type
- Add /change/ delete dependency
- Mark/unmark clause item
- Add /delete negotiation attribute
- Move clause
- Question according clause / Answer
- Fixation
- Refuse change /addition / deletion / move / fixation (/ all)
- Accept change /addition / deletion / move / fixation (/ all)

The content of the addition of clauses depends on the type of the clause. For example, a violation may consist of requirements. The changing of clause text refers to changing those words of the clause which are not marked. This may include the change of the position of marked elements (or clause items), e.g. when a sentence is reformulated. A change of a clause type has consequences also for the clause items. Those ones not necessary will be unmarked automatically after acceptance. Addition and deletion of dependencies refers to the prerequisites of rules behind a clause. These could be time-dependent clauses or the activation by the fulfilment of other clauses (e.g. obligations). In addition, dependencies to other clauses can be the relationships between them (e.g. hierarchy or the association of descriptive clauses to obligations).

For the detection and clarification of misunderstandings, uncertainties etc. there is the possibility to ask questions and then answer the question. A special change is the fixation request. Fixation means that once it is accepted, no change on the clause is possible anymore. This does not mean a fixation of the negotiation attribute values in the core negotiation but it is for example not possible to take a negotiation attribute off the negotiation agenda. All changes that are requested need to be approved by the counterpart which means that there is the possibility to accept or reject the changes. In figure 4, a protocol for the usage of the different actions for a bilateral negotiation is given. From state 3 to 6 all the mentioned transitions are possible in parallel which can then be accepted individually or as a whole.

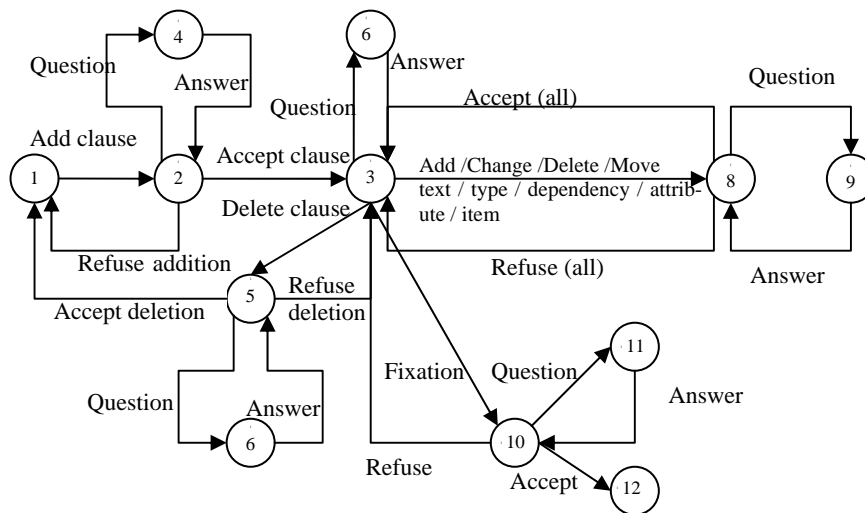


Figure 4: Contract communication protocol

For the core negotiation and the ontology negotiation no changes have to be made. But the different communication protocols cannot be seen as being isolated. Rather, they are inter-related. For example, the introduction of a new contract paragraph might affect the negotiable attributes for the core negotiation later on, the concepts and relationships in the ontology, and the contract document with its formal representation.

4 Conclusion and future work

Electronic negotiations concern values for contract attributes as well as the meaning of certain terms and the formulation of contract clauses. To enable such wide negotiation processes, work needs to be done regarding document-centred negotiations. The negotiation support system Negoisst enables complex electronic negotiations concerning any type of attribute the negotiators want to discuss. Furthermore, ontology negotiations are possible representing the background of the negotiation to be defined by the negotiators. The present paper focuses on the work necessary to enable document-centred negotiations enabling negotiations about contract paragraphs, formulations, wordings etc.

It is necessary to integrate all three types of negotiation mentioned above. In order to do so, more work regarding the communication content has to be done. On the one hand, the contract management extension of Negoisst covers the communication part. But on the other hand, it is also necessary to re-model the document and the message data representations.

A formal representation of the communication protocol the communication content, their semantics, and consequences will be developed in order to make the consequences transparent. Therefore, the concrete formalisation of the contract has to be developed and linked with the formal communication model.

With respect to the fulfilment phase, it is also desirable to allow monitoring of the state of fulfilment which leads to the need of a formal representation of the contract content.

Finally, the communication can concern several contract documents with relationships between them. For example, sub-negotiations might take place which lead to sub-contracts that are combined into an overall contract or a negotiation might be based on a frame contract.

The current work provides the basis for an extended Negoisst enabling all types of complex electronic negotiations as discussed in the paper.

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Talking about services – towards communication support for service-orientated companies

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Abstract: Services gain more and more importance in business. In this article, we will analyse the impact this has on the communication processes. We will analyse the reasons for this development and develop an appropriate definition of services for our context. We will then discuss the changes to the processes and the communication of the company and give a first analysis of applicable methods for analysing and modelling the changes. A short example of the construction industry will illustrate our approach.

1 Introduction

Services gain more and more importance in our economy. Many product-oriented companies now offer a variety of different services to their customers. This move to services will have a strong influence on the processes and communication patterns of the company. The new forms of communication and cooperation need to be reflected in the tools supporting corporate processes since these tools currently focus on classical products. Before being able to conduct requirement analysis for these tools, we need a more precise view on and an understanding of the changes.

The current paper provides the foundation for this work. Therefore, we will first have a look at the reasons for the move to services (section 2). To get an understanding of the unique characteristics of services, we analyse the common definitions for services in literature in section 3 before providing an appropriate definition for our context in section 4. We do an analysis of the changes to corporate processes caused by services and focus on applicable methods for analysing and modelling these changes (sections 5 and 6). An example from the construction industry will be used to illustrate the impact of the move to services in section 7. A brief outlook will conclude the paper

2 Reasons for the move to services

Starting some decades ago, business has undergone a fundamental change in most industrialised countries. Pushed by the effects of industrialisation, standard of living has improved and thus labour costs have increased enormously. At the same time, costs for transporting goods have decreased or – especially in information technology – have even vanished.

In labour intensive production processes, these effects cause a growing pressure from low-wage countries, where production can be done to lower costs. Competition is thus no longer a local but a global game and traditional companies face the challenge to find a new position in the game of competition.

2.1 Selecting the right strategic advantage

According to [Po80], companies have two strategic advantages they may gain:

- Uniqueness perceived by the customer
- Low cost position

When the strategic target is industry-wide, these advantages are better known as “differentiation” and “overall cost leadership”.

Under the described general conditions, the low cost position cannot be reached without fundamental changes in production strategy such as outsourcing the cost-intensive production processes or even offshoring the whole company. If the company wants to remain on their traditional home market, the low cost position is not the one preferable under most conditions.

So most established companies facing the described problems decide to take the other strategy and to differentiate themselves from their competitors. But how can the company achieve the strategic differentiation in the market? Since the core products get more and more comparable [VRG04], differentiating can only be done by adding new components to the core product. Most of these added components are services that companies employ to add unique features to the product. These features differentiate the products from the ones of the competitors and add an additional value creating increased willingness of customers to pay for them. This strategy is often accompanied by components to reduce producing costs, too. After all, these trends lead to an increasing rate of services on the share of employment as well as on the gross national product [LW04].

2.2 Changes to the interfaces of the organisation caused by services

A change to a service-orientated organisation involves fundamental changes to the organisation. The customers as well as the suppliers get more involved in the fulfilment process, the expectations of quality differ completely [PZB85]. One of the major challenges is the change from a product to a process view and the accompanying integration of the customer [FI01].

Most services focus on providing a solution for a problem of the customer. But this cannot be done with a separated production process. Rather, the customer gets involved and integrated in the process of production – a change with fundamental influence on the process. In classic production processes, the production is normally completely invisible for the customer. For service production, there is a possibility of a more precise separation according to [FI01]:

- Processes done by the customers themselves
- Processes visible for the customer
- Processes invisible for the customer

The integration also leads to a change in the communication to the customer: there will be more flexibility and less formality. Furthermore, the classical hierarchy of communication patterns will break up [Ma78]. Taking into account that the move to services also includes a greater involvement of subcontractors, there will be the same situation at the new emerging interface to the subcontractors. Therefore, the company will need to prepare for changes on both ends of its value chain. Changes will include the planning and coordination of resources such as time, personnel, or material not only within the company but also with the external partners. Furthermore, a cultural change will be necessary to understand the customer as well as the suppliers as an integral part of the production processes. These changes will also need to be reflected by the tools supporting the market and the interfaces.

To take a closer look at these changes, we first need to get an image of the unique characters of services causing these changes. Therefore, we will analyse the definition of services in the next chapter.

3 Definition of services – a literature view

Discussion about the term “Services” is more often found in German literature than in English literature. When looking at the German term “Dienstleistung” we have to keep in mind that the German term is a composition of the verb “dienen” (to serve) and the noun “Leistung” (activity or performance). “Service”, when used in German context, has either a more technical meaning and may stand for maintenance or repair services or stands for customer service and the perceived quality. Therefore, there may be some minor differences in the understanding of the term.

3.1 Common definitions of services

Discussion in German literature (e.g. [Co01]) often starts with a discussion about the type of possible definitions. Mostly three possible ways are given:

- An enumerative definition based on examples.
- A negative definition defining services as the opposite of property goods.
- A definition based on characteristics.

Only the last approach may get to a scientifically acceptable definition, since the first one will only list examples without looking on the common characteristics and the second one will give a definition of property goods and not of services.

Based on this, the most common definition of services is based on three factors [Hi89, Kl01]:

- There may be only a potential to fulfil a service and there are no finished products since services cannot be produced in advance (potential orientation of services).
- The consumer is involved in the production process (process orientation).
- The service is a non-material good which becomes concrete only when performed for/on the consumer (output orientation).

In contrast to German literature there is no common definition of services in English speaking literature. Most authors identify intangibility as the fundamental characteristic of services (e.g. [Ra74, EL77, Ze81, ZPB85]). In most cases, the authors name additional characteristics of services such as:

- Consumer participates in the production process
- Consumption or use is only possible with participation of the seller (No transfer of ownership)
- Non-standardisation / Heterogeneity
- Payment is mostly done after performance
- Production and consumption are inseparable
- Services cannot be stockpiled (Perishability)

In addition, [Ba77] further distinguishes between two aspects of intangibility: services are impalpable (they cannot be touched) and can also be mentally intangible (they cannot be grasped).

3.2 Critiques of the common definitions

These definitions are criticised in several manners. [Kl01] already notes that services also may have some material components while there is a need for a potential of fulfilment for material goods. [Me93] introduces a third kind of “Auftragsleistungen” (order-driven production), which shows that there are material goods which also cannot be produced in advance. [Kl84] also criticise the intangibility and notes “In contrast, some services [...] apparently can be described without problems in industrial categories.” (Translation by the authors).

In English literature no such discussion could be found. We instead find an ongoing development of the definition in which each author creates a definition out of a set of criteria. The problem is that the definitions seem to get more and more vague. For example, [Gr03] defines services as:

“A service is a process consisting of a series of more or less intangible activities that normally, but not necessarily always, take place in interactions between the customer and service employees and/or physical resources or goods and/or systems of the service provider, which are provided as solutions to consumer problems.”

But how can we talk about services, when we have no clear understanding of the term and there is no definition which is precise and undisputed? Solutions like the one promised by [HK98], who reject services and real assets as opposite terms cannot be the right way either since we need a proper definition to discuss the undisputable differences services make to business.

A more promising way is suggested by [Kl01], who states that “Dienstleistung” is a theoretical construct based on empirically observable facts. Thus it is, using the notation of Peirce, a representamen and cannot be true or false but rather more or less appropriate. Thus there is not one definition of services but a specific, content dependent one. To have a look at the specifics of communication about services, we first have to create an appropriate definition for them.

4 Defining services for communication support

To arrive at the required definition, we will look at the common characteristics of services and their influence on the communication processes. The approach will be first to summarise the definitions for and characteristics of services found in literature and second to analyse the influence to the communication process. The third and last step will be to summarise the relevant characteristics for a definition of services appropriate for a communication-oriented view on them.

4.1 Intangibility can make auditing more difficult

Intangibility was noted as one of the fundamental characteristics of services. But although intangible, services may consist of physical material transporting parts of or the result of the service (e. g. the CD-ROM to transport a software program). Mostly services are performances, operations, or actions. Intangibility may also include mental intangibility of the process as mentioned above.

But although services may be intangible, they all aim to change the real world as real assets do. There is no difference to talk about different changes – as long as they can be audited. If the result cannot be audited by an external person (e. g. because it is about a feeling, knowledge, etc.), the goods are said to have high experience qualities. In this case, the verification (by court or an external person) of a proper delivery gets difficult or even impossible. This may result in a need for special regulations for faulty performance, since the partners cannot rely on the common legal regulations. If even one of the contract partners or both face the same problem (e. g. by a medical diagnosis), the goods are said to have high credence qualities ([Ze81]). In this case, it may get difficult to define the proper aim of the service which might also influence the communication.

4.2 Interaction leads to bilateral treatments

There is a need of interaction between customer and provider to conduct a service. Often, the customer himself/herself gets involved in the process. These factors may bind the service to a specific location. Thus services cannot be stockpiled and consumption may not be possible without the provider. The level of interaction differs widely and may range from giving some basic information to fulfilling the whole service for/on the customer. In most cases, there is an ongoing interaction between both parties which is affected by changing roles.

Communication is affected by this in two manners: first there will also be communication during the performance of the service, which also may influence the subject terms of the contract ([Ma78]). Second there is now a bilateral agreement independent of the payment: not only the supplier makes a commitment but also the customer does: depending on the impact of its interaction, factors such as time of interaction, goods to bring in, actions to do etc. have to be clarified. This commitment is not always made explicit: these factors are often implicitly included when concluding the deal.

4.3 Uninspectability and importance of soft facts in sales

Sales differ in several manners for services: since most services cannot be performed in advance, the provider can only sell a proposal of performance or sales is inline with production. This makes a test of the service in advance impossible. After production it may be impossible to sell the service to a third person. The content of the deal gains importance and the focus moves from disposal in time to process-orientation and long-time functioning. Customer satisfaction is influenced by soft facts and the surroundings and results from a comparison with the expectations ([PZB85]). The success factor for marketing is to take these expectations into account and to satisfy or even exceed them – marketing is parallel to production. A customer's search process is mostly based on experience and credence qualities and is orientated towards the capabilities of the provider which may be actively influenced by signals sent out by the provider. The customer might not be aware of his/her needs or might have a wrong picture of them.

Specifics in sales are expected to influence mostly the pre-contractual phase. Due to the specifics of service, it is not possible to negotiate about an already existing object and, therefore, the customer cannot inspect the object before signing. The process and time orientation leads to a need of clarification of adoptions to the agreement in case of a predictable or non-predictable change of external environment. These factors as well as the growing importance of the surroundings and of soft facts lead to incomplete agreements with an increasing uncertainty factor. For communication this means that complex communication processes about the exact matters of the treaty and, if applicable, about adaptations to or clarifications of the treaty occur.

4.4 No amendment in production

Sales, production and consumption of services mostly occur in time, whereby the customer has a threefold role as supplier, co-producer and consumer. The customer can experience and check the product first during production. Manufacturing errors are mostly behavioural errors and can not be mended.

In particular, the lack of possible amendments and return of a faulty service makes contractual clauses important for the case of faulty performance. These contractual clauses need to aim at a reconciliation of interests of both parties in case of failure. The result is a firmer requirement of customer input which can create the need for special clarifications before or during the transaction. In addition, services with a strong focus on a long-term process also result in an ongoing change to the production process.

4.5 Vagueness of results and requirement of standardisation of the interaction

Services mostly consist of human work and subjective and situational factors have an impact on the delivery process. Services are mostly unique for customers and can not be standardised; a uniform result is impossible. Service development results not in a complete construction plan but in a script with procedures and rules of the service production instead.

The lack of standardisation mostly influences the internal processes of the provider. Since the customers or suppliers may get involved in these processes, there may be some influences to external communication as well. The treaty must accept some variance in the results which may also need to be clarified. If the provider wants to try to standardise his service, it may get interesting for him/her to get to the result in a specific manner or to find the external factor in a specific way. This may get part of the contract or influence the contractual phase, since the provider may make different offers depending on the conditions (e. g. time dependent rates for telecommunication, special conditions for online orders etc.).

4.6 Uncertainty resulting in agency problems

The production process is faced with uncertainty due to the integration of the external factor and the high stakes on human work as well. Both the supplier and the customer face problems of information deficiency and uncertainty. When starting with production, the exact result of the production process is mostly unknown, the external factor is indetermined in form, quantity, time and place. Simultaneous production and lack of storability result in uncertain planning employment. The restricted patent protection is another factor increasing uncertainty.

These uncertainty components and the resulting information asymmetry allow opportunistic behaviour for both parties. The resulting problems like moral hazard etc. are thus very common for services: lack of relevant information before signing may be hidden characteristics, information differences may be taken advantage of after contracting. Also hidden action and hidden intention is of high importance. Thus the instruments for solving agency problems are of high significance in the pre-contractual phase and for the contract itself; arrangements to ensure a compatibility of incentives for all parties involved are very common.

4.7 Bringing it all together – a definition for the communication view

Based on these results, we can now summarise the findings to arrive at a definition appropriate for the relevant communication context. Before doing so, we have to keep some issues in mind:

- There is not one definition of services but only a more or less appropriate one. Consequently diverging definitions are not automatically wrong. Thus our definition will match our focus, namely the influences on the communication processes.
- There is no hard distinction between services and asset goods: there are goods that have more characteristics of services and such with more characteristics of assets. There is a continuous transition from one extreme to the other.

We can now summarise our findings. Factors distinguishing services from asset goods in our relevant context are:

- The definition of the exact contents and targets of the performance is more difficult than for asset goods; there is a high part of experience and credence qualities. These uncertainties exist for both parties.
- The treaty is based on mutuality: there will be implicit or explicit commitments for the beneficiary of the contract as well.
- The grade of fulfilment is also dependent on the external environment whereby different contractual regulations are possible.
- Regulations for cases of faulty performance of the full contract or parts of it gain importance. This includes measures to protect for opportunistic behaviour of the contract parties.
- The contract will be rather incomplete and often long-term.

All these factors deal with uncertainty – either in the process itself or due to a more complex contractual situation. Thus we can define services as follow:

*Services are goods where uncertainties existing in the phase of provision or its surroundings will have an impact on the contractual phase.*¹¹

This definition explicitly excludes all uncertainties solved before the contractual phase; e. g. if the uncertainty of the supply market was handled in advance by obtaining the required goods.

What consequences does this definition have on the classification of goods to services? We will only give a first view on this by looking at three main factors:

- The involvement of the external factor increases the uncertainty and therefore the service character. But the degree of service character depends on the character of the external factor. If the external factor is relatively homogeneous (e. g. a simple input to be made by the customer) then the degree of service character is low. If, on the other hand, the external factor is heterogeneous, there is a high degree of service characteristics.
- Contracts covering a long period result in more service characteristics due to the increasing uncertainty.
- Immateriality is not an indicator for services per se. Only the mental intangibility as described by [Ba77] leads to increased service character.

Compared to other definitions, our definition seems to be compatible with most of them, but focus more on the impact (uncertainty) as on the cause (immateriality, integration ...) of it.

5 Analysing the changes to corporate processes

Having determined uncertainty as the fundamental characteristic of services from a communication view, we can now start to analyse how uncertainty influences the processes of the company. We will distinguish three different domains: [Me92]

- Material processes
- Information processes
- Business processes

The character of material processes is unlikely to change when moving to services. Of course the amount or the type of material needed may now be unclear since there is no bill of material or the material will now come from the customer and must be returned, or the “material” is even the customer himself/herself. But all this is only a change of the material flow and not a change of the general concept.

Things are different regarding information processes. While changes to the amount of information exchange will not influence the concept, the vagueness will. While information for asset goods normally follows a strict scheme (e. g. “1 pair of trousers in size 48 in colour #1 of your catalogue”), information for services will not always (“1 pair of trousers fitting my figure and suitable for my blazer”). Thus, the quality of information becomes more important and a uni-directional information flow changes to a bi-directional interaction regarding the detailed content of the good. Thus new models such as CoMAP ([Ke00]) become important which look not only at the information flows but also at their quality.

Business process may undergo a complete change since the intensity of interaction with the customer increases, the sequence of actions change etc. Therefore, we will analyse communicative business processes in detail in the next chapter.

6 Modeling and analysing communicative business processes

The business process undergoes a fundamental change when changing to services:

- There is not one standard process with a fixed sequence of planning, sourcing, production and sales (and some variants dependent on business model) but there is an ongoing process which involves all parts with parallel, overlapping, and repeating task.
- There is not one production process but there may be a sequential procedure which involves feedback and adjustments.
- There is not only a limited, fixed number of interfaces to the customer but there is an increased number of them which may occur at different times and places.

¹¹ See [Ka01] for a similar definition.

- Discussion about the contract will no longer include only the classic contractual data such as quantity or price; it will instead include new items such as forms of interaction and performance that become more and more important.

We are particularly interested in the influence on communicative business processes when integrating services into a business portfolio of a producer of products. To analyse and model these processes, the speech act-oriented approaches of the language action perspective [Sc01] seem to be helpful, which give general patterns for the communication structure [MR03].

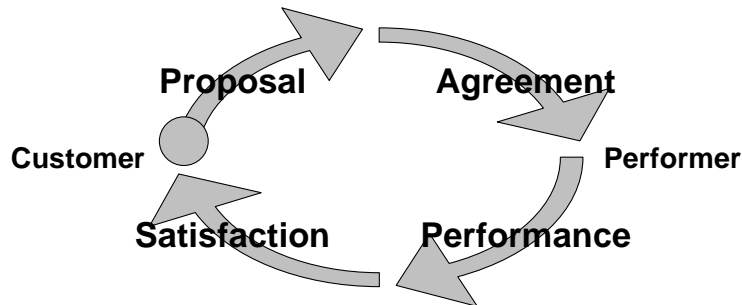


Figure 5: Action Workflow [Me92]

The Action Workflow Approach [Me92] divides business processes into action workflow loops. It consists of four steps:

- Proposal: The customer requests execution of a specific action.
- Agreement: The customer comes to an agreement with the performer about the conditions needed for satisfaction.
- Performance: The performer performs the action and declares its completion.
- Satisfaction: The customer declares that he is satisfied with the result of the action.

The main characteristics of Action Workflow are the possibility of sub-loops and the closeness of the process giving the customer feedback of successful completion. However, [KS00] shows that the feedback is often missing in business processes. Action Workflow is a very flexible approach since it explicitly allows sub processes within the phases like the ones found when renegotiating about open or upcoming terms in the service agreement. The term “satisfaction” used for the last step, where the customer declares that the completion is satisfactory, focuses on the problem solving component of the process. This model is very promising for services since it allows modelling some of the specific aspects identified. Uncertainty can be partially handled by adding new sub processes for clarification. However, it is not possible to represent open treaties or renegotiations. This has to be further investigated.

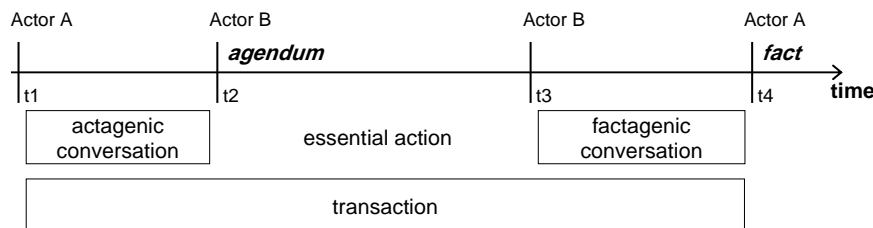


Figure 6: DEMO [RR95; extended]

DEMO (Dynamic Essential Modelling of Organizations) is a “cross-disciplinary theory about the dynamics of organizations, as well as an analysis method based on that theory” [RR95]. It deals with transactions starting with an “actagenic conversation”, which results in agreements about future actions and ending with “factagenic conversations”, where facts are established. The underlying actions are executed during the “essential action”. DEMO follows a very similar approach to Action Workflow. It is a more generalised model, which does not explicitly include renegotiations, partial acceptances or amendments. But since the essential action, where action is executed by B, is a very open term, this may implicit being included in this part. But since Action Workflow is more promising for us and due to the similarities of the model, we will focus more on Action Workflow than on DEMO in future work.

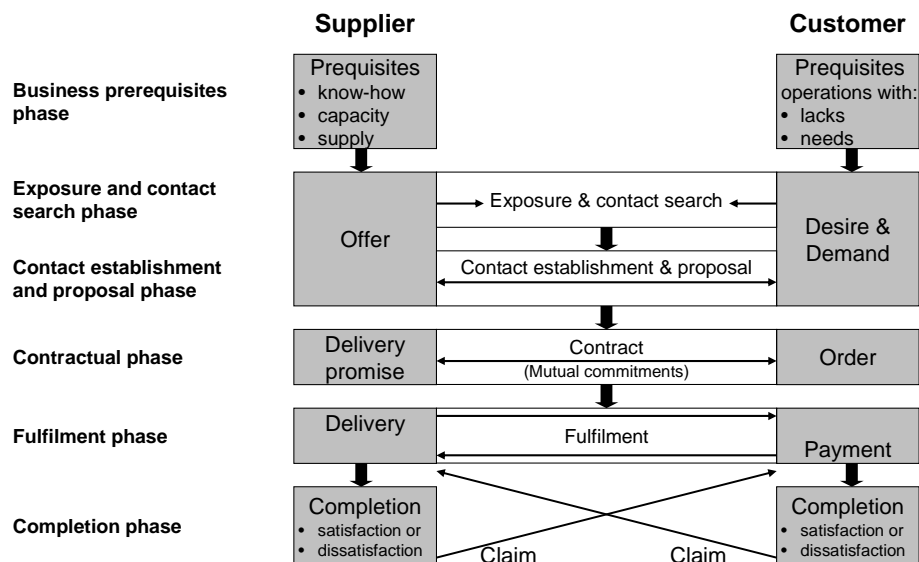


Figure 7: BAT [Go98; extended]

Like DEMO, BAT (Business Action Theory) is a single flow oriented abstract model. It was developed based on Action Workflow by dividing the first step into three steps and has more semantic richness and more complexity than Action Workflow to gain analysis strength [Go98]. It divides business interaction into six generic phases but has no longer an explicit feedback loop. Due to this single flow orientation it seems to be less appropriate for services, but it is more detailed as the other models and includes some interesting aspects like the claims for both supplier and customer and the bilateral construction of the fulfilment phase. In addition, the SIMM-methodology [LR98] is an extended method behind the theory, which allows modelling more complex business processes. The adaptability of this method to services has yet to be investigated as well as the expandability of event-driven-process-chains to model the specific aspects of services. At first glance, vagueness and the different types of parallel sub-processes would need to be added.

7 An example from the construction industry

The construction industry currently faces the challenge that traditional manufacturers and craftsmen such as window manufacturers or roofers can no longer survive in a purely price-based market. We can observe a shift towards an integration of services in their product portfolio resulting in a change of their intra-organisational and inter-organisational communicative business processes. An example from the construction industry is used to illustrate our arguments.

Consider the following scenario. A family as customer wants to build a semi-detached house and goes to a construction company offering such houses in the relevant town. To reduce complexity, we will focus on a single-contract approach so you will have one person responsible for the whole project. There are three main ways for the customer:

- They choose a completely pre-planned and pre-configured house.
- They choose an individual house completely planned based on the individual needs.
- They choose the middle, i.e. adapt a pre-planned house (or scheme) to their needs and thus create a customised one.

Under the described conditions, the pre-planned house is comparable to a classical product: there is nearly no uncertainty in the process – the customer buys a completely predefined product from the seller; the seller has a near to complete picture of the actions to carry out as long as there is no unexpected event during construction.

The second choice – the individual house – has mostly service characteristics. The process will start with the customers talking to an architect about their vision of the new house. Plans will get more precise during the process, planning permission needs to be received, and then the building process can start. At the start of the information/negotiation/contracting phase, there will be uncertainty on both sides: the customer is unsure about the satisfaction with the architect's proposal while the architect is not sure how well the customers' expectations have been met. Both sides are not sure whether the project can be realised and how much it will cost.

Thus there must be a shift to services including customisation. Examining our example further, we can see that there is not only one way of customisation but instead several ones. Assume that our customers want to have a house that has a lower level of energy consumption.

Consider the following two rather similar situations:

- The salesperson tells the potential buyers that thicker insulation can do the trick and shows them two different types of wall insulation and roof insulation.
- Instead of presenting the customers with only the material, the sales person offers a complete energy advice. For example, (s)he might say that a insulation for walls and the roof alone is not effective if the windows are not made with specifically insulated glass.

Although both situations look very similar at first, there are several fundamental differences between these two approaches. In the second situation, the salesperson no longer offers a configurable product but a fitting solution including products and services. The salesperson coordinates the process of energy optimisation of the house. Furthermore, the communication between salesperson and customers changes from a hierarchical sales-oriented discussion to an interaction of equal partners. The discussion is no longer only about “what” and “how much” but also about “how”, “why” and “whether or not”. There is no longer a single point of contract but an ongoing process of discussion by means of communicative enrichment. The contract will be more flexible and will allow adaptations and breaks at several points. The first contract may be concluded at an earlier time but may get completed much later.

As it can be seen, the change of arrangement is very small, but there is a much higher impact on the process and uncertainty gets involved. The major change is neither a technical or physical one – it is a change in thinking and in communication.

There has been a trend towards such service-orientated offerings over the last years. But what makes these offerings more attractive to both parties if the constellation is nearly the same but involves more uncertainties?

It can be expected, that the result of a service-orientated offering fits the needs of the customer much better than the classical product solution. The customer both receives and perceives a higher quality which implies a higher willingness to pay. Findings such as those in [Sc02] show that not only the received quality increases but the result itself may have a higher factual quality and the fulfilment process may be of higher efficiency when there is a bilateral cooperation process for the parties involved. Thus there will be a win-win-situation and a strategic advantage on the market which motivate the move to services.

8 Outlook

We have seen that the move to services brings a new factor to the corporate processes, namely uncertainty. This will mostly influence the communication and the business processes within the firm and along the value chain. The example has illustrated that services bring changes to thinking and communication – and not primarily to the technical or physical constellation. The next step is to analyse these changes in more detail to get a better understanding of them. The presented LAP-orientated models for modelling and analysing the communication and the business processes can provide the foundation for this but will probably need to be adapted to reflect all specific characteristics of services. With these findings, we can then identify the specific needs for communication support in service-oriented companies.

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Integrating variable user goals into user acceptance models

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Abstract: Models on the user acceptance of information systems are generally applicable only in work environments because they implicitly assume that the user's goal is to enhance job performance. If users strive for other than work related goals these models tend to fall short. In our paper we present a procedure to explain user acceptance that does not assume a specific user goal up front. In doing so, we apply the theory of means–end chains to develop a hierarchy of users goals. This goal hierarchy is characterised by decomposed sub – goals as means for the users. The sub – goals are less complex and less abstract and lead through the means – end chain to the main user goal. Our contribution is to demonstrate that a goal – system match at the means level can lead to higher perceived usefulness of new information systems. To this end we also suggest new measures for perceived usefulness.

1 Introduction

Across many different user acceptance models, the concept of perceived usefulness has consistently been a strong determinant and a fundamental driver of user acceptance. The Technology Acceptance Model ([Da89], [DBW89]), for example, treats it as a pivotal construct in explaining why users intend to use technology. Similar notions of usefulness have been formulated in general theories of adoption (relative advantage [Ro03]), and a unified theory of user acceptance of technology performance expectancy [VMD03]). Perceived usefulness implies that the system in question provides utilitarian value ([TT88]). Accordingly the user views the information system as a means to an end, or in other words: as an instrument to fulfil a goal external to the user-system interaction. The goal of the user is the end state that he or she wants to achieve using the information system.

User goals and perceived usefulness are therefore by implication strongly correlated. If the goals of the users vary, so will the perceived usefulness of the instrument (i.e. the information system). Utilitarian value is assessed as a function of the extent to which a system meets the user goal. Hence, if the user goal varies, the utilitarian value of an instrument also varies. For example, an online bookstore is useful if a person aims to browse or buy books, but it ceases to be useful if this is not what that person aims to do.

We would therefore expect user acceptance models to pay significant attention to the goals of the user. Unfortunately the attention paid to user goals in the current conceptualizations of user acceptance is rather limited. One reason why this is may be the relatively narrow context in which the user acceptance models have been developed. Davis (1989), for example, developed the technology acceptance model specifically for work environments ([Da89]). In an office context, the goal of an information system is, normally, to increase a user's task performance. Because this goal is fairly undisputed, it is likely to be treated as a constant in the model.

Problems arise when the user acceptance models are taken away from the office context, and applied to other contexts. For example, the user goals of hedonic information systems and electronic commerce applications are very different from, and sometimes much less obvious than, the traditional office information systems. If these goals are not made explicit, the users will 'invent' their own goals as they assess perceived usefulness. Consequently it will be difficult to compare their assessments because the users can have different goals for the same system.

There are difficulties in the office context as well, in particular with the advent of integrated enterprise information systems. These systems fulfil a variety of user goals for a variety of users. Users may individually use these integrated systems for different goals, and it then becomes increasingly awkward to compare their usefulness assessments.

In this research project we are trying to overcome these limitations by introducing variable user goals. By equipping user acceptance models with flexible ways to include user goals, the models are becoming more applicable beyond the office context, for example, in the realm of hedonic information systems, and electronic market applications. They will also then become applicable to large, integrated systems that fulfil many different user goals for many different stakeholders.

The first objective of the paper is to introduce variable goals in existing user acceptance models. To achieve this we will borrow from the conceptualization of variable goals in other areas of management research, in particular the organisational literature ([EK83], [Et64] [Shi98]). Of direct relevance are the goal hierarchies as applied by GUTMAN (1997) for consumer goals and by CHMURA AND CROCKETT (1995) for information system alignment.

The second objective of the research is of a methodological nature. If we look at the current scales for measuring perceived usefulness, we can see that the user goals are actually embedded in the scale items. For example, DAVIS (1989) developed in his study several scale items to measure perceived usefulness. The items are for example Control Over Work, Work More Quickly, Makes Job Easier [Da89]. These are strongly related to the office context, and not applicable to, for example, electronic commerce applications. This research paper will therefore have a close look at the existing scales for perceived usefulness and see if they can be made context free. We will provide an overview of the means – end chains as an instrument to develop a hierarchy of user goals. Furthermore prior research scales are presented to demonstrate the strong linkage between existing user acceptance models and the work-related user goal job enhancement. We summarise our results by presenting a six step procedure that can be applied to study user acceptance with variable user goals.

2 User Goals and User Acceptance

Goals are desired states (positive goals) or unpleasant consequence to be avoided (negative goals) (Win87). Goals are the main motivation for, or in other words, an important driver of user behaviour (Gu97). The understanding how goals develop and the actions users perform to achieve them enables us to explain and possibly predict the future behaviour of users (EK01).

Two different types of user goals are introduced in prior research: performance goals and learning goals. In achieving performance goals, users aim to demonstrate their competence. Therefore, they tend to use systems that assist them in the fulfilment of their job requirements. In contrast, when learning goals are adopted, users aim to increase their knowledge base. The user behaviour to any cause of failure depends on the pursued goals. A performance-oriented user deals with failure as unfavourable consequence and may act negatively to it. In contrast, learning-oriented users experience challenging tasks and difficult circumstances as a possibility to learn. When facing with failure, they understand such feedback as an opportunity to learn and grow (BMZ96).

A popular way to conceptualise goals is the hierarchy of goal approach, also known as means – end chains (MEC) analysis (Gu82). The MECs strive to model the interdependencies of multiple goals [FAR02]. It does so by explicitly recognising super- and sub-relationships. Sub-goals are ‘lower’ level goals, and super-goals are ‘higher’ level goals. The hierarchy of goals can be represented as a graphical schema and can be visualised as a tree structure, called the hierarchy tree. Hierarchies aim to support the understanding of relationships between different goals and in doing so, the complexity of the interlinked goals is illuminated ([Gut97], [CC95]). The grounding theory for means- end-chains is mostly provided by GUTMAN (1982): he defines means as “objects or activities in which people engage” and ends as “valued states” (Gu82).

Figure 8 illustrates an abstract means – end chain and it makes the twofold association of sub – goals clear. Depending of the position in the chain they can serve as a means to reach an end and be itself an end for another sub – level goal. GUTMAN (1992, 1997) applied the means – end chains to the marketing literature to link the customer values to the promoted product.

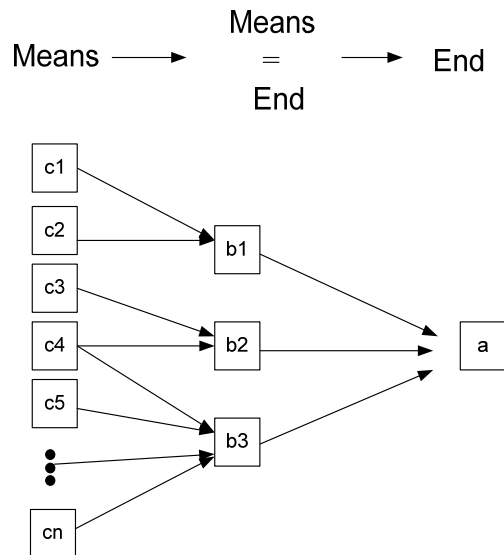


Figure 8: Means – End Chains and Goals Hierarchy

Reynolds and Gutman (1988) describe a technique to identify the user goals: the laddering method. Laddering is an in-depth interview technique where the motivations, internal assumptions and attributes are interrogated and so expressed externally. In doing so, the possibility exists to model the interview outcomes as means – end chains (RG88). Although this technique is widely used (AH02), (NSS02), (HPA04), (AH03) certain critique exists for example it is too costly and too complex, and users are artificially forced to answer (AH02).

The laddering technique enables the identification of the user goals, but it does not assist in the decision whether a particular goal is an end state, or whether the goal is a sub – goal. KENNEY (1994) recommends drilling down to the main goals by continually asking the user the question “Why is that important for you?” The two possible answers are 1) because the goal is the main driver of the user activity or behaviour and 2) that the goal is important because it aids in reaching another, higher level goal. In the latter case, the goals become means and they are modelled using a link between them (they become super- and sub goals (Ke94)). NAH ET AL. (2005) analysed in their study the values mobile application offers to its users. In doing so, they applied KENNEY’S (1994) value-thinking approach to identify the values users relate to any mobile devices. The values they collected in their conducted interviews illustrate the desires of the users. The result has been a list of values that are sorted into fundamental, what we understand as end – states, and means. Figure 9 presents a section of their final means-end-chain but even here we can reconstruct the chain, starting with the low level sub – goals. For example “maximise ease of use of the device” supports the achievement of the employee’s acceptance of that new application system (NSS05).

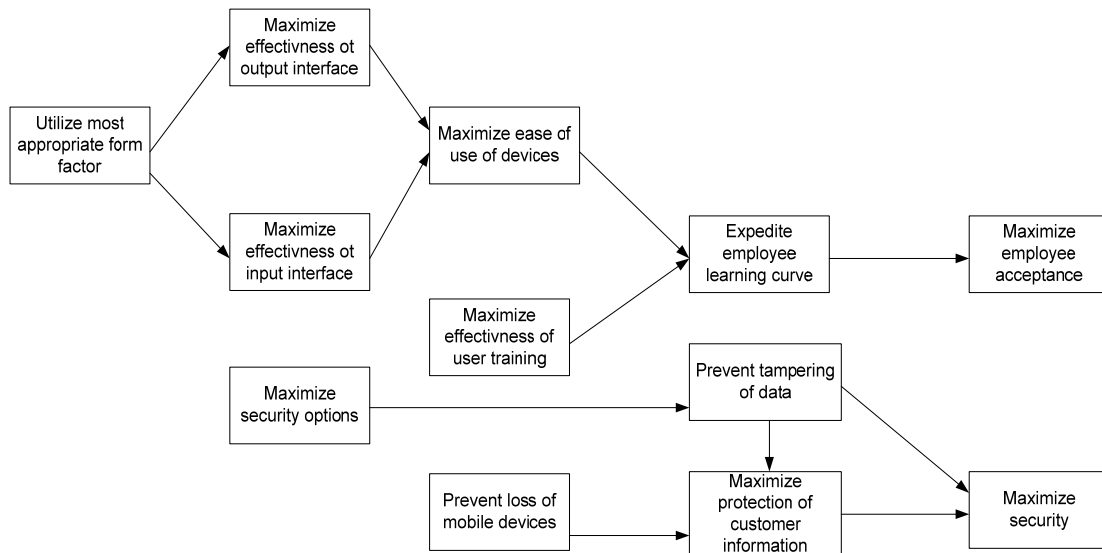


Figure 9: Example of a means – end –chains for using mobile applications by Nah et al. (2005)

In summary, users can have different goals at different levels, decomposed and represented through means–end chains. The lower level goals serve as means to reach an end, they are generally less complex and therefore easier to elicit.

Figure 3 illustrates how variable user goals (as described using MECs) may fit into an extended technology acceptance model. The central concept between MEC and perceived usefulness is a construct called ‘system-goal match’. This construct is defined here as the degree to which the user believes the features of the information system match the user goals at the lower end of the MEC. Higher levels of system-goal match are hypothesised to lead to higher levels of perceived usefulness and higher levels of IS use. If we are able to get a match on a sub – level than we can realize (based on the means – end – chains that operate in the background) a match between the higher level user goals and the system.

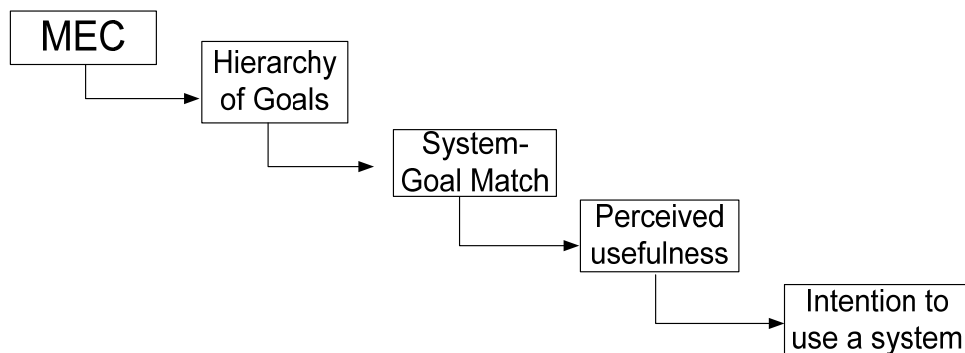


Figure 10: Applying means – end –chains to predict user intention of information systems

3 Measuring perceived usefulness with varying goals

Let us now turn our attention to perceived usefulness, and more specifically, to the ways that this construct is measured. Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" [Da89]. Acceptance models that incorporate the construct perceived usefulness are the Technology Acceptance Model by DAVIS (1989); DAVIS ET AL. (1989), the Technology Acceptance Model 2 by VENKATESH AND DAVIS (2000) and the UTAUT by VENKATESH ET AL. (2003). All the models focus on systems in an office environment and assume the work related goal enhance of *job performance* as the goal for the users. This assumption is based on the organizational context where enhanced *job performance* is awarded with promotions or bonuses [Da89].

DAVIS (1989) has developed scales to measure perceived usefulness, as presented in Table 2 under the goal *enhance job performance*. The items concentrate on job related issues, for example quality of the work, how easy the job could become, and how much quicker the job could be done. However that implies, if users pursue other goals than *enhance job performance* we need to rethink these measures.

Item	Description
1	Quality Of Work
2	Control Over Work
3	Work More Quickly
4	Critical To My Job
5	Increase Productivity
6	Job Performance
7	Accomplish More Work
8	Effectiveness
9	Makes Job Easier
10	Useful

Table 2: Measurements of Perceived Usefulness [Da89]

The goals a user can have could come from various fields, for example, his or her private life. Beside the types of user goals introduced earlier (learning goals and performance goals), we can think of further types of goals. Examples include 1) enjoyment goals, e.g., a computer game; 2) environmental goals, if the information system is used to avoid the print outs on paper, 3) security goals, if the information system is designed to protect property, data and life.

For these various types of goals new scales are necessary to measure the user's belief of the usefulness of the information system. These measurements should be as generic as possible and therefore should not contain any notion of a goal. Instead they should solely focus on the usefulness in general. We introduce in Table 3 potential measurement items, which are partly based on the HED/UT scale that was introduced by VOSS ET AL. (2003).

Item	Measures
1	Not useful -- Useful
2	Not practical -- Practical
3	Not helpful -- Helpful
4	Not necessary -- Necessary
5	Not productive -- Productive
6	Not constructive -- Constructive
7	Does not add value -- Adds value

Table 3: Measurements of Perceived Usefulness without Goal Fixation

4 Conclusion: a preliminary procedure to better study perceived usefulness and user acceptance

Usefulness is an important construct in user acceptance, and we believe it is timely to introduce the concept of the user goal in user acceptance models. This would remove any ambiguity that can arise if a respondent is asked about the perceived usefulness of a particular system or website, and starts to wonder 'usefulness for what?'. We expect that by employing this two-way approach (methodological and theoretical), a more generic acceptance model can be conceived that can appropriately address these ambiguities.

To finish the paper, we are presenting here a new procedure to better study perceived usefulness and user acceptance. It is supported by the findings of Keeney (1994) who recommend four steps to identify and structure goals. His research, however, did not focus on information systems usage, but rather on decision making scenarios. The procedure we are presenting contains of the following five steps:

1. Identification of the main user goal(s)
Step 1 focuses on the users of the information system solely and attempts to identify their main goals. These goals may be complex, abstract and at this level hard to fulfill because difficult to elicit.
2. Definition of sub-goals
The second step defines sub-goals for all main user goals by splitting the main goals into smaller and less complex portions. Sub-goals on low levels are more specific and for that reason easier to fulfill: the sub-goals represent a method to achieve goals at the next level and the overall main goal. The result is a first list of sub-goals that may not have any clear relationship. Keeney (1994) discusses in his paper the possibility that this list contains redundant and unimportant sub-goals. They need to be eliminated during further evaluation.
3. Development of a hierarchy of user-goals
The decomposed sub-goals can now be structured as sub – and super – goals in a hierarchy of goals. This hierarchy of goals illustrates sub – goals that are at the same decomposed level and can demonstrate the relationship between sub – and – super goals, for example supporting relationships and competing relationships. The goals in the hierarchy are all relevant for the user and are the result of the second evaluation in step 2.
4. Identification of Means-End-Chains for the main user goal
The hierarchy of goals is a tree diagram that contains various branches. A tree is a summary of all means – end – chains and a branch represents a single means – end – chain. The MEC lead all from sub – goals to super – goals, however the realization of a main user goal can be reached by different MECs. The MEC is the instrument to connect the different levels of sub – goals in the hierarchy of goals. It is even important to evaluate which MEC is most effective to reach the main user goal and whether the MECs conflict.
5. Identification of the lower-level goal (the user goals) and how the system can match them
The sub – goals on lower levels are more clear and easier to describe and so the match between a sub – goal and the system requires less effort.
6. Evaluation of perceived usefulness against the backdrop of these user goals
Finally, we are then able to assess precisely how a user perceives the usefulness of a system. The idea is to put the MEC before them and ask them how they assess the usefulness of this system against the backdrop of this MEC.

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