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Background of the Ninth Research Symposium on Emerging Electronic Markets (RSEEM)

The Research Symposium on Emerging Electronic Markets (RSEEM) is an annual event destined to provide a forum for researchers for presentation and discussion of their current and ongoing work. In order to stimulate a lively discussion, the number of participants has traditionally been limited to 30 people. In 2002, we had two focus topics:

E-Procurement and the Future of Electronic Markets

Compared to recent years, we wanted to further extend time for discussion. The forum serves two purposes. First of all it provides a platform for doctoral students to present their ideas and receive feedback from an international audience. Ongoing Ph.D. theses and projects are presented by junior researchers and input is given by the other participants. Besides, we asked for short presentations of visions of the future followed by a moderated discussion among the participants. Such discussions hold the potential of resulting into ideas for future (joint) projects. This second type of exchange underlines the aspect of “emerging” markets as suggested by the conference title.

In 2002, one of the focus topics is "E-Procurement" - the topic of bringing together vendors and buyers. E-Procurement systems support the internal processes for the purchase of products and services. The transfer of electronic product catalogues from the sell-side to the buy-side is one of today's main challenges in electronic commerce. A specific challenge is bridging the gap between companies using common formats and protocols.

Contributions are grouped into sessions covering the following topics:

- Business Models for Electronic Markets
- Market Fundamentals
- E-Procurement
- Electronic Contracting
- Case Studies
- Personalization of E-Commerce Applications
- Outlook

All paper submissions to RSEEM 2002 represent the original work of the authors. There were no rigid guidelines regarding paper size for the final papers. We asked to submit between 4 and 12 pages.

The University of Applied Sciences (UAS) Basel is proud to host this year’s RSEEM. We would like to thank all authors for their valuable contributions. The proceedings feature a couple of highly interesting papers in the dynamic field of Electronic Commerce.

Basel, September 2002 Petra Schubert and Uwe Leimstoll

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Hybrid Strategies in Consumer Retail Markets

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Abstract

After the hype in electronic commerce many Internet-only retailers had to give up. Today most activities in electronic commerce arise from store-based retailers. By capitalizing on their existing customer base and competencies, they can get ahead of their Internet-only competitors. This paper focuses on the benefits arising from the physical channels of multi-channel retailers to their online channel and from the online business to their physical stores. In this context the profitability of web-based stores is revised.

1 Introduction

In the mid-1990s the advent of Internet-based business-to-consumer electronic commerce was perceived as a revolution in retail markets. At this time much attention has been paid to the new Internet-only retailers. Stressing on the advantages of retailers with the Internet as the only channel like cost savings or global reach, many researchers predicted the displacement of store-based retailers.

Nevertheless many Internet-only merchants failed in establishing themselves in the market during the last years. Especially the costs of setting up and maintaining an online shop as well as the requirements of physical distribution caused them huge problems. Moreover they did not achieve the expected sales because many consumers don't order products from unknown Internet-based retailers owing to their lack of trust. As a result, many Internet-only retailers had to give up. Simultaneously many traditional retailers have added the Internet as an additional channel becoming multi-channel retailers. They have realized that they can capitalize on existing competencies to succeed in electronic commerce.

The aim of this paper is to investigate the benefits of integrating the Internet in the existing channel-mix for traditional retailers. Here, the focus is on store-based retailers but the Internet can be integrated with channels like catalogue or TV as well. To understand the retailers' incentives for integrating the Internet with their existing channels,

the synergies arising from this integration are considered. The examination of these synergies demonstrates that they are reciprocal. On the one hand, the web-based store benefits from existing physical stores. On the other hand the physical businesses profit from the Internet presence. Based on the benefits of hybrid strategies for web-based stores, the profitability of the online channel for store-based retailers is reviewed.

The remainder of this paper is organized as follows. Section two elaborates a strategy to integrate physical and online channels and gives two examples of multi-channel retailers who have integrated both channels. Section three identifies the possible benefits for the web-based store arising from the integration. And it denotes the necessary requisites. The following section four specifies the benefits of the integration that the physical channels can capitalize on. Based on these benefits, the profitability of the online channel is revised showing a starting point for an adequate cost accounting system. The paper concludes with further research questions.

2 Multi-channel retailing

2.1 Hybrid strategies

When store-based retailers extend their business to the Internet, they can either run the online presence separate from their physical operations or integrate it with the existing channels. As with the integration both benefits and difficulties arise, each retailer has to select the degree of integration fitting best his actual situation and strategy [Gulati/Garino 2000]. At the beginning of electronic commerce era many retailers kept their web presence separated from traditional business. Today most retailers choose a business model that integrates physical and online channels because in most circumstances the realized benefits are more important than the problems of integration.

To exhibit a typical buying process of a customer facing channel integration, the combination of physical stores and the Internet is considered. For identifying the integration potential, the transaction process is used as framework. It comprises all activities that occur during a buying transaction and includes the phases information, agreement, settlement [Schmid/Lindemann 1998] and after-sales [Gebauer/Scharl 1999]. A possible combination could be the following: A customer searches for a product on the web site of a multi-channel retailer. As she is uncertain about her choice, she goes to a store of the retailer for physical inspection of the product. In order to compare this offer other retailers, she uses again the Internet. Finally the customer decides to buy the product from the retailer she visited the store. She orders immediately from the online shop. The payment is done by credit card. For delivery she chooses the physical store. Once she has taken the product at home, she discovers a defect and returns it to the store. The combination of both channels is depicted in Figure 1. Beside this example, there exist more possibilities of merging different channels. Each single phase of the transaction process can be supported by one or more different channels.

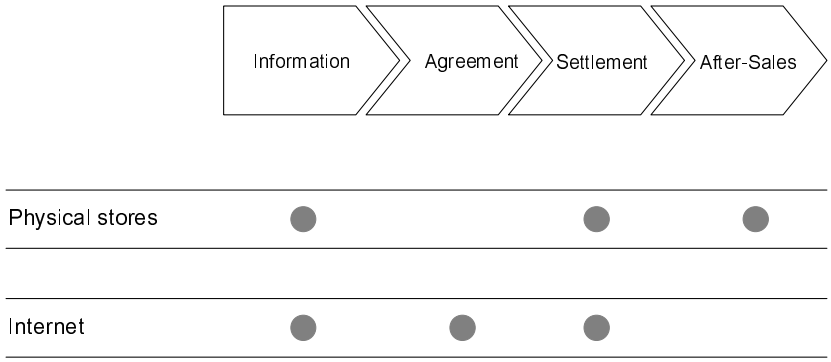

Figure 1: Transaction process combining stores and the Internet

The combination of web-based and physical stores is described by terms like “multi-channel commerce”, “bricks-and-clicks” or “clicks-and-mortar”. However these terms do not differentiate between the simple addition of the Internet to the existing channel-mix and its integration. Therefore the terms *multi-channel retailing* and *hybrid strategies* [e.g. Rohrbach 1997; Steinfield/Klein 1999] are used to point out this difference [Armbruster/Schober 2002]. With multi-channel retailing any extension of the channel-mix will be denoted. Whereas the strategies of *integrating* the Internet with the existing channels will be categorized as hybrid strategies. Here, the customers are facing neither the store-based nor the online channel as separate units. They rather use a hybrid channel construct consisting of elements of both channel types. Accordingly, the hybrid strategies describe a subset of the multi-channel strategies.

2.2 Examples

2.2.1 Staples

Staples is an US office supplier with shops in the US, Canada, United Kingdom and Germany. Especially in the US Staples links his offline (shops and catalog selling) and online offers. Staples’ web site (www.staples.com) offers a store-locator to help customers finding a nearby shop. And with the real-time access to inventory, customers can check the availability of products before driving to a store. Staples website also shows special offers that are only available in the stores and gives the customers the possibility to print a shopping list of the selected products.

In the physical stores, customers have access to the lager Internet inventory through web-enabled kiosk terminals. They can order products they cannot find in-store. And for customers who have ordered products online, the kiosk terminals offer the possibility of printing receipts and paying for online purchases with cash, check or credit card at the physical stores' cash registers.

2.2.2 Electronic Partner

Electronic Partner is a network of independent traders for TV, video, hi-fi, telecommunication, multimedia and white goods through Europe. In Germany, 560 traders are connected to a web-based store (www.ep-netshop.de). To link online and physical presence, the online shop provides customers a store locator. Products ordered online can be picked up at any store. The system automatically suggests the customer the nearest store for delivery. But the products can be send to any other store, too. Small products are shipped by mail. When large products are ordered online, the order is automatically attributed to the nearest trader. He delivers and installs the new product and disposes old products, e.g. a TV set. For payment, the customer has the choice between electronic payment and paying cash. Finally, products ordered online can be returned to any store.

3 Benefits of hybrid strategies

3.1 Two-way synergies

Multi-channel retailers adopting hybrid strategies can realize multiple benefits in contrast to retailers with separated channels. From the integration of physical and online channels multiple synergies result. The investigation of these synergies shows that they are two-way, arising to online channel as well as to the existing physical stores [Schoenbachler/Gordon 2002]. The same holds for the further benefits of channel integration. On the one side, web-based stores gain from the existence of a physical presence. The online channel can capitalize on the established brand that creates awareness and trust. In addition it benefits from existing infrastructure as well as experience and savings in advertising are possible. Accordingly multi-channel retailers spend less money for electronic retailing than Internet-only retailers.

On the other side, the physical stores benefit from the Internet presence. Via an online shop store-based retailers can respond to changes in customer behavior. An online presence permits retailers to enhance customer support and service by offering for example the possibility to download instruction sheets. Moreover marketing savings can be realized (see section 4.2). Hence the Internet permits store-based retailers higher customer retention and easier acquisition of new customers. Therefore the existence of a web presence strengthens the traditional channels.

3.2 Benefits of hybrid strategies for web-based stores

The benefits arising from hybrid strategies to a retailer's web-based store can be divided in the categories partner-related risk reduction, transaction-related risk reduction, savings in advertising and benefits from infrastructure and experience:

Partner-related risk reduction [Armbruster/Schober 2002]: The lack of online consumer trust is an important barrier for electronic commerce [Tan/Thoen 2000]. The customers' distrust is particularly high when they don't know the retailer offering products on the Internet. However when they know a physical store of a multi-channel retailer, customers are more confident to order from an online shop [Steinfield et al. 1999].

Transaction-related risk reduction [Armbruster/Schober 2002]: The consumers perceived risk when buying online is higher than for purchases from physical stores

[Tan/Thoen 2000]. Particularly for products whose properties cannot be represented through electronic media – like taste or flavor – customers are uncertain about their product choice. When buying from multi-channel retailers, customers can go to a physical store to view, smell, touch or try products with properties that are difficult to describe by electronic means [Rohrbach 1997; Steinfield et al. 1999]. Thus they can buy a product like a perfume the first time in-store and order it next time on the Internet.

Another impediment for ordering on the Internet is that customers feel uncertain about the possibilities to return faulty products. If retailers pursue hybrid strategies, products bought online can be easily returned to a physical store of the retailer [Steinfield et al. 1999].

Savings in advertising: Store-based retailers with established brands have advantages in attracting customers. They use their physical stores to enhance the awareness of their online shop, e.g. by printing the URL on bags. Web-based kiosk terminals in the stores, can make customers familiar with the Internet presence. Consequently, multi-channel retailers can realize cost savings in advertising compared to Internet-only retailers.

Benefits from infrastructure and experience: When store-based retailers set off an web-based store they can leverage their existing infrastructure, brands, and customer bases. Furthermore they have experience in inventory management and fulfillment. And can capitalize on greater market knowledge and purchasing power.

For reason of these benefits, it is to expect that in the future only few Internet-only retailers will be on electronic markets. Yet some Internet-only retailers opened physical stores to benefit from the synergies between physical and online channels. An example is the German flower shop Valentins that was founded in December 1999. It opened his first physical store in September 2001 (www.valentins.de). Another example is the perfumery Beautyspy (www.beautyspy.com) which opened a store in Munich in February 2001. In this shop customers have the possibility to test products and to receive make-up advices.

3.3 Requisites of hybrid strategies

To capitalize on the benefits described above, it is not sufficient that retailers simply set off a web site. But they have to respond to following requisites [Goersch 2002]:

- Integrated branding: An important success factor for multi-channel retailers is keeping the brand image consistent in all channels. Using the same brand name, logos and colors creates a seamless shopping experience for the customers and improves awareness creation and trust.
- Channel cross-promotions: Advertising efforts must be integrated across channels. The physical stores can serve for promoting the online shop. Therefore information about the Internet presence should be provided to the customers in the stores. Special online offers and services create incentives to entice customers online.
- Consistency: Product categories, pricing, customer support and policies should be consistent in all channels. Eventual discrepancies have to be comprehensible for the customers. For example special in-store discounts on the occasion of a store anniversary.

- Exploiting channel-specific capabilities: The integration of all channels does not mean that channel-specific capabilities should be leveled over all channels. The strengths of the respective channels – like social interaction for physical stores or search assistance for the Internet – can be used to enhance customer support.
- Integrated logistics: The integration of logistics is a condition for giving the customers real-time information about inventory and permitting them to pick up and return products at physical stores.
- Integrated information management: When services like payment for online orders in physical stores are offered, the integration of information over all channels is necessary. Hence, the integration can be used to gather more information about customers and thereby enhancing personalization.

The requisites described above focus on consumer-related benefits of the channel integration. For the success of hybrid strategies further requisites have to be considered. Important problems for multi-channel retailers are channel conflicts. Given the risk of sales cannibalization, the traditional channels refuse to cooperate with the new Internet channel. But cooperation between the channels is essential for realizing the benefits of hybrid strategies [Steinfield 2002]. For example a customer returning a product ordered online should obtain the same services as in-store customers. Therefore an organizational structure that minimizes channel conflicts and fosters cooperation has to be developed.

Besides, channel conflicts can be decreased when the products offered on the Internet cannot directly be compared to the products offered in-store because the product range of the online shop is for example restricted to promotions. This prevents also conflicts with resellers that arise when manufacturers extend their direct selling through the Internet.

4 The future usage of electronic commerce

4.1 Electronic commerce profitability

As pointed out in the section 3.2, the costs for running an online shop are generally less important for store-based retailers than for Internet-only retailers. Yet when capitalizing on synergies between physical and web-based stores, the costs are still very high. Therefore, an important issue of investigations in multi-channel retailing is the question whether electronic commerce is profitable.

If the profitability of the online business corresponds to that of the traditional business or is even higher, the decision for sustaining the online channel is evident. However for launching an online shop with the appropriate back end systems, high up-front investments are necessary. In addition, important annual expenses arise from maintenance as well as software and hardware updates. These costs increase even in accordance with the success of the online shop, i.e. the more web site traffic arises, the more powerful systems are required. Therefore economies of scale are difficult to create [Barsh et al. 2000].

Moreover in electronic retailing, high fulfillment costs occur. Multi-channel retailers cannot necessarily capitalize on the above mentioned benefits arising from the existing infrastructure because fulfillment in electronic commerce is different from store replen-

ishment. Costs are increasing since economies of scale get lost in fulfillment when individual consumers are delivered. In particular products that are difficult to pick, pack and ship are mostly unprofitable. In contrast to physical goods, digital goods can be sent directly over the Internet. Consequently, digital products are especially suited for electronic commerce. Nevertheless, physical goods constitute the greatest part of goods in retailing.

Due to the lack of online consumer trust and the impossibility of physical inspection many customers prefer only browsing the Internet for information but buying in physical stores. Consequently, the most important expenses for the Internet presence – costs for ordering and payment functions with their back end processes and systems – are spent for a small part of the consumers buying online. Exemptions are in general niche products that are difficult to get in common stores.

Frequently, important investments and operating costs for web-based stores face only small sales generated in this channel. Therefore online shops have often a lower profitability than traditional businesses and many even incur losses. In this situation multichannel retailers have to analyze if they should keep or abandon their retail web site. For making this decision it is important to consider that the profitability of the online channel is not only determined by the sales of the online shop. As benefits arise from the Internet presence to physical stores (see section 4.2), these benefits have to be taken into account for assessing the profitability of the web-based store. When these benefits outweigh the losses, the Internet can be used to strengthen the traditional business. Otherwise, when the losses cannot be offset, retailers have to decide if they abandon their online shop and restraint their Internet presence to information. For example, the Munich-based department store Ludwig Beck (www.ludwigbeck.de) will close its online shop for classical and jazz music (www.onlybeck.de) because of the high losses incurred.

4.2 Benefits of hybrid strategies for physical stores

As mentioned above, the physical stores can profit from channel integration, too. The sources of benefits are the coverage of diverse shopping preferences, enhanced support and service, increased market power, and savings in marketing:

Coverage of diverse shopping preferences [Steinfield et al. 1999]: With hybrid strategies, retailers can respond to different shopping preferences of diverse customer groups. Depending on the specific situation, customers purchase from a particular channel or from multiple channels [Nicholson et al. 2001; Schoenbachler/Gordon 2002]. Consumers choose the Internet mainly for its convenience. But many use the Internet only to browse for information – and buy in-store due to their lack of trust in electronic operations and their desire for physical inspection and immediate gratification. Thus, with their Internet presence retailers can attract new customers searching for information on the Internet to their physical stores. In contrast, retailers without online presence can loose customers to their competitors present on the Internet.

For retailers it is important to respond to these changed shopping preferences because customers using multiple channels are particularly valuable. A study by Shop.org found that shoppers who use both stores and the Internet spend an average of $600 more annually in-store than customers using only physical stores for shopping [Vargas 2001].

Enhanced support and service: Retailers can enhance customer service and support through an online presence [Steinfield 2002]. For assisting consumers in their purchasing decision, detailed information and a product comparison function can be provided. Since most consumers browse the Internet for information but purchase from physical stores, these services support primarily in-store sales. To better serve customers, retailers can offer a wider product range in the web-based store. And through the Internet, customized products can be offered. In the physical stores, kiosk terminals provide access to the wider product range of the web store and the customization function.

In the after-sales phase, the web site may be used to schedule deliveries or to sell extended warranties and expendable items for products bought in the physical stores. For enhanced customer support FAQs can be used and instruction sheets presented for download. These features do not only enhance customer support but also permit to save money as many customer problems can be solved through the Internet decreasing the need for support from salespersons.

Increased market power: Multi-channel retailers capitalizing on hybrid strategies have advantages over their single channel competitors both in traditional retail markets and on the Internet [Armbruster/Schober 2002]. Due to the synergies arising from channel integration they can benefit from cost savings. Retailers who extend their market share through electronic commerce can increase their purchasing power as they order more products from their suppliers.

Savings in marketing: Like the Internet presence, physical stores can benefit from savings in marketing as a result of channel integration. On the web site, store locators indicate customers where they can find nearby stores. Special in-store offers like coupons present financial incentives for customers to come to the physical stores. Other the Internet serves for gathering additional information on the customers. When this is combined with a store card, the customers' behavior in all channels can be observed.

4.3 Cross-channel controlling

Measuring the effects of electronic commerce constitutes a difficult task for multi-channel retailers. As synergies arise from the Internet to physical stores, the expenses for the web site generate revenues in the stores too. To measure the contributions of a retailers web site to the revenues of the physical stores, a cross-channel controlling is required. The difficulty of data capture is that the effects of these benefits are complex posing a problem for evaluating. For example how can the following situations be assessed:

- A customer attracted by a retailer's Internet presence spends $200 in-store.
- A customer decides to order a cardigan online from a retailer she knows the physical stores even though an Internet-only competitor offers the same cardigan with $5 discount.
- A customer brings videocassette recorder which he had ordered online to the customer service in the physical store for repair. When he comes picking up his repaired recorder, he buys some videocassettes.
- A customers returning a faulty product she ordered online spends the money she receives from the customer service for this product immediately in the store.

Hence, with the advent of electronic commerce, channel switching has become a common buying behavior. For measuring the contributions of the online channel to the traditional channels, existing metrics have to be adapted and new metrics be developed. This represents an important challenge for sales management and controlling.

5 Conclusions

Despite the predictions that Internet-only retailers become the driving forces in electronic commerce, today very few Internet-only retailers like Amazon have established themselves in the market. Today, store-based retailers are the most important players in electronic commerce. Consequently, the division in old and new economy is obsolete.

This paper has delineated the reasons for this trend illustrating that multi-channel retailers can capitalize on synergies arising from hybrid strategies, i.e. the integration of physical and web-based stores. Due to the benefits of integration, store-based retailers generally expend less for setting up and maintaining an web-based store than Internet-only retailers. Moreover, the paper considers the profitability of the online channel. Here it was pointed out that an online shop that suffers losses could nevertheless be profitable when the benefits arising for physical stores are more important than the losses. The paper finally outlined that for the analysis of the net benefits metrics have to be revised.

This paper has focused on the motivations of store-based retailers for adding the Internet to their channel-mix. More research is necessary to examine the implications of hybrid strategies. For the design of hybrid strategies it is important to know in which situations consumers switch channels. The result may be a couple of preferred channel combinations that should be especially supported by the retailers. Moreover, the possibilities to guide customers to more cost-efficient channel combinations need to be investigated. Further the requirements for organizational implementation of hybrid strategies in view of channel conflicts should be investigated.

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A Case Study of an Intermediary Bringing together American Designers and European Producers in the Soft Furnishing Trade

Electronic Business Patterns for Business Networks and Interfaces

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Abstract

Electronic business initiatives involve the coordinated activities of enterprises forming business networks. These enterprises interact via their business-to-business interfaces. In this paper we discuss the role and characteristics of business-to-business interfaces in business networks. The focus is on the description and analysis of the SoftFurnishing case. SoftFurnishing offers a web purchasing service for interior fabrics via a managed marketplace. The SoftFurnishing case was used for the exploration of the conceptual framework, especially the interface concept. The case analysis resulted in some observations about strategic and operational design choices. Finally, we have observed some matches and mismatches between design choices on the strategic and operational level.

1 Introduction

In today's economy many electronic business initiatives involve the coordinated activities of interdependent enterprises. These interdependent enterprises form a business network, where the actors (organizations and individuals), activities and resources are connected to each other. Enterprises are forced to be excellent and adaptive due to increasing competition and dynamics. This means focusing on those critical activities in which you are the best and leverage the capabilities of other enterprises for other activities. Moreover, enterprises have to respond quickly to changes, both internally and as a network. This means also changing the interactions and relationships and/or actors in the business network. To function in such a networked setting enterprises need

networkability: the ability to establish, maintain, develop and dissolve business relationships rapidly and flexibly [Alt/Fleisch/Österle 2000]

We assume that for networkability an important factor is how enterprises arrange their interfaces with other enterprises and that interface characteristics are affected by the business interaction and relationship characteristics. The research problem is "How can organizations deal with coordination in a business network under pressure of co-operation and competition, and what does this imply for the business-to-business interface?" The research results in design guidelines and principles for the interface in the form of design patterns.

The notion of business-to-business interface is used to refer to the common boundary of two (or more) organizations enabling interactions between enterprises. The application of ICT offers opportunities to automate and transform the interface. The application of ICT should be assessed in the context of business relationships rather than as a technical issue (Cunningham et al., 1993). Therefore the research has a holistic view on the interface by paying attention to strategic, organizational, and ICT aspects.

In this paper we focus on the description and analysis of the SoftFurnishing case. SoftFurnishing[1] offers a web purchasing service for interior fabrics via a managed marketplace. The SoftFurnishing case was used for the exploration of the conceptual framework, especially the interface concept. In the end, this should lead to design guidelines and principles for the business-to-business interface. For now, however, this is beyond the scope of this paper. The rest of this paper is organised as follows. In section 2 we describe the research method and conceptual framework. Thereafter, in section 3 the SoftFurnishing case is described. In the analysis of SoftFurnishing (section 4) we identify design choices that are typical in this setting, on how the interface supports the value propositions and services in the network. We end with some concluding remarks, both on the case as well as next steps in research.

2 Research approach

2.1 Research method

We conducted a pilot case study to explore the conceptual framework for the case description and analyses. The case study concerns a business network in the soft furnishing industry consisting of three types of actors: interior designers, managed marketplace (SoftFurnishing), and fabrics producers. The focal actor is SoftFurnishing. SoftFurnishing offers a web purchasing service that brings together American designers and European producers. For now, we focus on the description and analysis of SoftFurnishing using our conceptual framework.

The fact that the focal actor is an intermediary makes the case very interesting because one can expect that especially for intermediaries networkability is of great importance. Moreover, one of the most debated topics in electronic business is the role and function of wholesalers, distributors and other intermediaries. There is a long discussion about intermediation, disintermediation, and reintermediation (Chircu & Kauffman,

[1] Names of companies and organisations in this paper have been altered to protect their identities.

2000). Distributors are at the forefront of the changes by virtue of being in the middle and operating in thin margins. Information technologies, such as the web, make disintermediation of existing channels a serious threat; at the same time, they provide an opportunity for some distributors to succeed in reinventing their value logic (El Sawy, Malhotra, Gosain, & Young, 1999).

The research method consists of the following, five steps: (1) collecting information about the case, (2) describing the case with the help of the conceptual framework, (3) analysing the case to identify design choices, (4) specify design patterns, and (5) reflection upon the design patterns. In this paper the emphasis is on the steps 2 and 3.

We used several sources of information including interviews with various people (project manager, business development manager, and logistics manager), internal and external presentations, business and IT design documents, press maps, trade articles, etc. We also explored the website by using a guest account. All information comes from the focal actor SoftFurnishing. This means the case description is based upon the viewpoint of SoftFurnishing.

2.2 Conceptual framework

To describe and analyze the case the concepts and their relations are made explicit in the conceptual framework. This framework is founded on the interaction and network perspectives in industrial marketing and purchasing research (Axelsson & Easton, 1992; Håkansson, 1982; Håkansson & Snehota, 1995). The conceptual framework (Figure 1) is based upon the following line of reasoning. A vertical business network refers to actors (organizational entities) and their buyer-seller exchanges. An actor is an organizational entity and consists of activities, resources, and people. The role of the buyer-seller exchange is to coordinate the activities, resources, and people of one actor with the activities, resources, and people of another actor. Buyer-seller exchanges consist of interactions and relationships. Interactions represent the here and now of the inter-organizational behavior and constitute the dynamic aspects of relationships. Relationships are shaped by interactions and form the context in which interactions take place.

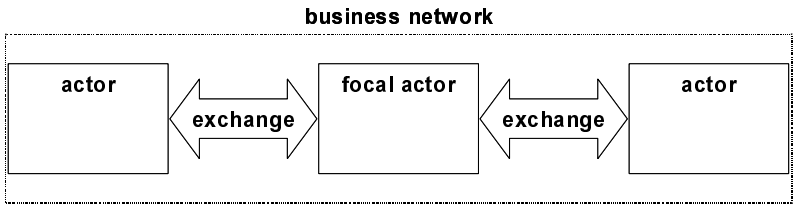

Figure 1: Basic concepts: Business network, actor and exchange.

Interactions take place via the interface. We define the **business-to-business interface** as the organisation of common boundary of two (or more) actors enabling interac-

tions[2]. The interface consists of (1) **channels** (means for interaction) where two (or more) actors can interact and (2) the **arrangements** (agreement or understanding) for the usage of the channels and interactions.

In this research we approach the business network and interface from three different perspectives. For all three perspectives we start from the same conceptual framework (Figure 1), that, however, is specialized depending upon the nature of the perspective. The three perspectives are:

(1) Strategic perspective: We approach the business network as a value network and the interface as place for the transfer of value. A value network consists of actors, value propositions and value activities (Porter, 2001; Stabell & Fjeldstad, 1998).

(2) Operational perspective: We approach the business network as a service network and the interface as place to collaborate and communicate. We emphasize services and business processes between actors.

(3) ICT perspective: We approach the interface as a place to mediate, support or automate services and business processes between actors by computer network technologies. Applications, application integration, and communication channels are primary elements.

For now, we focus on the strategic and operational perspective. The ICT perspective is not described separately but we refer to ICT issues in the strategic and operational perspective. For a full discussion of the conceptual framework we refer to Fielt (2002a).

3 Case description

In this section we describe the SoftFurnishing case. The description is focused on the primary activities related to demand and supply. We start with the business idea that was the starting point for SoftFurnishing and a basic description of the business network. Thereafter we zoom in on the strategic and operational perspectives by means of the value and service network. We limited ourselves to a high-level description with some examples about the details. A more detailed account of the case can be found in Fielt (2002b).

3.1 Business idea

The parent company of SoftFurnishing wanted to introduce electronic business for major improvements in the distribution channels of fragmented and inefficient markets. The opportunities were not found in the traditional markets of the parent company but in the adjoining market of soft furnishing. The parent company decided for a greenfield operation and started an e-business enterprise (SoftFurnishing.com) that offers a web purchasing service which enables the soft furnishing trade to source decorative fabrics at competitive rates, quickly and effectively, from a global network of leading produc-

[2] Merriam-Webster (2001) describes interface as (1) a surface forming a common boundary of two bodies, spaces, or phases <an oil-water interface>, (2a) the place at which independent and often unrelated systems meet and act on or communicate with each other <the man-machine interface>, and (2b) the means by which interaction or communication is achieved at an interface.

ers. The first version of SoftFurnishing (interior fabrics) has been implemented and is fully operational.

The parent company choose for interior fabrics because of the following attractive characteristics: (1) product: homogenous, intermediary good, and easy to ship, (2) market: global, fragmented (both demand and supply side), and inefficient, and (3) strategic: key design product, and valuable database. In America there are long chains between producers and customers that pushes up the prices and causes delays. Structural costs can be removed by reducing the actors involved and the activities performed.

3.2 Business network

The starting point for the business network of SoftFurnishing (Figure 2) is the "vertical triad", i.e. the vertical business network consisting of three types of actors: interior designers, SoftFurnishing (intermediary), and fabrics producers, and their buyer-seller exchanges. SoftFurnishing is considered to be the focal actor.

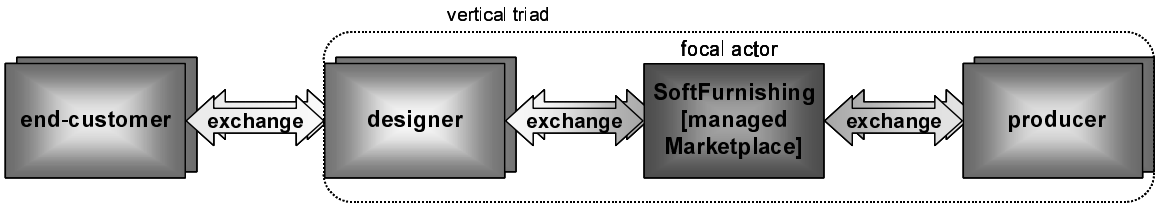

Figure 2: SoftFurnishing business network, actors and exchanges.

On the demand side the network scope is restricted to the end-customers (the customers of the designers) in the marketplace. While there is no direct involvement of the end-customers in the marketplace they do play a part in it. For example, the marketplace supports the communication between the designer and end-customer. On the supply side the network scope is restricted to the producers. There was no indication that the suppliers of the producers play a part in the marketplace.

The actors in the business network are:

- End-customer: The end-customer is the end-consumer of home interior design products. The end-customer is a customer of the interior designer.
- Designer: An interior designer is professionally trained to create a functional and quality interior environment. SoftFurnishing aims for interior designers who are a design professional (professional dealer or home decorator) active in the high-end of the home interior design market and member of the trade.
- SoftFurnishing: SoftFurnishing offers a web purchasing service for interior fabrics. SoftFurnishing acts as an intermediary that operates a managed marketplace.
- Producer: A producer that designs and manufactures soft furnishing products. SoftFurnishing aims for producers of exclusive, high-end interior fabrics.

- The buyer-seller exchanges are:
- End-customer-designer: The designer creates an interior environment for the end-customer.
- Designer-SoftFurnishing: The designer can buy interior fabrics from SoftFurnishing.
- SoftFurnishing-producer: The producer can sell interior fabrics via SoftFurnishing.

SoftFurnishing describes its role in the business network as a managed marketplace. The *managed marketplace* is an intermediary that is a mix between a (electronic) marketplace and wholesaler. SoftFurnishing positions this role by means of a number of topics, which are presented in Table 1. There is no direct exchange between the designer and wholesaler; the designer does not know the producer and vice versa. In this sense it is not a transparent marketplace. This configuration means that SoftFurnishing occupies a central position in the business network.

SoftFurnishing makes use of multiple channels to interact with the designers. The website (designer view) is the main channel for the conclusion of transactions while the fulfillment is taken care of by a delivery channel for packages. Next to these channels there is a customer support and order desk that can be approached by phone, fax or e-mail. SoftFurnishing also makes use of sales agents (to introduce the designers to the purchasing service) and organizes events. For the interaction with the producers also multiple channels are used: supplier relationship managers, supplier desk, website (producer view), delivery (for replenishment), and EDI connection.

Table 1: Managed marketplace: A mix between (electronic) marketplace and wholesaler.

topic		**marketplace**		**wholesaler**
Pricing policy:	▶	by producer		by wholesaler
Relationship:		producer - customer	▶	wholesaler – customer
Web site:		producer specific site	▶	wholesaler site
Catalogue:		different catalogues	▶	one catalogue
Order process:		no combined orders	▶	combined orders
Payments:		customer to producer	▶	customer to wholesaler
Profit generation:	▶	fees (operationally)	▶	margin (legally)[3]
Ownership stock:	▶	no ownership		ownership
Returns & claims:		no responsibility	▶	responsibility
Care desk:		by producer	▶	by wholesaler
Marketing:		by producer	▶	by wholesaler

[3] The producer sets the producer price to SoftFurnishing (principal concept) instead of setting the designer list price (agent concept). The producer is provided with insight in the margin, duties and operational charge calculations by means of a 'Margin Calculator'(full transparency).

The formal arrangements between and the SoftFurnishing and the designer are laid down by SoftFurnishing and made explicit via standard policy statements and terms and conditions. For example, about order changes or cancellations the policy states that SoftFurnishing's system processes orders immediately upon submission and therefore SoftFurnishing cannot change or cancel an order once it has been placed. Next to the formal arrangements there is the desire of SoftFurnishing to be perceived as a reliable and trusted service.

The arrangements between SoftFurnishing and the producer are laid down in a contract that is the result of negotiations between SoftFurnishing and producer. These contracts go towards a detailed level and cover many topics. For example, how producers supply the fabrics (on consignment), that producers provide sample material, what the price system entail, how claim and returns are handled, who pays for the costs of producing photos, etc.

3.3 Strategic perspective

From a strategic perspective the focus is on the *value network*: the value activities of the actors and the value propositions of the exchanges. Here, we restrict the scope of the value network to the value propositions and activities involving SoftFurnishing (Figure 3).

Figure 3: SoftFurnishing value network, actors, value activities and value propositions.

In the following section (3.3.1) we first examine the value activities. Thereafter, we go more deeply into the value propositions (section 3.3.2).

3.3.1 Actors and value activities

We decompose the activities of SoftFurnishing into strategically important value activities to understand the scope of the value activities and their value creation logic. The following value activities can be distinguished:

- Marketplace: Activities associated with the buying and selling of products (in a broad sense, including project support, visualization, samples etc.).
- Logistics: Activities associated with receiving, storing, and physically distributing the products.
- Network management: Activities associated with the acquisition and management of service providers and the planning and control of networked business processes.
- Marketing and sales: Activities associated with the acquisition and retention of designers and the support for designers buying products.

- Producer relationship management: Activities associated with the acquisition and retention of producers and the support for producers selling products.
- Business development: Activities associated with new projects that broaden the business scope.

The mediating role (marketplace) and operational capability (logistics) are the core of the added value of a managed marketplace like SoftFurnishing. Having and protecting the relationships with designers and producers is the critical success factor. SoftFurnishing wants to offer a high-quality (speed, selection, reliability, convenience, and responsibility) and cost-efficient service. This is incorporated in the value activities and their linkages.

3.3.2 Value propositions

The value propositions between designer, SoftFurnishing, and producer are described in Table 2. Due to the central position of SoftFurnishing all value propositions are with SoftFurnishing. The value propositions of designer and producer towards each other run along SoftFurnishing.

We elaborate the value proposition of SoftFurnishing towards the designer:

- Better price through competing suppliers: The designer is able to compare the fabrics of different suppliers at different prices.
- Wide high-end European product range: Top European fabrics are available on the US market.
- Latest products are immediately available: Because of the online concept products are immediately available world-wide.
- Single trusted supplier: The designer is a direct customer with SoftFurnishing and therefore has one single credit line.
- Smart product search logic: A sophisticated search engine to help the designer find the fabrics.
- Personalized product selection & market trend information: Through SoftFurnishing the different designers are informed on certain market information and trends on a personalized basis.
- On-line tracking & tracing of orders: By using tracking and tracing tools of the carrier, the SoftFurnishing can provide this to the designer.
- Marketing tool towards end customers: SoftFurnishing is a way to market the fabrics to the end customer. The designer can provide the end-customer with up to date figures on lead times, prices etc.

Table 2: Value propositions in the value network of SoftFurnishing.

designer ➡ SoftFurnishing	**SoftFurnishing ➡ designer**	**SoftFurnishing ➡ producer**	**producer ➡ SoftFurnishing**
revenue	competitive price	expanded market reach (new sales channel)	high-end European products
detailed product/market information	wide, high-end European product range	direct control over pricing towards designers	exclusive products
preferred fabrics supplier	latest products immediately available	very fast time to market	inventory on consignment
need for related products	single trusted supplier	sell through a trusted supplier in the USA	vendor managed inventory
	smart product search logic	better margins	exclusive e-commerce channel
	personalized product selection & market trend information	world wide supply chain	
	on-line tracking and tracing of orders	detailed product/market sales information	
	marketing tool towards end-customers	customer care, claims, and returns handled	

3.3.3 Interface

The web is used by SoftFurnishing as a new channel. The web channel offers SoftFurnishing the opportunity to innovate the distribution channel in the interior fabrics market and remove structural costs. Via the web SoftFurnishing offers a high-quality and cost-efficient service. However, it is the totality of channels and how they complement each other that enable this kind of service and the accompanying value propositions.

A strategic choice of SoftFurnishing is to have no direct contact between designers and producers. This means there is no interface between designer and producer. This implies that the full interface between producers and designers should be supported by SoftFurnishing and should be sufficient to support the value propositions.

The strategic arrangements follow from the role of SoftFurnishing and the division of responsibilities over the actors. These are presented in Table 1. In addition, everything is branded as “SoftFurnishing”.

3.4 Operational perspective

3.4.1 Service network and actors

From an operational perspective the focus is on the service network: the services provided and used by the actors (Figure 4).

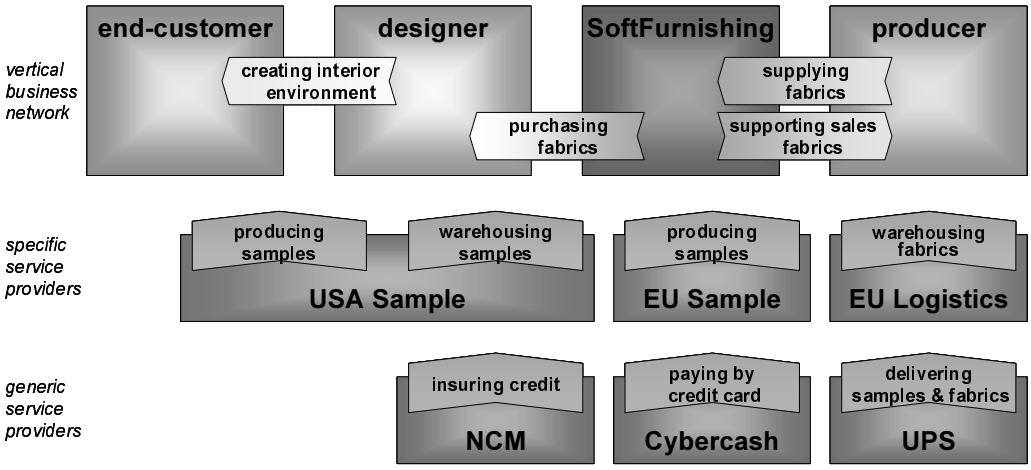

Figure 4: Service network.

The starting point for the service network is the business network (see also section 3.1). As opposed to the value network the end-customers are within the scope of the service network because they play a part in the business services and processes. These actors and their services are presented in the vertical business network in Figure 4.

The vertical business network makes use of other actors to execute specific supporting services for the vertical business network. These actors are presented as the specific services providers in Figure 4. The actors that provide the specific supporting services and their and main activities are:

- EU Logistics: An European organization that acts as logistic service provider. The activities that EU Logistics in the SoftFurnishing network performs is the management of the warehouse and the coupage of ordered fabrics for interior fabrics on consignment.
- EU Sample: An European organization that acts as sample producer. The activity that EU Sample in the SoftFurnishing network performs is the production of samples.
- USA Sample: An American organization that acts as sample producer and sample warehouse. The activities that USA Samples in the SoftFurnishing network performs are the production of samples and the management of the warehouse for interior fabrics samples.
- These actors are viewed as part of the business network because they perform some critical activities that SoftFurnishing has outsourced. With these actors there is a kind of partnership:
- These actors have been early involved in the start-up of SoftFurnishing thinking along with SoftFurnishing from their expertise.
- These actors have made investments for this electronic business initiative and run part of the business risk. They can profit from this if SoftFurnishing becomes a success but will loose if SoftFurnishing fails.

- At these actors there are specific activities (e.g. coupage), people (e.g. training), and resources (e.g. fabrics storage, electronic data interchange (EDI) connection) for SoftFurnishing.

SoftFurnishing also makes use of other actors for more generic supporting services. These actors are presented as the generic services providers in Figure 4. There are more actors involved but these are viewed as part of the environment of the business network providing the business infrastructure that is shared by many other actors and business networks. Examples of actors that are viewed as part of the business infrastructure are Pantone (textile color system and products), frequent-flyer program, banks, credit card companies, etc.

From the strategic perspective we stated that the role of SoftFurnishing is a managed marketplace. From the operational perspective we see SoftFurnishing also has the role of network orchestrator because SoftFurnishing makes use of other actors to execute (steps of) the business processes. There have to be arrangements with all these different actors and the (steps of) the business processes that are executed at different actors have to be geared towards each other. Again this configuration means SoftFurnishing occupies a central position in the business network.

3.4.2 Service elements and interactions

The services in the service network consists of one or more service elements. In figure 5 the service elements of the *purchasing service* and the *supporting sales service* of SoftFurnishing (service provider) are presented.

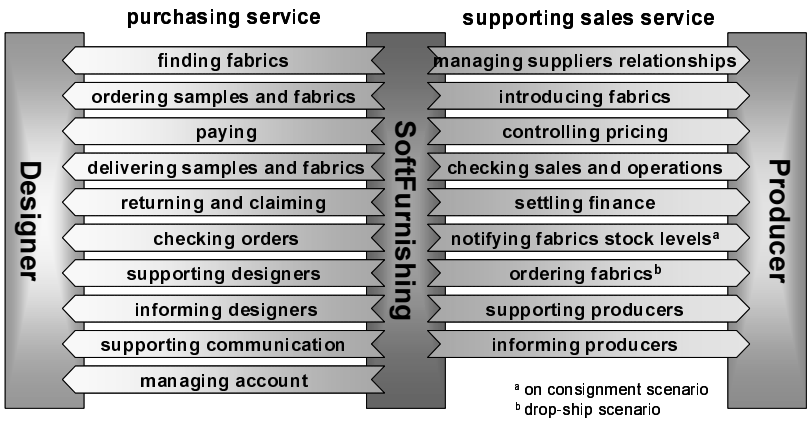

Figure 5: Service elements of SoftFurnishing.

We will elaborate some of the service elements of SoftFurnishing:

- Finding fabrics: This service enables designers to search, view, save, and reserve the fabrics they are interested in.
- Ordering fabrics and samples: This service provides designers with samples and fabrics that SoftFurnishing offers.

- Paying: This service supports the financial transactions that take place in the purchase.
- Delivering fabrics and samples: This service delivers the ordered fabrics and samples to the delivery address.
- Checking orders: This service offers designers the possibility to view their order history and check the order status (tracking & tracing).

The service elements are externally visible and accessible via interactions. For example the *finding fabrics service element* is externally visible and accessible via the following set of interactions:

- A designer can search the collection of fabrics.
- A designer can view a fabric: specification (detailed product and price information), visualization (different views), the fabric in different colors, related fabrics, etc.
- The designer can reserve fabrics for a certain period. Reservations can be converted into an order, extended or cancelled.
- The designer can save and organize fabrics selections in saved item folders. The designer can compare items in a folder (visualization and specification of items gets presented side by side).

For the *supply fabrics service* the producer (service provider) offers to SoftFurnishing (service user) there are two scenarios:

(1) The on consignment scenario: the inventory of fabrics are on consignment in the warehouse of SoftFurnishing, or

(2) The drop-ship scenario: the inventory of fabrics are in the warehouse of the producer.

These different scenarios result in different service elements and interactions. The on consignment scenario has the service element “managing stock“ (vendor managed inventory at the warehouse of SoftFurnishing). The drop-ship scenario has the service elements informing “inventory levels“ and “delivering fabrics“. In the drop-ship scenario there are interactions with the producer daily to communicate inventory levels and there are interactions for every order.

3.4.3 Interface

SoftFurnishing uses the web as a channel towards both designers and producers. However, the designers have a access to different functionality than the producers (referred to as the designer browser and producer browser). The design of the user interface of the designer and producer browser is very different. More attention and resources were spend on the designer browser and it is much more attractive. The design of the producer browser is much more focused on the functional aspects.

The fabrics in the delivery channel go via the SoftFurnishing warehouse. The drop-ship producers do not ship directly (SoftFurnishing does not want to provide them any customer data). All orders get packaged and labeled as SoftFurnishing fabrics. This even holds for the American producers who ship directly (the exception to the rule that drop-ship producers do not ship directly). But even these producers use the labels and packaging lists of SoftFurnishing.

From an operational perspective the number of interfaces increases due to the inclusion of the service providers. All arrangements with these service providers are with SoftFurnishing. Also most interactions are with SoftFurnishing. Especially the interface between SoftFurnishing and EU Logistics is very important because it directly affects the order fulfillment processes. The interface between SoftFurnishing and UPS is prescribed by UPS. For example, UPS requires that SoftFurnishing makes use of an EDI connection.

4 Case analysis

Based on the case description we have analyzed the data on strategic and operational design choices and their mutual alignment. Alignment refers to the match or mismatch between design choices from on the strategic and operational levels.

4.1 Strategic design choices

Partial transparency: A first observation is that the business network is partially transparent (Figure 6). Looking at the actors the marketplace is not transparent. Designers do not know of specific producers, and producers do not know of specific designers. Everything is branded as SoftFurnishing. Producers do not get customer data. However, there is transparency when it comes to products and prices. Designers can compare products and prices of the different producers. To conclude, marketplaces do not per definition enhance the transparency of business networks. The SoftFurnishing case shows that marketplaces can introduce transparency in some areas while at the same time introduce non-transparency in other areas. This non-transparency allows SoftFurnishing to stay firmly in control of the business network.

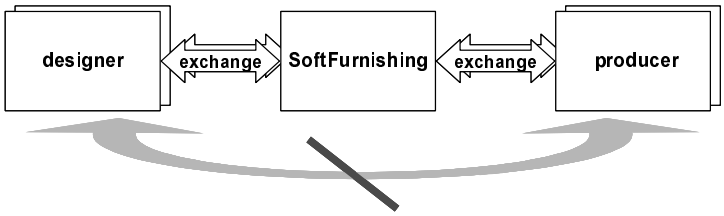

Figure 6: Partial transparency.

Transitivity of value propositions: A second observation is that a number of value propositions of SoftFurnishing to designers or producers are not directly supported by SoftFurnishing, but only by their network partners. As such, the value proposition is handed over by SoftFurnishing. SoftFurnishing controls the transitivity of the value propositions and can leverage them. This transitivity is abstractly represented in Figure 7. For example, the high-end fabrics are offered by the producer to SoftFurnishing, SoftFurnishing offers these high-end fabrics branded as SoftFurnishing to the designers. Another example is tracking & tracing value proposition of SoftFurnishing towards the designers, which is a service offered by UPS. This indicates that the brand “SoftFurnishing” is strong enough to attract producers and service providers that are willing to hand over their individual value propositions. The risks of relying too much on transi-

tivity, sometimes referred to as hollow corporations, is that competitors can easily copy the strategy and that one can easily be bypassed. Moreover, in the case of unique value propositions it can increase the dependency of marketplaces on their producers and service providers.

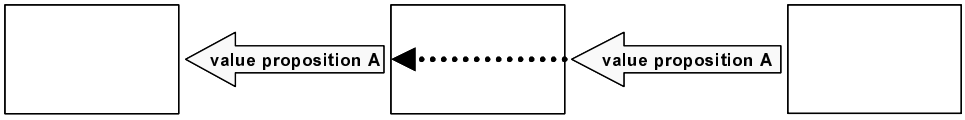

Figure 7: Transitivity.

Inventory-based value propositions: SoftFurnishing takes full control of the inventory and supply chain. This is on the one hand an added value to the producers (they do not have to take care of inventory and order fulfilment activities such as coupage and worldwide delivery), and on the other hand to the designers (available-to-promise and fast, guaranteed delivery). As such, SoftFurnishing is more an innovative logistics concept supported by e-business, than vice versa. This observation contradicts the common electronic business motto “replace inventory by information”. Apparently, logistics can be a strategic factor in e-business instead of just a matter of operational excellence. Intelligent inventory management[4] constitutes an important value proposition for marketplaces (Figure 8)

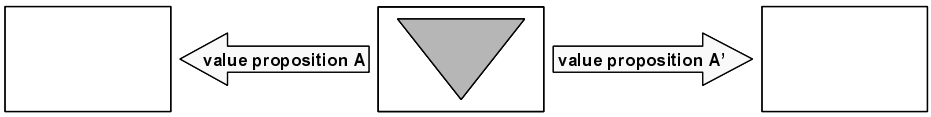

Figure 8: Inventory-based value propositions.

4.2 Operational design choices

Network orchestration: SoftFurnishing has the role of network orchestrator (see also section 3.4.1) SoftFurnishing has the arrangements with all these different actors and takes care that (the steps of) the business processes that are executed at different actors have are geared towards each other. Most interactions are with SoftFurnishing and most information is exchanged with SoftFurnishing. In this way SoftFurnishing stays firmly in control of the business network. The amount of actors, arrangements, activities, and their mutual dependence makes network orchestration a complex activity that requires a substantial effort. This reduces the risk of copying or being bypassed (see discussion on transitivity in section 4.1).

[4] Interestingly SoftFurnishing has outsourced part of its logistic activities. However, the arrangements are such that service levels are guaranteed. SoftFurnishing stays in full control of its services to the producers and designers (see also network orchestration in section 4.2)

Location of inventory: SoftFurnishing has two scenarios for the supply of fabrics: the on consignment and drop-ship scenario (section 3.4.2). These scenarios lead to different service elements and interaction frequencies (Figure 9). SoftFurnishing prefers the on consignment scenario. With this scenario SoftFurnishing has total control over inventory and order fulfillment and can guarantee the quality of service. However, SoftFurnishing also implements the drop-ship scenario. Some producers do not want to participate in the on consignment scenario and are attractive and powerful enough to get their way (this is the exception). An important implication is that the interface between SoftFurnishing and the producers is designed to accommodate two different supply scenario's.

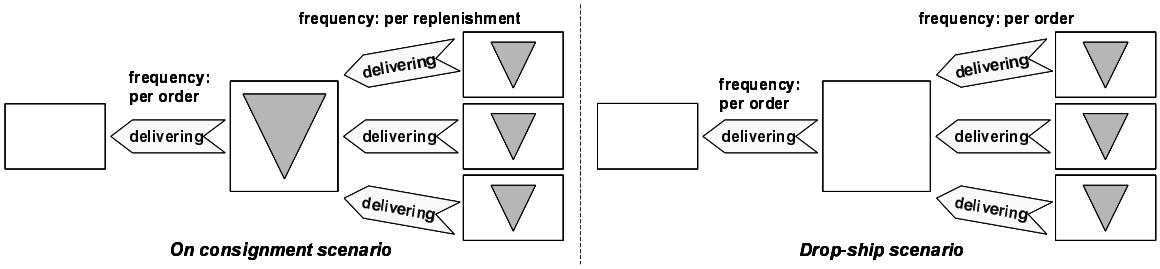

Figure 9: Location of inventory

Multichanneling: SoftFurnishing uses multiple channels. Firstly, the same service element can be accessed via different channels (customer choice). For example, the designer can order fabrics via the website or the order desk (phone or fax). Secondly, a special channel can be used to handle errors and difficult situations of the regular channel (exception handling). For example, via the customer desk channel it is possible to reserve more fabric than via the website. Thirdly, one channel can be followed buy another channel (sequential). For example, an order is placed online and the fabric is delivered by a package service. To conclude, SoftFurnishing explicitly uses a multichannel approach where virtual and physical channels complement each other.

4.3 Alignment

Alignment refers to the match or mismatch between strategic and operational design choices. Both matches and mismatches are discussed below.

4.3.1 Matches

Non-transparency of actors: An important strategic design choice of SoftFurnishing is that there is no direct contact between the designer and the producer (see also partial transparency in section 4.1). This puts SoftFurnishing in a strategic position and establishes the SoftFurnishing brand. On the operational level we observed that there are indeed no interactions between the designers and producers and that information about the specific designers or producers is not provided by SoftFurnishing. For example, the drop-ship producers do not ship directly (SoftFurnishing does not want to pro-

vide them any customer data). All orders get packaged and labelled as SoftFurnishing fabrics.

Replacing physical item by an electronic service: It is SoftFurnishing's strategy to offer compete on prices. SoftFurnishing can do this by removing structural costs. Besides this they also want to quickly introduce new fabrics. On the operational level we observed that there is the visualization of fabrics (visualization service) and there are interactions for ordering and delivering samples (sample service). The sample service is meant to replace the traditional way of working in which sample books are distributed. These sample books are expensive to produce (costs) and not frequently replaced (new fabrics). The visualization and sample services do not have these disadvantages. The visualization of fabrics is made possible by using special software and a database with images. The placing of a sample order is supported by ICT (the designers can order the samples via the website) and order processing is automated via application integration between the web application and the ERP system of SoftFurnishing. This ERP system is accessed from the sample warehouse where the order fulfilment takes place.

4.3.2 Mismatches

Automated business integration: On the operational level there is an EDI connection between SoftFurnishing and one of the drop-ship producers. This EDI connection was implemented during the pilot project. The other drop-ship producers receive their orders by e-mail and phone. This EDI drop-ship producer has no real-time processing (they batch it) and use manual interventions (they have to read the mailbox and for rare order types retype the message). It is SoftFurnishing's strategy to competes on prices. The EDI connection, however, is not cost-efficient (not enough volume) and does not increase in the service quality (still manual intervention that can lead to errors).

Limited service impact: An important strategic decision of SoftFurnishing is to offer marketing tools towards end-customer. On the operational level we observed that this tool is designed to provide tracking & tracing and information about products and prices to end-customers. It is questionable if these services add much value for the designer. This type of information is more likely to be a dissatisfier if not provided when needed than an order winner for designers.

5 Conclusions

In this paper we explored the role and characteristics of business-to-business interfaces in business networks. We presented a conceptual framework to describe and analyze the SoftFurnishing case. The case analysis focused on strategic and operational design choices and their mutual alignment. The most important findings are summarized below.

We have seen that marketplaces do not per definition increase transparency in value networks. SoftFurnishing deliberately has created some non-transparency, which allows them to firmly keep in control of the business network. A second observation was that a number of value propositions (and services) was directly transferred from suppliers to the customers by SoftFurnishing. This indicates that a marketplace not necessarily has to add value on all inflowing value activities. When a marketplace brand has enough strength prodders and service providers apparently are willing to hand over

their value propositions. Another observation was that logistics and inventory management remain important. SoftFurnishing is more an innovative logistics concept supported by e-business, than vice versa. This observation contradicts the common electronic business motto “replace inventory by information”. Finally, we have observed some matches and mismatches between design choices on the strategic and operational level.

6 Limitations and future work

We end this paper by discussing limitations of our research and future work.

Most concepts used to describe the case could easily be related to case information. Often the case information contained similar terms. For the actor concept we focused on the activities, not paying attention to the resource and people concepts. This seemed to work well for the description of the primary activities of SoftFurnishing case. However, some concepts remained troublesome. It is hard to get a grip on the relationship concept. Also the interface concept should be used for the specific purpose it is intended for, it is easily used too broad. Besides working on these concepts the next step will be to make a more explicit operationalisation of the conceptual framework.

The conceptual framework enabled us to describe the case in a structured manner. This has the advantage that analysis can be systematic by looking at apparent matches and mismatches and use this as a basis for identifying design choices. This analysis approach needs better foundations. These foundations may be found in organization and ICT literature about fit and alignment. The case analysis resulted in a number of observations related to design choices. However, a discussion of the design choices is lacking. This can be done by comparing them with what can be found about them in literature and/or get feedback from experts. This is future work and beyond the scope of this paper.

The case study has to be completed discussing the results with and getting feedback from SoftFurnishing. To make it a proper network study there should be a follow-up that would get information of the other network actors, especially the designers and suppliers. Also a follow-up that would examine the second version of SoftFurnishing (broader product range: rugs next to fabrics) and future versions (towards a collaborative platform for designers and suppliers) is worthwhile to find out more about the evolution of the business network and what this means for the interfaces.

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Adaptation and Evolution of Internet Based Electronic Marketplaces: an Empirical Analysis

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Abstract

Internet based businesses operate in highly unstable environments witnessing shakeouts and changes in the industry structure. Capturing the adaptation and evolutionary strategies of Internet Based Electronic Marketplaces (IBEMs), which operate in such environments, would help in understanding how competitive advantages can be created despite strong competition. The research would first identify the resources, capabilities and complementary assets leveraged by IBEMs at each stage and how these resources and capabilities are adapted. The research framework based on the case studies conducted brings out a four-stage framework. Based on the variables captured through the above method, we would conduct a Case Survey of firms based in the US, Europe and Asia based on published information from company annual reports, research reports, published cases, academic papers and various other sources.

1 Introduction

The Internet is radically transforming the way search and transactions are carried out by firms. These include buyer/supplier and product/services searching, transactions such as procurement, asset disposal etc. Business-to-business marketplaces have emerged to facilitate the above-mentioned functions. They not only act as market makers but they also have entered into alliances with various firms thereby offering value added services such as such as vendor rating, logistics, payment processing etc. by accessing complementary assets of partners. Internet based businesses are defined as *'businesses which use the Internet as the primary medium to generate their revenues'*. Internet based businesses operate in a highly competitive, fast-changing and uncertain

environment and hence their adaptation capabilities will determine which organization will survive. The aim of this research is to use the resource-based theory as a means of analyzing the evolution and adaptation of business-to-business Internet Based Electronic Marketplaces (IBEM). The research would also analyse how the IBEMs are creating sustainable competitive advantage by leveraging complementary assets through strategic networks. The Resource based View of the firm (Barney, 1991) would be used in the analysis. Other theories such as strategic adaptation, evolutionary economics, dynamic capabilities as well as strategic networks would also be used in the research.

2 Motivation of the research

Organizations build capabilities either through managerial design as by improving organizational manufacturing/services by improving operations or through the evolutionary adjustment of organizational practices (Burgelman, 1994). Capabilities, which are difficult to design, are likely to be very valuable (Teece et al, 1997). Some of the least imitable and in a way the most valuable capabilities are those that are developed over a period of time through the gradual evolutionary process (Selznick, 1957). Performance of organizations is best understood in dynamic evolutionary terms as organizational evolution occurs through organizational dynamics in response to the environmental challenges. Internet based businesses operate in highly unstable and competitive environments and these businesses and the environments in which they operate are characterized by considerable change. They have undergone rapid changes in terms of their market valuations, customers, lines of businesses, mode of service/product delivery, distribution channels as well as their alliances. Hence it would be useful to understand the evolutionary and adaptation paths chosen by Internet based businesses in terms of their resources and capabilities as well as their complementary assets and strategic networks.

3 Literature survey and research gap

Economies have two basic mechanisms for coordinating the flow of materials or services through adjacent steps in the value-added chain: markets and hierarchies (Coase, 1937; Williamson, 1975). An electronic market is defined as "an inter-organizational information system that allows the participating buyers and sellers in some market to exchange information about prices and product offerings" (Bakos 1997). IBEMs are market makers whose primary roles are to match buyers and sellers, broker deals, and facilitate transactions. Market makers perform four basic functions such as price setting, coordinating exchange, market clearing and allocating goods and services (Spulber, 98). The adaptive behavior of organizations is especially important in the context of Internet based businesses as they are more vulnerable to competition due to their limited cash reserves and debt capacity, their over-dependence on a limited product/service line, relatively limited market presence, significant demand fluctuations and aggressive competition. Adaptation refers to comprehensive, continuous changes in products, services, resources, capabilities, and external linkages through which firms seek to regenerate competitive advantage. Adaptation can be conceptualized in terms of a number of dimensions such as products or services offered, customer profile, marketing, distribution, personnel, financial etc. (Morris *et al*, 1999). Key characteristics of the Internet such as interconnectivity and network externalities,

makes it necessary for Internet based firms to adopt inherently dynamic strategies (Shapiro & Varian, 1999). Evolution is driven by the process of interactions between organization and the environment, learning behavior, and the survival/growth strategies in different environments. A key aspect of evolution is adaptive capability to the changing environment.

The strategies of Internet based businesses can be studied by examining the evolving patterns of resource allocation as well as strategic networks. Identifying resources critical to gaining and sustaining a competitive advantage is important, as this would help firms to acquire, manage, and develop resources internally or through alliances. The resource-based view of the firm (Barney, 1991; Penrose, 1959; Wernerfelt, 1984) suggests that differences in firm performance are primarily the result of resource heterogeneity across firms. Capabilities are capacities to deploy resources, usually in combination, to effect a desired end (Amit & Schoemaker, 1993). Dynamic capabilities is an extension of RBV approach and are rooted in a firm's managerial and organizational processes (Teece *et al*., 1997; Eisenhardt and Martin, 2000). Identifying resources capable of being strategic assets is the first step in testing RBV. The existing research fails to identify the critical resources and capabilities of IBEM.

Competitive advantage of Internet based businesses are based on informational assets, which are harder to protect from imitation. Hence the sustainability of competitive advantage is likely to depend on the effective leverage of complementary physical assets as a new entrant wishing to duplicate them would be facing significant entry barriers including high capital costs, scale economics and learning (Porter, 1980). Information-based resources and capabilities have a higher degree of mobility than other types of resources and capabilities. Also, time compression diseconomies (Dierickx and Cool, 1989) provide an effective barrier to imitation for firm-specific resources and capabilities that had to be built over time due to factor market imperfections. In the early stages of development of an industry, the sources of competitive advantage may be embedded in the technology (Abernathy & Utterback, 1978). However as technology matures and its implementation gets standardized, sustainability of competitive advantage from it becomes difficult. Complementary assets (Teece, 1986) are resources or capabilities that allow firms to capture the profits associated with a strategy, technology, or innovation. Even if other firms can imitate the new product, they will not be able to gain competitive advantage from this imitation if they do not have access to the necessary complementary assets. For IBEMs, complementary assets can be defined as assets that are required to gain competitive advantage from the implementation of best marketplace practices. The role of complementary assets in the competitiveness of IBEMs has not yet been explored.

4 Proposed conceptual framework

The framework has been arrived at on the basis of the pilot cases studies conducted. In the pilot study, interviews were conducted with two firms. The proposed four-stage framework combines the analysis of firm adaptation and growth with regard to their resources and capabilities and complementary assets with the analysis of sustained competitive advantage *(Refer Figure 1)*. The framework proposes that firms rely on continuous adaptation to regenerate competitive advantage under conditions of rapid change. This is achieved by adapting their existing resources and capabilities, acquiring new resources and capabilities and accessing complementary resources and capabilities through alliances. Firms change what they are and what they offer through

the continuous adaptation process and hence they need to regenerate competitive advantage relative to the new competitors they encounter in these domains. The activities of IBEM's could be described in terms of the following four stages: *Transaction, Value added services, Integration and Multi-market collaboration.*

4.1 Transaction

In this stage, the firm has identified the key resources, which needs to be built in order to create competitive advantage. The firm has privileged access to resources and/or markets. According to the resource-based view, privileged access means to control valuable and rare resources. The main focuses of IBEMs at this stage are the reduction of transaction costs and attract customers. For the purpose of this research, we can interpret this stage as the initial formative phase of the firm. In the case of Internet based businesses, the key resources identified in this stage based on the pilot study are Technological resources; Information based resources and Financial resources. IBEMs exhibit the following characteristics in this stage:

- Building of resources and capabilities
- Lack of sustainable competitive advantage
- Financial returns is not a critical factor
- Focus on customer acquisition
- Very high emphasis on marketing and brand building
- Intense competition
- Perceived low barriers for entry
- Low importance for complementary resources
- Focus on building communities

P_1: The technological capabilities of IBEMs built in the growth phase offer only short-term competitive advantage and are prone to imitation and substitution

P_2: For IBEMs, managerial and organizational resources satisfy the criteria for being valuable, rare, inimitable and non-substitutable as they are strongly firm specific and path dependent

P_3: In the Transaction stage of IBEMs the key resources are technological, financial and information based and capabilities are managerial and technological

P_4: In the Transaction stage IBEMs are extremely susceptible to competition and the focus is on building resources and capabilities internally

4.2 Value Added Services

In this stage, the firm identifies the complementary resources, which needs to be leveraged to deliver its products/services. The firm enters into alliances with partner firms to access these resources. The key complementary resources and capabilities, which are accessed, include fulfillment resources, vendor assessment, shipment inspection and

payment processing resources. The following characteristics are exhibited by IBEMs in this stage:

- Investments in relation specific assets
- Knowledge exchange and learning
- Combination of complementary, scarce resources and capabilities
- Focus on service differentiators

The variables, which would help to understand the firm adaptation and evolution at this stage, include complementary assets as mentioned above in addition to the variables in stage 1.

P_5: The short time window during which Internet based firms need to succeed in commercializing their products and services accentuates the need to access external complementary assets

Integration

From this stage onwards the firms move from islands of knowledge to building interorganizational information systems. IBEMs integrate their products/services with those of their customers and thereby build switching costs. In the longer run, these processes will become imitable. This is the stage wherein managerial, organizational or technological capabilities are built in that may give rise to a competitive advantage. At this stage, firms are capable of renewing their capabilities and thereby hinder imitation and substitution in the short run. Hence they may obtain above-normal returns for long periods of time. However, stage 3 activities become stage 2 activities as imitators catch up. Integration activities involve tight coupling with the processes of the customers, integration with the ERP and transaction processing systems of buyers and sellers, training of end users etc. The following characteristics are exhibited by IBEMs in this stage:

- Investments in integration of internal processes with those of customers
- Investments in relation specific assets
- Knowledge exchange and learning
- Investments to create lock-in
- Build long term relationships with customers

P_6: In the Integration stage, IBEMs are more stable as they have invested in the requisite resources and capabilities through integration with the processes of its partners

4.4 Multi Market Collaboration

Stage 4 activities are a matter of innovations in products/services, processes or organization. At this stage firms collaborate with other marketplaces and thereby create network externalities. The firms are not only capable of searching for new dynamic capabilities. What characterizes this stage is their ability to achieve sustained competitive advantage by exploiting stage 2 and stage 3 activities. Whereas stage 3 activities involve the ability to invent and exploit new products, interorganizational processes etc., stage 4 activities involve the ability to invent and/or absorb new ways of accomplishing this by collaborating with other marketplaces. Characteristics of IBEMs at this stage are as follows:

- Investments in integration of internal processes with those of other marketplaces

- Investments in relation specific assets
- Knowledge exchange and learning
- Investments to generate network externalities and lock-in
- Build long term relationships with customers and other marketplaces

5 Analysis of the framework

The above framework aims to capture the types of resources and capabilities as well as complementary assets, which needs to be leveraged by internet based businesses and IBEMs in particular at various stages in order to secure sustained competitive advantage. It also looks into ways in which firms adapt their resources and capabilities. The framework has the advantage that its sequential mode of analysis allows to identify precisely where and at what stage the firm has built its resources and capabilities and at what stage they are starting their adaptation process. The link between an attribute and its adaptive implications can be studied by analyzing the organization's history and the effect of the attribute. As adaptation is dynamic and cumulative, the effect of an attribute or a combination of attributes on adaptation would be felt in future. Thus, in this way the analysis of firm adaptation, the analysis of resources and capabilities as well as the analysis of sustainability of competitive advantage are merged.

Internet based businesses need to adapt to survive and grow in the fast changing business scenario. To achieve this, they need to have control of certain resources and capabilities. The above framework aims to capture the types of resources and capabilities as well as complementary assets, which needs to be leveraged by the firm at various stages in order to secure sustained competitive advantage. It also looks into ways in which firms adapt their resources and capabilities. The framework has the advantage that its sequential mode of analysis allows to identify precisely where and at what stage the firm has built its resources and capabilities and at what stage they are starting their adaptation process. The link between an attribute and its adaptive implications can be studied by analyzing the organization's history and the effect of the attribute. As adaptation is dynamic and cumulative, the effect of an attribute or a combination of attributes on adaptation would be felt in future. These aspects suggest that summing up the history of the organization offers a means of studying the same. It is not necessary that all Internet based businesses must pass through all stages or must pass through the stages one at a time. Many firms do not reach stage 4 or even stage 3, and most firms contain activities that are at more than one stage. It is a theoretical attempt to examine the conditions for sustained competitive advantage. The activities at the five different stages of development of the firm are supported by different types of internal and external resources and capabilities. Thus, resources that support the stage 2 activities may be different from the type of resources that support stage 3 or 4 activities. Whereas important stage 2 resources may be physical resources, the important stage 3 or 4 resources are managerial, organizational or technological capabilities. Moreover managerial and organizational resources may better satisfy the basic resource-based criteria for being rare, valuable, costly to imitate, etc. This is so because they are more likely to be strongly firm specific and hence difficult to imitate. This is due to them being internally accumulated through path-dependent processes of change. Thus, in this way the analysis of firm adaptation, the analysis of resources and capabilities as well as the analysis of sustainability of competitive advantage are merged.

6 Research design, methodology and variables

The industry-level cross sectional studies aren't very helpful for capturing the evolution of Internet based businesses, as they would fail to capture how over time they have adapted and evolved. To understand this we need to look inside firms to understand evolution at the organizational level. The study proposes to adopt two methodologies. The first part of the research involves using the Case Study methodology and a multi case design would be adopted to allow for replication logic. A number of cases are treated as a number of experiments, each case serving to confirm or reject the inferences drawn from the previous ones (Yin, 1984). As there are constraints such as geographical as well as financial restrictions, the case studies are restricted to firms with operations in India. The case study involves in-depth inquiries through interviews and hence only those firms are chosen who are willing to provide accurate and accessible information.

Based on the variables captured through the above method, a Case Survey (Lucas, 1974; Yin and Herald, 1975; Yin and Yates, Larsson, 1993) would be conducted of the firms based in the US, Europe and Asia based on published information from company annual reports, research reports, published cases, academic papers and various other sources. Case surveys bridge the gap between surveys and case studies to combine their respective benefits of generalizable, cross-sectional analysis and in-depth, processual analysis (Larsson, 1993).The variables, which would help to understand the firm adaptation and evolution at the various stages, include internal resources such as Resources and Capabilities, Relational resources such as Complementary assets and Industry Structure variables.

Resources	Capabilities	Complementary assets	Industry Structure
IT Infrastructure (Applications, Enterprise, Network, Hardware)	**Organizational** (Product/service development, Alliance formation, Information processing	**Vendor assessment & Certification**	**Competition**
Information based resources (Customer database, Marketplace engine, Content)	**Managerial** (Account management, Transaction management, Valuation of materials, Customer service)	**Fulfillment**	**Entry barriers**
Financial	**Technological** (Design, Development, Support, Maintenance, Order processing, Systems Integration)	**Shipment inspection**	**Substitutes**
Property		**Electronic payment**	**Bargaining power of partners**
Intellectual property (Trademark protection, Patents)		**Insurance**	**Regulatory changes**
Reputation (Marketing, Advertising)			**Exit barriers**

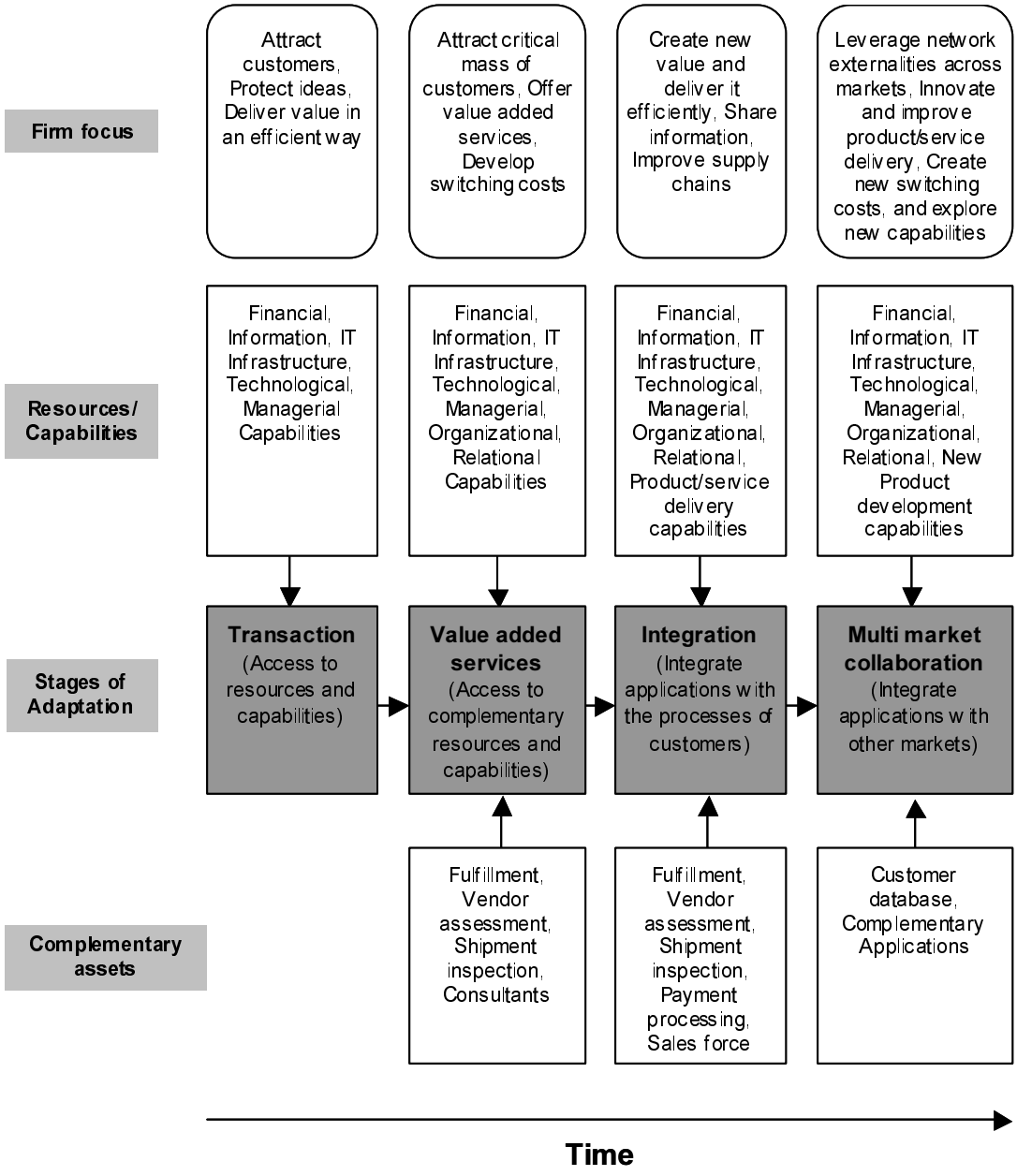

Figure 1: Stages of adaptation in IBEMs

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Characterizing Efficiency and Information Incorporation in Sports Betting Markets

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Abstract

We analyze data from thirty-three "interactive" sports betting markets on the World Sports Exchange (WSEX), where betting is allowed continuously throughout a sporting event. Our study includes markets based on soccer (European football) games from the 2002 World Cup, and markets based on basketball games from the 2002 National Basketball Association (NBA) championship in the United States. We show that prices in such betting markets on average approach the correct outcome over time. We record important events throughout the course of the games, for example changes in score. We show that the corresponding price dynamics in the markets are closely coupled with actual game events: the market reacts almost instantaneously to the occurrence of those events, indicating agreement with the assumptions of the efficient markets hypothesis. We compare the dynamics of price changes in soccer games with dynamics in basketball games, highlighting the characteristic differences between these two types of games and their corresponding markets. We also compare the nature of these sports betting markets with "political stock markets" (betting markets on the outcomes of political elections) on the Iowa Electronic Market (IEM).

1 Introduction

Typically, a market is thought of as any place where items are bought and sold, whether a physical place or an online one, and whether the items are physical items or more abstract financial instruments like securities or derivatives. At the same time, a market can serve as a tool for aggregating the players' (i.e., buyers' and sellers') knowledge about items of uncertain value. As an example, one of the motivations for a seller to utilize an auction mechanism is to help price an item whose value is not completely known to the seller: rather than set an arbitrary price, the seller can initiate an auction to find out the "correct" (efficient) price according to the actual demand among the buyers. In fact, under certain assumptions, an equilibrium price in a market can be viewed as a summary statistic that reflects the overall knowledge of all market players about the item's value. So in this sense markets are good mechanisms for combining information that is spread across a population, and summarizing that information in terms of price.

Perhaps an even more direct example of an uncertain-value item than an auction is a *gamble*. A gamble, also called a *security* in the classical economics literature, pays an amount contingent on some future outcome. For example, the gamble "$1 if it rains tomorrow" pays $1 if it rains tomorrow, and $0 if it does not rain. If an agent purchases (one unit of) this gamble for $0.3, then the agent wins $1-$0.3=$0.7 if it rains, and loses the $0.3 otherwise. Clearly the expected value (or expected utility) of the gamble is uncertain, and depends on the buyer's subjective probability of rain.

One of the stronger forms of the so-called *efficient markets hypothesis* (sometimes referred to as the *Hayek hypothesis* [Beckmann94] and justified using the *rational expectations* equilibrium concept [Grossman81, Lucas72]) states that information is incorporated into market prices virtually instantaneously, as soon as it becomes available to any trader. Informally, the reasoning behind this assumption is that, if some trader has superior information that allows him or her to obtain an expected profit at the current price, then he or she will take advantage of the opportunity by appropriately buying or selling, thereby driving prices toward the correct value (equilibrium price) given the new information.

Gambling markets ranging from horse racing markets [Thaler88] to standard sports betting markets like the National Basketball Association (NBA) point spread market [Gandar98] to an experimental market in the Euro 2000 soccer championship [Schmidt2002] have been analyzed for signs of economic efficiency and information aggregation. In almost all investigations, assessments coming from the market (in the form of prices or odds encoding probabilities or expectations) appear remarkably accurate and unbiased.

A new form of sports betting—called *interactive betting*—is now becoming popular on the Internet.[1] In this type of market, bets can be placed or revised at any time throughout the corresponding sporting event, even as, for example, teams score points, penalties are called, or key players are injured. Clearly, as significant events happen "on the field", the probabilities of the gamble outcomes change, and the expected value of the gamble changes. The continuous nature of the market allows prices to nearly instantly reflect the most recent events in the game, and the most accurate likelihoods of the possible game outcome at any given moment.

[1] Some say interactive betting will do for gambling what Ebay did for auctions.

We analyze price data from thirty-three such interactive betting markets on the World Sports Exchange (WSEX),[2] including fifteen soccer games from the 2002 World Cup held in Japan and South Korea, and eighteen basketball games from the 2002 National Basketball Association (NBA) Championship held in several different cities in the United States. We show that prices nearly always react almost immediately to game events (e.g., score changes), as predicted by the efficient markets hypothesis. We show that prices in the markets inexorably converge (on average) toward the correct answer, as information pertaining to the final outcome is revealed during the course of the game. We highlight distinctive properties of soccer and basketball games and the characteristic differences between their corresponding betting markets, with some implications for the relative psychologies of the two games.

In Section 2 we discuss some background work in this field of research and introduce any necessary definitions and concepts. In Sections 3 and 4, we describe results from soccer and basketball markets, respectively. In Section 5 we will compare the characteristic difference between these two games. In Section 6, we make qualitative comparisons between WSEX and the Iowa Electronic Market (IEM),[3] an online betting market in political outcomes run for research purposes by the University of Iowa Tippie College of Business. We conclude with some summarizing thoughts in Section 7.

2 Background

2.1 Related Work

It is clear that markets often react quickly to the release of new and relevant information. This becomes very interesting in the case of betting markets, as the relationship between price and information is very clear. There is direct relationship between the current price of a gamble and the probabilities of the possible payoffs of it, and so any information available about the gamble for any possible outcome should affect the price appropriately according to the rules of Bayesian updating.

The economic theory of *rational expectations* (RE) accounts for information incorporation in markets. RE theory posits that prices reflect the sum total of all information available to all market participants [Grossman81, Lucas72]. Even when some agents have exclusive access to inside information, prices equilibrate exactly as if everyone had access to all information. The procedural explanation is that prices reveal to the ignorant agents any initially private information; that is, agents learn by observing prices.

Plott et al. [Plott97] investigate, in a laboratory setting, whether parimutuel markets (the type employed at horse races) are able to aggregate information, as postulated by RE theory. Plott and Sunder [Plott82, Plott88] and Forsythe and Lundholm [Forsythe90] conducted laboratory experiments to test the reasonableness of the RE assumption in the context of a securities market (essentially a betting market as described in the introduction). In many cases in all these experiments, the equilibrium reached reflected the combination of all information, as predicted by RE theory.

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[2] http://www.wsex.com

[3] http://www.biz.uiowa.edu/iem/

Beyond the controlled setting of the laboratory, empiricists have analyzed the accuracy of implied probability assessments given by public markets. Perhaps the most direct tests involve betting markets. Several studies demonstrate that odds on horses at the track correlate well with the actual frequencies of victory [Thaler88]. Other sports betting markets, like the National Basketball Association point spread market [Gandar98], or an experimental soccer market organized at the Max Plank Institute in Germany [Schmidt2002], provide accurate and unbiased forecasts of likely game outcomes. Financial options markets (in many ways equivalent to betting markets) yield accurate probability distributions over the future prices of their underlying stocks [Sherrick96].

The Iowa Electronic Market (IEM) supports trading in securities tied to the outcome of political and financial events. Since opening to the public, many IEM election markets (especially US Presidential election markets) have attracted wide participation and following, and in many cases have proven more precient than public opinion polls [Forsythe99]. Other election markets have now opened in Canada[4] and Austria[5]. Pennock et al. [Pennock2002] show that forecasts on IEM consistently improve over time, reflecting a roughly constant flow of information into the market. The authors develop a theory of information aggregation to explain this behavior, and describe an algorithm to automatically extract semantic explanations of large market swings by mining online news sources.

Even market games, run entirely with play money, show signs of "economic" efficiency and information aggregation. Pennock et al. [Pennock2001a, Pennock2001b] show that games like the Hollywood Stock Exchange[6] and the Foresight Exchange[7] (an implementation of Hanson's *idea futures* concept [Hanson95]) yield remarkably accurate forecasts of future events.

2.2 Metrics

We use the *logarithmic score* to measure accuracy and information incorporation in betting markets. The logarithmic score is a *proper scoring rule* [Winkler68b], and is an accepted method of evaluating probability assessments. When experts are rewarded according to a proper score, they can maximize their expected return by reporting their probabilities truthfully. Additionally, more accurate experts can expect to earn a higher average score than less competent experts. Suppose an expert reports probabilities $\mathbf{p_1, p_2, \ldots p_k}$ for **k** mutually exclusive and exhaustive alternatives. Let $\mathbf{w_i=1}$ if and only if the **i** th event occurs, and $\mathbf{w_i=0}$ otherwise. Then the expert's score for the current event is $\mathbf{ln}(\sum^{k}_{i=1} \boldsymbol{w_i p_i})$. Higher scores indicate more accurate forecasts, with 0 the maximum and negative infinity the minimum. The "expert assessments" given by the market are taken to be the (normalized) prices of the possible outcomes.

Note that under the logarithmic scoring rule, an expert's expected score equals the entropy of his or her probability distribution. Stated another way, the negative of the logarithmic score gives the amount that the expert is "surprised" by the actual outcome. So the logarithmic score is both a measure of forecast accuracy and an information-

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4 http://esm.ubc.ca/

5 http://ebweb.tuwien.ac.at/apsm/

6 http://hsx.com/

7 http://ideosphere.com/

theoretic measure of the amount that the market is surprised when the winner of the gamble is finally determined.

We use the concepts of average logarithmic score and average entropy in our analyses in this paper. We used the midpoint of the bid and ask prices of the eventual winner of the bet to calculate the average logarithmic score. If the price (bid+ask/2) of the ultimate winner is p(t) at time t, then the average logarithmic score for the market at time t is

$$\text{Average\_Logarithmic\_Score } (\mathbf{t}) = \frac{\sum_{i=1}^{N} \log p(t)}{N}$$

where **N** is the number of markets. Similarly, the average entropy at time **t** is

$$\text{Entropy } (\mathbf{t}) = \frac{\sum_{i=1}^{N} (p(t) \log p(t) - (1-p(t)) \log(1-p(t)))}{N}$$

3 Soccer World Cup 2002

We analyze fifteen markets on WSEX corresponding to fifteen soccer games in the 2002 World Cup. These include several games from the first round and a few from second round of the tournament. The markets for the soccer games on average started long before the games started (usually 1-12 hours before the commencement of the game). The markets offered continuous betting on the outcome of the game, often with an associated point spread. A game of soccer normally lasts for 90 minutes in the first round (where games can end in a win for either team, or a draw). In the later rounds of the tournament a game may continue for more than 90 minutes if it remains undecided. In that case, the game will be played for 30 minutes more; if it still remains undecided, then the decision will be based on a penalty shoot-out. In the games we consider here, there are no cases of a penalty shoot-out. The matches were played from June 7 to June 15, 2002, and three out of these fifteen games ended in draws. We recorded the price variations from the WSEX market, the score changes in the actual game, and the game clock time in parallel. The prices, scores, and game clock are aligned according to the time at which the information was gathered from the World Wide Web. For scores and game clock information, we used Livescore.com. Prices, scores, and clock information were gathered in ten second intervals throughout the games, though the websites did not always update immediately, and network delays may have introduced further synchronization errors.

Date	Match Details	Scoring	Scoring Time
Jun 07, 2002	Sweden vs. Nigeria	0-1	28th minute
	Sweden vs. Nigeria	1-1	36th minute
	Sweden vs. Nigeria	2-1	79th(62nd) minute
Jun 11, 2002	Denmark vs. France	1-0	22nd minute
	Denmark vs. France	2-0	85th(68th) minute

Table 1: Scoring times in Sweden vs. Nigeria and Denmark vs. France games

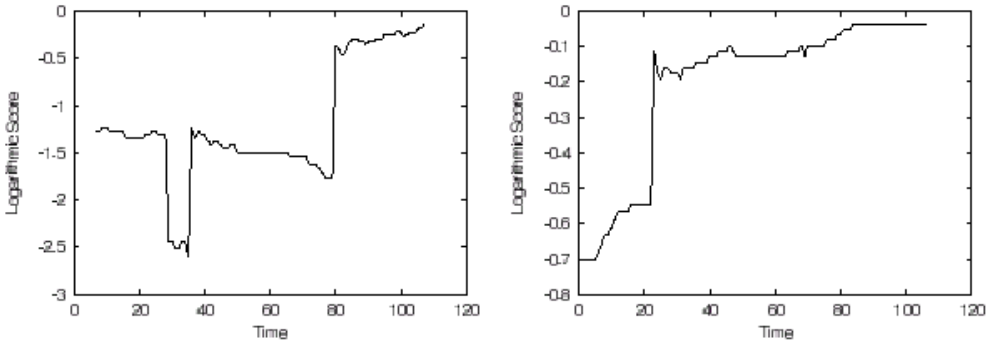

Figure 1: Logarithmic score plots for two World Cup 2002 soccer games. Left: Sweden vs. Nigeria. Right: Denmark vs. France.

We show examples of price changes for two representative games in Figure 1. The left figure is the logarithm of the price of Sweden (the bet winner) in the “Sweden vs. Nigeria” game played on June 7, 2002, while the right hand side figure is the same for Denmark in the “Denmark vs. France” game played on July 11, 2002. Interestingly, in the first game (“Sweden vs. Nigeria”) there are immediate and large price variations after each scoring, but in case of the second game (“Denmark vs. France”), though price changes are prominent for the first goal, there is almost no price change after the second goal. This highlights the natural time factor involved in the market where the team currently winning near the end of the game is likely to finish as the winner, and, depending on the score, a last-minute goal does not have much impact on the outcome. The scoring times in these two games are listed in Table 1. For scoring in the second half of the game, we give both the actual time from the start of the game and the game clock time in parentheses. Other games display very similar characteristics to these two games.

3.1 Delay Calculation

We evaluate how promptly the market reacts to scoring in the games. We denote the timestamp of the scoring as τ_s and the timestamp of the price update as τ_p. The network delay supposedly associated with these two websites are represented as δ_s and δ_p. We here assume that no general predicting devices have been used while playing in the market and any negative time difference between τ_p and τ_s is due to the delay difference in updating of the corresponding websites. We eliminate this difference by thresholding the most negative difference at 0, and adding this value to every other difference; this results in a conservative (over-) estimate of delay.

No.	Date	Match Details	Result	Threshold Θ	Time Difference Δ
01	Jun 07, 2002	Argentina vs. England	0-1	56 sec	0 sec
02	Jun 07, 2002	Sweden vs. Nigeria	0-1	11 sec	55 sec
03		Sweden vs. Nigeria	1-1	11 sec	2 sec
04		Sweden vs. Nigeria	2-1	11 sec	0 sec
05	Jun 08, 2002	Brazil vs. China	1-0	0 sec	0 sec
06		Brazil vs. China	2-0	0 sec	22 sec
07		Brazil vs. China	3-0	0 sec	0 sec
08		Brazil vs. China	4-0	0 sec	no change
09	Jun 08, 2002	Italy vs. Croatia	1-0	44 sec	44 sec
10		Italy vs. Croatia	1-1	44 sec	0 sec
11		Italy vs. Croatia	1-2	44 sec	no change
12	Jun 08, 2002	S.Africa vs. Slovenia	1-0	0 sec	0 sec
13	Jun 09, 2002	Costa Rica vs. Turkey	0-1	44 sec	0 sec
14		Costa Rica vs. Turkey	1-1	44 sec	22 sec
15	Jun 09, 2002	Japan vs. Russia	1-0	34 sec	0 sec
16	Jun 10, 2002	Korea vs. USA	0-1	0 sec	21 sec
17		Korea vs. USA	1-1	0 sec	0 sec
18	Jun 10, 2002	Portugal vs. Poland	1-0	0 sec	22 sec
19		Portugal vs. Poland	2-0	0 sec	0 sec
20		Portugal vs. Poland	3-0	0 sec	0 sec
21		Portugal vs. Poland	4-0	0 sec	no change
22	Jun 10, 2002	Tunisia vs. Belgium	0-1	0 sec	21 sec
23		Tunisia vs. Belgium	1-1	0 sec	0 sec
24	Jun 11, 2002	Denmark vs. France	1-0	0 sec	0 sec
25		Denmark vs. France	2-0	0 sec	no change
26	Jun 11, 2002	Senegal vs. Uruguay	1-0	41 sec	0 sec
27		Senegal vs. Uruguay	2-0	41 sec	83 sec
28		Senegal vs. Uruguay	3-0	41 sec	124 sec
29		Senegal vs. Uruguay	3-1	41 sec	83 sec
30		Senegal vs. Uruguay	3-2	41 sec	83 sec
31		Senegal vs. Uruguay	3-3	41 sec	62 sec
32	Jun 12, 2002	S.Africa vs. Spain	0-1	11 sec	33 sec
33		S.Africa vs. Spain	1-1	11 sec	35 sec
34		S.Africa vs. Spain	1-2	11 sec	0 sec
35		S.Africa vs. Spain	2-2	11 sec	11 sec
36		S.Africa vs. Spain	2-3	11 sec	33 sec
37	Jun 13, 2002	Ecuador vs. Croatia	1-0	0 sec	86 sec
38	Jun 15, 2002	Germany vs. Paraguay	1-0	11 sec	0 sec

Table 2: Time difference between the price update and the scoring in 38 different cases of 15 games from 2002 Soccer World Cup resulting in average time difference of only 24.7647 seconds

$$\Delta = (\tau_p + \delta_p) - (\tau_s + \delta_s)$$

$$= (\tau_p - \tau_s) + (\delta_p - \delta_s)$$

$$= (\tau_p - \tau_s) + \Theta$$

where Δ represents the ultimate difference between the price update and scoring and Θ is the threshold. We have shown all 38 cases of these in Table 2. Column 2 shows the names, and column 4 represents the result of the game; in case of multiple goals, it shows them one after another with the final score last. Columns 5 and 6 represent the threshold and time difference in each individual case. We found that the average time difference is 24.7647 seconds. Note that this difference reflects a very conservative estimate, due to the thresholding; any delay may be entirely a result of website update delays and/or network delays. Note that in the calculation we excluded cases where

there is no change of price after goal scoring (i.e., when the outcome is already nearly certain).

No-	Date	Match Details	Result	Threshold Θ	Time Difference Δ
01	Jun 07, 2002	Argentina vs. England	0-1	56 sec	0 sec
02	Jun 07, 2002	Sweden vs. Nigeria	0-1	11 sec	55 sec
03		Sweden vs. Nigeria	1-1	11 sec	2 sec
04		Sweden vs. Nigeria	2-1	11 sec	0 sec
05	Jun 08, 2002	Brazil vs. China	1-0	0 sec	0 sec
06		Brazil vs. China	2-0	0 sec	22 sec
07		Brazil vs. China	3-0	0 sec	0 sec
08		Brazil vs. China	4-0	0 sec	no change
09	Jun 08, 2002	Italy vs. Croatia	1-0	44 sec	44 sec
10		Italy vs. Croatia	1-1	44 sec	0 sec
11		Italy vs. Croatia	1-2	44 sec	no change
12	Jun 08, 2002	S.Africa vs. Slovenia	1-0	0 sec	0 sec
13	Jun 09, 2002	Costa Rica vs. Turkey	0-1	44 sec	0 sec
14		Costa Rica vs. Turkey	1-1	44 sec	22 sec
15	Jun 09, 2002	Japan vs. Russia	1-0	34 sec	0 sec
16	Jun 10, 2002	Korea vs. USA	0-1	0 sec	21 sec
17		Korea vs. USA	1-1	0 sec	0 sec
18	Jun 10, 2002	Portugal vs. Poland	1-0	0 sec	22 sec
19		Portugal vs. Poland	2-0	0 sec	0 sec
20		Portugal vs. Poland	3-0	0 sec	0 sec
21		Portugal vs. Poland	4-0	0 sec	no change
22	Jun 10, 2002	Tunisia vs. Belgium	0-1	0 sec	21 sec
23		Tunisia vs. Belgium	1-1	0 sec	0 sec
24	Jun 11, 2002	Denmark vs. France	1-0	0 sec	0 sec
25		Denmark vs. France	2-0	0 sec	no change
26	Jun 11, 2002	Senegal vs. Uruguay	1-0	41 sec	0 sec
27		Senegal vs. Uruguay	2-0	41 sec	83 sec
28		Senegal vs. Uruguay	3-0	41 sec	124 sec
29		Senegal vs. Uruguay	3-1	41 sec	83 sec
30		Senegal vs. Uruguay	3-2	41 sec	83 sec
31		Senegal vs. Uruguay	3-3	41 sec	62 sec
32	Jun 12, 2002	S.Africa vs. Spain	0-1	11 sec	33 sec
33		S.Africa vs. Spain	1-1	11 sec	35 sec
34		S.Africa vs. Spain	1-2	11 sec	0 sec
35		S.Africa vs. Spain	2-2	11 sec	11 sec
36		S.Africa vs. Spain	2-3	11 sec	33 sec
37	Jun 13, 2002	Ecuador vs. Croatia	1-0	0 sec	86 sec
38	Jun 15, 2002	Germany vs. Paraguay	1-0	11 sec	0 sec

Table 2: Time difference between the price update and the scoring in 38 different cases of 15 games from 2002 Soccer World Cup resulting in average time difference of only 24.7647 seconds

The average log score and the average entropy of all 15 soccer games appear in Figure 2. Both are plotted versus time, where 0 is aligned with the start of the game. We also processed price movement information during the interval, which typically consists of two halves of 45 minutes of play separated by a 15 minutes halftime break. And we also surprisingly found some minor price movements after the 90 minutes of play ended, so the plots range in time (in minutes) from 0 to close to 110. As seen from the graph it is clear that during the time period from the 46th to the 61st minute (which approximately encompasses halftime of most games) there is less price movement (the average log score and entropy are flat compared to other regions), as we would expect, since very little information about the game outcome is decided during halftime. Moreover, the final few minutes show large price movements, meaning that the largest changes in the amount of certainty of the outcome happens at the end of the games on average (around 104th minute in the graph which actually is (104 – 15) or 89th minute of the 90 minute game). This likely reflects the fact that people feel more certain about

the outcome of the game just a few minutes before the game ends. Otherwise the average log score is increasing roughly linearly heading toward zero, indicating a roughly constant flow of information on average through much of the game. The average entropy of these markets (Figure 2) shows the downward slope during the two halves of play as information about the outcome becomes available, and the ultimate drop to 0 entropy (certainty) at the end of the game. This indicates a roughly constant reduction of uncertainty over the result over time with a more rapid resolution of uncertainty near the end of the game. The small glitch near the end is due to some games where few last minute goals changed the result of the game and the uncertainty level increased slightly for a few minutes.

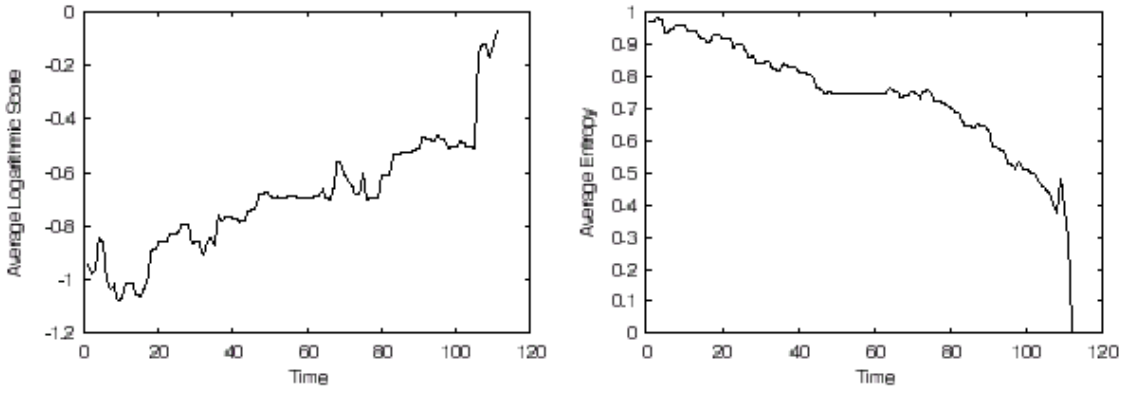

Figure 2: Average logarithmic score (left) and average entropy (right) of fifteen soccer markets on Sports Exchange. Higher (less negative) log scores reflect increasing accuracy; lower entropy values reflect increasing certainty in the outcome.

4 2002 NBA Championship

Basketball games are characteristically different and played for 4 quarters, each lasting for 12 minutes, totaling 48 minutes of playtime. There is a halftime break of about 20 minutes in between the 2nd and 3rd quarters. We analyzed 18 games from the 2002 NBA championship played between May 6, 2002 and May 31, 2002. We recorded score and game clock information from Sportsline.com, and price information from WSEX and aligned them according to the timestamps. On average we sampled the stream every 10 seconds. Figure 3 plots the average logarithmic score of these games using the average of the bid and ask prices (bid+ask/2), as well as the average entropy. Here time is shown in minutes starting from 0 to 170 minutes. Though the actual game is played for only 48 minutes, here we processed the price information during several breaks also, which adds up to little more than 2.5 hours in total play time.

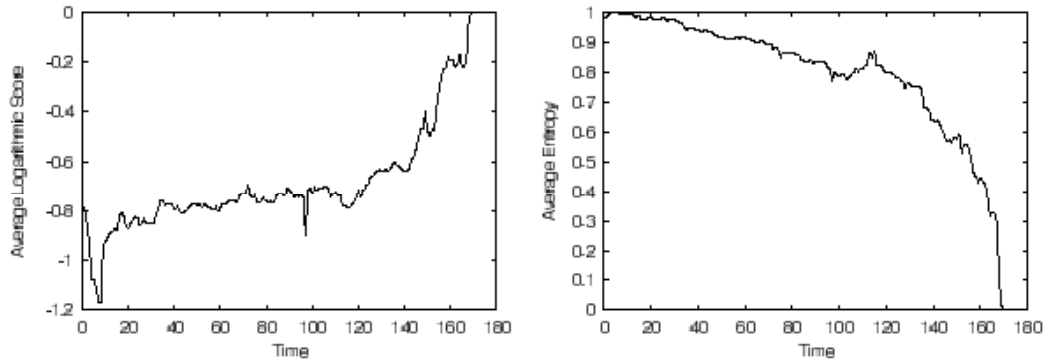

Figure 3: Average logarithmic score (left) and average entropy (right) of eighteen basketball markets on Sports Exchange. Higher (less negative) log scores reflect increasing accuracy; lower entropy values reflect increasing certainty in the outcome.

The average entropy of these games (right side of Figure 3) is indicative of major uncertainty over the course of the game, as the entropy value is greater than 0.7 for more than 77% of the game and greater than 0.8 for more than 55.5% of the game. This means the people participating in the market are very uncertain about the outcome of the game and their uncertainty has been reflected in the price movements. Not surprisingly this entropy drops sharply over the last 23% of the time and heads towards 0, reflecting increased certainty about the outcome in last quarter of play.

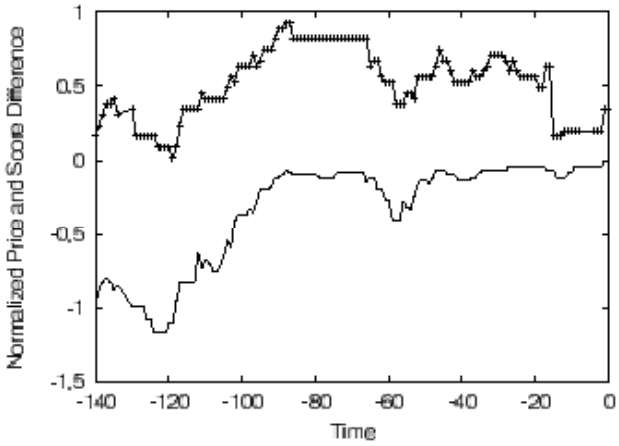

Figure 4: Correlation between logarithmic normalized price of the winner and the score difference in the basketball game between San Antonio and LA Lakers held on May 07, 2002

We find that price changes in basketball games are highly correlated with score changes. Figure 4 displays the correlation in one of the games on May 7, 2002 played between San Antonio and the Los Angeles Lakers. This is one of the 18 games where the correlation value of logarithmic normalized price and the score difference is very high. In this graph the top curve is the normalized score difference between these two teams and the bottom curve is the logarithm of the price of the winner. The correlation

between these two has been measured as 0.93. For other games the correlation values are shown in Table 3.

No.	Date	Winner	Details	Correlation
01	May 06, 2002	Dallas	Dallas vs. Sacramento	0.911234895882537
02	May 07, 2002	New Jersey	Charlotte vs. New Jersey	0.931731122180932
03	May 07, 2002	San Antonio	San Antonio vs. LA Lakers	0.643892830218919
04	May 10, 2002	Detroit	Detroit vs. Boston	0.241489294093237
05	May 10, 2002	Los Angeles	Los Angeles vs. San Antonio	0.899529974086272
06	May 12, 2002	LA Lakers	LA Lakers vs. San Antonio	0.769319276995048
07	May 13, 2002	Sacramento	Dallas vs. Sacramento	0.913128573373542
08	May 14, 2002	Boston	Boston vs. Detroit	0.759604460761744
09	May 14, 2002	San Antonio	San Antonio vs. LA Lakers	0.366704064261902
10	May 15, 2002	New Jersey	Charlotte vs. New Jersey	0.764031988154954
11	May 24, 2002	Sacramento	Sacramento vs. LA Lakers	0.794065198465937
12	May 25, 2002	New Jersey	New Jersey vs. Boston	0.469322845099931
13	May 26, 2002	Sacramento	Sacramento vs. LA Lakers	0.152905436965 19
14	May 27, 2002	New Jersey	New Jersey vs. Boston	-0.113023133552283
15	May 28, 2002	LA Lakers	LA Lakers vs. Sacramento	0.680983360751506
16	May 29, 2002	New Jersey	Boston vs. New Jersey	0.851181768248148
17	May 31, 2002	New Jersey	New Jersey vs. Boston	0.876953977582046
18	May 31, 2002	Sacramento	Sacramento vs. LA Lakers	0.193926069160131

Table 3: Correlation between log of normalized bid price of winner and score difference in 18 games from USA National Basketball Association League 2002. The average of these correlations is measured as 0.61

5 Soccer and Basketball

We will now try to compare the basic characteristics of these two games. In the last two sections we illustrated the average entropy and average logarithmic scores of these two types of markets. We also have shown the correlation between scoring and price movements. Here we will itemize the characteristics of these two games.

- Basketball games are more uncertain for a larger proportion of the game. One way to interpret this is that basketball is more exciting longer into the contest, as the outcome does not become clear until late in the game. Another way to look at it, when a comeback does occur in soccer, it is that much more unlikely, and thus more dramatic than in basketball.
- Both in basketball and soccer the price is highly correlated with the scoring, but there are some fundamental differences between these two due to the fundamental difference of these two games. In case of basketball there is continuous scoring throughout the game and so the price change is very frequent, following closely with the scoring. Typically in basketball a single score for either team does not

change the price much. In the case of soccer markets, prices do not change that often, but when they do change with a score it is often a very drastic change.

6 WSEX and the Iowa Electronic Market

The Iowa Electronic Market (IEM) is a betting market mainly focused on political elections, run for research purposes by the University of Iowa Tippie College of Business. Figure 5 shows the average logarithmic score of twenty-two IEM markets. There is a qualitative similarity between this graph and the average logarithmic score of the markets on WSEX. One difference between these markets is that IEM markets are longer term (run over a period of months or years), while the sports markets are shorter term (run over a period of hours). The horizontal axis of the IEM markets is the number of days as opposed to the horizontal axis of the WSEX markets, which is measured in minutes. Nonetheless, we still see a roughly constant increase in log score on average with a large increase near the end as election day approaches and the outcome becomes clear. In previous work [Pennock02], we employ an entropy-based feature extraction algorithm to mine possible semantic explanations from news sources for large price changes in the 2000 US New York Senate market and 2000 US Presidential market.

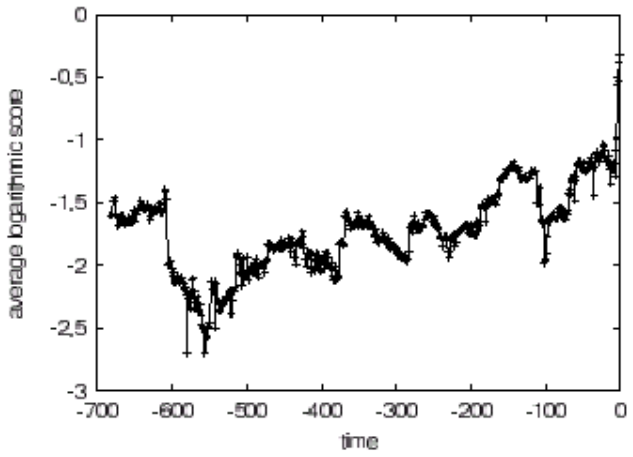

Figure 5: Average logarithmic score of twenty-two political markets on Iowa Electronic Markets. Higher (less negative) scores reflect increasing accuracy. The horizontal axis is the number of days until the end of the market (on or near election day).

7 Conclusion

In this paper we have analyzed data from sports betting markets, where betting is allowed continuously throughout the sporting event. We have looked at both soccer games and basketball games. We show that prices in such betting markets on average approach the correct outcomes. We show that important events throughout the course of the game (goal scoring, etc.) and the corresponding price dynamics are well-correlated, and the market reacts almost instantaneously to these events. We also show that the distribution models of soccer and basketball exhibit some characteristic

differences. Still, many characteristics are qualitatively similar, including in much longer-term markets like IEM.

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E-Procurement on Electronic Markets: Results from an Empirical Study in the European Automotive Industry

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Abstract

Electronic markets are discussed as an important part of electronic business and an approach to solve inter-organizational supply-chain problems. Even so, less than 25% of all enterprises in the European automotive industry currently use e-markets. The participation on e-markets is influenced by the existence of a company's e-business strategy. Surprisingly, there appears no significant correlation between the existence of a company's e-business strategy and efficiency gains. Another emergency is that e-market based supply-chain management belongs not to the substantially requisitions of the automotive companies to participate on e-markets.

1 Introduction

The automotive industry is one of the largest industrial sectors worldwide. Through the internationalisation of markets, manufactures and suppliers are increasingly forced to intensify their business relations. Particular intricacies result from the industry's extraordinarily complex process structures and dependencies [Automobilindustrie 2001]. E-business is often argued as a solution to handle this challenge, reducing costs, improving product quality etc. [Gehm 2002].

An increasingly important part of e-business have become electronic markets (e-markets), electronic intermediaries that allow multiple buyers and sellers to do businesses [Malone et al. 1987]. Through the late rise of vertical markets in the automotive industry (most markets result from the year 2000) less data about their usage exists (e.g. traded goods and services, efficiency gains, barriers etc). Accordingly, a detailed analysis of the characteristics and all the associated possible dimensions becomes essential.

In order to obtain data about the status-quo of e-business and e-markets the Institute of Information System, Frankfurt University and the PA Consulting Group conducted a comprehensive study in the automotive industry. The aim of the study was to explicit the status quo of e-markets and to answer the following questions:

- Do the automotive companies have a consistent e-business strategy?
- Does a consistent e-business strategy influence the participation on electronic markets?
- Does a correlation between e-business strategy and efficiency gains exist?
- Where are the differences between horizontal and vertical markets in the view of participating companies?
- What role do e-markets play for supply-chain management?
- Of what importance are various marketplace characteristics for the decision to participate on e-markets?

In the following we first give an overview about relevant terms including several research hypotheses. After a description of our study design, selected survey results will be presented. The paper ends with a summary and a prospect.

2 Definition of Terms and Research Questions

2.1 E-Business Strategies

The advent of the internet has changed traditional business models and business processes [Fritz 2000]. A firm's successful business strategy, especially with regard to the usage of new information and communication technologies, has to consider these influences in order to maintain its competitive position. Independent form a specific industry, various analyst estimate that only 25-30 % of all companies have a consistent e-business strategy today [DCI 2001; Wamser 2001]. According to a recent survey of automotive/manufacturing companies, conducted by KPMG and the Economist Intelligence Unit in June and July 2000, e-business and so e-markets have become an integral element in the business and engineering strategies of manufactures and suppliers in the automotive industry. Due to a higher availability of resources, it is assumed that especially large enterprises have employed e-business strategies [Wirtz 2001; Gehm 2002].

Thesis 1: Large automotive enterprises employ e-business strategies more often than small and mid-sized enterprises

2.2 Electronic markets

The Literature on electronic markets has long recognized the importance of different kinds of intermediaries and different functions they serve [Bakos 1997]. A key attribute of an e-market is that it is a single inter-organizational information system that links multiple buyers and sellers. As a result, a buyer (seller) needs to establish just a single link to the marketplace system to exchange information and/or transact with the large, potentially unlimited number of seller (buyers) who also subscribe to the marketplace. In general, horizontal and vertical e-markets can be distinguished. Whereas vertical

markets refer to the buying and selling of industry-specific (direct) items that immediately enter a manufacturing process (e.g. the parts that are assembled into an automobile) [Gebauer/Segev 2001] horizontal markets focus on indirect goods and services (also referred as maintenance repair and operation) needed in a huge number of industries. Indirect items typically involve a larger number of buyers and are much less predictable with respect to buying volume and frequency [Beam et al. 1998]. In contrast to indirect goods most direct items can be delivered by a restricted number of suppliers only.

The use of e-markets frequently implies a long term reengineering of supplier-customer relationships, in the area of indirect as well as the area of direct products. Whereas from an organizational perspective an e-markets changes the flow of information between business partners and organizational structures, from a IS perspective new applications and standards can be necessary [Warkentin/Bapna 2000]. Hence, we believe that especially companies with a consistent e-business strategy belong to the group of marketplace participants.

Thesis 2: enterprises with a consistent e-business strategy use e-markets more frequent than companies without an e-business strategy.

In the automotive industry several marketplaces are initiated by large enterprises. Whereas OEMs like Volkswagen and BMW pursue proprietary concepts (private markets) restricted to their own suppliers [Bernhardt/Feige 2000] DaimlerChrysler, Ford, General Motors, Nissan, Renault and the PSA Group (Peugeot and Citroen) cooperate on the common platform Covisint. Beside these OEM-driven marketplaces more and more suppliers have joined forces to initiate their own platforms [Baldi/Borgman 2001], focusing the trade between automotive suppliers only. Examples are SupplyOn, NewtronAutomotive and Rubbernetwork. TecCom, another supplier-driven concept is unrivalled to the illustrated markets below focusing the trade of automotive spare parts between suppliers and dealers only (see Figure 1).

2.3 Market transactions and services provided by the marketplace system

Market transactions can be divided in four core phases, the information, negotiation, settlement and after-sales phase [Schmid 1993; Lincke 1998]. Depending on each phase different market function and services are used for support (for a detailed analysis see [Bichler 2001; Fricke/Gauder 2001]. The support decreases from the information phase to the after-sales phases [Hoffmann 2001]. Whereas early e-markets have provided information and catalogue-based procurement services only, today's vertical concepts are extended by value-added services, such as for supply-chain management and for product development [Bernhardt/Feige 2000; Konicki/Aloire 2001]. Especially e-market based supply-chain management has increased in importance [Buxmann 2001]. Forrester research expected that in the next years 63.0% of the companies will use SCM services on e-markets [Homs et al. 2000].

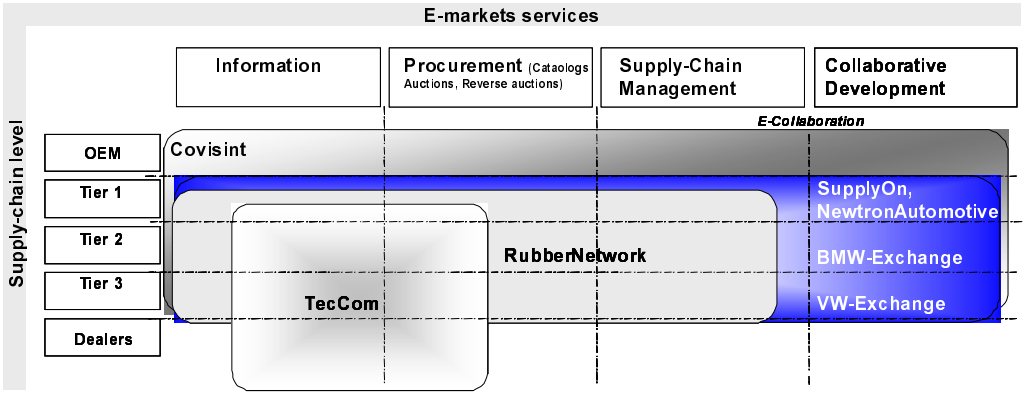

Figure 1: Classification of vertical e-markets in the automotive industry by service and target group

As figure1 shows, Covisint provides information, procurement, supply-chain management and product development services. OEMs as well as all supplier categories belong to the target group. SupplyOn, NewtronAutomotive and the two private exchanges (BMW and VW) also support the whole spectrum of services, restricted to suppliers only. Whereas TecCom provides information and catalogue-based procurement services for suppliers and dealers, collaborative development is not supported by RubberNetwork.

2.4 Transaction and Purchasing costs

The price a product is sold for consists of purchasing costs (production costs + profit margin) and coordination cost. Throughout the relevant literature, often different terms are chosen to describe coordination costs [see e.g. Chandler/Daems 1979; Malone et al. 1987]. Coordination costs include the transaction costs of all the information processing necessary to coordinate the work of people and machines that perform the primary processes. Economic theory asserts that firms will choose transactions that economize on coordination costs [Wigand/Benjamin 1993]. Malone et al. [1987] argue that IT reduces the cost of a transaction. It follows that e-markets can be more efficient forms of coordination. Beside the reduction of transaction costs, e-markets can lead to a reduction of purchasing costs (e.g. bundle effects).

According to Berger [2001] in the automotive industry e-markets can reduce the costs per automobile between US$ 500-1000. DaymlerCrysler expect that the average material costs can be reduced by 17% [DaimlerChrysler 2001]. Further a reduction of transaction costs up to 20% is classified as realistic [Lee 1998; Merz 2002]. Through the central approach implied by a consistent e-business strategy we believe that efficiency gains can be achieved in companies using an e-business strategy more frequent than in companies without a strategy.

Thesis 3 and 4: Enterprises with a consistent e-business strategy achieve a reduction of transaction cost (3) and purchasing cost (4) more frequent than enterprises without an e-business strategy.

2.5 Decision Parameters for Participation on E-Markets

A companies decision to participate on e-markets can be influenced various parameters. Berlecon Research: [1999] e.g. identified, that in the area of electricity anonymity (trading partners do not know each other) played an important role for participation. To prevent compatibility problems with internal and external information systems the availability of corresponding standards is of importance [v. Westarp et al. 1999]. Whereas small and mid-sized enterprises often focus on WebEDI solutions because of less transaction volumes and restricted financial resources only, large enterprises require a higher level of integration.

Thesis 5: The integration of internal systems is a more important argument for large than mid-sized and small companies for participating on e-markets.

Bailey/Bakos [1997] argue that participants in e-markets are frequently concerned that it is possible to falsify electronic documents or create fraudulent electronic presence, which increases the importance of the trust role of electronic intermediaries. Another important decision parameter is the amount of members participating on the marketplace. The benefits realized by individual participants in an e-market increase as more organizations join the systems [Bakos 1991]. This property is known in economics as network externalities [Katz/Shapiro 1985]. Another decision parameter can be the business model realized by the marketplace operators. In Literature, transaction-oriented and membership fee oriented business models can be found. Because membership-fee oriented concepts most imply a long term use of the marketplace system and a high transaction volume to depreciate a companies investment, we believe that large enterprises rate fix cost-based models higher than small and mid-sized companies.

Thesis 6: Fix cost-based business models are a more important argument for large than mid-sized and small companies for participating on e-markets.

Thesis 7: Transaction-oriented business models are a more important argument for SME than for large enterprises for participating on e-markets.

In the automotive industry e.g. large OEMs have traditionally used their market position to influence small business partners. This has also been referred as the Lopez-effect [Buxmann et al. 2000]. Therefore it is suspected that SME are more influenced by their business partners than large enterprises.

Thesis 8: The influence of business partners is a more important argument for SME than for large enterprises for participating on e-markets.

3 Design of the study

In order to obtain data about the status-quo of e-business, research objects were standardized business software, EDI, supply-chain management, e-markets and e-procurement (without intermediation) a questionnaire containing 45 questions on 9 pages (two of these focusing solely on e-markets) was sent to 800 suppliers and manufactures in the European automotive industry. Prior to mailing the questionnaire, each company was contacted by phone to identify the responsible managers to whom the questionnaire was then directly addressed.

125 relevant questionnaires from 9 countries were returned (15%) with the most respondents from Germany (48.0%), followed by Austria (16.0%), France (12.8%), Scan-

dinavia (Norway and Sweden) (9.6%), Benelux (Netherlands and Belgium) (7.2%) and others (England and Switzerland) (6.4%).

In order to be able to identify possible dependencies according to firm size, with regard to their annual revenues we classified the responding enterprises as small (revenues < € 250 Mio.), mid-sized (revenues < € 500 Mio.) and large (revenues > € 500 Mio). On the whole, 48% of the 125 participants were small companies, 18.4% mid-sized and 33.6% large enterprises (Figure 2, left). To clarify the respective roles of the enterprises in the industry in more detail, we distinguished between manufactures (OEM, original equipment manufacturer) and different tiers, i.e. the level of a supplier in the supply chain in the view of an OEM (Figure 2, right).

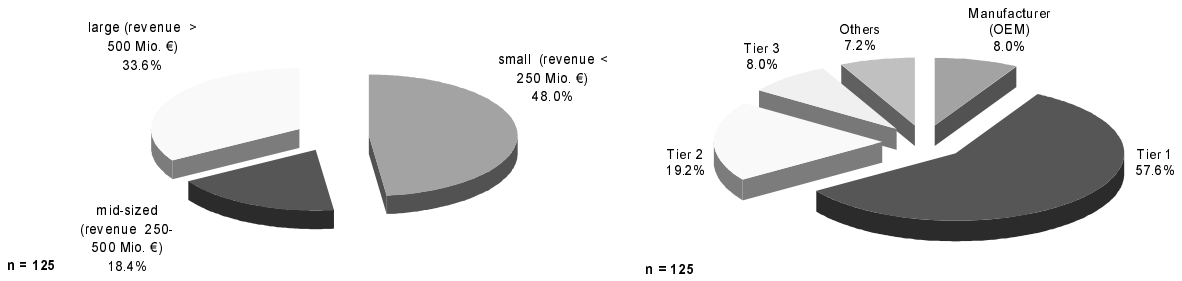

Figure 2: Size and supply chain level of the responding enterprises

As shown in figure 2 (right), the sample is dominated by 1st tier suppliers, followed by 2nd tier (19.2%), 3rd tier (8.0%) and OEM (8.0%). Further companies (7.2%) (e.g. logistics services provider) are summarized in the category others. For the survey's demographics see figure 3.

4 Survey Findings

4.1 E-Business Strategies

To evaluate thesis (1), the first question of the survey addresses the existence of e-business strategies in the automotive industry. We distinguished between a consistent company-wide e-business-strategy and a consistent strategy for sub-areas (e.g. for a division) as well as the lack of an e-business strategy.

33.1% of the responding enterprises have a consistent company-wide strategy and about 28.2% of the respondents have a consistent e-business strategy for sub-areas, while 38.7% have no e-business strategy. As shown in figure 3 Austrian (70.0%) and German (66.7%) enterprises use e-business strategies (company-wide and for sub-areas) most. With 26.7% France is on last position.

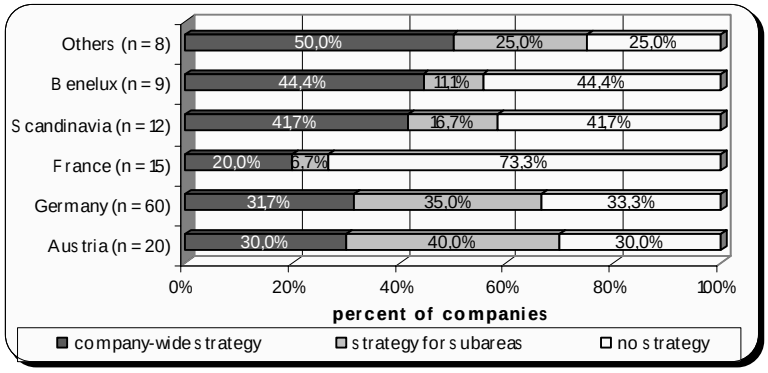

Figure 3: E-business strategies by region

Looking at the different company-sizes it is obvious that companies with revenues of more than 500 Mio. Euro use e-business strategies more than small and mid-sized companies. Furthermore, we can see that small enterprises have less developed e-business strategies (see figure 4).

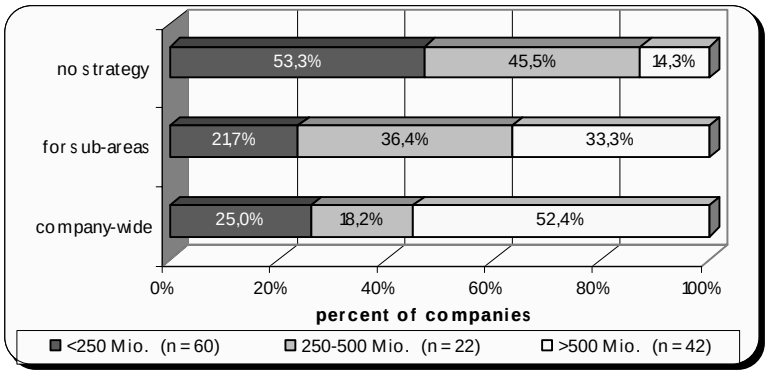

Figure 4: E-business strategies by enterprise-size

To analyse the dependencies between the company-size and e-business strategies we have summarized small and mid-sized companies to the group SME, and all companies with a company-wide strategy and a strategy for sub-areas to the group consistent strategy into a 2x2 cross-table. The exact Fisher-Test was calculated for examination. With an error-probability of $p < 0.0001$ a significant correlation was found for our sample. Therefore, we can accept the thesis that large companies use e-business strategies most.

To identify reasons for a lack of e-business strategies and reasons why companies just employ a strategy for sub-areas, the respondents (with the exception of those who have a company-wide strategy) were asked about barriers (multiple answers were possible).

54.9% of the respondents without a company-wide e-business strategy see “missing strategic importance” as a main barrier. Only 11.5% of the companies are currently planning or evaluating a consistent e-business-strategy. According to the responding managers, other barriers are difficulties in the development (17.7%) and the rollout (9.8%) of a consistent e-business strategy (e.g. through the variety of business units or the independence of a division) as well a missing support by the management (3.9%). 16.4% named different other reasons. The findings show that the importance of e-business is not wildly spread in the management of companies.

4.2 Usage of Electronic Markets

The respondents were asked if e-markets are used in there enterprises. Only 24.8% of the European enterprises employ e-markets. 8.8% of those plan a further participation. Whereas 23.3% of the respondents plan a utilization (time horizon is between ½ and 1 ½ years), 52.0% of the European suppliers and manufactures do not use or plan a marketplace participation (see figure 5, left).

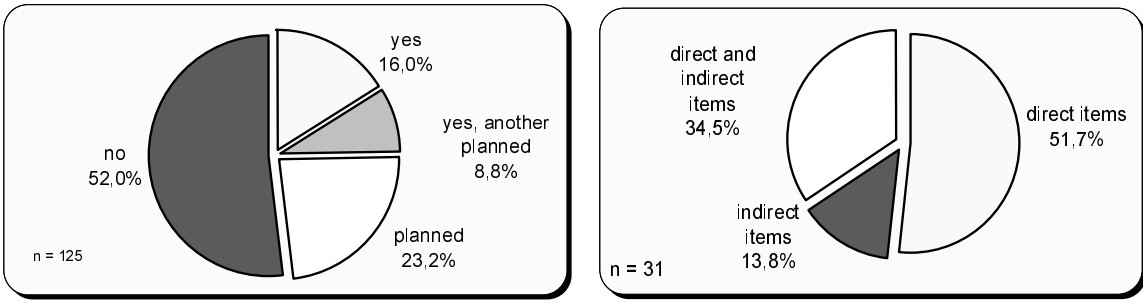

Figure 5: Use of electronic markets depending on the type of goods and services

47.6% of all marketplace participants have a company-wide e-business strategy, about 30.0% have a strategy for sub areas and only 23.3% of the marketplace participants do not have an e-business strategy. To examine thesis (2), the Fisher-Test was calculated again. With an error-probability of $p < 0.036\%$ a significant correlation was found for our sample. This mean, that automotive companies with an e-business strategy (company-wide and for sub areas) use e-markets more frequent than enterprises without an e-business strategy.

To analyse the use of e-markets in the automotive enterprises in more detail, we wanted to know the type of goods and services (direct vs. indirect) traded by the companies. 57.7% of the marketplace participants exclusively use e-markets for the procurement of direct items and about 13.8% for indirect products. 34.5% of the participants have experiences in both areas (see figure 5, right).

Another classification can be made using the kind of participation. We distinguished an active participation (the marketplace is used for business transactions) and a passive participation (companies are only listed but do not use the marketplace for trading related activities). 69.0% (41.4% + 27.6%) of the marketplace participants in the automo-

tive industry use at least one platform in an active way. Whereas 31.0% participate only passive, 27.6% participate active as well as passive (see figure 6, left).

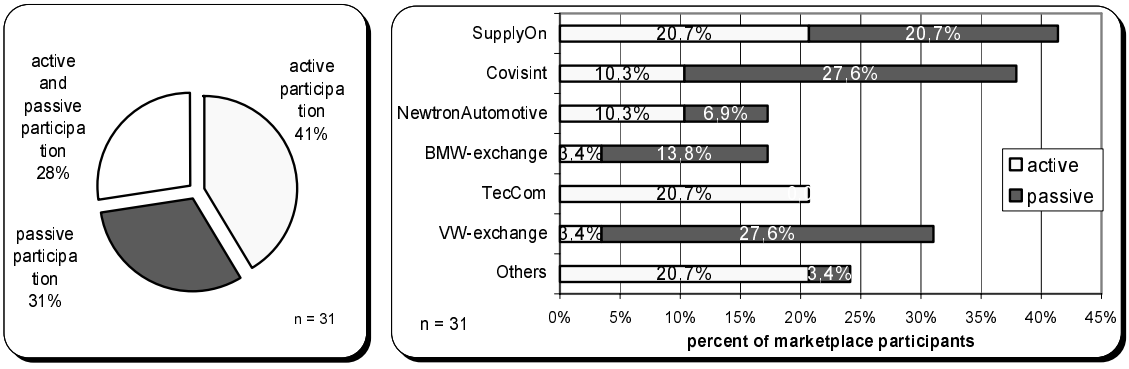

Figure 6: Kind of participation and participation on specific markets

We also wanted to know which automotive-specific markets are used by the companies. As figure 6 (left) shows, SupplyOn dominates our sample. 41.4% (20.7 % active and passive) of all e-market participants use SupplyOn, followed by Covisint (37.9%) (10.3% active; 27.6% passive) and VW-Exchange (31.0%) (3.4% active; 27.6% passive). With 17.2% NewtronAutomotive (10.3 % active; 6.9% passive) and BMW-Exchange (3.4% active; 13.8% passive) is used. Remarkably all TecCom participants (20.7%) use the system in an active way.

As a result, the high passive participation on e-markets can be explained by the missing standardization in the automotive industry [Konicki/Aloire 2001]. Another finding is that the automotive companies use more competing markets, e.g. Covisint and VW-exchange, simultaneous. On average 2.66 e-markets are used by a single company.

According to the survey respondents the use of e-markets will perspicuously increase in the next 1½ years (see figure 3). 55.2% of the respondents planning activities for the future intend participation on Covisint, about 48.3% on SupplyOn and 27.6% on the exchange platforms of BMW and VW. Remarkably, only 10.3% of the respondents named NewtronAutomotive and an TecCom. 21.4% plan a participation on different other markets (e.g. Rubbernetwork).

On average 2.48 markets are planned by a single company. The average participation planned increases to 3.66 if also those companies are considered already using a marketplace system (Figure 5). This clarifies the increasing importance of vertical markets but also makes clear, that through the different supplier- and OEM-specific concepts companies are forced to participate on different systems not to lose competitive advantages.

4.3 Market Functions and Services

The active marketplace participants were asked, which functions and services are used from their companies on horizontal (indirect) and vertical (direct) markets. 81.8 % of the

active marketplace participants use functions to search suppliers, about 63.4% use product search and 27.3% perform availability checks in the area of vertical markets. Whereas 63.6% participate on auctions and 45.5% on reverse auctions (request for quotation, RFQ), electronic payment (27.3%) and order processing (status information) (16.2%) are less frequented. Accept the use of reverse auctions; services for indirect items are more frequented by the automotive companies. Value-added services (e.g. a support of supply-chain processes) and after-sales services have not been named at all (see Figure 7, left).

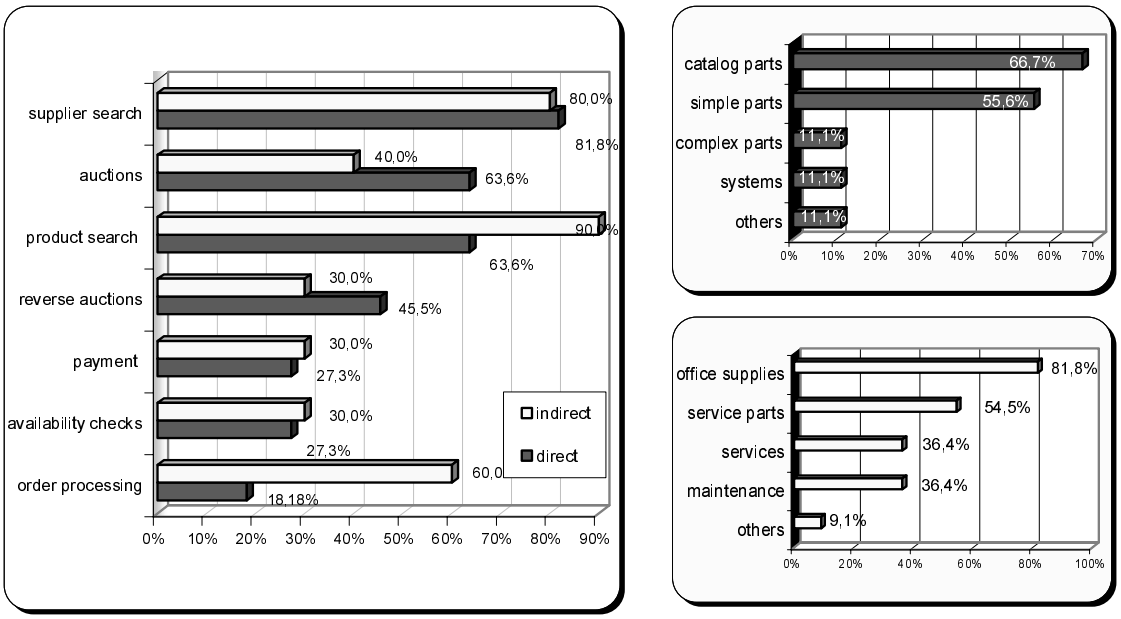

Figure 7: Used market functions and direct/indirect items procured

We also wanted to know, which direct items are purchased by the companies. As Figure 7 (top right) shows, 66.7% of the active participants named catalogue parts (standardised DIN parts e.g. screws), and about 55.6% simple external parts (e.g. synthetic/metal parts, electronic components). Complex external parts (>20 part numbers, e.g. processed cast parts with assembly parts) and systems (>40 part numbers) are only procured by only 11.1% of the relevant respondents. 11.1% named different other items.

Also in the area of indirect goods and services simple items dominate our sample (see Figure 7, bottom left). 81.8% purchase office supplies and 54.6% spare parts. 36.4% purchase services and maintenance items (e.g. lubricants, oil, lacquers). Of a minor importance are other s goods and services (9.1%) (e.g. travels).

The results illustrate that currently simple items dominate on e-markets and so valid the common thesis that e-markets are more suitable for less complex goods and services.

4.4 Transaction and Purchasing Costs

To quantify efficiency gains, we asked the active marketplace participants if the use of e-markets leads to a reduction in transaction cost (tc) and/or an improvement of their purchasing conditions respectively purchasing costs (pc).

In the area of direct goods and services 23.5% of the responding active participants have not achieved a transaction cost reduction. 47.0% realized a reduction of 5% and further 23.5% a reduction of transaction cost between 5-15%. 5.8% of the responding marketplace users did not answer the question (no commend (n.c)). In contrast to production related items all companies responded positive effects for indirect goods and services. 8.3% of the active participants achieved a transaction cost reduction of 5% for indirect items, about 47.7% between 5-15 % and further 33.0% of the participants a reduction up to 30.0%. 16.6% of the relevant respondents did not answer the question.

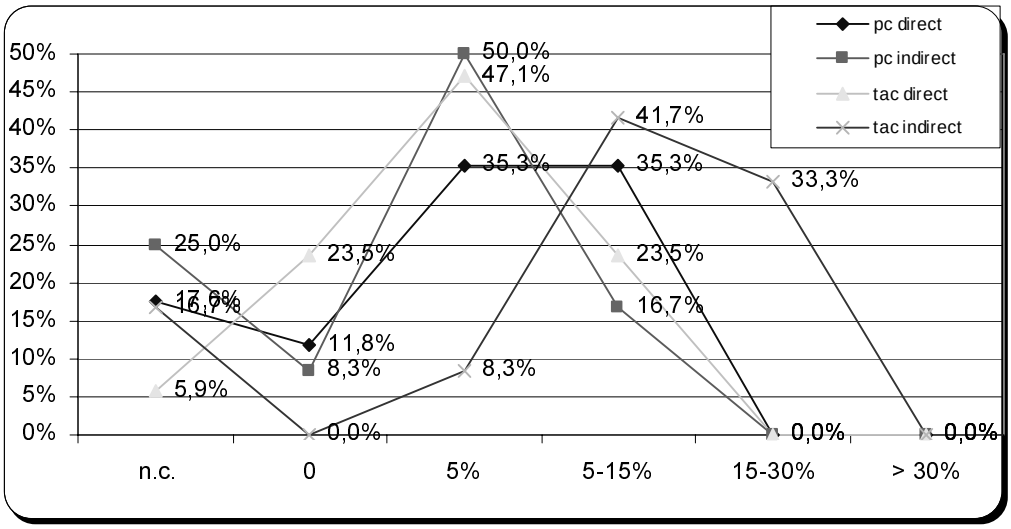

Figure 8: Reduction of transaction and purchasing costs depending on the type of goods and services (direct vs. indirect)

Looking to the purchasing costs of the companies the following results were found. 35.3% of the relevant respondents achieved a reduction by 5% in the area of direct goods and services and also 35.3% achieved a reduction between 5-15%. 11.8% of the companies did not realize positive effects and 17.7 of the respondents were not able to quantify efficiency gains. For indirect goods and services 50% of the responding companies obtained cost reductions by 5% and 16.6% between 5-15%. 8.3% did not realize a reduction in purchasing costs in their companies. 25% did not answer the question (see figure 8). A significant correlation to valid thesis (3) and (4) however was not found for our sample. Therefore they must be rejected.

4.5 Barriers for the Participation on Electronic Markets

We also wanted to know the barriers for participating on vertical e-markets (multiple answers were possible). According to the responding managers the most common bar-

rier for using e-markets is an unclear cost-benefit relation. 55.5% of the companies do not see real benefits compared to traditional bilateral business relation. Further 42.6% of the companies complain that their suppliers are not tied to a marketplace and therefore network effects can not be achieved. As another barrier the companies (40.6%) named information transparency (e.g. purchasing conditions, purchasing volume etc.). In praxis, inter-organizational cooperation's often fail because of a missing willingness of the supply-chain entities to externalize sensitive data not to lose competitive advantages [Weitzel/König 2001].

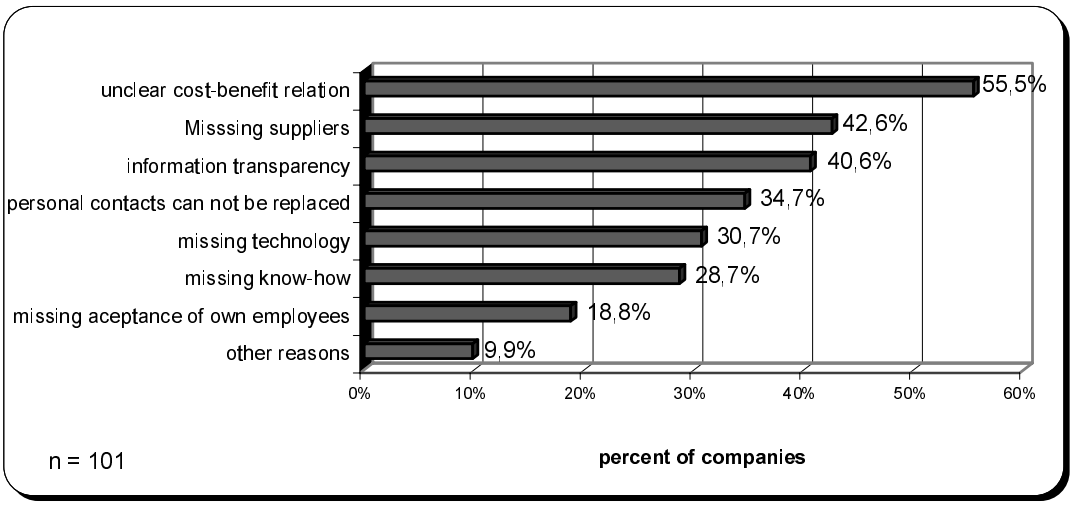

Figure 9: Barriers of participation

34.7% argued, that personal contacts cannot be replaced by electronic media in the area of direct products and about 30,7% designate missing technology in the own company. Missing know-how (28.7%) associated with e-markets and a missing acceptance of a companies employees are of a minor importance (18.8%). 9.9% named different other reasons.

4.6 Importance of Various Marketplace Characteristics

Another objective of the survey was to analyse decision parameters for participation on e-markets. The respondents were asked to rate various characteristics on a scale from 1 = very important to 6 absolutely unimportant). Independent from a specific company-size perspective the respondents have given the following answers:

With an average of (1.54) trust is the most important parameter for participation The integration of in-house systems (1.84) and the compatibility to external business partners (1.86) are very important parameters too, followed by implementation and running cost (2.13). A high number of marketplace participants (2.71), integrated logistics services (2.81) (e.g. tracing and tracking of deliveries), the influence of business partners (2.90) and auction services (2.92) can be interpreted as important decision parameters. Of a minor importance are entrance restrictions (3.03), data conversion services (3.13), the marketplace business model (transaction-oriented costs (3.06) and membership fees

(3.26). Surprisingly services for supply-chain management (3.04) achieved only an average rating.

Less important decision parameters are anonymity (e.g. the exchange service hides the name of the transaction partners) (3.32), services for the support of collaborative engineering processes (3.34) and financial services (3.46). The less appreciation of financial services leads to the assumption, that these processes are settled bilateral between trading partners anymore. Table 1 shows the average rating of the various marketplace characteristics in total and by company-size.

Table 1: Average rating of various decision parameters for participation on e-markets

decision criteria	**average rating (all companies)**	**average rating depending on company-size**				
		small companies		**mid-sized companies**		**large companies**
trust in operator	1,54	1,56	<	1,65	>	1,46
integration of in-house systems	1,84	1,88	>	1,76	<	1,84
compatibility to business partners	1,86	1,92	>	1,76	<	1,83
price and running costs	2,13	2,14	<	2,28	>	2,06
high number of participants	2,71	2,48	<	3,11	>	2,81
integrated logistics services	2,81	3,00	>	2,55	<	2,69
influence of business partners	2,90	2,88	<	3,16	>	2,78
auctions / reverse auctions	2,92	3,20	>	2,86	>	2,57
entrance restrictions	3,03	3,34	>	2,83	>	2,73
supply-chain management	3,04	3,02	>	2,95	<	3,11
transaction-oriented costs	3,06	2,86	>	2,78	<	3,47
data conversion	3,13	3,27	>	3,00	<	3,03
membership fees	3,26	3,21	<	3,24	<	3,35
anonymity	3,32	3,08	<	3,80	>	3,38
collaborative engineering and development	3,34	3,39	<	3,79	>	3,03
integrated financial services	3,46	3,48	>	2,90	<	3,75

As illustrated in table 1, only little differences between small, mid-sized and large companies exist. A high number of participants for example is more distinctive for small (2.48) than mid-sized (3.11) and large companies (2.81). Further entrance restrictions are more important for large (2.73) than small (3.34) and mid-sized enterprises (2.83). To examine, if significant differences between small, mid-sized and large enterprises exists, we calculated the SPSS analysis of variance ANNOVA. No significant differences between small, mid-sized and large enterprises were found. Therefore theses 5, 6, 7 and 8 must be rejected.

5 Conclusion

In this paper we have analysed the existence of e-business strategies and the usage of e-markets in the automotive industry. Examining the existence of e-business strategies showed frequency and kind of strategy of e-business strategies according to company-size and region. We proved statistically that e-business strategies are employed in large enterprises more than in small and mid-sized enterprises and also substantiated that companies with a consistent e-business strategy use e-markets more frequently than companies without an e-business strategy.

E-markets are only used by less than 25% of the automotive companies. Looking to planned market participations, the results show a clear trend towards an increased use of vertical markets in the automotive industry. Surprisingly large, mid-sized and small enterprises do not significantly differ in their ratings of various decision parameters for a potential participation on e-markets. Another emergency is that e-market based supply-chain management belongs not to the substantially requisitions of the automotive companies to participate on e-markets.

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Cost Savings and Other Benefits in the Management of Replacement Parts

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Abstract

Migros, the largest retailer in Switzerland offers its customers comprehensive customer service. This case study describes the organisation of the process of obtaining replacement parts from the supplier to the end customer. This process is carried out by the service provider M-Service *with the help of integrated information systems. Particular attention is given to an electronic multi-supplier catalog, which significantly increases efficiency and effectiveness in the procurement of replacement parts.*

1 The Migros enterprise

1.1 The company

The core business of Migros as the largest Swiss co-operative retailer consists of supermarkets and hypermarkets as well as specialist shops. In addition, the company owns its own factories which largely produce food, and is also a service-provider in a range of areas.

In 2001 the Migros Company made a consolidated turnover of 20 billion CHF – 2.6 percent more than in the previous year. The retail business turnover makes up nearly 80 percent of this total. Migros has 80'000 employees. The number of members of the Migros co-operative rose to roughly 1.9 million in 2001.

Migros has a market share of 16 percent in the retail sector, (24 percent in the food sector and 9.5 percent in the non-food sector). Since 2000 a slight upward trend has been evident.

In order to fulfill individual customer requirements, Migros follows a clear sales strategy in its core business: supermarkets (local and regional supply) and hypermarkets (inter-regional shopping centres which also carry a wide selection of non-food items such as

clothes, toys, electronic equipment) offer a creative selection of food, complemented with other consumer goods for daily use. Specialist shops with a range of non-foods (Do it & Garden, Micasa, Sportxx, OBI) operate separately.

As a prerequisite for the implementation of its strategy, Migros is developing expertise across the board, in areas of quality, price, innovation and ecology. In commodity management, particular value is placed on a process orientation along the entire value chain.

The customer has highest priority in the company strategy. The role of Migros' customer service organisation examined here should be seen in the light of this. Service to the customer should be competent, obliging, and tuned to customer needs. It should guarantee customer satisfaction and foster customer loyalty.

1.2 The customer service organisation 'M-Service'

M-Service is Migros' customer service organisation. Its main responsibility is to provide replacement part management for eight *Migros Service Centers*. The Service Centers in turn supply 435 *Customer Service desks* as well as *Service Outlets* for bicycles, skis, ice-skates, etc. The Customer Service desks provide Migros customers with advice and a comprehensive repair and replacement part service for all hardware which has been sold by Migros.

The Service Centers carry out roughly 800,000 customer orders per year made by the branch Customer Service desks and in 2001 made a turnover of 50 million CHF. The Service Centers employ 410 staff (full-time equivalent), not including the Customer Services staff in the branches.

M-Service carries out the main functions required to structure the company's business processes efficiently, from the manufacturer of replacement parts, via the decentralized Service Centers, and on to the customer. In addition it is responsible for the worldwide procurement of replacement parts (the main task), stock management, running a logistics centre for repairs and replacement part orders as well as providing and maintaining information and logistics systems. M-Service has operated an electronic product catalog since 1999, which supports the Service Centers in the procurement of replacement parts required for repairs and for customers.

2 E-business strategy

Migros' immediate plan is to gain experience through its e-business activities. The main focus of interest is in new forms of shopping and consumer behaviour and the increase of productivity across the entire product chain. The projects aim to demonstrate ways in which economic benefit can be created.

3 Procurement solution

E-procurement in the Migros Service sector is an internal management solution. The Service Centers adopt the role of buyer and order the required replacement parts and assemblies from M-Service (the seller). Electronic support of the ordering process and transaction management are located in the Service Centers (Figure 1).

M-Service, in its purchasing capacity, adopts the function of procurement service provider: Besides central purchasing and logistics services, this includes content and catalog management, aspects of transaction management as well as user administration (Figure 1).

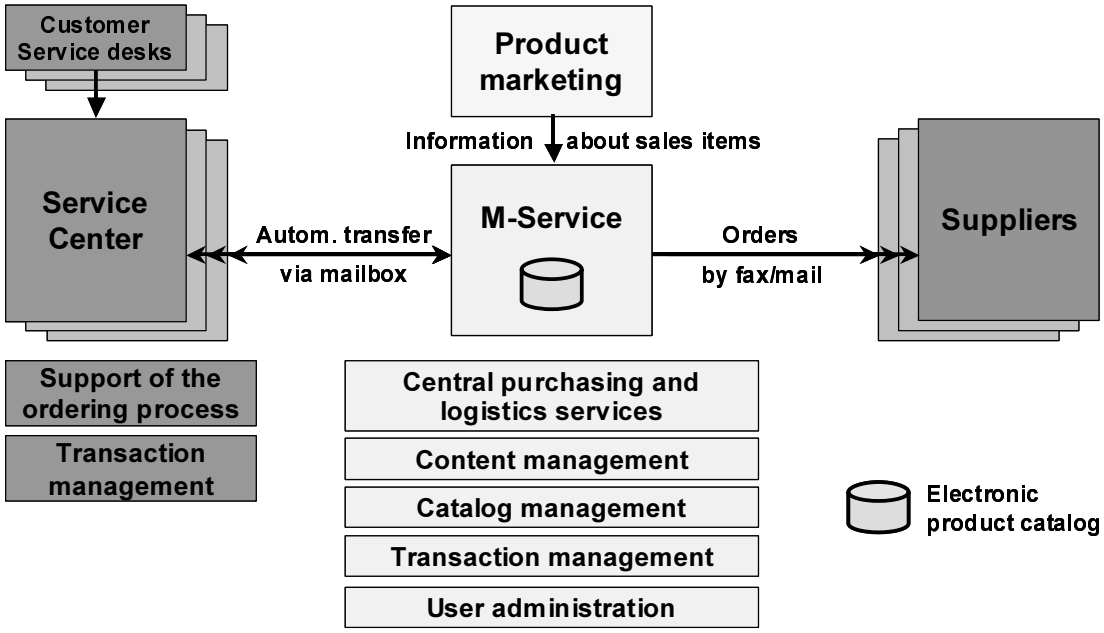

Figure 1: Distribution of the E-Procurement basic functions

With the combination of an electronically integrated fulfilment of the procurement transaction and an electronic product catalog, the Migros e-procurement solution consists of two logically different components which will be described below. While these partial solutions have already been integrated on a technical level, the underlying processes have not.

3.1 Functions and processes in the transaction-oriented procurement process support

Central to the e-procurement total solution is the ERP-System OpaccOne with the electronic multi-supplier catalog NetCat (see section 1.3.2 for further details). The ERP-System handles most of the data and, along with other systems, drives the primary process between the central M-Service and the decentralized Service Centers. Figure 2 illustrates the systems involved and the process of Migros' internal procurement of replacement parts, as described in this section.

Replacement part orders are registered in the information system KUSEM (Customer Service Migros) at the Customer Service desk terminals of the respective Service Centers. Employees can find the relevant information about the replacement parts in the browser-based search in NetCat. The orders are passed on to the sales module of the ERP-System. This module sends an order online to deliver the goods to the warehouse subsystem Kardex PP5000, which shows incoming and outgoing goods in the central

warehouse. The warehouse subsystem in turn provides confirmation and later the information that the goods have been sent. With the NetCat function 'delivery lists', the Service Centers can keep themselves informed about the expected date of delivery.

The invoices for the internal payment between M-Service and the Service Centers are made by the ERP-System. They are first transferred electronically to a clearing house and are then forwarded to the co-operative accounting system. The invoices for the end-customers are made by the Service Center in KUSEM.

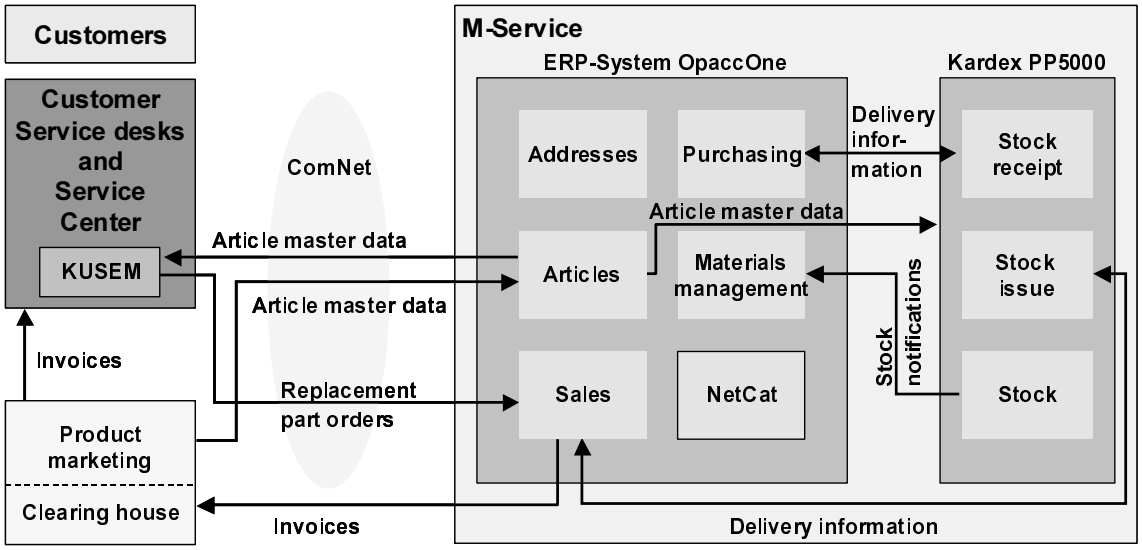

Figure 2: The integrated procurement process

The purchasing module of the ERP-System places the orders for the procurement of replacement parts with the suppliers. The actual orders are normally sent by fax. Information about ordered replacement parts is reported in the warehouse subsystem and information about incoming deliveries is reported back to the ERP-System. Because of the online connection between ERP- and the warehouse subsystem, information about incoming goods is also immediately available in the ERP-System.

The processes between M-Service and the Service Centers, such as the placing of orders, delivery information, incoming goods, payment for goods, etc, are carried out electronically and without manual registration or confirmation. The electronic integration of the processes and partial systems means that Migros requires few staff to carry out a large quantity of deliveries to the Service Centers.

3.2 Electronic multi-supplier catalog

An important subsystem to support the process of the procurement of replacement parts is the electronic online catalog NetCat. This is an integrated multi-supplier catalog, which makes it significantly easier for the Service Center employees to choose the correct replacement part. The catalog contains all replacement parts which are carried by Migros, as well as the products in which they are used.

NetCat replaces the previously used physical replacement part catalog, which was made on microfilm. A significant disadvantage of this catalog was that it was never up-to-date and that it took a long time to find the item required.

With NetCat, the employees of the Service Center and the customer service desk have at their disposal a very comfortable catalog system which provides quick access to Migros' entire, most up-to-date replacement part program. Special search functions carry out the search for complete products and individual items. The catalog also provides the following information:

- Full text search and structured search for products and replacement parts
- Identification of replacement parts by means of pictures, exploded views or parts lists
- Order numbers, quantities in stock and delivery time of replacement parts.
- Guarantee time, service time, location of repairs (in-house or external)
- Instructions for dealing with repairs

As a partial system of OpaccOne, NetCat has access to the complete data of the ERP-System. The photos in the catalog mostly come from Product Marketing. The preparation of the electronic explosion drawings requires a lot of work. Generally the manufacturer's drawings are scanned and the various positions linked with the relevant detailed information. This information is partly collected from stock lists or other documents from the manufacturer. From the range of replacement parts described, the employee in the Service Center compiles a replacement part list according to the order. The order is then generated in KUSEM to M-Service on the basis of this list. There was a break in the availability of the media mid- 2002 because the order data had to be entered in KUSEM manually.

In preparation for the continued integration of the order process, there are plans to place the orders directly via NetCat in the OpaccOne sales module. This would be technically possible. With regard to the further development of the electronic catalog, Migros is considering making it available to the end customer.

A log file analysis has revealed that a year ago around 1'100 searches were made in NetCat per day and that there are currently around 1'800 searches per day. The acceptance of the catalog is therefore very high and its significance in replacement part management is increasing. In future a log file analysis should be able to identify which search words are being entered by staff.

The basis for the electronic product catalog is the ERP-System OpaccOne, which M-Service has used for a long time. OpaccOne is constructed according to a multi-tiered architecture. The back office and front office applications provide the interface to the user. Application Services provide the connection to the central Dataflex data base. The electronic product catalog NetCat consists of a collection of XML-templates.

4 Cost-benefit analysis of the multi-supplier catalog

With the changeover to the electronic catalog NetCat, Migros' Customer Services achieved a range of improvements which were not in easily assessed in advance. The most significant improvements include the following:

Simplification in handling replacement parts

Before the electronic catalog was introduced, the Customer Service desk often did not manage to identify the required item. With the new catalog, the replacement parts are quickly and clearly identified so that the workload has decreased and the processing time has been reduced by half. In addition, the improved quality of information has helped reduce both the waiting time at the desk and the stress factor for Customer Service staff.

Greater price transparency for the customer

A big disadvantage of the earlier catalog was that the sales price was not given. This meant that the customer could not be advised as to the price of a repair or a replacement part. Now all the information the customer needs to make a decision for or against a repair is available to at the desk.

Doubling of customer orders

The introduction of NetCat resulted in a doubling of customer orders (for replacement parts) over five years. The reason for the greater willingness to make an order for a repair has been the improved availability of information. Customers who decide against a repair are nevertheless generally satisfied with the service offered and generate new business by making a new purchase.

Improvement of repair planning

The response from the warehouse system provides immediate information on the availability of the replacement parts. Repairs can therefore be planned much earlier and more exactly.

Cost savings

Changing from microfilm to the electronic product catalog caused the annual cost of the replacement part catalog to fall from 120,000 to 50,000 CHF. Further savings were made because of the reduction in wrong orders, und in the implementation of the replacement part stock. The development of NetCat cost around 50,000 CHF.

For Migros the project was a success. Customer satisfaction increased dramatically because of the positive effect on dialogue with the customer. In this way the electronic product catalog fulfilled the requirements which were formulated in the overall company goals. The project shows that positive effects can be achieved in e-business when the relevant expertise and appropriate technology are applied to provide relatively easy solutions.

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IT Supported Inter-Organizational Purchasing: the Case of a Purchasing Association

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Abstract

This paper examines the benefits and challenges of IT supported procurement for purchasing associations. The purpose of this paper is to study the impact of a web-based purchasing platform on an existing purchasing association. We will look into the design of the procurement process and expected process changes, including changing patterns of division of labour and probably levels of intermediation ([Klein/Teubner 2000]). As a result we will try to understand the contingencies and success factors of Web-based procurement support in an inter-organizational setting. A point of special interest will be the behaviour of suppliers: how do they respond to the ongoing changes and what are preconditions for their cooperation in terms of electronic data exchange or further levels of systems integration and favourable conditions?[1]

1 Introduction

While e-Procurement has become a well accepted model for many companies, especially for MRO products and services [Dolmetsch et al. 2000], less is known about the impact of purchasing platforms for co-operative networks. While the underlying ration-

[1] This paper is based on preliminary findings of the EC funded project DOMINO (IST-2000-29545). DOMINO (Dynamic Organizational Management for Interfirm Network Orchestrations) project tackles with the management of the dynamic inter-firm arrangements in new organisational forms. Different motives for partnering and network formation lead to the emergence of several distinct types of networks. The primary objective of the project is to maximize the current understanding in this field and to set the basis of common reference. For more details about DOMINO project please visit DOMINO website at www.ist-domino.net.

ale for IT support in procurement, in particular increased transparency and control over the entire purchasing process as well as demand pooling and leveraging of buying power, remains the same, the challenges of implementing inter-organizational procurement support are quite substantial. Many purchasing associations have been established well before IT support appeared to be a viable solution for them (even though some early examples exist, see e.g. [Klein/Kronen 1995]) and have streamlined organizational structures and processes in order to reap most of the benefits of coordinated purchasing. IT, in particular web-based (multi-vendor) product catalogues, market mechanisms and purchasing platforms, holds manifold promises of improved information flows and efficiency gains.

Our analysis is based on a case study about Küchen Partner AG – a horizontal purchasing association of local fitted kitchen designers and kitchen furniture stores in Germany and Austria. We will examine the existing purchasing process of Küchen Partner network and the role and impact of IT.

2 Purchasing co-operations

Co-operations and networks have a long tradition. However, recent developments of information and communication technologies (ICT) have facilitated a wide-spread proliferation of organizational networks. From a managerial perspective, organizational networks seem to be appropriate to cope with recent challenges such as technological changes, globalisation, changing customer needs, fragmented markets or increasing importance of knowledge.

The large number of existing network types reflects the plenitude of reasons to co-operate and to establish an organizational network cf. [Sydow 1999]; [Riemer et al. 2001]. Before we describe potential reasons and motives for establishing a purchasing association, we will take a brief look at purchasing.

2.1 Purchasing: Definitions and delimitations

Purchasing is part of the procurement process cf. [Nowak/Buhmann 2001]. According to [Wirtz 2001] procurement ensures the supply of goods and services that are needed by an enterprise but that are not produced by the enterprise itself.

The recent e-Procurement literature mainly emphasizes procurement of indirect goods (e.g. using Desktop Purchasing Systems or marketplaces). The buyer-supplier relationships usually are transactional, fluid, short-term and the switching cost between suppliers is moderate. It is supposed that products of different suppliers are interchangeable (i.e. they have the similar characteristics and quality). Therefore, buyers aim to reduce search costs and to buy at the lowest possible price.

Nevertheless, IT facilitated strategic procurement (e-Sourcing) also is an ongoing topic. The buyer-supplier relationships usually are relational, long-term and require a high level of asset specificity. IT is used for automating the bidding process, to find new suppliers (or to monitor existing suppliers), and to facilitate supply chain integration.

Purchasing mainly comprises functional activities such as searching, selecting, maintaining suppliers, negotiation, fulfilment and monitoring of order processing. Purchasing can be differentiated between centralized and decentralized purchasing on the one hand and between strategic and functional purchasing on the other hand (cf. [Wirtz

2001]). Various authors recommend to centralize strategic purchasing and to decentralize functional purchasing in order to combine the advantages of both worlds. But in reality, especially in small and medium enterprises, this proves difficult because in many cases strategic and functional purchasing tasks are assigned to the same organizational unit. This organizational unit usually is busy coordinating functional activities. Therefore, there is a lack of strategic purchasing.

2.2 Motives for establishing purchasing co-operations

[Prahalad/Hamel 1990] have observed that it is unlikely that organizations can master all the key competencies they need. Therefore, it is essential that organizations co-operate to gain access to such competencies in order to enhance their scope. Other reasons why firms engage in co-operative relationships include gaining access to new technology or markets, obtaining economies of scale in joint research, production, marketing, building complementary skills, sharing risks for activities, and technology licensing agreements ([Nassimbeni 1998], p. 545).

Inter-firm initiatives can pursue either a market-based or a resource-based rationale. The motivation of market-based network approaches are, for example, to enter or develop new markets, to overcome barriers of entry, to offer services/products collaboratively, to reduce competition within the market or to extend control over the market environment. Resource-based network initiatives (collaborative sourcing) typically focus on the collaborative development or the sharing of different types of resources like knowledge, technology, human resources, infrastructure etc.

According to [Klein 2001] co-operations are means to increase efficiency or to expand the service portfolio. Starting points for increasing efficiency are grouping activities (e.g. strategic purchasing) and achieving virtual size, especially in order to gain economies of scale. In addition, particular functions or services can be outsourced to external service providers. In order to expand the service portfolio it is possible to co-operate with third-parties such as service providers or other co-operations. Qualified co-operations provide their participants better price conditions by demand aggregation and suited services. These co-operations usually are coordinated by a central body.

Basically, there is a wide range of possible co-operation options (e.g. purchasing, administration, marketing or consulting). The situation in the kitchen retailing market is comparable to the grocery market: small and medium-sized stores have to compete with big firms or chains. In order to survive, to offer attractive prices and services to their customers and to reduce costs the small stores co-operate and try to achieve virtual size. As a result, the kitchen retailing sector is characterized by a “purchasing association landscape”.

2.3 Classification of purchasing co-operations

Two types of purchasing co-operations can be differentiated: vertical and horizontal co-operations cf. [Arnold/Eßig 1997]. A vertical co-operation is a co-operation along the value chain, i.e. actors of adjacent stages of the value chain co-operate. Especially in the automotive industry this type of co-operation is prevalent. Large framework contracts between buyer and supplier are placed in order to decrease acquisition prices or to guarantee a high product quality. However, we think that this organizational con-

struct is less a purchasing co-operation, but rather a supply chain co-operation or a long-term buyer-supplier relationship.

A horizontal purchasing association is a co-operation of firms of the same stage of the value chain. These firms, in most cases competitors, work together and aggregate their demands in order to reduce acquisition costs and to get better buying conditions. This type of co-operation is the prevalent organizational structure between small and medium-sized kitchen stores. However, in the kitchen industry, competition is contained as network participant typically will be guaranteed a territorial claim.

2.4 The Küchen Partner AG network

The network of Küchen Partner AG is a modified version of the value web model presented by [Selz 1999]. Küchen Partner AG as the network hub acts similar to a value web broker, i.e. it is a central network coordinator who “cherry-picks” services for its members. On the one hand Küchen Partner AG negotiates price conditions for its members and on the other hand they look for external services and that are attractive and valuable for them.

Before we describe Küchen Partner’s network in detail, we will give a brief insight into the German kitchen retailing market.

2.4.1 Market structure

The German kitchen retailing market is dominated by big firms and furniture chains. The market is divided into three segments which reflect the prevalent customer segments:

1. big furniture stores like IKEA, Roller, Zurbrüggen, etc. cover 50 per cent of the market
2. small and medium-sized fitted kitchen designers, i.e. specialized stores for kitchens and kitchen furniture cover 30 per cent
3. the remaining 20 per cent are covered by catalogue sellers (e.g. Quelle), do-it-yourself stores, technique-specialized stores and direct sellers

The economic recession in Germany is also noticeable in the kitchen retailing industry. In 2000 the market turnover was approx. 3.17 billion EUR in Germany, whereas it has decreased by 4 per cent in 2001.

Small and medium-sized kitchen stores can only survive by co-operating with other stores. These networks can achieve virtual size in order to compete with big furniture stores and by demand aggregation they are able to get better purchasing conditions. They can combine their resources and capabilities and offer additional consultancy to their members. Nowadays, only 10 per cent of small and medium kitchen stores are independent.

In Germany, there are three big and several small and medium-sized associations. The big ones are:

- VKG (members: 1.279; turnover in 2000: 1.44 billion EUR)
- Musterhausküchen (members: >1.000; turnover in 2000: 1.46 billion EUR)
- Der Kreis (members: 1.413; turnover in 2000: >1.5 billion EUR)

Smaller associations (e.g. Küchentreff, Küchenareal or Küchen Partner) usually have between 50 and 150 members. In many cases, small associations co-operate with big ones (e.g. Küchen Partner AG is co-operating with VKG) in order to benefit from their wide-spread service portfolio and special purchasing conditions.

2.4.2 Network structure

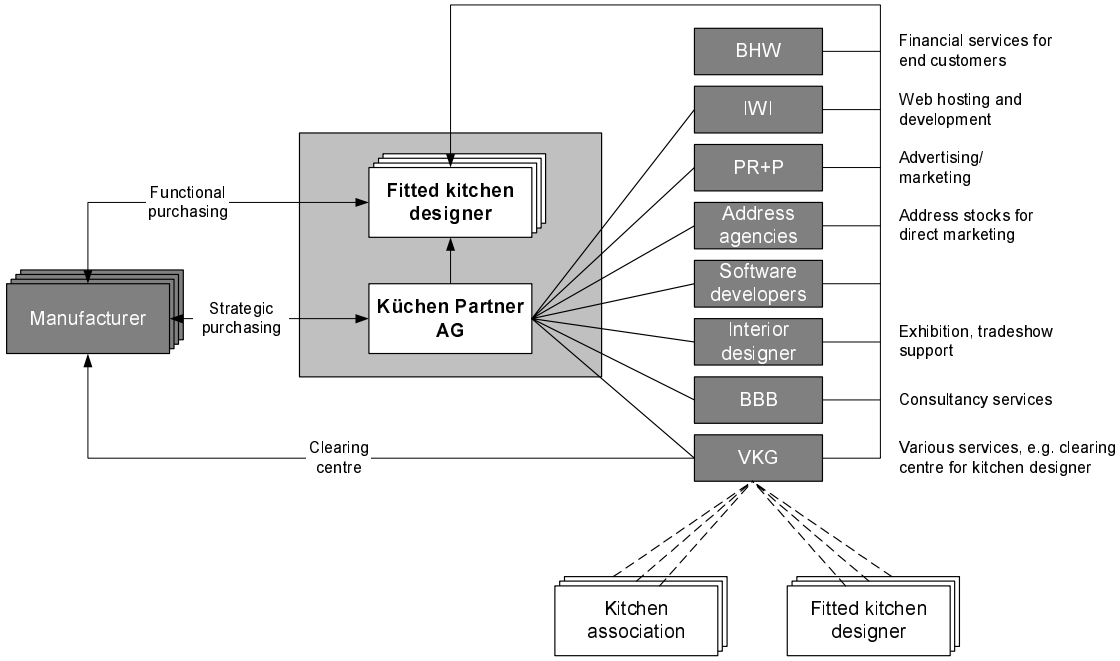

Figure 1: Küchen Partner network structure

The structure of the Küchen Partner AG network is depicted in figure 1. We differentiate between the “core network” including Küchen Partner AG and its associated fitted kitchen designers (grey box) and an extended network between Küchen Partner AG and third-party service providers.

The Küchen Partner network is an association of about 60 local fitted kitchen designers and kitchen furniture stores in Germany and Austria. The AG itself is a very lean organization – there are only four employees directly working at Küchen Partner’s headquarter. Every participating kitchen store holds one share of the AG. The AG gets its revenue by withholding a little amount of each bonus payment for its members. Further fees, charges etc. are not levied.

Küchen Partner AG – coordinator of the “core” network – represents the interests of its shareholders (namely the fitted kitchen designers) regarding manufacturers, service providers and co-operation partners. The aim is to stay competitive within the market (in competition with other associations), to secure the independency of its members, and to develop new business opportunities for them. Therefore, Küchen Partner AG has a flexible, lean, and responsive organisation structure. There is only limited competition among the network members because of different regional scope (guaranteed ter-

ritorial claim by AG). Küchen Partner maintains inter-personal relationships with its shareholders in order to ensure that all relevant interests, wishes and problems are known and can be managed appropriately. Küchen Partner AG concentrates on its core competencies, all other activities are outsourced to service providers.

Küchen Partner AG regards itself as a “technology leader”. The AG provides an Intranet platform to increase information and communication efficiency. New members are carefully selected in order to strengthen the average technical skill within the network. They are expected to use the Intranet platform as well as the Internet in general and they have to be “open” for future trends like web-based services or process automation.

The kitchen designers are mainly interested in their competitiveness and especially in increasing their sales volume while reducing costs. Besides, they look for new business opportunities. Furthermore, the kitchen designers aim at increasing their customer orientation and service level.

The Küchen Partner network is involved in several co-operations (extended network). The most important one is the co-operation with VKG. VKG is like Küchen Partner an association of fitted kitchen designers, but one of the big three. Küchen Partner uses VKG’s clearing centre and other services such as leasing and financial services. Furthermore, Küchen Partner’s kitchen designers partly benefit of VKG’s price conditions.

2.4.3 Küchen Partner’s Intranet platform

Küchen Partner’s members request to retain a high level of autonomy and that operations of the AG be kept lean. The networks value proposition is to leverage pooling effects through efficient coordination (management). The AG facilitates its members

1. demand pooling and price negotiations with major suppliers
2. network CI (branding, marketing etc.)
3. outsourcing management, e.g. for marketing, IT support etc.

Any other tasks or processes remain at the kitchen designers, especially the functional purchasing and payment process.

Therefore, the role of IT reflects the members’ requirements. The implemented Intranet solution is a fast, cost effective and efficient mean to access information and to communicate with each other. A welcome side effect of this solution is the reputation of being an innovative association. This is a strong argument in the process of soliciting new members.

We will briefly present one example that visualizes an increasing efficiency combined with cost reduction: the distribution of price conditions within the network. Before establishing the Intranet solution, the conditions have been distributed to the kitchen designers via paper-based mail or fax. It was a cumbersome and time-consuming process. Everytime the conditions have changed, the condition lists have been printed out, packaged and sent out via mail. Often the kitchen designers had outdated condition sheets because something in this process has failed. Today, all kitchen stores are able to access the conditions via the Intranet. The cost and time for distributing the information have been significantly reduced (e.g. no costs for postage and packing) and the condition sheets are always up-to-date.

Although every kitchen designer has at least one computer with Internet access (required by their kitchen design software), currently only 20 % of the kitchen stores using the platform intensively. The bigger part of the partners are using the platform rarely. They argue that the platform is neither efficient nor effective. Nevertheless, Küchen Partner AG attempts to motivate and convince these members by promoting it in personal meetings, general company meetings, by writing articles in flyers or in circular letters. In addition, they "force" them to use the Intranet. All information is provided on the Intranet immediately. The offline distribution of information only takes place on demand.

The major advantages of the Intranet platform for the Küchen Partner AG are a more effective and efficient communication (with a simplified workflow) and the access to information. The software architecture is flexible and qualified to integrate functions of external partners. For example, the platform provides access to VKG's clearing centre application.

3 Purchasing processes in the German kitchen retailing market

3.1 Purchasing processes

A typical purchasing process of Küchen Partner's associates is depicted in figure 2. The process is divided into three parts: strategic purchasing, functional purchasing and central regulation.

In the context of strategic purchasing, Küchen Partner AG negotiates certain prices and conditions for its shareholders with important manufacturers. Important manufacturers generate an above average turnover within the Küchen Partner network. For less important manufacturers usually the VKG conditions will be used. The functional purchasing part contains the order and fulfilment process between kitchen designers and manufacturers. Kitchen designers plan and design kitchens for their customers with specific CAD software. The software generate a parts list that will be used to order the needed furniture and electric appliances. The order process either will be triggered automatically by the software or manually by fax or telephone. A crucial part of this process is the data distribution process because of several media conversions. The third part contains the central regulation process. VKG acts as the clearing centre for Küchen Partner's associates. In the following sections, the three process parts will be presented in more detail. Finally, we emphasize the role and impact of IT for the purchasing process in general.

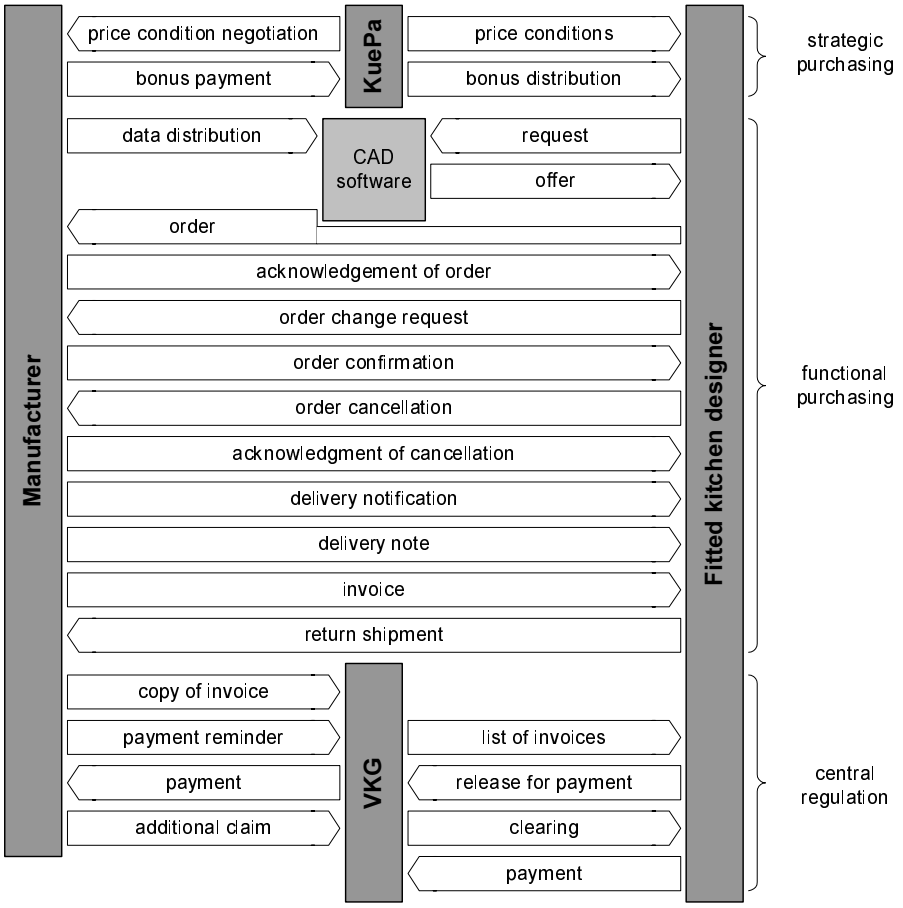

Figure 2: Purchasing process of fitted kitchen designers

3.2 Strategic purchasing

Küchen Partner provides a price condition handbook for its fitted kitchen designers. The handbook contains acquisition prices as well as bonus levels of every available supplier and service provider. The negotiation process is two-fold. On the one hand, Küchen Partner AG negotiates directly with important manufactures. On the other hand certain price conditions negotiated by VKG are used (figure 3). The latter applies for less important manufacturers, i.e. the turnover within the Küchen Partner network with these suppliers is below average and it is not worthwhile to spend efforts in negotiating with them. As a result the kitchen designers at least gain VKG's purchasing conditions, but for several manufacturers the conditions are even better.

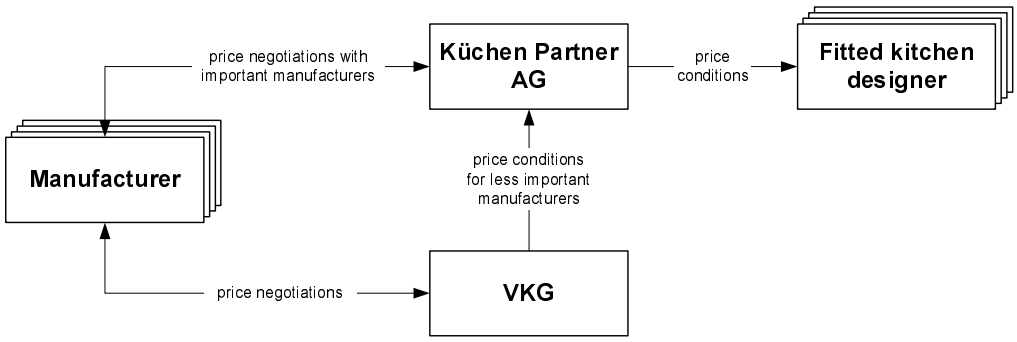

Figure 3: Price condition negotiation process

The price condition handbook is edited by Küchen Partner AG. Most of the condition sheets published by manufacturers are paper-based. In order to get a uniform and electronic version, the data is entered using a Word template. Afterwards, PDF documents are generated and are made available on Küchen Partner's Intranet. Küchen Partner members can access and print out the data immediately. A paper-based version of the condition handbook is only created and shipped on demand. If a kitchen store wants to calculate its profit margin with a spread sheet application, it cannot use the condition data directly, but it has to re-enter the data into its application.

In regular intervals the manufactures distribute bonuses. They are collected at Küchen Partner AG. After discounting a small margin, the bonuses are dispersed to kitchen designers according their yielded turnover. The yielded turnover is published on the Intranet in a monthly statistic. Every kitchen designer can see its own cumulative turnover, current bonus levels etc.

3.3 Functional purchasing

In order to customize and to design kitchens kitchen store use specific CAD software tools. These tools generate offers for the customer (including a 3-D model of the designed kitchen) as well as manufacturer-depended parts lists and orders. Therefore, the CAD software regularly needs data updates of product data such as kitchen furniture, electronic appliances, price information etc. The data distribution process from manufacturer via software company to kitchen designer is very time consuming, crucial and cumbersome (figure 4).

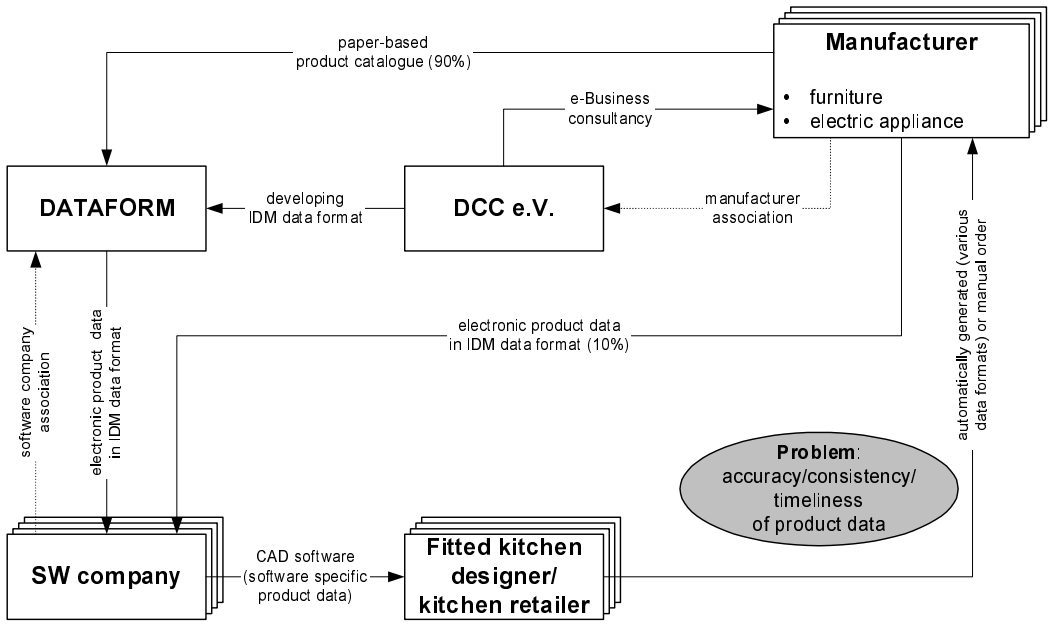

Figure 4: Data distribution and order process

Two associations play an important role in this data distribution process: DATAFORM and DCC. DATAFORM, an association of software companies, is in a monopolistic position because it is the sole service provider in Germany which converts product catalogues of furniture and electric appliances manufacturers into electronic data. In the beginning they used their own proprietary data format (Format 90), but meanwhile pedalled by DCC they use the IDM (Integrated Data Model) data format.

DCC is an association of kitchen furniture manufacturers, software companies and other service providers. One reason for founding DCC was to balance the power between DATAFORM and manufacturers. Therefore, DCC has developed various data formats for electronic data interchange of master, order and dispatch data in the kitchen furniture and retail sector (e.g. IDM format). In addition, it assists its members in e-Business questions, especially to publish catalogue data electronically in order to bypass DATAFORM.

At the moment, approximately 90% of manufacturers' catalogue data is paper-based. Therefore, DATAFORM is still an important actor in the data distribution process. After converting data into electronic formats, DATFORM distributes product data to several CAD software companies that convert the data into their own software-specific, proprietary format. Beside this, the software companies add 3-D models in order to visualize the data within their applications. Afterwards, the companies either places the data updates on their servers, where software applications can download it and update their database automatically, or they distribute the updates per CD-Rom or floppy disc.

The distribution process from manufacturer to customer is very time consuming and can last up to 8 weeks. Hence, a major problem results for both kitchen designers and manufacturers. It is not guaranteed that the product database of the CAD software is still up-to-date because manufacturers change their product portfolio from time to time. It even happens quite often that at least some parts of an order are not available any

more or have changed (e.g. colour has changed, new design of buttons etc.). This partly explains the high error rate of purchase orders and end customers' complaint rate (nearly 50% of sold kitchen are complained) in the kitchen retailing sector.

Although the CAD software supports an automatic order processing, this feature is barely used. Kitchen designers mostly prefer to print out the orders and send it per fax or e-mail. In addition, it has to be emphasized that only 30% of the manufactures accept automatic orders (either as an EDI document or using an interface of their ERP system). And not all of these 30% can process the order data automatically. For example, some of them have to re-enter the EDI documents into their internal ERP systems.

3.4 Central regulation

The last part of the purchasing process is the central regulation. Küchen Partner AG does not operate a clearing centre, but the kitchen designers use the one of VKG. The central regulation process is indicated in figure 5.

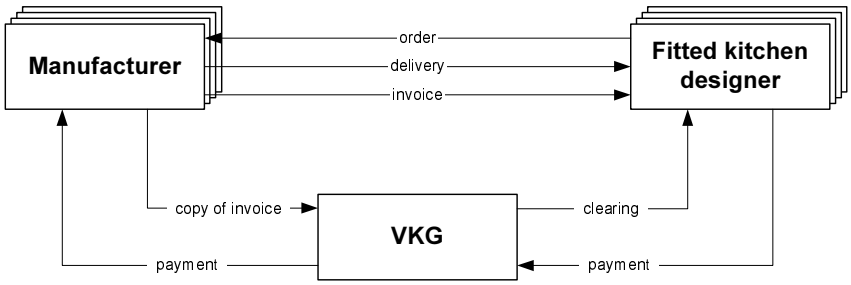

Figure 5: Central regulation process

The manufacturer sends the invoice of delivered products to the respective kitchen designer and also an copy to VKG. After the kitchen designer has released the payment VKG pays the invoice. In regular intervals VKG clears open invoices with kitchen designers. VKG assumes the financial risk completely (e.g. default of kitchen designer), therefore the kitchen designers have to pay an additional security fee when the clearing takes place.

VKG transfers kitchen designers' sales figures to Küchen Partner AG. Küchen Partner AG generate sales statistics on a monthly basis that include the cumulative turnover, bonus levels etc. These statistics are used as a key for apportioning manufacturers' bonus distributions.

Küchen Partner's Intranet has an interface to VKG's clearing system. Thus, kitchen designers can use VKG's clearing system for checking open invoices and releasing payments. Beside this, there is no further IT support for kitchen designers in the central regulation process.

3.5 Role and impact of IT

As we have described, there are various IT applications, platforms and tools that facilitate parts of the purchasing process. However, uniform data format standards or inter-

organizational purchasing systems are missed. The whole purchasing process is pervaded by media conversions and inappropriate interfaces.

Nevertheless, the existing systems facilitate the process at different levels. Küchen Partner's Intranet, for example, although there is no direct support of the purchasing process, provides access to the condition handbook and sales statistics in a fast and cost-efficient manner. CAD software tools are another example. Without these tools a kitchen designer never could design or customize any kitchen due to the complexity of this task. Furthermore, first approaches of an automatic order processing are visible. But the greatest challenge still remains: how can the data distribution process be accelerated in order to get a grip on the data inconsistency between CAD tools and manufacturers' production programmes.

4 Conclusions

The kitchen retailing sector is characterised by a large number of small and medium-sized firms and hence resulting a high degree of fragmentation. The market conditions, especially the competition with big furniture stores and chains require the co-operation between SMEs. Meanwhile several purchasing associations such as Küchen Partner have emerged. But the value for kitchen designers participating in purchasing associations is limited.

Purchasing associations provide virtual size for their members by pooling their demand. This leads to economies of scale which have a positive impact on participants' cost structure and efficiency. Furthermore, purchasing associations can achieve a higher level of professional management in comparison to the individual kitchen designer. Especially, an association can take care of strategic and quality issues. Beside this, purchasing associations pick out and "procure" external services respectively they source out services that can be done better by designated service providers. Demand pooling is thus extended to areas such as marketing, IS and financial services.

In the Küchen Partner case the AG's support for functional purchasing, i.e. the procurement of core products, is very limited. Although the AG makes available the condition handbook and provides an interface to the central regulation system, the kitchen designers have to handle nearly the whole functional purchasing process themselves. Particularly the problem of data inconsistency and the lack of standardization should be tackled on a network level in order to represent the kitchen designers' interests in an appropriate manner.

Another obstacle regarding e-Purchasing is the fact that kitchen designers often are not willing to use their computers for more than designing kitchens. This rejection is reflected in the number of Intranet users as well as in the number of designers who generate orders automatically with their CAD software. Therefore, Küchen Partner AG should mediate the benefits of a higher degree of process automation (e.g. reducing error rates, increasing efficiency, improving information and communication flows etc.).

Finally, the mentioned problems cannot be solved by Küchen Partner and its members alone. The whole sector is in an early stage (or better in a pre-stage) of e-Procurement. The necessity of format standardization and process automation is recognised and associations like DCC have started working on it. But one great challenge remains. There are several lobbies and groups (furniture manufacturers, electric appliance manufacturers, software companies, financial service providers etc.) that have different re-

quirements and demands regarding data standards. And there is no actor visible who might conciliate these groups. Therefore, it is likely that several standards will coexist for the foreseeable future. This poses a major obstacle for the proliferation of e-Purchasing respectively e-Procurement in the kitchen retailing sector.

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An Electronic Business-to-Business Negotiation System

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Abstract

Business negotiations consist of different phases. To conduct a complete e-commerce transaction includes the performance of electronic negotiations. Research has long concentrated on simple negotiation models such as auctions. In this paper, we will present a negotiation support system that enables human negotiators to conduct complex electronic negotiations and offers system features to ensure efficient interactions.

1 Introduction

A business-to-business transaction on an electronic marketplace usually follows a general pattern. Firstly, the business partners need to identify each other which is usually initiated by a search for products and suppliers (on the buyer's side) or a search for customers (on the supplier's side). The first phase of a marketplace transaction thus is the *search* phase which results in a list of potential business partners. After that, the business partners enter the next phase which is concerned with *negotiations*. In this phase, the partners negotiate about the contract conditions aiming at finalising a business agreement which is represented by a final business contract. If the negotiation phase is successful, the result will be such a contract. If no agreement can be reached, the negotiation is terminated and possible re-negotiations start or new negotiations with other partners found during the search can be initiated. If an agreement is reached, the contract needs to be processed in the final phase of a marketplace transaction, namely that of *fulfilment*. Both business partners need to fulfil their obligations including payment and delivery.

In this paper, we will concentrate on the negotiation phase. It is easy to see that this phase is communication intensive (Weigand, et al., 2002). In traditional commerce, business partners meet face-to-face, use the telephone, write letters, send faxes etc. to negotiate. Electronic negotiations are a type of written communication and are con-

ducted via an electronic negotiation system. E-negotiations are distinct from electronic auctions which have been a popular approach in the past years (Kersten, et al., 2000). Auctions are characterised by a sequential process with clear rules that are implemented in an algorithm to determine the best bid or offer. Negotiations, on the other hand, can deal with complex interactions, contain communication steps and leave the decision when to accept an offer (that has gone through a process of exchanging counter-offers) in the negotiators' responsibility (Kersten, 2002, Schoop and Quix, 2001).

The negotiation support system *Negoisst* will be introduced in this paper and its system features will be demonstrated to show how efficient electronic negotiations between human negotiators can be conducted exploiting the potential of information technology.

2 The Negotiation Support System Negoisst

Negoisst is based on the following observation. In electronic negotiations, negotiators need to communicate via a written medium. They need to specify their offers and, more importantly, they need to be able to justify them, explain, question, reply, suggest, threat etc. Thus, the medium of exchange are messages that can carry these communicative acts. To avoid ambiguity of the agreements, there must be a medium to write down the agreements in a more formal and structured way. Thus, the second important feature of a negotiation is a document. Each negotiation aims at finalising a business contract which is a document. The contract evolves over time during the negotiation steps. Therefore, *Negoisst* combines structured message exchange and cooperative document management (Schoop and Quix, 2001). In the following paragraphs, the features of *Negoisst* will be outlined and illustrated.

2.1 Message Exchange

The negotiation in *Negoisst* is conducted via message exchange. Messages are the medium for formal and informal conversation between the negotiation partners.

2.1.1 Message Type

To avoid misunderstandings about the messages, there is a message type that needs to be specified by the user. The message type indicates the intention of the sender, e.g. whether the utterance is a formal order or an informal enquiry about certain products or services. The message type is based on speech act terms (Habermas, 1985, Searle, 1969).

In addition to the types which have been developed specifically for business interactions, we also use a categorisation of message types. The Theory of Speech Acts proposes five categories of speech acts that we have adopted for the current work (Schoop and Quix, 2001, Searle, 1969). For example, assertives such as reports or statements represent facts of the real world; commissives such as promises represent the author's intention to carry out the action in question; directives such as orders or requests represent the author's intention to get the recipient to carry out a particular action. The categorisation is used for the negotiation protocol (see section 2.1.3). Furthermore, it is important to know the consequences for each message type. For exam-

ple, a formal offer commits the author to do as offered if the recipient accepts the offer. Figure 1 shows the composition of a request message.

2.1.2 Message Content and Message Categories

The content of the message is specified in natural language to enable the negotiators to express what they mean in the most powerful and intuitive way. On the other hand, natural language can often be ambiguous. Therefore, *Negoisst* offers message categories for defining a semantics for parts of the message. Consider the following extract of a message: "The price is 200 EURO, payable in 5 instalments." "200" could be defined as "total price", "EURO" could be defined as "currency", "5 instalments" could be defined as "method of payment". This ensures that the exchanges are unambiguous to a large extent. The categories are pre-defined for a particular business branch. However, the list cannot and indeed should not be complete since there are always contexts in which new negotiation items can occur. Therefore, the list can be extended by the user, i.e. the user can define new categories and place them in the appropriate place in the tree of categories. Figure 1 shows the usage of the message category "delivery date" for parts of the conversation.

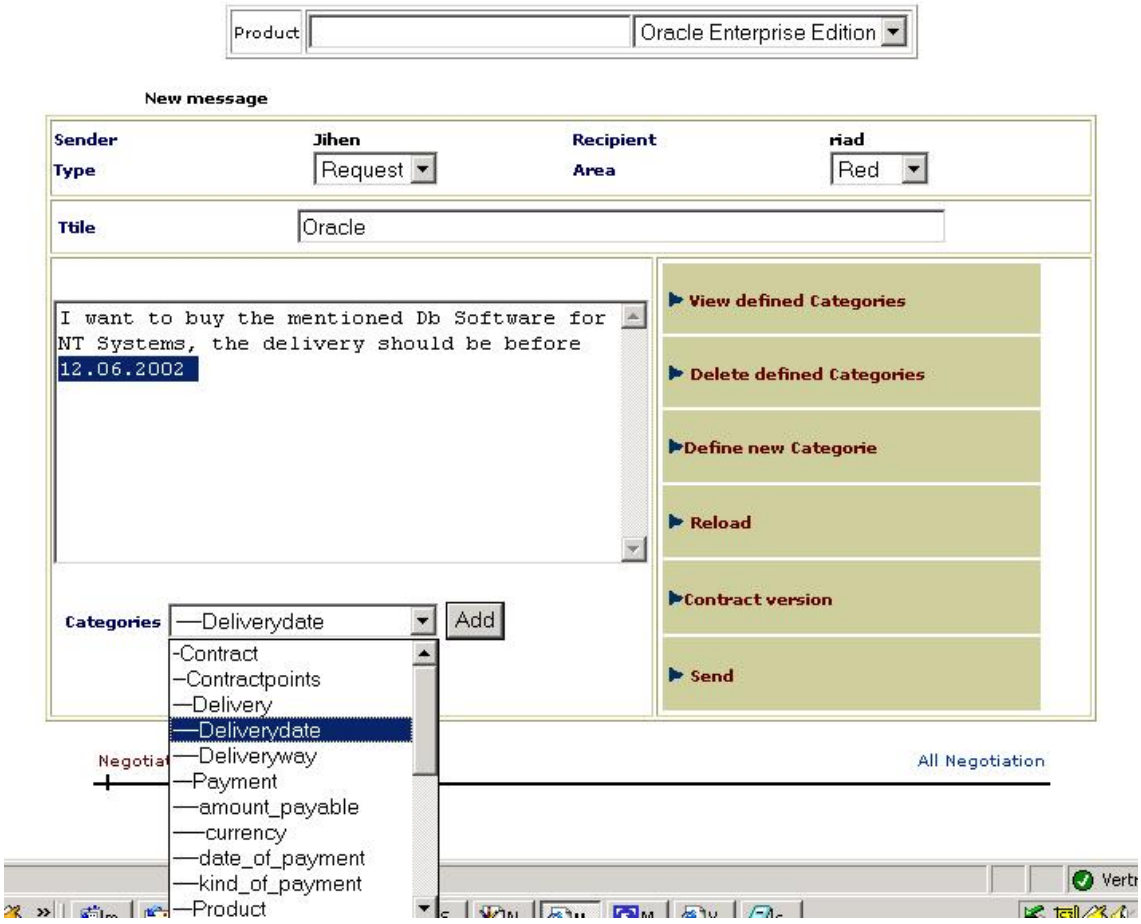

Figure 1: Message Composition in *Negoisst*

2.1.3 Negotiation Protocol

A negotiation protocol is implemented which controls the negotiation workflow. The message types are important for prescribing how a negotiation can proceed. For example, Negoisst offers the possibility to start a negotiation with a request or an offer message; a request can only be answered by a counteroffer, an acceptance, or a rejection; a negotiation can only end with an act of acceptance or an act or rejection. Furthermore, turn-taking is implemented to avoid negotiators replying to their own messages.

Since the complete exchange is stored, traces of messages and of documents are available for the negotiators, e.g. as a memory aid, to assess different negotiation strategies, for coordination of several negotiation processes etc. Therefore, it is possible to see the history behind an agreement, the reasons for a specific decision, the process of negotiating about a specific topic, and the justification for the final contract. By storing the interactions and by making the obligations explicit, monitoring of the contract fulfilment is enabled (Schoop and List, 2001).

2.2 Contract Management

As mentioned before, the second important element in Negoisst is the concept of a document. Documents in this context represent versions of the business contract as the outcome of a negotiation. The contract versions are automatically deduced from the message content including the semantic categories. Thus, there is a link between the messages and the documents. Each message leads to a new contract version.

At each step in the negotiation, it is possible to view the current contract version resulting from the current message. Negoisst offers a trace of messages and a traces of documents. Furthermore, the combined view of messages and documents implements the link between these two concepts. In each document, the negotiator can click on any contractual item which will open the message that introduced that particular item with the current value. Therefore, it is possible to trace back the interaction for each element in each contract version. Figure 2 shows such an example.

Furthermore, it is possible to view a list of obligations resulting from the current document and from the previous ones to make it clear for all negotiators involved what the own obligations are, what the obligations of the business partner are, and which actions need to be taken next.

2.3 Contract Fulfilment

Although Negoisst is mainly a negotiation system, it has been extended to offer functionalities for the fulfilment phase as well.

The user can view a list of obligations. Furthermore, it is possible for the user to check the satisfiability of these obligations during a negotiation and thus to find out whether the current contract version could be fulfilled if it became the contract. Thus, potential problems can already be envisaged during the negotiation when reparative action can still be carried out. The aim is to avoid drawing up contracts that will be difficult or impossible to fulfil.

Once the contract has been drawn up, the second functionality of contract fulfilment becomes relevant. The list of obligations is adapted to the current context. In particular,

actions that have already been conducted (such as delivery of products or the payment) are considered to construct the current list of obligations. Some obligations depend on a certain time value such as payment before a deadline. If the deadline is past, then the obligations to pay before that deadline no longer holds because the obligation can never be fulfilled. It is possible to find out these problems, to alert the users, and to initiate pre-specified actions (such as reminders, contractual penalties etc.).

Figure 2: Combined view of messages and documents

3 Outlook

In this paper, the negotiation support system *Negoisst* has been presented. *Negoisst* enables negotiations between human negotiators that go beyond the functionalities offered by current auction or agent-based systems. In particular, complex interactions are supported that require human intervention.

Negotiations are conducted via semi-structured message exchange and cooperative document management. The most innovative feature of *Negoisst* is the semantic enrichment process it offers for natural language conversations. It is possible to define a category (and thereby a particular semantics) for parts of the message, thereby avoiding ambiguity of the exchanges.

Negoisst has been successfully validated for the construction area and is currently in a test phase for cooperative construction teams where an architect negotiates with different trades such as roofers, bricklayers, window manufacturers etc.

Currently, we work towards ontology-based negotiations that enable a more formal definition of the message categories (Schoop, et al., 2002).

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Improving Contract Management in E-Business: Business and Legal Analysis of Electronic Contracts

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Abstract

The use of electronic contracts for negotiation and signing contractual agreements is an approach to improve business-to-business collaboration. However, the deployment of e-contracting is a challenge from the legal, business and technical viewpoint. In this article we examine different types of contracts in an e-business relation and propose a framework for analyzing the contractual and technical interdependencies.

1 Introduction

Conducting business on an e-marketplace requires the negotiation of sales contracts with trading partners as well as agreements on the technical aspects of the collaboration. Moreover contracts with service providers, e.g. marketplace operators, have to be taken into consideration. To reduce time-to-contract and to handle the complexity of legal and technical agreements in e-commerce we want to propose the concept of an “e-contracting knowledge base”. This concept should help the trading partners to plan, negotiate and manage a contractual relationship over the internet.

In this article we discuss different types of e-commerce contracts and their interrelation. We examine contractual relationships with the help of different views. For this analysis we apply the media reference model [Schmid, 2000]. Finally we investigate the potential of XML as format for e-contracts and discuss how XML and the representation of contracting rules can contribute to improvements in contract management.

2 Electronic contracting in e-commerce

2.1 Electronic contracting

The expression electronic contracting refers to the formation of contracts by means of electronic communications [UNCITRAL, 2002]. Electronic contracting focuses on negotiation of the terms and conditions of the contract, as well as the monitoring of contract performance [Lee, 1998]. The term electronic contracting system describes applications that support the formation and negotiation of electronic contracts [Tan et al., 2001]. These applications may also contain decision support functions.

E-contracts, in the legal sense, are contracts that are negotiated and concluded with the help of digital media and signed with a digital signature. A contract is not only a legally binding agreement between a buyer and seller, but also a source of information regarding the conduct of the business. According to the Secure Electronic Contract Project (SeCo) of the University of St. Gallen [Greunz et al., 2000] an electronic contract can be represented as XML-document.

2.2 Example of a e-contracting scenario

In order to conduct an e-business transaction a contract, regulating the terms and conditions of the trade, has to be drawn up. In addition technical agreements concerning the set-up of the e-commerce software have to be concluded. These technical agreements do not necessary have a legally binding character.

To illustrate the complexity of contract management in e-business we take the example of four related contracts and agreements governing an e-business relationship:

- Contract C1: sales contract between two trading partners: a buyer wants to purchase PC hardware. This sales contract is based on a model contract.
- Contracts C2,3: contracts regulating the service between the trading partner and a service provider, e.g. a contract for a B2B-payment service between trading partner A and bank X.
- Agreement T1: a technical agreement between the two trading partners on a specification to couple their e-commerce systems.
- Agreements T2,3: technical specifications of a web service, in this example a payment service.

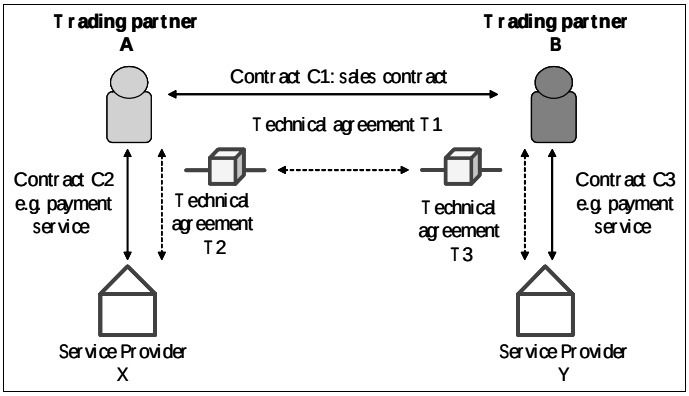

Figure 1: Contractual relations in a e-business transaction

2.2.1 Legal binding agreements governing the trade

In an e-business transaction we have legally binding agreements between the trading partners, for example a sales contract. In addition we have contracts between a trading partner and a third party, e.g. an application service provider (ASP). These service contracts can have direct or indirect influences on the sales contract and on the technical infrastructure: The service contract with a payment provider might influence a payment clause of the sales contract. In addition the service contract with the provider regulates technical aspects. Usually the service contract will contain Service Level Agreements (SLA). The SLA describes the service the ASP offers to the customer, the Quality of Service (QoS) and the responsibilities in case of a fault.

2.2.2 Technical agreements regulating the set-up of the technology

An e-business transaction requires several agreements concerning the technical standards, security features and business processes. With the emerging concept of web services the agreement on a technical specification will become more important. A web service can be described as a business unit, application, or system functionality that can be accessed over the Internet. From a technical viewpoint, the characteristics namely, “self-contained and modular, self-describing using XML-standards, programmatically and dynamically accessible over networks” are important [Smith, 2001]. As far as B2B transactions are concerned, web services will be deployed to provide a specific functionality to business partners, either to the users or to integrate with the application of the partner.

If trading partners want to conduct business in an open environment they have to agree on the business processes as well as on the technical system levels. Therefore they have to agree on a specification for setting up the e-business relation. An example of such an agreement is the “ebXML Collaboration Protocol Agreement”[1]. This document contains the necessary information to plan the integration between different web applications. XML is applied to represent the information of this agreement [Kotok, 2002].

[1] http://www.oasis-open.org/committees/ebxml-cppa/

3 Analysis of electronic contracts in e-commerce

3.1 Concept for analysing e-contracting relations

We want to propose a concept for planning and analyzing a contractual relationship in e-business. The main idea is to generate an integrated view on the trade contracts as well as on the technical agreements. The ability to analyze these aspects will become important especially if a company is engaged in many business relations, all using different e-commerce standards.

In addition the proposed concept should support the management of the relation between the trading partner and his e-commerce service providers. This becomes especially interesting, if the service provider offers B2B services, that minimize the risk involved in the trade, e.g. a payment service with a guaranteed payment. Moreover it is important for the trading partners to monitor the performance of their providers, especially if the transaction is business critical.

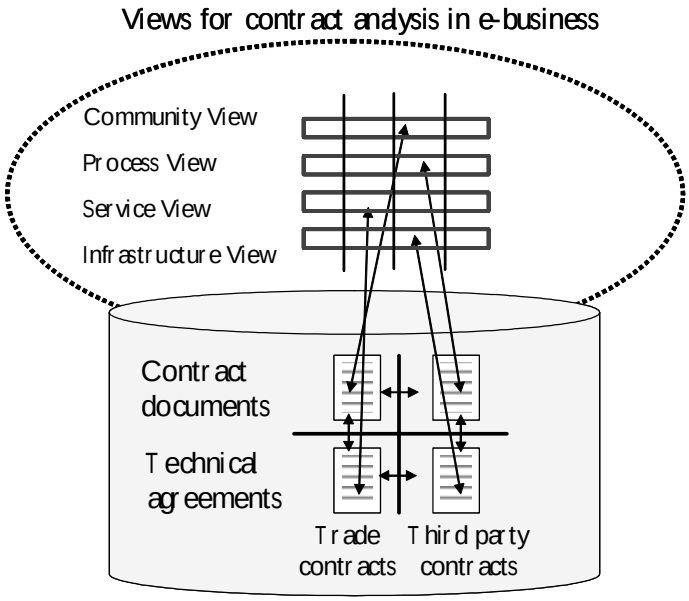

Figure 2: Analytic views for contractual relations in e-business

The media reference model [Schmid, 2000] serves as a framework for the design of transaction-based electronic media. The model describes the transaction in four phases: knowledge, intention, contract and settlement. In the Knowledge Phase information about the offered products and selling conditions is provided. In the Intention Phase, the parties signal their intentions with offers and counter offers. In the Contracting Phase, the parties negotiate and sign the contract. In the Settlement Phase, the parties act according to the negotiated contract. In the media reference model these four phases are analyzed from four different viewpoints: the community view, the process view, the service view and the infrastructure view. In the following section we will analyse the information, which is processed while negotiation and executing electronic contrasts, with the help of these four views.

3.2 E-contracting analysis: Community View

The community view should provide information about the contract standards and rules in the community. Furthermore the roles and protocols, which are relevant in the context of the contract, are analyzed in the community view.

3.2.1 Contract rules and standards in the community

In specific communities we find standards and rules for the formation of contracts. For example the swiss IT association, SWICO[2], publishes model contracts for the IT-industry, e.g. sales contracts for hardware or service contracts for IT-projects. Another example is the International Chamber of Commerce's model international sale contract[3].

There are different methods to support the community members in the contract formation process. For example an industry specific vocabulary can be used for the description of the parties, products or services in the contract. In addition contract templates can provide the basic document structure of a contract and contain customary clauses.

A community can create a specific legal framework, e.g. a multilateral contract signed by all parties. This contractual structure governs all contracts in the community. The Bolero[4] rulebook is an example of such an agreement in a closed contracting community.

3.2.2 Roles of the contracting parties

The community view of the media reference model describes the roles of the parties and the interaction protocols. This information is essential in the contract negotiation, as the partners must reach an agreement on the questions „Who performs which activity and what happens in the case of non-performance ?".

Whereas a paper-based contract document is a static view on the obligations, an e-contracting system could monitor the roles and responsibilities of the trading partners and the fulfilment of the obligations. In extension the roles of third parties can affect the roles and responsibilities of the trading partners.

3.2.3 Protocols for contracting negotiation and fulfillment

In the context of negotiation and executing contracts two classes of protocols are relevant. On one hand protocols for the negotiation have to be applied. The ebXML initiative denotes these protocols as contracting patterns[5]. An interaction protocol expresses the patterns that are used during collaboration on the formation of the contract, e.g. the rules for a public invitation to tender. In addition we have protocols and rules that govern the fulfilment of the contract, e.g. trade procedures [Lee, 1998].

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2 www.swico.ch

3 www.modelcontracts.com

4 www.bolero.net

5 www.ebxml.org/specs/bpPATT.pdf

3.2.4 Example: Community view on the e-contracting scenario

In our example following aspects are relevant for the contract formation:

Contract C_1 is generated from a model contract for IT-hardware. Beside the use of the industry specific vocabulary the trading partners have to analyse if the proposed clauses are compliant with their own contracting strategy. Moreover the roles and responsibilities of trading partners A and B could be documented and monitored in a contract management system.

Contract C1-C2: the relationship between the sales and the payment service contract can be evaluated. We assume that both trading partners want to execute the payment with the help of a B2B payment services. An example is the Identrus Eleanor6 payment service, which offers several payment instruments, e.g. a “certified conditional payment obligation”.

3.3 E-contracting analysis: Process View

For the analysis of the contractual situation it is essential to distinguish the legal status in the precontractual phase and after signing the contract. A decision support system could assign to each process a legal status and evaluate the consequences and the risks of a contractual agreement [Tan et al., 2001]. The previous mentioned contracting patterns determine the processes in the negotiation. In some cases additional contracts might be needed, e.g. a non-disclosure agreement. Another important approach to manage the contractual relation is the description of business processes in an electronic form, e.g. ebXML business process specification schema[7].

Example: The contract C1 and the agreement T1 could contain a description of the business process of the trade. A trading partner could assign to each process the risk, e.g. for non-performance of the other party.

3.4 E-contracting analysis: Service View

To exchange information and to interlink the IT-Systems technical agreements are needed. At present there are several developments to describe the specification for an e-commerce transaction. One example is the Web Services Description Language (WDSL) [8].

Example: The service view analyses the specification of a web service that is deployed in the transaction. In our example the interface to the payment service has to be specified. When the e-contract is signed by both parties a XML-message is generated and send to the payment web service.

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[6] http://www.identrus.com/products/eleanor.xml

[7] http://www.ebxml.org/specs/ebBPSS.pdf

[8] http://www.w3.org/TR/wsdl

3.5 E-contracting analysis: Infrastructure View

For the contractual relation it is important to assure the interoperability on a legal and technical level, e.g. accreditation of digital signatures. Moreover security issues and the reliability of the infrastructure have to be regulated in contractual agreements.

Example: The digital signatures of both trading partners have to be technical interoperable as well as legally equal. To ensure that the e-contract is processes without errors, e.g. caused by a system breakdown, all parties have to keep to the operating rules.

4 The role of XML in e-contracting

Although the internet is used for representing product information and supporting order processes, the paper-based contract is still commonly used in the contracting phase. Here the digital representation of the contract can bring new innovations in e-commerce. There are several research projects that are investigating how XML can be applied to represent business information in a contract. The Secure Electronic Contract Project of the University of St. Gallen [Greunz et al., 2000] and the project COSMOS [Griffel et al., 1999] worked out approaches for XML-contracts. Based on the findings of the COSMOS project the EU-project OCTANE [Kühne, 2001] is currently developing an XML-based electronic contracting editor , that can be deployed in different contracting domains. Currently we are investigating the possibilities to represent community specific model contracts and contracting rules in XML. One area of application is the domain of contracts in the IT-industry. We plan to develop an e-contracting knowledge base that helps the contracting parties to analyse the contracting situation. In extension each trading partner could set-up a contract warehouse to manage his electronic contracts.

To discuss the possibilities and limitations of XML in the context of electronic contracting it is important to distinguish the objectives for using XML. Firstly, XML can be used to represent the content and data objects of the contract, e.g. industry specific vocabulary. Secondly, XML offers capabilities to define the structure of the contract, e.g. with a contract template based on a XML-Schema. A third reason for deploying XML is the possibility to specify contracting rules, e.g. required or optional clauses. A further advantage of XML as document format is the flexibility of the layout and the export/import capabilities. In addition the XML Signature standard allows signing XML substructures, for example to sign a specific clause. Although XML plays an essential role for innovations in the field of contracting, it has to be combined with other forms of knowledge representation. To capture the knowledge in a contracting community contract configuration tools, based on relational database, as well as new semantic web technology have to be deployed. The MIT is currently studying the applicability of semantic web technology and business rules for electronic contracting [Grosof, 2001].

5 Conclusion

The introduction of electronic contracts is an important component for conducting e-business in a global environment. E-contracting will help to reduce time-to-contract and improve the collaboration between the trading partners. However, the deployment of e-contracting is a challenge from the legal, business and technical view. To handle the complexity of the set-up and operation of contractual relations based on e-contracts, we proposed the views of the media reference model as analytic method. Currently we

are studying different contracting domains with the help of this concept. Our goal is to represent the contracting knowledge and rules in a formal way, in order to realise the vision of an e-contracting knowledge base.

It is important to notice, that the development of e-contracts requires standardisation on a technical level as well as on a semantic level of the contract. For this reason we expect the first B2B e-contracting applications in closed contracting communities.

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Emerging Patterns of Uniformity in Electronic Markets: the Case of the Travel Portal AVIGO

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Abstract

In the early years of the "New Economy" companies started to test out very different options of applying the Internet for their purposes. While this has lead to a large versatility of e-business ventures, there is a number of arguments that commercial web sites might become more similar over time. This article, on the example of the newly launched travel portal AVIGO, investigates whether an increasing degree of uniformity is likely to occur in the online flight ticket market. The new site is compared with 21 competitors of diverse backgrounds regarding a set of 22 criteria which reflect challenges in designing flight booking sites. The analysis unveils that web sites in the industry currently differ in a number of important aspects but that the new entrant in almost all regards mimics the practices of important competitors. These findings are discussed in the light of second mover advantage and strategic differentiation and suggestions for further research on the emergence of uniformity in electronic markets are presented.

1 Introduction

During the past years, the Internet has been applied by companies to conduct or support business in a multitude of different ways. Reasons for this versatility may be seen in the universality of the medium as well as the high uncertainty about the determinants of success in what was once called the "New Economy". Thus, early e-commerce undertakings tested out very different options on all levels from business plan to web page layout. Also, e-commerce activities were often meant to stand out against competitors and thus to provide a means of strategic differentiation.

On the other hand, there is a number of arguments for the notion that e-commerce ventures might become more similar over time:

- Analogous to ERP systems, many companies have moved from individual solutions to packaged software e-commerce front ends (e.g. for online shops, virtual community platforms, content management systems). It can be assumed that software package inherent patterns and limited use of customisation contribute to greater uniformity of sites.
- Increased integration with back-end and interorganisational systems fosters uniformity as the availability and format of (e.g. product) data becomes more and more standardised.
- In planning and realising e-commerce applications, companies often rely on external support such as web designers and IT consultants. These service providers usually try to realise economies of scale by standardising their solutions.
- Much more than many other activities, online practices are extremely visible for business rivals and make it easy to "copy and paste". Especially the uncertainty about successful designs may motivate companies to mimic those whom they consider more legitimate or successful [Weigelt 2002, Dosi 1998, DiMaggio/ Powell 1983]. Furthermore, also practices from other markets and industries may be imitated.
- By visiting different sites, Internet users develop certain preferences and expectations regarding user interface, content, service level etc. In order to attract traffic and retain customers, companies are forced to respond to those expectations.
- The massive shake out in the past two years has sorted out those designs that are not economically feasible, thus reducing the versatility of undertakings. Conversly, late adopters of electronic commerce make use of their "second mover advantage" by applying those models and procedures that have proven to be successful.

Whereas it is beyond the scope of this paper to evaluate the relevance and contingencies of every single of these factors, it is argued that their combination and interplay may well lead to a greater degree of uniformity in electronic markets.

As a first step to test this assumption a new entrant's web site will be investigated regarding its correspondence with and distinction from existing practices in the market. The rationale behind this approach is that the first launch of a web site will apparently be preceded by a detailed analysis of the market as well as the options at hand, thus marking the outcome of a conscientious decision process of well informed professionals. Also, this method seems advantageous in that indications for a temporal development may be obtained without having to observe the market over a longer period of time: Whereas existing web sites carry the legacy of design decision made some time (often several years) ago, the new entrant represents its creators' belief about what will be appropriate in the future.

The structure of the paper is as follows: Online flight retailing, the domain of this analysis, is introduced in chapter 2. Structure, characteristics and reasons for choosing this industry are outlined and a new player, the German online travel portal AVIGO, is introduced. Chapter 3 deals with the selection of an appropriate sample and the criteria used for comparing the sites. This includes a detailed discussion of the challenges in designing web sites for online flight selection and reservation. In chapter 4, the criteria are applied to AVIGO and 21 other flight booking web sites and results are compared. The paper finishes with a discussion of the findings and proposes questions for further research regarding the emergence of uniformity in electronic markets.

2 Online flight retailing

In order to assess the uniqueness of a newly launched web site and its correspondence with existing practices, a comparison must be made with competing sites that serve the same or a very similar purpose. Here, web sites that sell tickets for scheduled airline flights have been chosen as the domain of study. AVIGO, a recently started online travel portal will be the new entrant under investigation.

2.1 Industry characteristics

For convenience, the term "industry" is used in this paper to refer to the domain of online flight retailing. Still, it should be noted that the background of players is rather heterogeneous and the defining criterion is actually a functional one: The study covers sites that sell scheduled airline flight tickets online. Operators of these sites include, among others, airlines, e-commerce startups, internet providers, media companies and offline travel agencies [Buhalis/ Licata 2002].

Several circumstances make it favourable to use online flight retailing as a domain for this study:

- Tourism and travel, especially airline flights, are very information intensive and have a long tradition in making use of information technology. This has roots in the first computer reservation systems, dating back to the 1950s [Consumer WebWatch 2002]. Since then, IT has always played a critical role in the development of the industry. Hence, it is not surprising that travel information systems were among the first to be successfully implemented on the internet [Chircu/ Kauffman/ Keskey 2001]. It can be assumed that companies also today pay a lot of attention to the proper design and implementation of their web sites.
- In recent years, the sale of flight tickets online has gained remarkable volume and importance. Travel and tourism belong to the three largest online retail markets [Law/ Leung 2000, Consumer WebWatch 2002] and within that sector airline tickets hold by far the biggest share [Marcussen 2001]. According to Jupiter Media Matrix, the sale of flight tickets online accounted for 16 billion USD in 2001 and will grow to 40 billion USD in 2007 [Kalehoff 2002]. This again gives rise to the assumption that the design of flight ticket web sites is subject to extremely careful analysis and strategic planning rather than the outcome of coincidences and low-priority decisions.
- Different from e.g. online book sales or internet auctions, the market is still rather fragmented and influenced by a considerable number of different players. This allows to compare the new entrant with a sufficient number of relevant competitors.
- Although the complexity of the product itself is low in that it can be reduced to a set of well-defined parameters, the sales process is very demanding and in many cases involves a great deal of customer advise. The complexity is driven by a huge variety of rates and offers, differing customer priorities, a multitude of terms and conditions, the bundling of several "legs" (sometimes from different airlines) to a route, sophisticated and dynamic pricing strategies of suppliers and the timeliness of availability information. Automating this process involves a lot of challenges. Some of these challenges will be discussed below in more detail. Because it is likely to be impossible to build a web site that fully satisfies the requirements of all potential customers, operators face a lot of trade offs, leading to non-trivial design options and a number of competing approaches. It is especially interesting to see,

in how far a late starter makes use of its second-mover advantage by choosing options that have already been established in the market.

2.2 AVIGO – a new online travel portal

The German travel portal AVIGO (www.avigo.de) was launched on August 14, 2002 by REWE Touristik group. REWE Touristik belongs to the three largest tourism companies in Germany (the other two being Neckermann Reisen and TUI) and holds a market share of about 17%. The group owns tour operators such as ADAC Reisen, DERTOUR, ITS Reisen, Jahn Reisen, Tjaereborg and Meier's Weltreisen. Furthermore, it controls about 2000 travel agencies and holds shares in hotel chains and charter flight companies. Most of those subsidiaries already operate web sites, frequently also including reservation and booking functionality. Different from TUI and Neckermann Reisen, the group itself did not target end customers on the web before AVIGO was launched. Thus, the new site may be seen as a move towards centralizing the e-commerce activities of REWE Touristik.

AVIGO is marketed as a full service platform for travellers that provides all kinds of travel related information, experience sharing with other travellers as well as direct booking functionality for a variety of travel products. Regarding last minute trips, packaged tours and charter flights, the site represents an extensive distribution channel for the afore mentioned subsidiaries of REWE Touristik, but also covers products from suppliers external to the group. The focus of this paper is on the online distribution of scheduled flight tickets through the AVIGO site. Here, the assortment encompasses published airfares from the global computer reservation system Worldspan and special offers of the group owned consolidator Dertour.

3 Method of analysis

The number of competing sites and even more the plethora of attributes in which they may differ call for a careful and well reflected choice of the sample and the comparison criteria applied in this study. While it is certainly impossible to compare the new entrant with all other sites of the domain in every possible aspect it is also obvious that the selection of sample and criteria may seriously influence the results of the analysis.

3.1 Sample

For the purpose of this study, heterogeneity of the comparison group is given priority over representativeness. Especially, emphasis is put on the coverage of players with different backgrounds. Here, four groups of flight retailing web sites will be distinguished [compare Klein/ Loebecke 2001, Marti 2001, Buhalis/ Licata 2002]:

4. Airline sites usually offer booking facilities for flights operated by the particular airline and sometimes also include offers from alliance partners or even competitors.
5. Travel superstores are characterised by a wide range of travel related products, the provision of additional information content as well as a considerable market share. They are operated by influential players such as CRS operators (Travelocity), airline alliances (Orbitz, Opodo) or IT companies (Expedia, founded and long time owned by Microsoft, since February 2002 controlled by USA Interactive). Sometimes, they are also referred to as “travel portals”.

6. Although in appearance and assortment very much alike travel superstores, here, tourism group sites will be treated as a separate category in order to reflect the specific ownership of AVIGO.
7. Internet travel agencies sites are focused on the online distribution of one or several types of travel products. They can be operated by intermediaries with or without travel agency outlets. Many of them draw on standard software packages or application hosting to maintain their web sites.

In order to grant comparability, it was demanded that, at the time of data gathering, all sites included in the sample should be able to provide at least one offering for the test case: a (preferably economy class) return flight for 2 persons from Düsseldorf (DUS), departing on Oct 14, 2002 to Dublin (DUB), returning on Oct 21, 2002. Last minute agencies, charter companies and no-frills airlines are not reflected in the study because they do not fulfil this requirement.

The sites of all airlines covering the test route were included in the comparison group: Aer Lingus, Air France, British Airways, KLM, Lufthansa and SAS. From the group of travel superstores, the three major players in Germany were selected, namely Expedia, Opodo and Travelocity. Regarding tourism group sites, the two main competitors of REWE Touristik, Neckermann Reisen and TUI were chosen.

The sheer number of online travel agencies raised problems in selecting an appropriate sample for this group: The German internet catalog WEB.DE e.g. lists about 250 sites in its travel agency category. As reliable data on market share of these sites is not publicly available, the selection had to be based on more subjective criteria. Citations in media and the unaided recall among a (non-representative) group of 100 first year students served to assemble a first set. Subsequently, this was further downsised in order to limit the number of sites that are very similar in layout and functionality e.g. due to the use of the same software package or application service provider. In the final sample, which consists of Airbroker24, Billiger-fliegen.com, Ebookers, e-Sixt, flights.com, flug.de, Skyways, Travel24, Travel Channel and Travel Overland, no more than two sites each can easily be identified as stemming from the same template.

3.2 Comparison criteria

Comparison criteria for the sites should fulfil the following requirements:

- They should refer to non-trivial design aspects that involve well reflected decision making. For example, whether a site shows a company logo is not a good criterion because there is no serious reason to omit the logo and in fact, all sites studied have one. On the contrary, the design decision should ideally involve a trade off between different goals, e.g. providing a lot of information vs. having the site clearly arranged and concise.
- They should be relevant to the success of the site, e.g. by referring to aspects that might provide value to the customer or enhance ease-of-use.
- They should be easy to observe and codify for the researcher. Especially, they should be time-invariant for at least a few days and the observation must not require the actual booking of a flight.
- The criteria in their totality should cover diverse aspects of the online flight booking process. They should e.g. not be restricted to the order form or the way flight details

are displayed. To elaborate on this, the following chapter will take a closer look at the online booking process.

3.2.1 Online booking process

To structure the online booking process, a generic model was developed that – despite the considerable differences on a more detailed level – is applicable to all web sites investigated in this study.

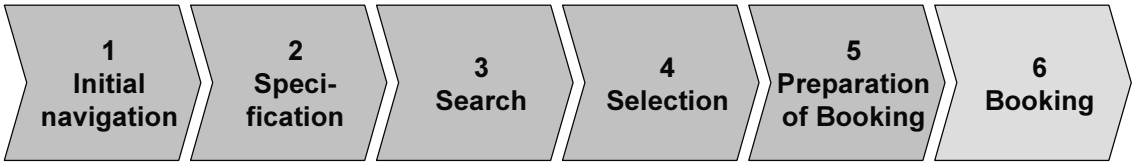

Figure 1: Generic online booking process

The process model is shown in Figure 1. It consists of 6 steps:

1. Initial navigation encompasses all activities and web pages from the site's main page to the first input that refers to the specific customer need.
2. The specification phase includes the entering of all data - such as route and date of travel and preferences for certain airlines – that is requested before a database search is started. Usually, information is entered using search forms which differ in layout and extent.
3. Searching for airfares and schedules can take several seconds or even minutes. Web sites use different approaches to cover this search phase. While some are letting the user wait in front of an empty screen, others show animated graphics or even advertisement.
4. After the search is completed, airfares, schedules, availability and other information are offered. The customer will then select the offer that suits best his preferences. Different types of implementing this selection phase can be observed.
5. As soon as flights have been selected, the customer is requested to provide additional information which is necessary to carry out the reservation or booking. In order to prevent expenses and liabilities from unintended orders, in our research the process was only followed up to the point when payment information had to be provided. In this paper, this phase is called preparation of booking.
6. The booking phase requires the provision of payment information and sometimes a final confirmation from the customer. For the above mentioned reason, this part of the process was excluded from the analysis.

It should be noted that the distinction between phase 5 and 6 is motivated by methodological issues rather than by the logic of the booking process. In the following chapters, challenges in implementing each of the phases 1 to 5 are discussed, leading to the identification of comparison criteria for flight retailing sites.

3.2.2 Initial Navigation phase

The main page of every web site serves as an entrance door and a figure head. It should give an inviting and enjoyable impression to the visitor and provide clear and concise information on the value and services offered by the site. Those sites that place a simplified or even fully featured **search form on their main page** sacrifice clarity and a part of the precious main page space in order to provide extra value to only those customers who wish to instantly start booking a flight. **Advertising special offers on the main page** will involve similar trade-offs. Furthermore, editorial work is needed to keep these announcements up to date. Advertising products that are out-of-stock can easily offend customers and is often regarded as intentional deceit.

Usually, the online sale of flight tickets is paralleled by a call center which can also carry out bookings and furthermore serves to support customers who are facing problems with the web site. While the **hotline numbers** are included *somewhere* in almost all of the sites, only some companies prominently place them on the main page, whereas others hide them in hard to find places. Apart from bad user interface design, a reason for this may be that sellers try to push customers to use the cost-efficient web site as much as possible and want to reduce the number of cases in which the more expensive hotlines are used.

3.2.3 Specification phase

The minimum set of attributes that a customer needs to specify when buying a return flight ticket includes **place of departure**, place of arrival as well as **flight departure and return dates**. For the experienced user, the most convenient way to enter these data is to type them on the keyboard. An alternative solution is to let the user choose day, month and sometimes even airport from a combo box. This is usually more time consuming, but avoids switching between mouse and keyboard and also informs the user about the actual choices he has at hand (e.g. airports that are covered by an airline). Furthermore, it might better reflect the traditional notion of many IT engineers to exercise as much control as possible on the user – although the approach can not prevent misentries[1].

[1] Ironically, some combo-featured sites even execute searches for flights departing on February 31.

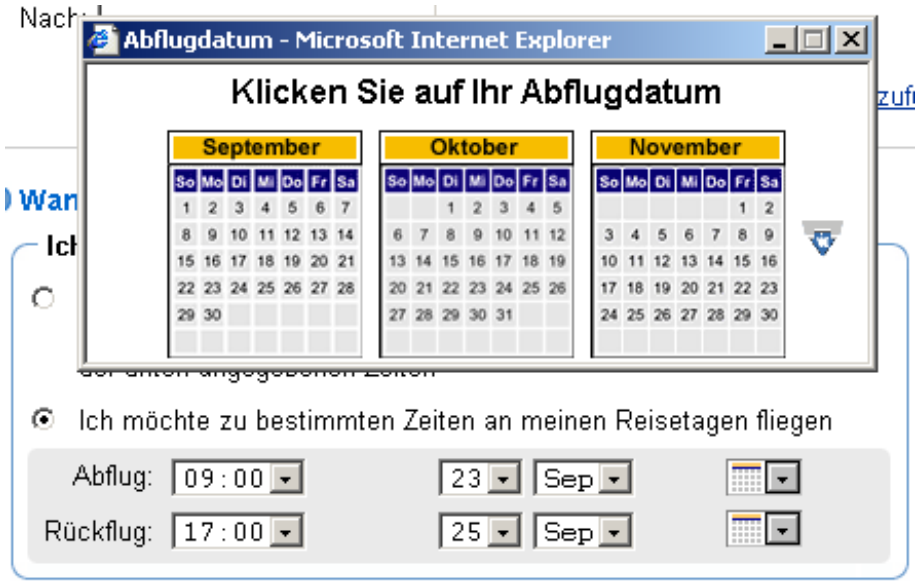

Figure 2: Specifying travel dates and times at Expedia using combo boxes and a popup calendar.

A more adjuvant feature to support the specification of travel dates is the **popup calendar** which can be opened with a mouse click in the search form of many web sites (see example in Figure 2). With this emulation of the traditional desktop calendar in travel agencies, the customer can conveniently pick the dates of travel by the use of his mouse and at the same time may check the days of the week.

For some travellers, selecting just the dates of a journey may be to imprecise and hence some sites have implemented an option to specify also the preferred **time of travel** – usually also in “combomania” style.

Round trips are just one way of bundling two journeys and selling them cheaper than the sum of the oneway fares. Many airlines also permit to bundle trips to so called **open jaws** or **multiple stop** flights. This way, they offer better rates to customers who fly e.g. from A to B and from B to C. Because the handling of those bookings is more sophisticated than for round trips and the demand for those offers is significantly lower, web sites have only recently started to implement open jaw bookings.

For various reasons, travellers may have **preferences for certain airlines**. This can be due to the outstanding security record of some carriers or to the bad service reputation of others. More often, loyalty programs such as frequent flyer cards will strongly influence the customer in choosing the operator of a flight. In all of these cases, customers will appreciate the possibility to have their priorities included in the flight search.

3.2.4 Search phase

The search for adequate flight schedules and airfares will usually take some time, usually up to 30 seconds, sometimes even over a minute. It has often been mentioned that

web users do not like to wait[2] [e.g. Law/ Leung 2000] and so it is of considerable relevance how different sites are dealing with the inevitable waiting time during the search process. While some are letting the user wait just in front of an empty screen, others are more creative in embellishing the "waiting loop" and have implemented different **holding patterns**. Also the information provided during this time varies: Often, it is restricted to a polite waiting request, sometimes accompanied by a simple graphic animation. More advanced approaches make use of the time by **providing** the customer **information** or even advertisement. These two interrelated design options form the comparison criteria for the search phase.

3.2.5 Selection phase

It has become good practice in online retailing to provide the user with feedback information on where he actually stands in the buying process, i.e. which steps he has already completed and which ones are still to be carried out. This is usually done with some kind of progress bar (see Figure 3) and it appears to be especially important in a buying process which is as complex as the one for flight tickets. As a matter of course, this **progress feedback** should be given on all pages within the booking process. The beginning of the selection phase is just one appropriate moment to test for its existence.

Figure 3: Progress bar indicating location in booking process on Aer Lingus site.

Within the selection phase, the customer chooses one out of a number of possible product configurations. Remarkable difficulties stem from the fact that the product parameters that are fundamental to this choice – namely airfare, schedule and availability – are in many ways interdependent. It is due to this fact that in the case of scheduled flights, product selection is a complex task which can hardly be met by a standardised procedure. Building an interface that can support the user in this task without confusing or restraining him is certainly one of the biggest challenges in the design of a flight booking web site. In this study, the approaches that the different sites have chosen are assessed using four criteria:

[2] A frequently cited rule of thumb states that for every 10 seconds waiting time 20% of the viewers of a web site will leave. Although such a strong effect is unlikely to appear in a scenario where users have the intention to book or investigate a flight, it is indeed important to realize that web users tend to be extremely impatient.

The **order of events** refers to the question whether the user will first select flight schedules or airfares or whether both is done simultaneously. The **display of flight schedules** is of interest because the combination of fares, outward and return flights can easily lead to a multitude of valid options that is hard to present in an intelligible way. Because users will have different priorities in making a selection they will appreciate the **possibility to change the sort order** of the display. Flight options might be sorted according to e.g. price, airline, departure time, number of stops, duration of journey etc. If none of the options is satisfying, it will be useful to **start a modified search from the actual page** without having to navigate back to the main search form.

Finally, price tagging practices are compared between the different web sites. More often then not, **airport taxes** are not mentioned when travel agents state their prices. By doing so, they give the impression that their offerings are cheaper than they really are, but also put up with the displeasure of customers who will sooner or later find out that they are paying more than initially expected.

3.2.6 Preparation of booking

Often, online retailers **require customers to register** for their service before the first purchase can be made. Though it is not necessary from a technological or legal point of view, this practice is widely believed to provide the advantage of fostering the customer relationship: By having his personal data already stored in the site's database the customer has an incentive to return to the web site for his next travel booking instead of shopping somewhere else. Also, data from the registration is often the basis for direct marketing activities such as email newsletters and personalised information. On the other hand, registration usually involves additional procedures such as choosing a user name and password and is not well liked by all customers.

Many travellers have **seating preferences**, such as smoker or non-smoker, window or aisle. These preferences can be voiced at the time of check in, but expressing them when the booking is done may be more convenient. Thus, some web sites allow to specify seating preferences and forward them to the respective airline. Recently, some sites also started to provide seating maps which can be used by travellers to select their preferred seat with the click of a mouse (Figure 4). Obviously, this feature is technologically demanding as it also affects the IT architecture of airlines and computer reservation systems.

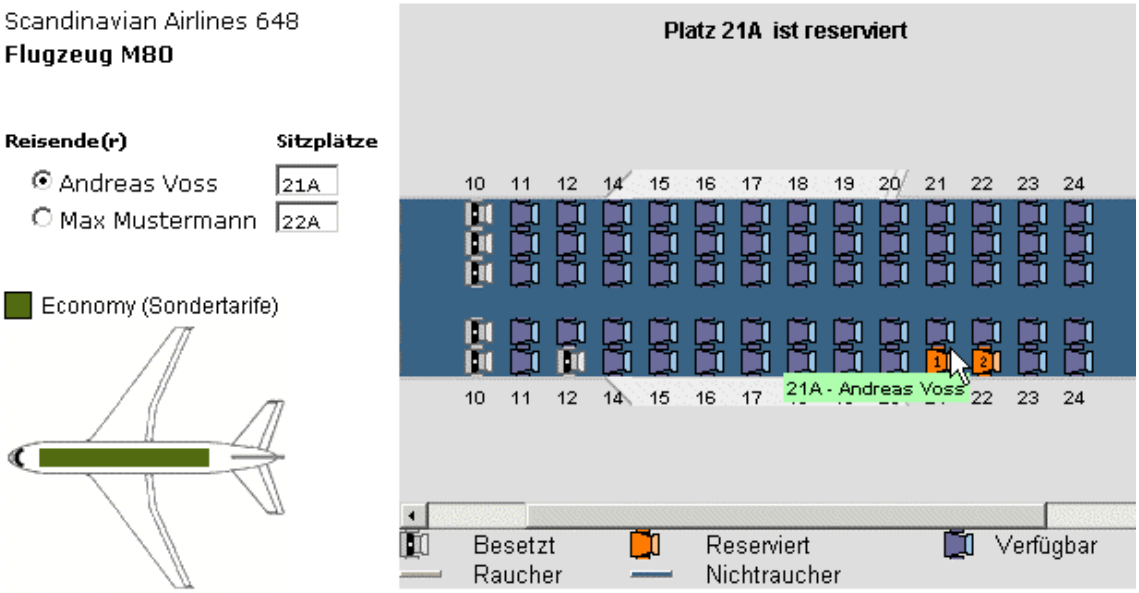

Figure 4: Interactive seating map on Opodo site.

Pressure from airlines and growing competition have forced some travel intermediaries to redefine the way they charge customers: As commissions are decreasing, they started to charge fixed **service fees** for bookings and / or shipment of tickets.

Means of payment for internet transactions has been subject to intensive debates and still today, none of the procedures commonly applied can be considered ideal for sellers and buyers. However, card based payment nowadays is the de facto standard for buying flight tickets online. It will be analysed whether web sites also accept other means of payment.

The handing over of the ticket to the customer acts as the last criterion for this study: Besides sending the ticket by mail or courier, some sites allow to **pick** it **up** at the airport (so called “ticket on departure”, T.O.D.) or in a travel agency outlet.

3.2.7 Practices observed in the sample

All sites in the comparison group have been carefully analysed regarding the 22 comparison criteria. Some of the sites offer more than one mode for flight selection and booking. For example, airbroker24 and billiger-fliegen.com have a “powershopper” feature and with Opodo, customers can choose between searching for “cheapest flights” or “all flights”. In these cases, the standard settings and functionalities have been used for the analysis.

9 of the criteria are of univalent, binary nature, simply referring to the question whether a certain feature or practice is existent or not. For the remaining 13 criteria, different practices are also distinguished in the way a feature or functionality is implemented. Particularly regarding the display and selection of airfare/ schedule combinations, web sites come up with rather different solutions to the problem (criteria 13 and 14).

A full listing of all characteristics observed in the comparison group can be found in the appendix of this paper. For most of the criteria, a “best practice” can not be determined. As mentioned earlier, the criteria were actually desired to refer to trade-off decisions and thus few of the practices observed can easily be said to be outmatching. However, it was tried to assess which of the alternatives tend to be **technologically** (respectively organisationally) most advanced and which ones are desirable from the point of view of the **customer**. In **Table 1**, these alternatives are marked with letters T and C respectively.

4 Analysis and results

For each site of the sample, data was collected on all 22 criteria by carrying out a test booking up to the point were payment information was requested. Wherever possible, the German version of a site was used for the comparison. Data gathering was carried out a few days before AVIGO was launched (between 7th and 9th of August). A summary of the observations can be found in **Table 2**. Just one week after the launch of AVIGO, the same kind of data was also collected on this site.

4.1 Characteristics of web sites in the comparison group

The frequencies of occurrence of the several characteristics provide an insight of what is common use among the web sites in the sample and where different approaches compete. The “average” flight booking site can be described as follows:

Special offers are presented to the customer on the main page, but he will hardly find a hotline number. Travel dates are specified using combo boxes. Time as well as airline preferences for the flights can be voiced. Requests for open jaw routings are possible. During the search phase, a holding pattern – most often a web page with some graphical animation – is applied without providing additional information. The sort order of the search results may not be changed by the user and there is no option to run a modified search directly from the results page. Airport taxes are considered when displaying price information. Service fees do not apply and tickets can only be obtained by mail or courier.

Regarding 9 out of the 22 criteria, dominant practices can not be identified (maximum frequency below 60%). Those are existence of search form on main page, specification of departure airport, support by calendar popup, feedback on progress of booking, order of events in selecting flights, display of airfares and flight schedules, obligation to register, voicing of seating preferences and payment options. This can be seen as an indicator that sites are still differing considerably in all phases of the booking process.

4.2 Differences between types of players

Substantial differences in the design of online flight booking exist between airlines, superstores, tourism groups and travel agencies. Though it is beyond the scope of this paper to discuss all of them in detail, some examples are worth mentioning:

- Whereas a search form can never be found on the main page of tourism group web sites, all superstores and most of the airlines place it there.

- A calendar popup is not often implemented by travel agents and airlines, but all of the superstores and tourism groups offer this feature.
- In the selection phase, no sites except those of airlines are following the approach of displaying airfares only after flights have been selected.
- All superstores display the valid combinations of airfare, outward and return flights as separate options and this way let the customer pick airfare and flights simultaneously.
- Travel agents are the only players who sometimes conceal airport taxes in the selection phase and who also may charge booking fees.

In general, it can be said that travel superstores get closest to the technologically advanced, but also customer-wise desirable practices. One possible explanation is that these sites are either relatively new (Opodo was launched on November 30, 2001) or great efforts are made to continuously improve them.

4.3 Characteristics of the AVIGO site

Important questions of this paper are in how far the new player, AVIGO, adopts existing practices and whether also more innovative solutions are implemented. In order to analyze this, the comparison criteria are also applied to the AVIGO site. The results are listed in the last column of Table 2.

In all but one categories, the characteristics observed at AVIGO can also be found at web sites in the comparison group. This may be seen as an indicator that the designers of the site prefer the adoption of established and approved practices to the creation of means of strategic differentiation. The observation suggests that online flight retailing has possibly reached a point in where copying “state of the art” becomes more desirable than being innovative.

An exception from this is the way in which AVIGO combines the display of airfares and corresponding flight schedules (criterion 14). Here, the site applies a technique that can not be observed in the comparison group[3]: One outward and return flight each are displayed together with the airfare. If other flight options exist, this is indicated by a small clock icon. Clicking this icon opens a list box from which alternative schedules can be selected (Figure 5).

[3] In fact, the author can not remember seeing this approach anywhere else.

Figure 5: Choosing between different flights valid for the same airfare at AVIGO

Even though the criteria presented in this article are helpful in directing the researchers attention, the assessment of the innovativeness of AVIGO should not be limited to this framework. Therefore, also a more general evaluation of the site was carried out with the aim to identify features and practices that are novel to the industry. A unique feature may be seen in the community section of the site where customers can share experiences and look for travel partners. Except from this, no signs of differentiation could be discovered at AVIGO. It is concluded that the degree of innovativeness of the site is rather low.

Apart from the availability of an interactive seating map and the support of ticket pickup, features at AVIGO can be considered technologically/ organisationally most advanced. This also holds for the degree in which they conform with customer desires, except that registration is required in order to book.

4.4 Compliance of AVIGO with common practices in the comparison group

A more sophisticated view of the ways in which AVIGO adopted existing design characteristics can be obtained by comparing the site with a) dominant practices in the industry, b) the four different groups of players and c) single competitors.

As has been mentioned above, in 13 out of the 22 criteria a characteristic is regarded dominant because it is observed in a manifest majority (more than 60%) of the sites. Interestingly, AVIGO complies with those dominant practices only in 7 criteria, and in the remaining 6 follows the minority. For example, only 14 % of all sites provide functionality to change the sort order of offerings, but nevertheless AVIGO employs this feature, too. Similar observations can be made with respect to hotline number, specification of travel dates, open jaw flights, information provision during waiting time and modified searches from the results page.

Distinguishing different groups of players provides an explanation for this phenomenon: AVIGO clearly follows those practices that are applied by the three travel superstores. Here, compliance with the dominant approach is found in 16 out of 22 criteria. An even stronger support for this notion is obtained by a direct comparison with the single players (see **Table 3** in appendix): Practices at AVIGO conform with those at Expedia in 19, with those at Travelocity and Opodo in 15 out of 22 criteria. With all other players, degrees of compliance are significantly lower. It is especially interesting to note that the similarities between AVIGO and the other two travel group sites are rather low.

5 Discussion

The case of AVIGO illustrates the decisions that a late entrant into the market of online flight retailing has made regarding important design options of its web site. It has been revealed that these decisions were lead by practices already existent in the industry rather than by the attempt to come to innovative, novel solutions. Because it can be assumed that the creators of AVIGO have made considerable efforts in analysing market and options at hand, it is concluded that at the present development stage of the industry, copying state of the art is more attractive than achieving uniqueness. This corresponds well with the notion of second mover advantage which claims that late entrants into a market can profit significantly from the experiences of their predecessors.

Practices in the industry are differing in many aspects. Thus, in implementing their site, decision makers at AVIGO repeatedly needed to choose between several competing design options. As the analysis shows, this was not done based on quantitative grounds such as the popularity or dispersion of the different practices within the industry. Instead, AVIGO seems to follow a small number of selected competitors. It is likely that those are players who are considered most experienced or successful by the decision-makers behind AVIGO – or simply appear to be most relevant to the targeted market. Interestingly, these "shining examples" are not web sites that stem from a similar background as AVIGO (i.e. the tourism group sites TUI and Neckermann Reisen), but the travel superstores which have a very different history.

Regarding the question of uniformity, this study contributes two findings: First, web sites in the travel industry differ in a number of important aspects and thus uniformity at the moment is rather low. Second, a recent entrant to the industry hardly shows attempts of differentiation and in almost all regards mimics practices from well established competitors. If this behaviour is representative for new entrants and also appears in the relaunches of already existent sites, it can be concluded that sites in the industry will tend to become more similar over time.

By and large, further research is needed in four areas:

1. The collection of additional evidence for the notion of emerging uniformity in electronic markets, e.g. by looking at other cases, including different criteria or investigating various industries.
2. A differentiation of different levels on which unification may occur. In this research, criteria from web page layout (e.g. combo box vs. text entry) to service procedures (e.g. payment options) have been covered. It is also desirable to look at e.g. prices, assortment or even business model.
3. The analysis of drivers and contingency factors that influence the unification process. Some examples for this have been given in the introduction of this article.
4. Implications for business strategy. If online practices are becoming more and more similar they will not be applicable for strategic differentiation any more. In this case, companies need to turn to other means of differentiation (e.g. service level, branding) or will risk increased competition and reduced profitability of the industry.

While this paper presented a “snapshot” analysis that tried to anticipate trends by comparing a new undertaking with several established sites, also longitudinal studies will be necessary to address those issues.

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Appendix

Table 1: Overview of comparison criteria and characteristics observed

Criterion	Characteristics observed in comparison group
Initial navigation	
1. Booking on main page	• Not available • Limited (express) search form (T/C) • Fully featured search form (T/C)
2. Special offers advertised on main page	• No • Yes (T/C)
3. Hotline number displayed on main page	• No • Yes (C)
Specification	
4. Specification of departure airport	• Text input (C) • Selection from combo box
5. Specification of travel dates	• Text input (C) • Number input (day) combined with combo box (month) • Selection from combo boxes
6. Support by calendar popup	• No • Yes (T/C)
7. Specification of time preferences	• None • Time of day (T/C) • Hour of day (T/C) • Time or hour of day (T/C)
8. Open jaw or multiple stop flight routes	• No • Yes (T/C)
9. Specification of airline priorities	• None • Choice of one airline • Choice of several airlines (at least two) • Also choice of airline alliances (T/C)
Search	
10. Holding pattern	• None • Waiting request, without animation • Waiting request, with animation (e.g. line of dots) (T/C) • System messages on search progress • Continuous reporting on search results (T/C)
11. Information provided during waiting time	• None • Slogans or information about the web site (C) • Advertisement for special offers or complementary products (T/C)
Selection	

Criterion	Characteristics observed in comparison group
12. Feedback on progress of booking	• None • Progress bar or the like (T/C)
13. Order of events in selecting flights	• Selection of airfare(s) first, then choice of flights • Selection of flights first, then display of airfare • Simultaneous display/ selection of airfares and available flights (T/C)
14. Display of airfares and flight schedules	• Only one flight pair per airfare displayed; more flights available by hyperlink • All valid combinations of airfare, outward and return flights are listed as separate options • All available flights displayed below each airfare; selection of outward and return flights by radio buttons (T/C) • Selection of airfare(s), outward and return flights in three subsequent steps • Selection of outward and return flights by radio buttons; only after that, airfare is displayed
15. Possibility to change sort order	• No • Yes (T/C)
16. Possibility to start modified search from the page	• No • Modification of dates only • Modification of dates and route (T/C)
17. Display of airport taxes	• Not at all • Already included in airfare • Displayed separately (T/C)
Preparation of booking	
18. Registration required	• No (C) • Yes
19. Seating preferences	• None • Seat preferences are forwarded to airline • Interactive seating map (T/C)
20. Service fee	• No (C) • Yes
21. Payment options	• Plastic card only • Debit entry possible • Bank transfer possible • Debit entry and bank transfer possible (T/C)
22. Receipt of ticket	• Mail / Courier only • Deposit in airport possible (T.O.D.) • Deposit in travel agency outlet possible • Deposit in airport and travel agency outlet possible (T/C)

Table 2: Frequencies of observations in the sample

Observation	Control group	Airlines	Super-stores	Tourism groups	Travel agents	AVIGO
1. Search form on main page (Initial navigation phase)						
No search form	43 %	17 %	0 %	**100 %**	**60 %**	
Search form	57 %	**83 %**	**100 %**	0 %	40 %	**X**
• Limited form	43 %	67 %	100 %	0 %	20 %	X
• Fully featured form	14 %	17 %	0 %	0 %	20 %	
2. Special offers advertised on main page (Initial navigation phase)						
No special offers	33 %	50 %	0 %	50 %	30 %	
Special offers	**67 %**	50 %	**100 %**	50 %	**70 %**	**X**
3. Hotline number displayed (Initial navigation phase)						
Not displayed	**62 %**	**100 %**	**67 %**	50 %	40 %	
Displayed	38 %	0 %	33 %	50 %	**60 %**	**X**
4. Specification of departure airport (Specification phase)						
Text	57 %	33 %	**100 %**	**100 %**	50 %	**X**
Combo box	43 %	**67 %**	0 %	0 %	50 %	
5. Specification of travel dates (Specification phase)						
Text	29 %	0 %	33 %	50 %	40 %	**X**
Number & combo box	5 %	0 %	0 %	0 %	10 %	
Combo boxes	**67 %**	**100 %**	**67 %**	50 %	**50 %**	
6. Support by calendar popup (Specification phase)						
No calendar popup	52 %	**67 %**	0 %	0 %	**70 %**	
Calendar popup	48 %	33 %	**100 %**	**100 %**	30 %	**X**
7. Specification of time preferences (Specification phase)						
No time preferences	38 %	33 %	0 %	50 %	50 %	
Time preferences	**62 %**	**67 %**	**100 %**	50 %	50 %	**X**
• Time of day	10 %	17 %	0 %	0 %	10 %	X
• Hours	33 %	50 %	33 %	50 %	20 %	
• Both	19 %	0 %	67 %	0 %	20 %	
8. Open jaw/ multiple stop flight routes (Specification phase)						
No open jaw	**62 %**	50 %	0 %	**100 %**	**80 %**	
Open jaw	38 %	50 %	**100 %**	0 %	20 %	**X**

Observation	Control group	Airlines	Super-stores	Tourism groups	Travel agents	AVIGO
9. Specification of airline priorities (Specification phase)						
No airline priorities	33 %	**67 %**	0 %	0 %	30 %	
Airline priorities	**67 %**	33 %	**100 %**	**100 %**	**70 %**	**X**
• One airline	33 %	0 %	33 %	100 %	40 %	X
• Several airlines	19 %	0 %	67 %	0 %	20 %	
• Airline alliances	14 %	33 %	0 %	0 %	10 %	
10. Holding pattern (Search phase)						
No holding pattern	24 %	33 %	33 %	0 %	20 %	
Holding pattern	**76 %**	**67 %**	**67 %**	**100 %**	**80 %**	**X**
• page w/o animation	10 %	0 %	0 %	50 %	10 %	
• page with animation	33 %	33 %	67 %	50 %	20 %	X
• System messages	19 %	33 %	0 %	0 %	20 %	
• Search results	14 %	0 %	0 %	0 %	30 %	
11. Information provided during waiting time (Search phase)						
No information	**80 %**	**100 %**	**67 %**	50 %	**80 %**	
Information	20 %	0 %	33 %	50 %	20 %	**X**
• Slogans, messages	10 %	0 %	33 %	50 %	0 %	X
• Offers	10 %	0 %	0 %	0 %	20 %	
12. Feedback on progress of booking (Selection phase)						
No feedback	52 %	17 %	**67 %**	**100 %**	**60 %**	
Progress bar or the like	48 %	**83 %**	33 %	0 %	40 %	**X**
13. Order of events in selecting flights (Selection phase)						
Airfares, Flights	43 %	33 %	0 %	50 %	**60 %**	
Flights, Airfare	14 %	50 %	0 %	0 %	0 %	
Simultaneous	43 %	17 %	**100 %**	50 %	40 %	**X**
14. Display of airfares and flight schedules (Selection phase)						
One flight pair + link	5 %	0 %	0 %	0 %	10 %	
All combinat. separately	29 %	0 %	**100 %**	50 %	20 %	
Flights below airfare	33 %	33 %	0 %	50 %	40 %	
Three subsequent steps	14 %	0 %	0 %	0 %	30 %	
Airfare after flight select.	19 %	**67 %**	0 %	0 %	0 %	
Nested scroll area	0 %	0 %	0 %	0 %	0 %	**X**

Observation	Control group	Airlines	Super-stores	Tourism groups	Travel agents	AVIGO
15. Possibility to change sort order (Selection phase)						
No sort options	**86 %**	**83 %**	**67 %**	**100 %**	**90 %**	
Sorting can be changed	14 %	17 %	33 %	0 %	10 %	**X**
16. Possibility to start modified search from page (Selection phase)						
Not possible	**71 %**	**100 %**	0 %	**100 %**	**70 %**	
Mod. search Possible	29 %	0 %	**100 %**	0 %	30 %	**X**
• Dates only	19 %	0 %	33 %	0 %	30 %	
• Dates and routing	10 %	0 %	67 %	0 %	0 %	X
17. Display of airport taxes (Selection phase)						
Taxes not considered	10 %	0 %	0 %	0 %	20 %	
Taxes considered	**90 %**	**100 %**	**100 %**	**100 %**	**80 %**	**X**
• Included in price	33 %	50 %	67 %	0 %	20 %	**X**
• Displayed separatel.	57 %	50 %	33 %	100 %	60 %	
18. Registration required (Preparation of booking phase)						
Registr. not required	57 %	50 %	33 %	50 %	**70 %**	
Registration required	43 %	50 %	**67 %**	50 %	30 %	**X**
19. Seating preferences (Preparation of booking phase)						
Seating not considered	52 %	17 %	0 %	**100 %**	**80 %**	
Preferences forwarded	38 %	**67 %**	**67 %**	0 %	20 %	**X**
Interactive seating plan	10 %	17 %	33 %	0 %	0 %	
20. Service fee (Preparation of booking phase)						
No service fee	**76 %**	**100 %**	**100 %**	**100 %**	50 %	**X**
Service fee	24 %	0 %	0 %	0 %	50 %	
21. Payment options (Preparation of booking phase)						
Plastic card only	52 %	**100 %**	0 %	50 %	40 %	
Also other means	48 %	0 %	**100 %**	50 %	**60 %**	**X**
• Debit entry	24 %	0 %	33 %	50 %	30 %	
• Bank transfer	19 %	0 %	67 %	0 %	20 %	X
• Both	5 %	0 %	0 %	0 %	10 %	

Observation	Control group	Airlines	Super-stores	Tourism groups	Travel agents	AVIGO
22. Receipt of ticket (Preparation of booking phase)						
Mail/ courier only	**80 %**	**83 %**	**67 %**	**100 %**	**80 %**	**X**
Pickup possible	20 %	17 %	33 %	0 %	20 %	
• Airport (T.O.D.)	10 %	17 %	0 %	0 %	10 %	
• Travel agency	10 %	0 %	33 %	0 %	10 %	
• Both	0 %	0 %	0 %	0 %	0 %	

Table 3: Compliance of AVIGO with other web sites

Web site	Number of matches	Web site	Number of matches
Aer Lingus	9 (41%)	Airbroker24	9 (41%)
Air France	9 (41%)	billiger-fliegen.com	7 (32%)
British Airways	6 (27%)	ebookers	12 (55%)
KLM	6 (27%)	e-Sixt	12 (55%)
Lufthansa	13 (59%)	flights.com	6 (27%)
SAS	13 (59%)	flug.de	12 (55%)
Expedia	19 (86%)	Skyways	7 (32%)
Travelocity	15 (68%)	Travel24	11 (50%)
Opodo	15 (68%)	Travel Channel	10 (45%)
Neckermann Reisen	12 (55%)	Travel Overland	11 (50%)
TUI	10 (45%)		

Software Architecture and Patterns for Electronic Commerce Systems

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Abstract

Electronic Commerce is one of the most significant fields in internet applications. With the focus moving from B2C-commerce to B2B-commerce, integrating internet and legacy systems within one company and getting technologies used in different companies to work together is a pretentious task. After discussing the current research in software architecture, including suitable notations for describing them, the aim of this paper is to derive and identify patterns on an architectural level that are specific to the domain of electronic commerce systems. In order to achieve this, we present two case studies featuring selected architectural views on both online shop and electronic procurement systems.

1 Introduction

Creating software systems in the domain of Electronic Commerce with a wide variety of e-business models [Bartelt et al. 2001] is still a challenging task. Although a couple of standard software packages as well as specialized, individual solutions exist, software design know-how in this area is not well documented. Based on current research in software architecture the usage of new patterns described in a suitable notation is proposed. Patterns are derived and identified on an architectural level specific to the domain of electronic commerce systems. In order to achieve this, two case studies featuring selected architectural views on both online shop and electronic procurement systems are presented.

2 Software Architecture

An important role for software architecture is to act as a mediator between the requirement analysis and definition phases and the rather fine-grained system design phase which paves the road to implementation.

As such, a software architecture should not only describe the system in purely technical terms but also capture the language spoken within the domain the system is going to be implemented in. In fact, it should be useful and understood (and understandable) not only by technicians, but virtually any stake-holder involved.

As for many terms, there are a couple of definitions for software architecture. They are not diametrically opposed, but rather emphasize different aspects of software architecture. One of the more frequently used definitions is the following [Bass et al. 1997]:

> *The software architecture of a program or computing system is the structure or structures of the system, which comprise software components, the externally visible properties of those components, and the relationships among them.*

One distinguishing feature is a high abstraction level. A software architecture should describe the system on a broad level, before subsequent phases take the design process into detail. This is illustrated by the fact that a component on an architectural level does usually not match a single class or object.

Another vital point to the architecture of a software system is that it has no single face. It is a collection of views on a system that vary both in viewing angle and abstraction level. Commonly used views include functional view, deployment view, business process view and others.

The functional view for example, will describe what functions need to be performed by the system and what domain entities are involved. The functional view can be looked upon from different detail or abstraction levels, and can be focussed on arbitrary subsystems or entities.

Not all views need to be relevant to all stake-holders. The mapping of software components to hardware, which accommodates for availability and fail-over requirements is probably not interesting for domain experts.

Software architecture depicts a software system by describing its constituting components and their interactions. This description is usually performed for different views of the systems.

To be able to effectively create a system's software architecture, suitable tools and a notation is required. During the 1990's, a significant amount of research went into this field. A number of notations where invented. These notations are known under the term architecture description languages (ADL).

As mentioned earlier, different definitions of software architecture highlight different aspects of it. Most ADLs emphasize the composition aspect, with special attention to the connectors which enable component interaction and promote the connector to a first-class entity.

Till now, none of the ADLs have had a major impact on today's software development. One of the reasons accounting to this fact is probably their focus on modeling particular

types of systems. An ADL like Wright [Allen 1997] for example, enables the modeler to perform deadlock analysis for component interaction.

An alternative approach is using the unified modeling language (UML) as a notation for describing software architectures. The advantages are that it is widely known, commonly used and there are a couple of production level tool suites that are mature.

3 Patterns …

Patterns provide solutions for recurring problems, that have proved useful in practice. They add the following benefits to software engineering:

- saving of time and cost because problems are not tackled from scratch
- deeper understanding and better ability of communication amongst stake-holders because patterns often identify and define key terms of the problem
- increased quality and robustness of the actual solution, because it has been tested and refined through repeated use in practice

Patterns like they were introduced by the now famous Gang of Four [Gamma et al. 1994] are largely design patterns. They usually solve a specific design problem within the context of object oriented languages.

Buschmann et al. [1996] use patterns to describe software architectures while Fowler [1997] uses patterns to solve recurring problems in specific application domains. They also introduce a hierarchy of patterns:

Architectural patterns describe a significant part of or view on a system. They sometimes define a certain style that is used throughout. One example is the model-view-controller pattern used in interactive applications.

Design patterns solve problems that are closely related to a specific programming paradigm. A significant part of literature related to patterns today focuses on design patterns, and especially those that are being used in the context of object oriented programming languages, in particular Java. These are patterns like façade, business delegate, bridge pattern and many others.

Idioms are most low level, often fragments of code and applicable only to a certain programming language. An example of an idiom is a reference counter for dynamically created objects in C or C++, in order to support efficient memory management.

We propose another class of patterns, which we call domain patterns.

Unlike architectural patterns, which are rather technical and generic with respect to the area the actual software system is being used in, domain patterns describe organizational structures or business processes that have proved useful within a particular application domain. One example is the order process used in electronic commerce systems.

In the remainder of this paper the focus will be on domain patterns, which are particularly useful in software architecture. They aid in establishing a common language, help identify and document domain specific entities and processes and preserve knowledge gained in subsequent software projects within a specific application domain.

4 … and Domain Architectures

In most cases the application domain for which a new software system is created existed long before - which means that the domain already has a certain set of standards or reference literature and there is a defined vocabulary for entities and processes in that domain.

It should be noted, though, that processes might change when adapted to information systems and in some cases might even make new processes possible that did not exist before, either because they would have been to costly or just not feasible. One example is realtime order and delivery tracking.

Two case studies are presented which examine two vital elements of electronic commerce systems - the catalog and the order process. They are performed for both online shops and electronic procurement systems in order to see where they differ and whether reuse of architecture through patterns is possible with these two related application areas. UML is used as a graphical notation, while the pattern description roughly follows [Meszaros et al. 1996].

The Catalog is a central part of any Electronic Commerce system. There are a number of different ways how to exactly organize products in a catalog. We try to give a blueprint for the organization of a catalog, discuss alternatives and compare it with common structures found in today's commercial products like Intershop Enfinity and standard E-Business formats like BMEcat, xCBL or cXML.

After looking at the catalog, which represents a rather static structure, the look is at a dynamic (business) process which is the order process. The order process involves user interaction with the front-end system as well as other systems in the background.

Existing deficiencies of UML are exposed and it is elaborated on the overall suitability of UML, if applied to modeling on an architectural level.

5 Architectures for Electronic Commerce

Before proceeding to the case studies, short definitions for both online shop and electronic procurement systems are given.

The online shop [Bartelt et al. 1999] is probably the most prevalent type of electronic commerce applications. Regarding involved actors, it is categorized as a B2C (Business-to-Customer) application. The retailer is selling goods to consumers.

Electronic procurement systems enable business between non-private parties. More precisely, a certain set of offerings is gathered from multiple vendors into a single view for the customers. Today electronic procurement application are usually centered around so called MRO goods (Maintenance, Repair and Operation), which are essentially items that are not directly involved into the value added process. Furthermore, electronic procurement applications are divided in two classes: supplier-centric systems and buyer-centric systems [Bruins et al. 2000; Georgantis et al. 2002].

In a supplier-centric system, the supplier manages and updates the catalog. This involves no or little costs for the buying party, but makes the actual procurement activity more complicated as soon as multiple vendors are involved.

In a buyer-centric system, the purchasing party manages the catalog of the procurement system, which might be a part of the corporate intranet. Aggregating the contents

of several possibly different catalogs from multiple suppliers is challenging, to say the least. The biggest advantage is the simplification for the purchaser, as he or she does not need to visit multiple websites with different user interfaces. Also, the purchasing party has full control on what catalogs or items are displayed for a particular user.

Another business model is the marketplace. Unlike online shops, where one vendor serves multiple customers and electronic procurement, where one vendor servers one customer at a time, in the marketplace multiple vendors interact with multiple clients.

5.1 Electronic Commerce Catalog Pattern

Context and Forces:

Before attempting to come up with a suitable structure for catalogs, we need to take a look at the requirements. As the catalog is a means to organize products, these requirements are of organizational nature:

- support nested categories
- items should be able to be assigned to multiple categories
- intelligently support variants of a base product (example: one item that is available in different sizes).
- attributes of products should be flexible enough to support each products peculiarities, but should also ease assignment of common attributes for all products or products of a certain type
- compatibility with major classification schemes, like UN/SPSC [Unspsc 2002] or Ecl@ss [Eclass 2002]

Solution:

A simple, straightforward model for the catalog is shown in figure 1.

The catalog serves as a root node. Below this root node we have a number of categories. Categories itself may be nested, the nesting may be of arbitrary depth. At the same time categories may have products assigned to it. Note that there may be categories that have no products assigned to, but a product needs to be linked to at least one category.

This structure fulfils the first two requirements that were proposed. Now we need to take a look at the products attributes which fall into a set of different types of properties, some of which are constrained in a certain way, while others have no such restrictions.

A suggested solution is shown in figure 2. There are properties that each and every product has.

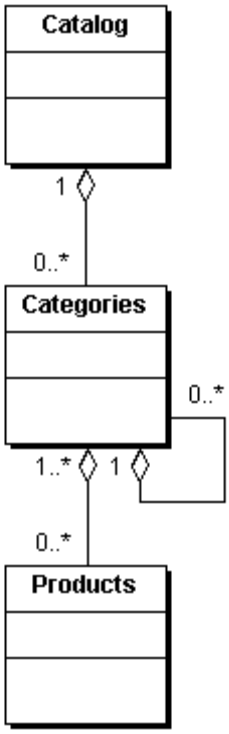

Figure 1: Basic Catalog pattern (UML class diagram)

We call them fixed attributes, and these are properties like manufacturer, identification code and textual description. Product type attributes are those attributes that certain kind of products have in common. An example for a product type attribute is the number of pages for a product type book. Note that we refer to product type, not categories. Categories might or might not group products of the same type under one category. Categories are presentation-oriented and are not necessarily related to product types.

The product type in our catalog pattern maps to the classification scheme used in the mentioned standards mentioned above. Finally, a base product may have variations of one product, that differ in color or size, for example.

Variations:

Although not stated in the diagram, you would usually assign a price to a product variation, not the base product, because certain variations may be more expensive than others. You may have a default price associated to a base product, though, in order to avoid the need to specify it for each variation in case it is same.

Finally, there may be the need to assign attributes that are freely definable. We call them custom attributes. This caters for information certain manufacturers specify, while others that deliver products of the same type may not be able or willing to provide, or that stem from different depth on information transported by different catalog exchange formats, which particularly applies to electronic procurement applications gathering data from a couple of source catalogs.

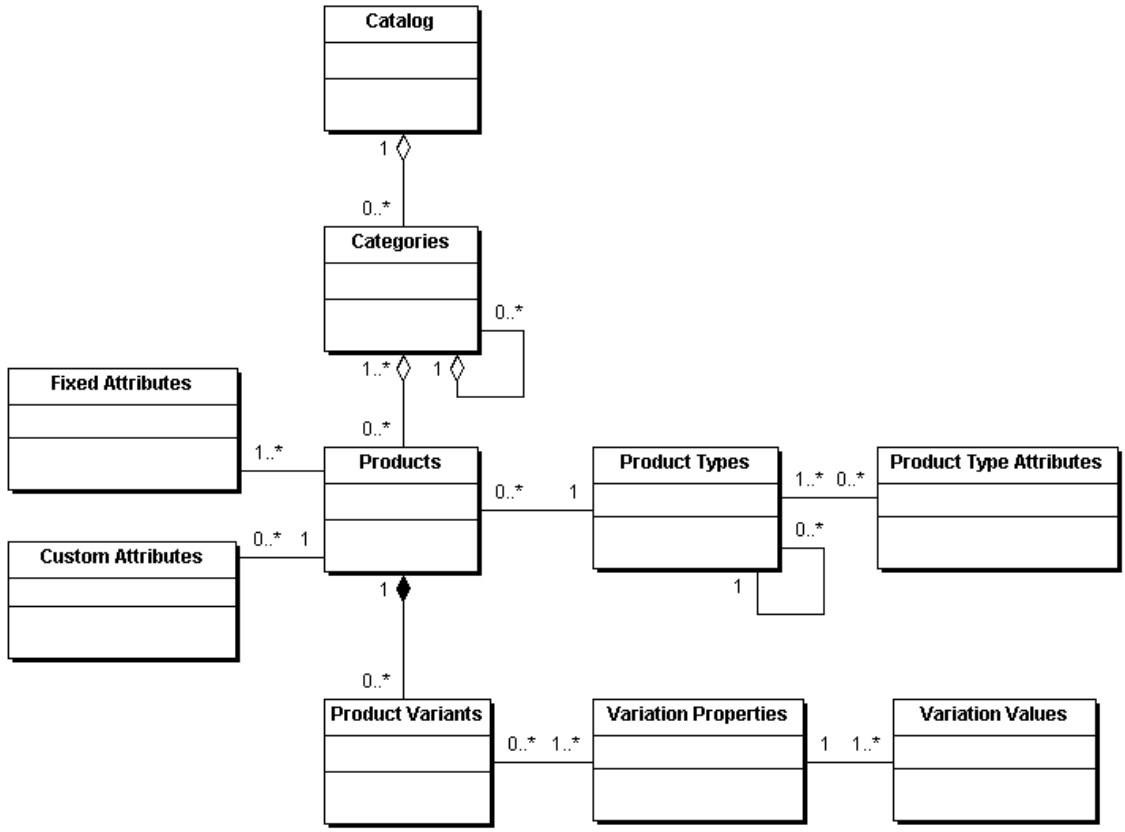

Figure 2: Electronic Commerce Catalog pattern (UML class diagram)

While this catalog pattern enables you to cope with most classification schemes in use today, there are a number of subtle questions that need to be answered during the planning and implementation of such a system. How do you assign products to multiple categories? Does each of the affected categories have a reference to one and the same product or is a new instance of this product being created alongside ? Note that this is not an implementation level decision. It rather depends on whether one has the requirement to assign different attributes depending on where the product is presented.

Currently available standard software packages handle this in different ways. Intershop Enfinity [Intershop 2002] assigns products by reference. Hybris Jakarta [Hybris 2002] allows you to have a copy of one product inherit all properties of the master product, and explicitly lets you overwrite attributes as required.

The catalog pattern may be used equally well for online shop and electronic procurement applications. The main difference does not lie in a suitable static structure, but rather in the process of populating the catalog.

It can also be used with catalog exchange formats like BMEcat [Bmecat 2002]. BMEcat has concepts and tags related to the catalog hierarchy, a so-called feature system that maps to product type attributes and classification schemes and product variants as well as user defined extensions that equal custom attributes in our catalog pattern.

Currently, there exist a number of standards for both classification and identification of products. A classification scheme groups related items into same categories, whereas an identification scheme assign unique codes to products in order to unambiguously identify them. Discussions of various identification and classification schemes can be found in [Beckmann et al. 2001] and [Granada 2001].

In supplier-centric electronic procurement applications, multiple catalogs are merged into one catalog in the procurement system. The use of one and the same classification scheme is essential for easy integration. If the source catalogs use different classification schemes, the process of merging these becomes intricate. Possible solutions include an approach to map one grouping scheme to another, which is beyond the scope of this paper.

Another difficulty lies in the diversity of catalog exchange formats. There are a couple of possible strategies to map one catalog exchange format to another. Almost all of them employ Extensible Stylesheet Language Transformations (XSLT), see [Buxmann et al. 2001; Omelayenko et al.2001a; Omelayenko et al.2001b] for examples.

5.2 Order Process Pattern

Context and Forces:

After having browsed through the products, the customers eventually proceeds to the order process. The requirements are simple:

- personal information of the purchaser, like payment and delivery details need to be collected
- the purchaser should get a confirmation
- order information must be passed to the relevant systems or persons for fulfillment

Solution:

A straightforward order process for online shops is presented below in figure 3.

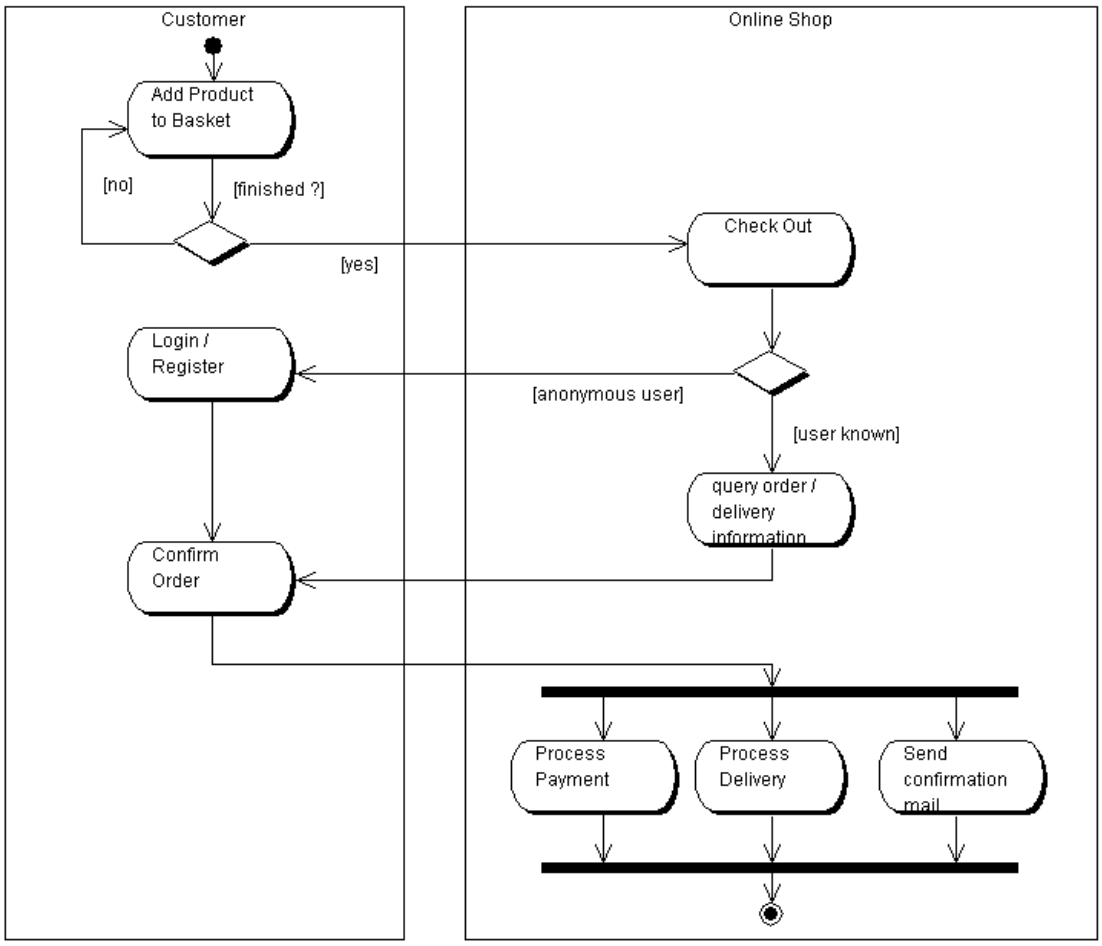

Figure 3: Order process for online shops (UML activity diagram)

The customer adds products to the basket and finally enters the order process. In an online shop, the purchaser may or may not have registered or logged in. Online shops usually defer the process of collecting personal information until absolutely needed in order not to scare off potential buyers from browsing through the offerings.

The payment and delivery processes might be tightly integrated with the shop platform through payment and ERP systems or might be handled manually.

Variations:

An electronic procurement application, particularly one that is buyer-centric, usually is part of a corporate intranet. In this case, proper authentication is handled right from the start in order to guarantee that the person is authorized to use the application.

Another significant difference is that electronic procurement applications need an additional workflow subprocess which is part of the order process itself, as seen in figure 4. During this process, orders can be queued for manual approval and budget constraints can be checked.

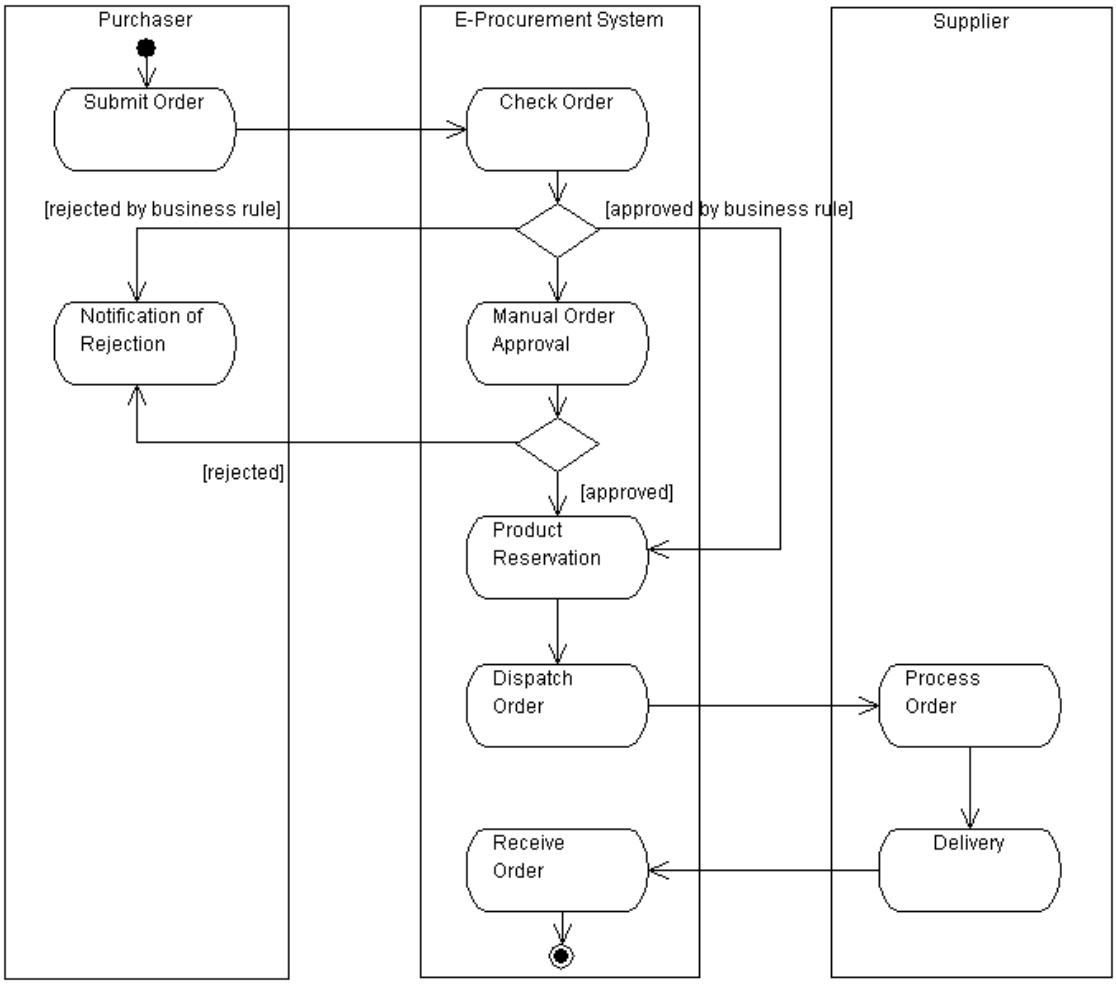

Figure 4: Authorization workflow for electronic procurement (UML activity diagram)

The order comprising of multiple products needs to be split into sets that correspond to one supplier each. Finally, the system must be able to handle invoice and billing functions.

6 Conclusion

The Unified Modeling Language has been used as notation throughout this paper. Using UML for architectural diagrams has drawbacks, though. First, there aren't really rules regarding what type of diagram to use for which kind of view, which stems from the fact that UML has not been designed as an architectural notation in the first place. The decision to choose the appropriate diagram type can be difficult for the person creating these diagrams and confusing for people reading them, because they might, for example, not be acquainted to class diagrams being used to describe domain entities which may or may not have anything to do with classes. Also, different people might use a different type of diagram for one and the same view.

In lack of convincing alternatives, we would still recommend to go with UML. Architectural issues are getting into the focus of UML's driving forces, although proposals are often not very concrete.

Regarding online shops and electronic procurement, it can be said that there exist patterns which capture best practices within these application domains. During the process of finding appropriate solutions it is important not to ignore concepts and reference solutions as well as requirements that have already emerged over the time within the application domain outside the context of information systems. These patterns can and already do serve as building blocks for domain specific standard software packages and frameworks.

The online shop is the predominant business model among electronic commerce applications existing today. Electronic procurement applications are emerging and most vendors that offer standard software packages for online shops are extending them to be used for electronic procurement.

Some requirements, like authorization workflow can be added with comparatively little efforts. Integrating multiple catalogs, which possibly employ different classification or identification schemes into a single application, though, is a major challenge.

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Global Identity Management to Boost Personalization

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Abstract

The development of the Internet was originally based on the assumption that a user remains anonymous. However, more and more services need to know the user for providing services or for presenting the user to other users. An important functionality in this context is personalization. To perform personalization identification and exchange of user profiles has to be performed on the Internet. In this paper we argue that user-centric global identity management is needed for personalization to spread. We present the current state of work in the area of identity management, discuss needs and possibilities for future developments, and show some results of the work we have done in this context.

1 Personalization

Personalization is increasingly considered to be an important ingredient of Web applications. In most cases personalization techniques are used for tailoring information services to personal user needs. In marketing, personalization supports one-to-one marketing which should increase the customer share over a lifetime. What used to be possible in the corner shop, since the shopkeeper knew her customers personally, will be extensively possible in the electronic medium by the storage of profiles and the automatic evaluation on the basis of predefined rules. With the use of electronic media, the advantages of mass production (the same online-shop and the same product database for all customers) are harnessed to the strengths of individual production (personalized website) [Schubert/Koch 2002].

Technically, personalization is about selecting or filtering information objects or products for an individual by using information about the individual (her customer profile). Different methods are known for performing this selection. These methods range from content based filtering with rules or vector similarities to automated collaborative filtering (see [Schubert/Koch 2002] and [Koch/Schubert 2002] for more information). But independently of the personalization method the ability to deliver personalization is al-

ways based on the acquisition of a picture of the user. Depending on the personalization method used, there are different requirements to the representation of this picture. For content based filtering information about preferred content and relationships to content objects has to be stored. For collaborative filtering relationships to other users and ratings have to be managed.

Figure 1 shows different types of information about a user that can be used for personalization. This information ranges from the name of the user, demographic attributes and the history of past purchases to dynamic attributes like the current position as used in location based personalization.

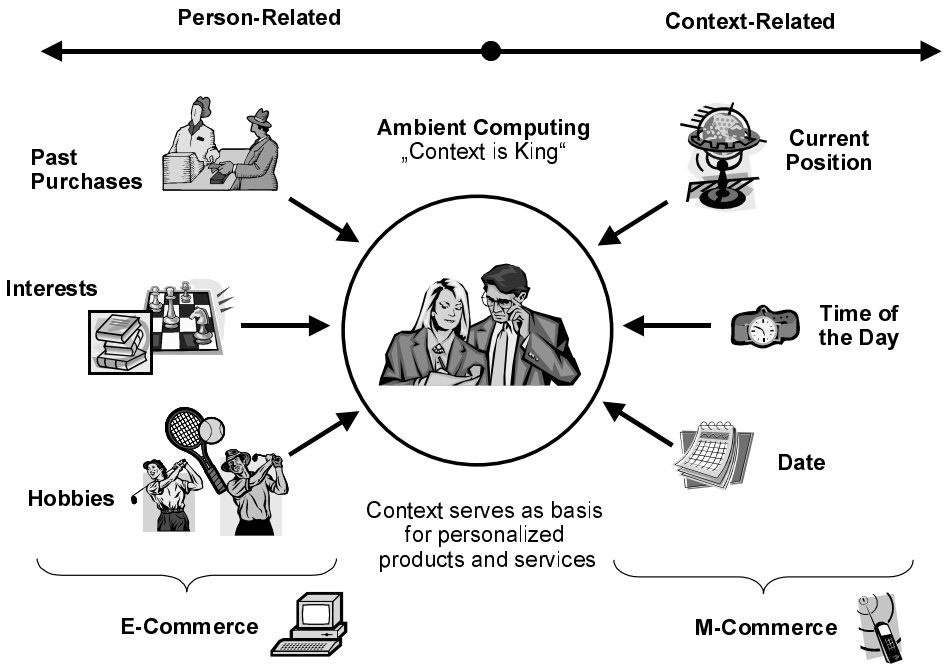

Figure 1: Personalization as key to ambient computing [Schubert/Koch 2002]

For coding simple user profile information like addresses or payment information some standards are available. Examples are the vCARD standard [Howes et al. 1998] or the profile scheme included in W3Cs P3P specification [P3P 2000]. These approaches are mainly based on hierarchically structured sets of attribute value pairs.

For more complex information like interests or browsing histories every personalization application defines a proprietary coding based on the application and on the algorithms operating on the information.

In addition to what is already used in live applications there is some work on user profiles emerging from Artificial Intelligence and Knowledge Management research. See [Essing 2001], [Fink/Kobsa 2000] or [Mertens/Höhl 1999] for more information on abstract modelling of user profiles and user profile servers.

2 (Problems with) Acquiring User Profile Information

There are various methods for capturing user profile information, which engage the user to different degrees. One usually distinguishes asking the customer (fill-in-profile, explicit feedback or ratings) and watching the customer (click-stream- or transaction-analysis). While the discussion of these methods is important it does not address some basic issues in user profile acquisition:

1) users often do not trust services that collect and use profile information (and therefore try to provide false information)
2) some time and effort is needed before enough information is collected to provide appropriate recommendations; small sites do not have a chance to get enough information from the user (by watching)

The second issue is called “cold-start-problem”. This means that users expect good recommendations from the beginning, but the system is only able to provide recommendations after having asked the user a lot of questions or after having watched the user for some time (to fill the user profile). This issue is of special importance in the field of Small and Medium-sized Enterprises (SMEs).

3 Identity Management

One idea for solving the problems mentioned in the previous section is to give control of profile information back to users (*to solve the trust issue*) and to allow the reuse of profiles among the different personalization services (*to solve the cold-start problem*).

To do so we have to separate the usage of user profiles (in the personalization services) and the storage of user profiles (e.g. in a central user profile server). This set-up opens the possibility of user profile reuse and provides a single location where user access control and user awareness (of who is using what information) can be implemented in a way the profile owners trust.

When we take a user-centric point of view to the issue we usually do no longer talk of user profiles and user profile management but of identities and identity management. An *identity* is the set of attributes describing (an aspect of) a person. Managing which information is available for which application is called *identity management*. Identity management is something we do in normal conversation everyday when we decide on what to tell one another about ourselves. In interactions with others we consider the situational context and the role we are currently acting in as well as the respective relationship with the interaction partners. This results in different sets of information being released to different interaction partners. Sometimes this leads to the situation that a person is known under different names in different contexts, e.g. by using special names, nicknames or pseudonyms suiting the occasion [Köhntopp/Bertold 2000].

Also or especially in the digital world people are using different (digital) identities. When interacting with different applications from different providers and using different identities it becomes hard to keep track of the information which service stores which information, and to keep the information in the services up to date.

An identity management system would allow people to define different identities, roles, associate personal data to it, and decide whom to give data and when to act anonymously. An identity management system would empower the user to maintain their privacy and control their digital identity.

Some projects that seem to follow similar ideas have been launched or announced in the past years: Microsoft Passport, Novell DigitalMe, the Liberty Alliance project and XNS. However, most of these solutions follow the centralization approach but do not give the user control of her profile (make the user owner of her profile). Additionally, these projects do not deal with complex user attributes that are needed to model interests or relationships. We will review related work in more detail in Section 5.

At Technische Universität München we have built our own identity management solution, which is clearly focussed on user empowerment and which supports complex user profile attributes, the IDRepository [Koch/Wörndl 2001, Koch 2002a, 2002b].

4 IDRepository

Our technical approach is to separate user profile information from services that make use of it, and store the identity in a central place where it can be maintained by the user and be accessed by different services (with permission of the identity owner).

The core component in our architecture is a user profile repository service (IDRepository) that stores identities and offers the identity owner and authorized services interfaces to access this information (see Figure 2).

The server offers a functionality to store more than one identity and to link identities to each other (defining data propagation paths).

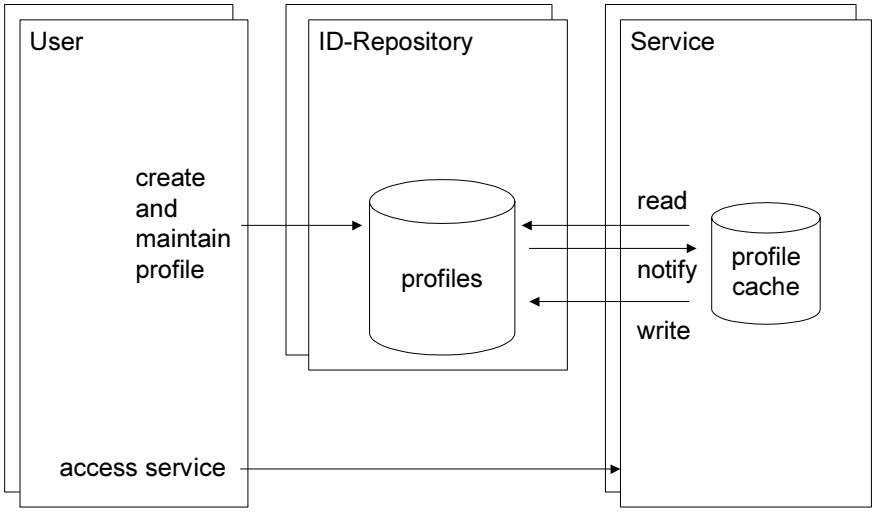

Figure 2: Identity Management Architecture Components.

For using the repository we have several possibilities placed between the following two extremes:

- one central identity server for storing all identities of all people
- one or even several servers per person storing different identities

We imagine that in the real world there will be a federated solution with independent identity providers – companies that operate identity servers – and no central authority (see Figure 3).

The services that read the profile information from the IDRepository should have a possibility to cache this information for some time. Here we need a means for keeping the cache up to date (and for the user to request deletion of the cached copy). After the negotiation of the basic lease this whole process can be seen as replication of the data with a master copy.

Now that we outlined the general architecture for storing and accessing profiles, there is the question of how a profile should be structured to be of general use and allow interoperability.

As mentioned in Section 1 current personalization solutions mainly rely on proprietary user profiles or use simple standards defining attributes for name, payment and delivery information.

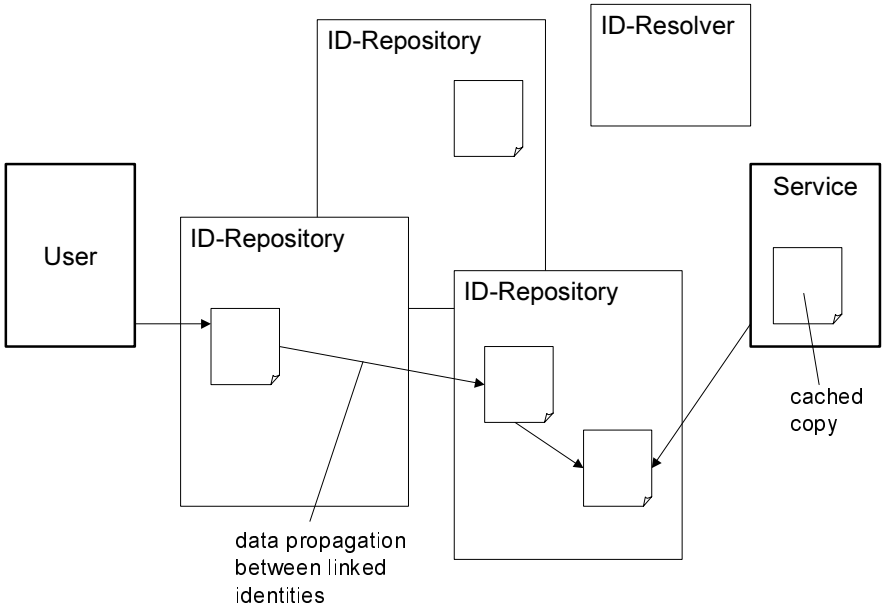

Figure 3: Identity Management Network.

When reviewing information needs in Internet based (personalization) services the following types of information can be identified:

- basic and demographic attributes like “name” or “gender”
- information about interests: This can be represented by correlations with predefined clusters or stereotypes (e.g. in iFAY (www.ifay.com)), by explicit attributes (e.g. “interest.music = ‘hip hop’”) or by collaborative interest definitions (correlations with other users). The source for all of this can be ratings given by the user to information (implicit by visit or explicit).
- ratings given by the profile owner to information items or products

- information about relationships to other people: colleagues, buddies, …
- browsing and shopping (transaction) history
- preferences
- PIM (personal information manager) information (e.g. calendar)

Some of this information can be stored in a standard way using attribute value pairs with string values, but not all of it. Therefore, our approach extends the standard approach by new data types mainly for ratings and for relationships. Additionally, there is the possibility to have multiple values in any place in the hierarchy. This is needed to store sets of values for an attribute (e.g. "personal.spokenLanguages = ('de', 'en', 'fr')") or to provide several data sets (e.g. "personal.address(1).street", "personal.address(2). street").

The main features in our approach can be summarized as follows:

- hierarchical attribute space
- values at any level can be sets (multiple values)
- domain specific standard set and additional application specific attributes
- special types for relationships and ratings
- ontology to define attribute hierarchy, attribute names and data types

Since attributes can be set by different sources they have to store meta information about who has set them. In addition to knowing who has set some data it might often be necessary to have a prove for this. If attributes are to be used for one application only, the service could store these attributes locally (and only store the other attributes globally in the identity management service) – but there might be needs where attributes should be exchanged among services and still have to be trusted (e.g. attribute that user has bought for more that $1000 at one e-commerce site which entitles her for special discounts in other services). The two solutions to this issue are that the identity management service itself guarantees the source of the data or that the data source digitally signs the data so that anybody can check the origin and the integrity. We have chosen the second possibility. The repository servers offer a possibility to sign any sub-hierarchy or sub-set of attributes in the repository and store the signatures.

5 Related Work

Work related to user profile and identity management can be found both in industry and research. First, there is work on client based profile management and provision to servers via form-fill-in or P3P in infomediaries. Second, there are already several server based identity management solutions. And third, there is basic work on identity management and privacy.

Infomediaries

Today, user-related information is stored by different services independently in proprietary ways. Alternatively, user profile information can be stored on the user's computer, and be provided to services when needed. This could lead to higher trust because per-

sonal information is located near the user and because the usage of profile information can be controlled and monitored.

Client-side user profile storage is implemented by so-called infomediaries. Infomediaries are (small) applications on the client computer, which manage user profiles and offer services such as automatic fill-in of Web forms or P3P interfaces for exchanging the information with services [Cranor 1999]. Examples for infomediaries are Jotter (www.jotter.com) or Persona (www.persona.com). Some infomediaries have additional features for automatically sharing information with marketers of products or services they have expressed interest in.

The main problem of client-side storage of user profile information is that it is not portable [Mulligan/Schwartz 2000]. Personal information stored on one computer (e.g. at work) cannot be easily transferred to another one (e.g. at home or a mobile device). An additional problem with today's infomediaries is that the definition of access rights is possible but much too complex for everyday usage.

Single-Sign-In and Server-based User Profile Databases

While the infomediaries focus on user control of identity information server-side solutions are often more service-centered.

These solutions relate back to multi-server authentication solutions like Kerberos [Steiner et al. 1988]. In such single-sign-in solutions different servers or services share one service to authenticate users. Often the single-sign-in solution is extended to a user profile that is shared among the different services.

Today different software vendors offer such single-sign-in solutions for Intranets. The solutions are mainly based on (X.500) directory services or at least accessible via the LDAP directory access protocol.

While the single-sign-in solutions mentioned before are tailored for Intranet usage, global solutions like DigitalMe from Novell (www.digitalme.com) or Microsoft Passport (www.passport.com) extend this approach to a service for Internet usage. The core of these services is a central user profile directory (operated by Novell or Microsoft). Users can store and maintain their personal data in these directory servers via Web interfaces. Services that are certified by the profile storage operator can get access to the authentication and profile information when a user tries to log in at these services.

The systems are very similar to what we have in mind with the IDRepository. The main difference is in the missing orientation towards the profile owner, which shows in the profile data scope, missing access right definition, and the concentration on one profile storage operator. So, the information stored in the repository is limited to "basic e-commerce information" like delivery information (name, address) and payment information. Profile owners do not have the possibility to define access rights to their needs or to get information about the profile usage.

Other central user profile repositories are even more focussed on marketing. So iFAY (www.ifay.com) or Yodlee (www.yodlee.com) support clustering users and making the information about the affiliation to clusters available to services that pay for it.

In addition to the large identity management networks like Microsoft Passport several smaller projects have appeared. Examples are XNS (www.xns.org) and Live-id.org

(www.live-id.org). These companies mainly follow a federated approach that allows for different identity servers operated by different companies.

To allow interoperability, the identity management providers and other companies that are already operating large Internet identification services like AOL, eBay, MSN or Visa have joined in the Liberty Alliance to develop a standard for connecting their identification and user profile storage services in a federated way. See [AberdeenGroup 2002], [Sun 2002a, 2002b] for more information on the industries viewpoint on federated identity services.

The Liberty Alliance is currently on the way to define an open standard for the representation of identities, for the authentification of users and for authorizing access to user profile information. The goal is to make it easy for services that are storing user profile information to exchange the information among each other [Liberty 2002]. However, the focus of Liberty Alliance again is on the services. There is no real user control built into the proposal yet.

Profile Information Exchange

Other related work in the commercial field is about exchange and synchronization of user profile information among users or among applications of one user.

Examples for the replication of user data among users are business card exchange services (see www.cardxchange.net for one example). In these services users can store their contact information (and any additional attributes) and make a subset (view) of this information explicitly available to other users. When the information is changed by the owner the electronic business card changes at all places or the people replicating the information are notified by email. Similar functionality is often built into Community Support platforms. So, various alumni platforms provide some form of address exchange functionality. An interesting generic approach in this area is the solution by XNS (www.xns.org) and OneName (www.onename.com).

Exchange and synchronization of PIM data (Personal Information Management – calendar, address and todo lists, notes) up to now has been restricted by the large number of proprietary protocols on the market, each focusing on only a small number of devices, applications and data types. SyncML (www.syncml.org) - an open industry standard for the synchronization of remote personal data across multiple networks, applications, platforms and devices - resolves this issue by providing a level of interoperability that is not possible with the industry's current proprietary synchronization protocols. In the context of SyncML also different data standards like vCard and vCal are promoted.

Identity management and usability

While commercial approaches concentrate on small subsets of user profile information and on service-centric implementations the research community is working on more general topics.

First we have to mention work dealing with what “identity” is and how the identity is used or determines interaction in online communication. Examples for work in this area are from Donath (1998) on Newsgroups and from Churchill and Bly (1999) on MUDs.

Security issues and legal implications are the topic of another large corps of work. Examples are [Damker et al. 1999] or [Köhntopp/Bertold 2000]. The work of Köhntopp also discusses general questions of identity management and user interfaces of identity management tools.

Finally, there is some work on the usability of security tools. At the University of Freiburg for example Jendricke and co-workers are discussing identity management as a concept for achieving usable security in the internet. They focus on reducing the complexity in user interfaces and are developing a security tool called Identity-Manager that allows the user to easily choose different views and identities [Gerd tom Markotten et al. 2001, Jendricke/Gerd tom Markotten 2000, 2001].

6 Identity Management Issues

The availability of user profile information will be important for future Internet based Electronic Commerce and Community Support services. Information about the users is needed for performing transactions, for presenting users to each other and for providing personalized services.

Identity management and central user profile repositories might help

- to motivate users making user profile information available (because they have control and awareness about who is using it)
- services to provide effective personalization without cold-start problems
- These two effects could help to boost the use of personalization in online services.
- However, there are still some challenges to be addressed. From the technical point of view the most important issues are:
- how to specify (and enforce) access rights (especially including usability and user interface issues)
- how to represent user profile data to make it usable by different services (up to now nobody has dealt with user profile structure very much)

Some of the issues cannot be solved through technology alone. Especially the issue of access right enforcement. As already discussed in the P3P project of the World-Wide-Web-Consortium a certification of services is needed to ensure that the services make correct statements about planned user profile usage. An issue linked with the service certification is the selection of a trusted operator for the identity management service. Here we have taken an approach that allows different providers to operate identity servers and allows the user to select.

To gain trust from the profile owners a solution has to clearly support

- definition and handling of different access rights and/or sub-identities
- provision of awareness of access to the profile information

The functionality has to be provided in an intuitive way and has to cover the emerging mobile applications that also need user profile information for performing their services. All this has to be provided by different (trusted) operators for identity management servers to choose from.

While this approach of federated identity management services is already taken up by big consortia (see section on related work), current approaches are still too much focussed on services to become global identity management solutions. In our opinion more user-centered solutions from service independent providers with a focus on access right definition and usability are needed for the future. In this context work on making the usage and configuration of these services as intuitive as possible to the profile owner is a central requirement. Here more work is needed. Another topic where additional work is needed is on business models for future identity management providers. First ideas are drawing from analogies of “user profile banks” with classical banks that have gained trust and are providing access to money from everywhere.

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An AI Approach to Information Filtering for Location Based Services

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Abstract

The perceived quality of Location Based Services (LBS) depends on the quality and the amount of information provided. Both information sender and receiver are interested in controlling the flow of information. Considering the phenomena of information-overflow and spam-mail it seems necessary to set up additional filters restricting the information flow according to e.g. predefined parameters or personal preferences of potential customers in their individual contexts. This paper introduces a user-controlled approach to represent filtering criteria for structured information-objects using a simple frame-constraint based knowledge representation in order to support immediacy, minimize visible complexity and to avoid consistency issues.

1 Introduction

1.1 Environment and setting

Preventing the phenomenon of *information-overflow* is the most important goal for the design of information systems in general. Information filtering in the area of mobile services is of special importance because of the limited resources of mobile devices e. g. display size, data transfer costs and the high *level of intrusion* of mobile push-technology.

Particularly procurement processes are characterized by the act of filtering information, e.g. product or service specifications and prices. Further parameters which often have to be considered are the locations of customers and resources in order to minimize transaction cost and delay.

The so called *Location Based Services* (LBS) [Pflug, Meyer 2002; Samsioe, 2002] as the currently most popular instances of *context-aware applications* [Schilit, 1994] enable information systems which automatically integrate these as parameters into the process of navigating through a set of alternatives.

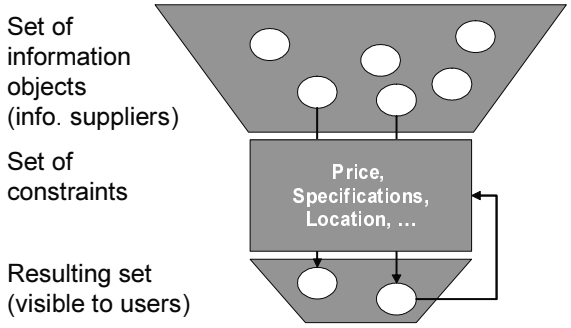

Figure 1: Simplified process of information filtering

The resulting set of information objects can be determined and presented in response to some kind of query (*pull approach*) or as soon as at least one alternative satisfies all constraints given (*push approach, permission marketing* [Schwarz, T., 2002]). This would lead to a notification of the user[1] and/or the presentation of an information object.

1.2 Motivation

Thus location-based commerce integrates elements of the customer buying cycle from the animation phase and the evaluation phase, where it ideally leads to a reduction of search costs in comparison to context unaware scenarios (from the customer's point of view). Although this reduction is at least partly compensated by the increased costs for the necessary infrastructure.

Suppliers profit by increased marketing efficiency if they can individually address customers in the area. These promises rely on an *implicit assumption*.

Every push-approach, even if combined with a *permission-marketing* concept, faces the risk of information-overflow leading to customers turning their devices off. Considering scenarios with multiple suppliers competing for a user's attention, it becomes clear, that some form of coordination of this information channel is necessary to keep clear of the information-overflow boundary.

Permission marketing and LBS push marketing implicitly rely on a non-opportunistic behaviour of suppliers. As a worst case, each supplier could explicitly cause the information-overflow phenomenon (e.g. if he could not attract the customer's attention) and thereby completely block the information channel and prevent local competitor's from contacting the customers.

[1] A consequence of mobility is the assumed 1:1 association between information devices and users.

Considering the amount of spam-mail in the fixed-line internet the abuse of LBS push channels for aggressive marketing activities seems plausible. Thus it is meaningful to set up an independent filtering mechanism in control of the customers or an agent acting in the interests of the customers.

2 A frame/constraint-based approach to information filtering

Information-retrieval and -filtering is one of the successful fields of applied *Artificial Intelligence* (AI). In this paper information filtering is investigated from a *knowledge based systems* (KBS) point of view.

KBS try to match the problem solving capabilities (the expertise) of an expert in a distinct problem domain [Kurbel, 1991]. A KBS is constituted by the explicit separation of problem relevant knowledge (also called *knowledge base*) from general knowledge included in the software code.

In a KBS assisting LBS enabled procurement processes this expertise has to be constructed as the cumulated product or service knowledge of all possible suppliers in a certain area and the individual needs and preferences of customers – the expertise of a broker or agent. This paper proposes a special representation for this knowledge.

While designing a KBS setting up the form of *knowledge representation* arises as a first but central step.

2.1 Knowledge Representation

There are to classes of knowledge representations: *symbolic* and *subsymbolic* representations. While symbolic representations contain symbolic elements (e.g. words) with an understandable meaning the so called subsymbolic representations have implicit meaning (e.g. neural networks).

Common web-filtering systems use symbolic representations but do operate on a technical instead of a semantic level and therefore use URLs, file- or image-sizes as criteria to guide the selection process (e.g. http://www.webwasher.com).

There are successful approaches to subsymbolic representation of information filtering „criteria“ or interest-profiles [e.g. Kuropka, Serries 2001; Marinilli, 1999; Riecken, 1994]. These systems are usually not under *control* of the user but evolve or learn from his behaviour or guidance with in the process of using the filter. Their results often cannot be symbolically explained or explicitly modified by users because of the lack of association between symbols und subsymbols. Furthermore the explanation of the filtering results is very limited by using subsymbolic representation but explanation is still an important factor for the acceptance of KBS [Kurbel, 1991].

In a learning system the more dynamic or abrupt changes in the interests of the users occur, the faster the quality of the filtering decreases over time. Furthermore, the mobile context is characterized by abrupt changes of context (e.g. changes of location, but also changes of social context like meeting people, etc.). Thereby changes in *information demands* are the results. Mobility allows *immediacy* – the possibility to arbitrarily

act or react at any time. In order to use the full potential of mobility, mobile applications have to support immediacy.[2]

Therefore a *semantic and symbolical* representation of filtering criteria considering the demands of mobile users will be investigated.

The common concept of *constraints,* as a special form of *semantic net* knowledge representation, can be used to express desired price, properties and locations of products or services as a set of variables. The concept is strongly *declarative* and enables an easy maintenance of the knowledge base which is of special importance because the knowledge base must be built and maintained at least partly by customers not teached to use knowledge representation techniques.

Formally a single constraint represents a relationship between two (or more) variables pruning their domain(s) [Barták, R, 1999].[3] Therefore constraints can be interpreted as declarations of conditions which can be used as triggers or *activators* for actions. Actions are e.g. the notifications of a user as mentioned above.

Both push and pull scenarios depend on the integration of the product or service knowledge, the knowledge of the *situative context* of the user (including his location), and the given constraints (provided by the user, supplier or both). The use of the frame paradigm or the more general object-oriented approach for representing this knowledge allows a combination of frames with a constraint approach to set up a hybrid concept of knowledge representation.[4]

This paper introduces a graphical notation[5] for the combined representation. *Activator constraints* are represented as directed associations between slots of the frames and frames indicating the dependency of the frame's visibility from the values of the connected slots. An additional (internal) formal notation is needed to express the exact constraint conditions but the graphical notation is useful to give an overview.

Currently, this notation is meant for illustration only. The implications of interacting with a graphical notation like this using a mobile device has not been discussed yet (see Figure 1) for an impression of the user interface used in a prototype application).

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[2] In a study of [BCG, 2000] 83% of potential users of mobile applications stated the immediate accessibility of up-to-date information as their motivation.

[3] Original text: A Constraint Satisfaction Problem (CSP) is defined as a set of variables X={X1,..,Xn}, for each Variable Xi a finite set of possible values (its domain), and a set of constraints restricting the values that the variables can simultaneously take

[4] Many frame-based systems already provide a constraint language to state the range of possible values for slots [Karp, P. 1993]. The Unified Modelling Language (UML) standard as an example for object-oriented knowledge-representation contains a complex constraint system (Object Constraint Language, OCL).

[5] The activator concept and notation was originally developed for the personalization of knowledge based configuration processes with a high degree of interdependency between configured elements in order to hide as much complexity as a situation allows.

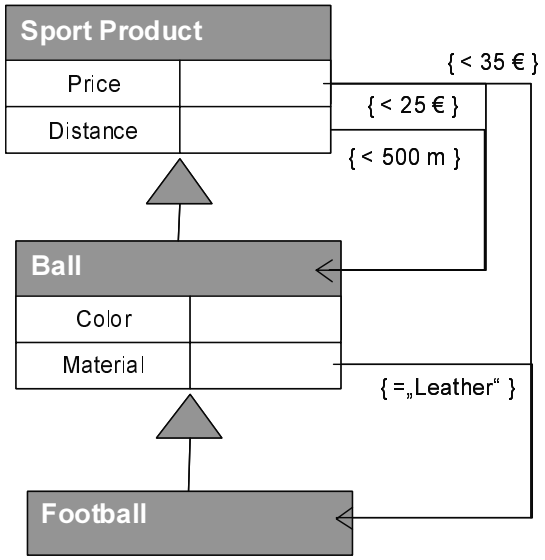

Figure 2: Example, graphical Frame-Constraint notation

Figure 2 shows an excerpt of a knowledge base with constraints set by the user as an example. This fragment can be seen as a kind of *pattern* matched[6] against physical resources in a distinct area. The slots *price*, *distance*, *color,* and *material* are inherited by the lower frame and thus also apply to instances of this frame.

Inferences on this knowledge base result in a notification of the user if an instance of "ball" costing less then 25 € is listed within a radius of 500 meters. For instances of "football" the slot "material" is further constrained: The price constraint is set to 35 € and no distance-constraint applies to instances of "football".

However if an instance of "football" satisfies the activation constraints of "ball" it will be activated.

2.2 Constraint consistency

These techniques rely on the accessibility and semantic representation of knowledge from different parties in the manner of a *semantic-web* (a *common ontology*) and the user's ability and willingness to express more ore less formal constraints and personal preferences. This can be seen as a subset of the *End-User Programming* (EUP) situation described in [Terveen, La Tondra, 1996].

The problem of consistency in *End-User Programming* scenarios is of minor importance when considering a set of activator constraints. Consistency describes the degree of agreement or lack of contradiction between multiple constraints. Regarding all tupels of constraints in a set there are three possible relationships between them

- They are unrelated and thereby per se non-conflicting each other.

[6] So this concept of a hybrid knowledge representation fits to the well known pattern matching algorithms used in many inference engines.

- They intersect in conditions (not consistency relevant) or conclusions.
  The latter expresses a logical “or” between the constraints which may lead to redundancy, but not to inconsistency.
- One rule subsumes another (as a special kind of intersection).
  This situation is technically consistent but usually undesired. This “inconsistency” can be resolved by suggesting the deletion of the less restrictive activator constraint.

An inconsistency as a context in which *conflicting* conclusions are deduced is not possible, because only one conclusion may be deduced in the inference process – the *activation* of an information item. An explicit expression for the *deactivation* of frames is not necessary and would allow inconsistencies.

2.3 Inference and interaction

Constraint representation gives the opportunity to work with either hard or fuzzy constraints combined with specific optimization techniques. In case of an empty result set the KBS identifies that alternative(s) violating the specified constraints in a minimal way. On the other hand optimisation techniques give additional guidance in large result sets by ordering the alternatives according to the degree of non-violating or according to pre-specified criteria.

When an information object is presented on demand (e.g. after navigating through a catalogue) users can specify constraints similar to the *Query by Example* (QBE) method indicating e.g. “Notify me, if I draw near a product like this costing less than X €” (“opt-in”). This interaction follows the idea that it is generally easier to criticise a given result than to state requirements in advance. Furthermore QBE spares the need for a user-visible formal constraint language as shown in the screenshots of Figure 3.

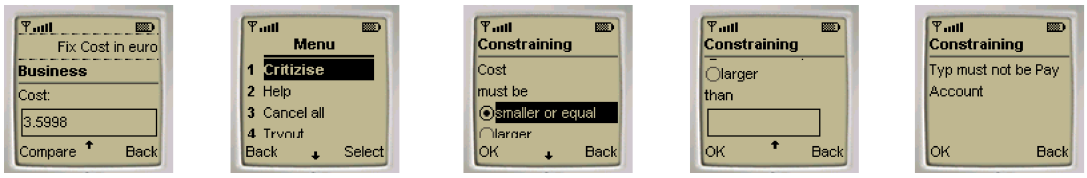

Figure 3: Example user interface for user constraint specification

Figure 3 shows the user interface implemented in a prototypical application enabling mobile devices to get access to a constraint based service configuration system. The images 1 to 4 of figure 3 show the navigation path for the specification of a numeric constraint while image 5 shows the specification of a nominal constraint.

In case of complex and customisable products or services (mass customisation) the sets of abstract usage-oriented customer-requirement-constraints can be used to deduce a configuration in form of technical product or service features automatically in a *constraint satisfaction* inference process.

3 Organizational issues

An integrated KBS maintained by a large group of competitors is unlikely to become reality because of conflicting interests. Classic economy shows some approaches for organizational solutions to similar problems. Intermediaries act as *agents*[7] (or brokers) of customers or suppliers.

A locally focussed intermediary could maintain a knowledge base in the way described and allow *activator constraints* as triggers for push information in a controlled and less intrusive way. In situations like this one the distinction between pull and push approach is fuzzy. There is a *pull* aspect in the user's specification of desired product attributes and general preferences but the information is send (*push*) on initiative of the agent afterwards.

An advantage of this setting is that privacy relevant information (e.g. customer's location history) about a user's preferences is not distributed and thereby can be kept under control more easily. Strongly opportunistic behaviour as described above no longer occurs, as long as only one party has the necessary information. Furthermore the intermediary has an incentive to ensure the quality of the knowledge base. This incentive can be seen as a necessary aspect for a success of the system as a whole.

4 Summary

Limited capabilities of mobile devices and the experiences with spam-mail indicate the necessity of user-controlled filtering mechanisms for location based services, particularly in push scenarios. Immediacy and the rapid change of context in mobile applications call for a flexible and user-controlled filtering mechanism.

As it is difficult for end users to use formal queries or constraint languages to configure filtering mechanisms an adequate and easy-to-understand user interaction is necessary. The hybrid knowledge representation of frames and activator constraints allows an easy way of maintaining the knowledge base *and* an efficient inference process.

Besides the technical aspects new intermediaries as "customer agents" can be introduced to partly overcome the knowledge acquisition and maintenance problems.

[7] Not necessarily but possibly involving AI agent methods.

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Personalization of E-Commerce Applications: an Empirical Study of Potentials and Readiness of SMEs in Switzerland

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Abstract

Personalization of E-Commerce applications is an issue that is gaining increasing importance with the advancing maturity of such systems. There is already E-Commerce software on the market offering integrated E-shop and personalization functions. However, the available software is too time-consuming and expensive for SMEs. With this in mind we saw a need to investigate the potential for personalization from the particular angle of SMEs. Besides the theoretical fundamentals of personalization this paper will present the results of an empirical study. With the help of a survey we investigated the application potential for personalization tools in Swiss companies. The conclusions show that SMEs are (still) sceptical towards E-Commerce applications which include personalization. It furthermore becomes clear that the heterogeneity of organizational and technical conditions hinders the development of standardized tools.

1 Introduction

The quality of E-Commerce applications has been constantly improved over the last few years. Especially the major suppliers run websites which are of noticeable usefulness and which are reliable enough to assure the customer's trust [Schubert/Dettling 2001]. This is confirmed by continuously positive growth figures in online business [BCG 2001, pp. 11].

Many consumers already take it for granted that they will be addressed personally when they pay repeat visits to the major E-shops such as amazon.de, buch.ch or ebay.com, and will not have to key in their address and banking details with every new purchase. Apart from this basic aspect of personalization, the concept hides a wealth of

possibilities. They allow the shop operators to offer their customers additional tailor-made benefits [Schubert/Ginsburg 2000].

According to a new study by Mummert + Partner [2001] personalization will play *the* decisive role in E-Commerce in the coming years. A question which arises in this context is the competitive ability of small and medium enterprises (SMEs) which cannot invest large sums in costly personalization tools. Hence in this paper we want to concern ourselves with the issue of personalization from the particular angle of SMEs.

The following findings derive from an E-Commerce survey carried out in Switzerland. The acceptance of the Internet is comparatively high in Switzerland; in the year 2000 more than 90% of Swiss SMEs already had Internet access. Penetration depended heavily on the field and the number of employees [Sieber 2000, p. 74]. In larger companies with more than 20 employees penetration was over 90% whereas in smaller companies with fewer than 6 employees the rate of use was only 45%. In the meantime the tendency has been for the smaller companies to catch up on Internet use [Netzwoche 2001, p. 34].

The E-Commerce survey was carried out as part of a project which investigates personalization tools for E-Commerce applications. The aim of the project lies in the development of a concept for a standardized, inexpensive personalization tool for SMEs. In the light of the Internet situation in Switzerland outlined above, the general starting position for the introduction of personalized E-Commerce applications in SMEs in Switzerland appears comparatively favorable.

The paper is constructed as follows; we will first provide an overview of the opportunities offered by the personalization of E-Commerce applications. In the main part of the paper we will present the most significant statements of the companies and experts questioned. Finally we will draw conclusions for the currently emerging potential for the implementation of personalization tools in SMEs in Switzerland.

2 Personalization of E-Commerce applications

With *personalization* of E-Commerce applications the information presented on the screen is specifically directed at a user (customer). A specific form of personalization is individualization, in which the display is unique for an individual user (figure 1). Personalization is based on information available about the customer. This is known as user or customer profile [Schubert 2000a]. These profiles can arise in E-Commerce applications in different ways: through the recording of transactions and surfing behavior (historical), through asking about preferences (questioning) or also determined by the current context in which users find themselves (situative).

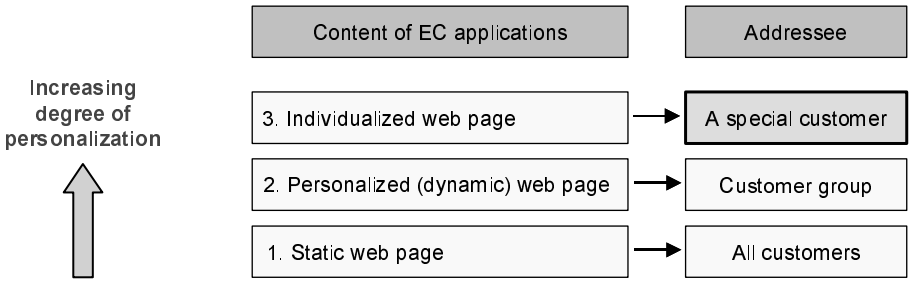

Figure 1: Degrees of personalization

In marketing, personalization supports one-to-one marketing [Peppers/Rogers 1997] which should increase the customer share over a lifetime. A related concept is that of mass customization [Pine 1993; Piller 2001]. What used to be possible in the corner shop, since the shopkeeper knew her customers personally, will be extensively possible in the electronic medium by the storage of profiles and the automatic evaluation on the basis of predefined rules. With mass customization the advantages of mass production (the same E-shop and the same product database for all customers) are harnessed to the strengths of individual production (personalized website) [Schubert 2000b]. As a rule these mass customization tools do not have the quality of the local shopkeeper; however, they assist in building up a personal dialogue with customers and thereby in binding them more strongly to the offer, with the proviso that customers desire this type of individual address.

Customer-specific quality and price differentiation, personalized cross-selling as well as tailor-made advertising methods count as further steps towards personalization. In order to tailor the offerings to individual customers you first have to get to know them. For this purpose, data already known to the company about customers and further data generated by users during interaction are recorded. From this data customer profiles are drawn up which allow a systemization of the related marketing measures (figure 3).

For the personalization of E-shops (online-shops), there are currently available integrated total packages, such as, e.g. One-to-One (Broadvision), Dynamo Relationship Commerce Suite (Art Technology Group), Personalization Manager (Net Perceptions) or ADAPTe (ResponseLogic), which already supply the full range of E-Commerce applications. These products are expensive applications which are generally destined for use in large companies. The standardized online-shops partially used in SMEs only contain rudimentary tools for the personalization of transactions.

Personalization can be an important component of the success of an E-Commerce application because it is beneficial to all interested parties [Buxel 2001]. From the E-Commerce supplier's point of view it represents a supplementary service which sets the switching costs at a high level and helps to bind customers to the offer on a long term basis. One fundamental reason for customer loyalty is often that customers have to invest a certain amount of time initially to feed into the system the most important information about themselves (preferences). If, subsequently, this information is actually used, there is little incentive for them to go through this process all over again with a rival. The main value for customers lies in the time saved and in the offer of information and products tailor-made to their needs.

There are various types of customer information which can be differentiated with regard to its extraction (recording of the dialogue or input from the customer) as well as its exploitation. Knowledge about a customer arises when the E-Commerce application operator gathers information about their clientele. This can either be through explicit asking of personal information or preferences in a data-input form (e.g. when making a necessary registration) or through the recording of interactions and transactions.

The process of personalization can be illustrated thus (figure 2):

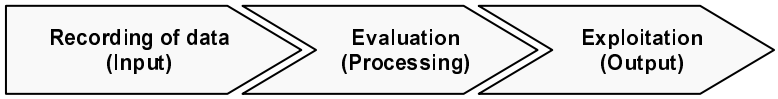

Figure 2: Personalization process

The prerequisite for a successful personalization is meaningful customer profiles. Figure 3 shows the mechanism of personalization measures on the basis of various selected customer profiles.

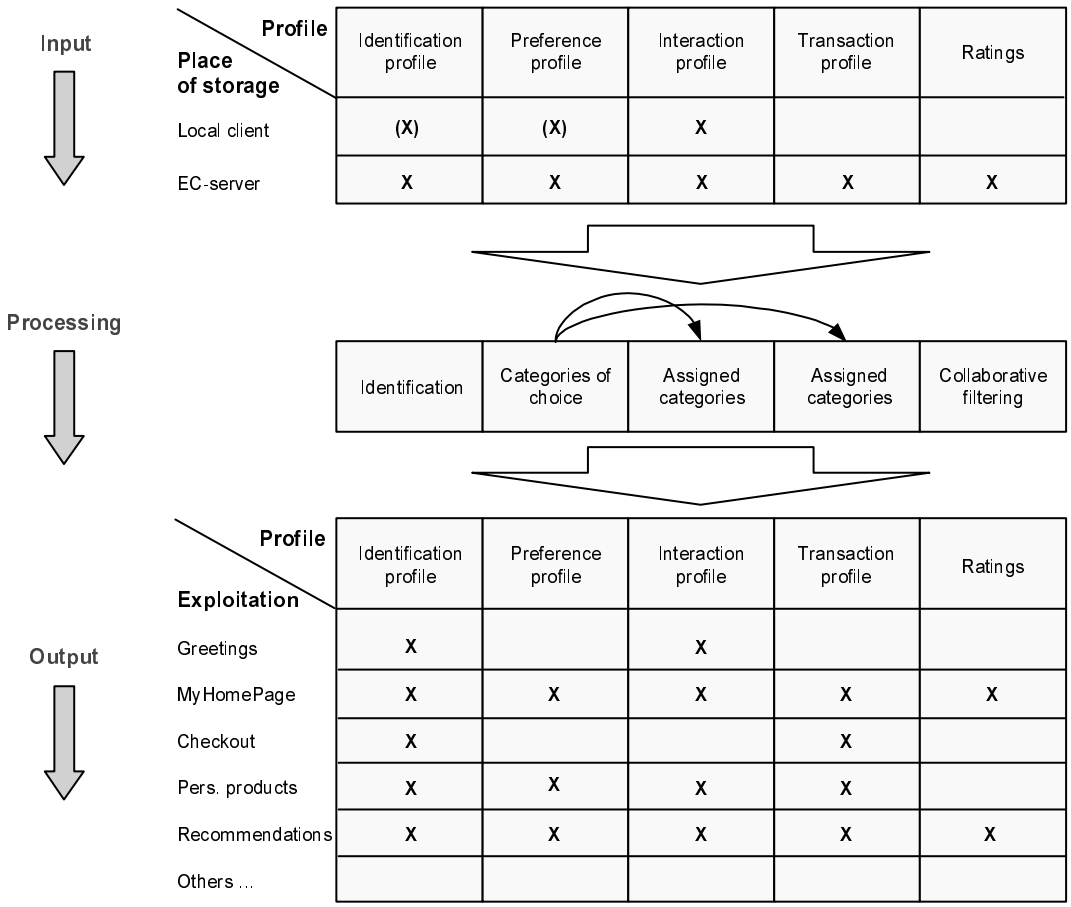

Figure 3: Mechanism of a personalization tool

Customer profiles can provide personalization functions without a specific customer having an extensive history of transactions. Through self-categorization and the assignment to categories with the help of templates a system which has already 'learnt' from the behavior of like-minded customers can provide even a new customer with its experiences. The process falls within the scope of collaborative filtering [Goldberg et al. 1992; Resnick/Varian 1997].

This study focuses on SMEs. We believe a separate consideration of these companies is meaningful because SMEs differ from corporations in many respects. In the context of the personalization of E-Commerce applications the specific features of SMEs become particularly relevant.

SMEs are generally characterized by the fact that they have limited resources and compared with corporations show the benefits and drawbacks of scale [Leimstoll 2001, pp. 132, pp. 155]. With regard to using E-Commerce applications above all limited financial resources, poor conceptional knowledge, lacking IT resources and low economies of scale can all have a negative effect. The low economies of scale result primarily from the small size of the company because the usefulness of E-Commerce applications increases with the number of transactions completed and the volume of turnover generated. In a small market segment SMEs offer specialized, qualitative high value products which are tailor-made to customers' needs (product differentiation). It is precisely for this reason that elements of personalization should also be applied in E-Commerce.

Bearing in mind the established opportunities offered by personalization we must examine which essential technical preconditions are fulfilled in SMEs and how much demand there is for personalization. The potential of personalized E-Commerce applications in SMEs as well as the requirements for the development of a personalization tool result from these three aspects.

3 Question Formulation and Design of the Study

The interests of SMEs are in the forefront of the survey, which was carried out in summer 2001. On the one hand the study is meant to give information about whether there is a demand on the part of SMEs for personalized E-Commerce solutions and how their exploitation can be evaluated. On the other the study is meant to show which technical and organizational preconditions are already met in the companies surveyed. For the recording of the primary data a standardized questionnaire was developed and repeatedly tested in pretest interviews. The regional chamber of commerce sent the printed questionnaires to 1250 randomly chosen SMEs in the region. Excluded from the survey were several freelance professions such as doctors and other companies whose main function is construction and utilities. The questionnaire was directed to members of management and those responsible for IT in SMEs.

Besides SMEs the survey was also meant to reach providers of IT services and management consultants, so as to record additional expert opinion. To that end the questionnaire was slightly modified and provided online. The experts were to answer it from the point of view of a company well known to them. The following table summarizes the most important details about the design of the survey.

Collection period	August/September 2001
Collection area	Basel-City and Basel-Country
Collection method	written survey with standardized questionnaire
Size of companies	SMEs with from 1 to 250 employees
Target group	mainly managers and those responsible for IT in SMEs in addition to independent IT service providers and management
Returns	271 questionnaires, 216 from SMEs and 55 from experts; rate: 16%

The explanations that follow are an excerpt from the whole study, primarily setting out the results of the SME survey. The 'expert' opinions will only be listed explicitly if they deviate significantly from those of the SME representatives.

4 Findings of the Study

Firstly some of the features of the firms surveyed are described, so as to present a picture of the underlying sample. This is followed by an analysis of the significance of marketing and sales processes for SMEs, and then comments will be made about Internet use and about evaluating the exploitation of personalized E-Commerce applications. Finally the technical and financial prerequisites for the development and operation of E-shops will be analyzed.

4.1 Features of the firms surveyed

In the SMEs the survey reached primarily *owners or managing directors* (53%) and *people responsible for IT* (25%). The remaining questionnaires came from people who fulfilled *both functions* (6%) and from people who had *other leadership functions*.

Amongst the experts chiefly *providers of IT services* or *management consultants* (45%) were addressed. A further number of the experts are *owners or managing directors* of the company (29%) from whose point of view they answered the questionnaire. The others hold *several* or *other functions*.

In the sample almost all areas are represented, mainly from the industrial (22%) and services (20%) sector. Trading companies account for 12% and IT/telecommunications firms for 8% of the sample.

Grouping the companies according to size categories illustrates clearly that the SMEs are chiefly represented by companies employing between 21 and 200 employees (figure 4). They account for 57% of the SMEs. A further 37% are made up of small firms with between one and 20 employees. Larger firms with more than 200 employees are barely represented.

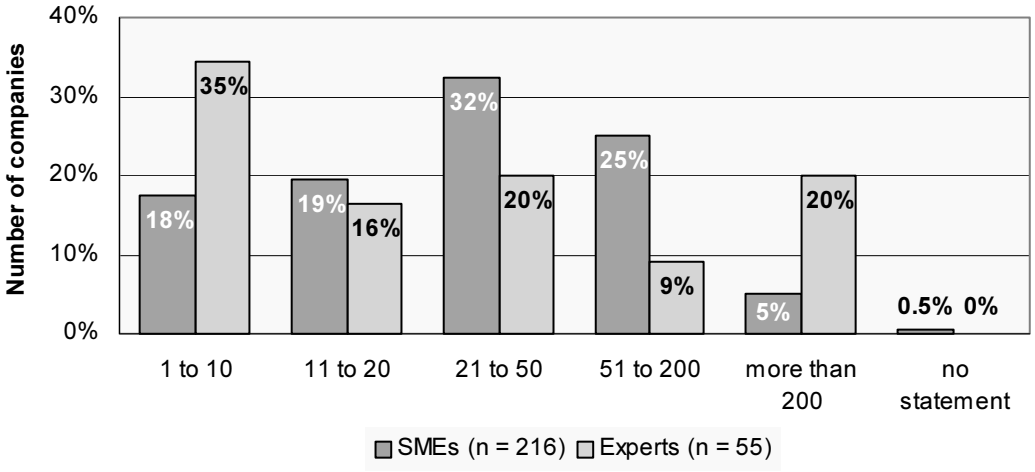

Figure 4: Number of employees, calculated as full-time jobs (full-time equivalent)

In the expert group the size distribution looks different (figure 4); here there are a lot of small firms with between one and ten employees. They account for 35% of the companies evaluated by the experts. Noticeably high is the share of firms with more of 200 employees (20%).

The high proportion of small as well as large companies in the sample of experts can be explained by the fact that the IT and telecommunications field is strongly represented in this sample. Firms in this sector are often very small (e.g. IT service providers) or very large (e.g. telecommunication corporations). This relationship is also expressed in the number of customers. The SME group shows a far more balanced distribution of customer numbers.

Especially on the basis of the distribution of company size the sample cannot be seen as representative. It should also be assumed that there is a preponderance of participation in the survey by those companies which are already tackling the E-Commerce issue, or at least intend to in the near future.

4.2 The significance of marketing and sales processes for SMEs

The E-Commerce activities of SMEs are at the center of the present survey. In order to evaluate the future role to be played by E-Commerce for the companies, we first have to clarify the general significance attached to sales activities. Figure 5 shows a few selected factors which have been evaluated in view of their significance for the companies' future competitiveness.

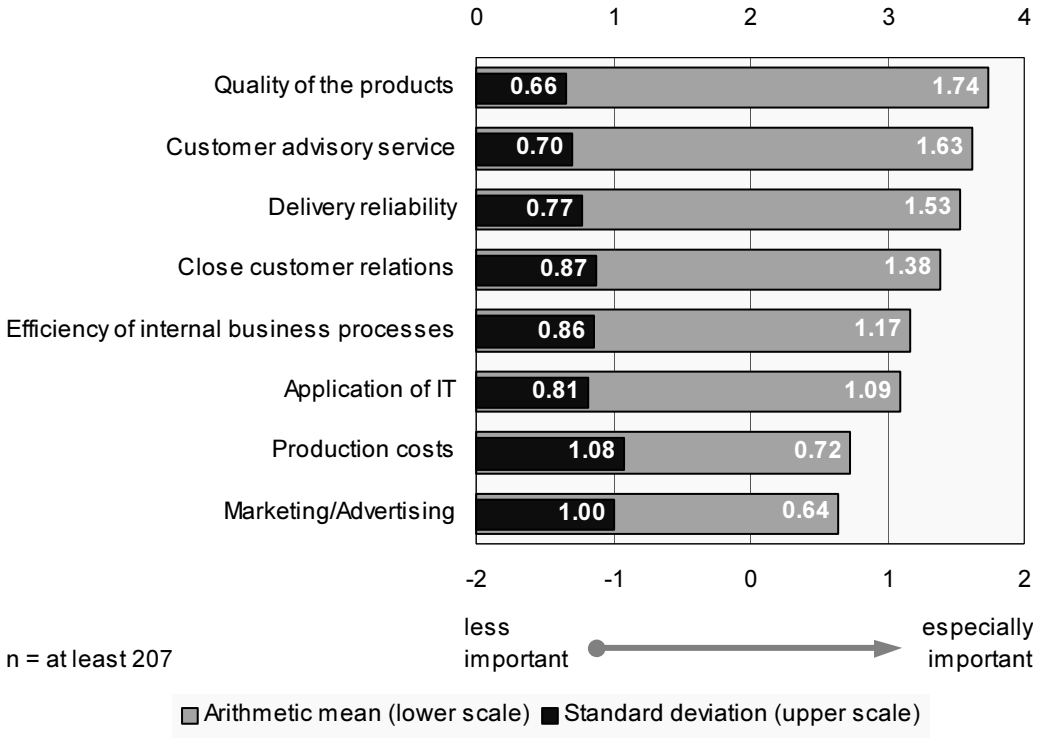

Figure 5: Success factors of SMEs based on the statements of SMEs

The companies are in fairly close agreement that the *quality of the products* will play an especially important role in the future. The sales-related factors, which are of especial interest here, *customer advisory service, delivery reliability*, and *close customer relations* follow immediately after in the order of their importance in places two to four. Thus they are evaluated higher than the *efficiency of internal business processes*, the *application of IT* in general and *production costs*. It is certainly somewhat surprising that *marketing and advertising* rank at the bottom (figure 5).

There are only slight differences between the appraisal of the SME representatives and the opinion of the experts. The importance of *marketing and advertising* (1.07) for example, is placed higher. On the other hand, in the eyes of the experts, *efficiency of internal business processes* and *production costs* land in the last two places.

From this result it follows that sales-related activities are of quite critical significance for the competitiveness of the companies. The support by information technology also plays an increasingly important role.

4.3 Current E-Commerce activities of Swiss SMEs

As mentioned in the introduction, empirical studies indicate that Internet use in Switzerland is steadily increasing. However, the concept of Internet use is seldom considered in a differentiated way. The manner in which the Internet is used will therefore now be clarified. The method of use gives information to some extent about the stage of development of the E-business applications implemented.

Figure 6 shows the results of an overview of Internet use. Represented are the various forms of use. Whereas the degree of extensiveness ('yes' answers) declines from top to bottom, the degree of planning ('planned' answers) first of all increases, and then declines again in the area of hitherto hardly-extensive applications ('no' answers).

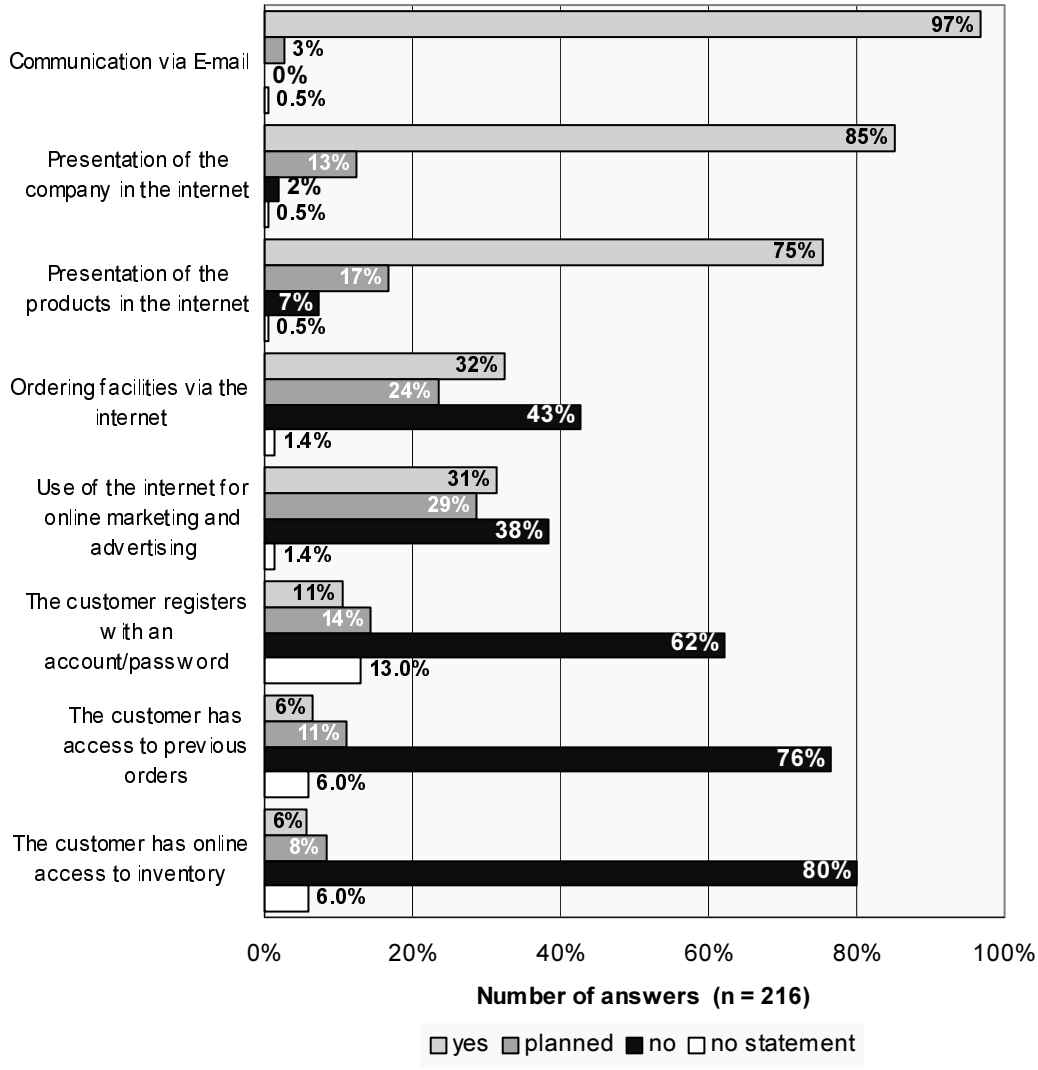

Figure 6: Different uses of the Internet, based on statements of SMEs

The findings concerning E-mail use go slightly further than the findings of other studies; E-mail is used by nearly all of the companies surveyed and there is no firm that does not want to use E-mail for communicating. *Company and product presentation* is also widespread. If we include planned use, then soon 98% of companies will present information about the company and 92% will present information about their products in the Internet. The evaluation of the experts hardly deviates from this.

Internet applications which go beyond the functions of E-mail and Homepage are clearly encountered more seldom (figure 6). *Ordering facilities via the Internet* (practiced by 32% of companies surveyed) as well as *use of the Internet for online market-*

ing and advertising are also included among the functions carried out to a considerable extent. Taking into account planned use, these two forms of use will, in the future, reach a degree of extensiveness of 56 and 60%. These are considerably more widespread in the companies of the experts; there, *ordering via the Internet* is possible in 44% of companies, and 53% use the Internet for *online marketing and advertising*. Together with companies planning to apply these uses, within experts' companies the degree of extensiveness reaches 77 and 78%.

In addition there is a group of Internet functions which have hitherto been put into practice in very few SMEs. These are functions which take up a special position with particular relevance to the personalization of E-Commerce applications (in brackets: carried out/planned): *personal registration of the customer on the website* (11/14%), *customer access to previous orders* (6/11%) and *customer access to inventory* of the supplier (6/8%). Among the expert-companies 22% already offer personal registration. *Planned* use is significantly higher here than with the SMEs; in the future about a quarter to almost a half of the expert-companies will offer these otherwise little widespread functions.

4.4 Basic functions in personalized E-Commerce

After the current situation regarding Internet use was identified, a further block of questions about the functions of personalized E-Commerce applications was in the foreground. Out of the many possibilities which these applications offer, some were singled out to see how they were evaluated by the companies surveyed (figure 7).

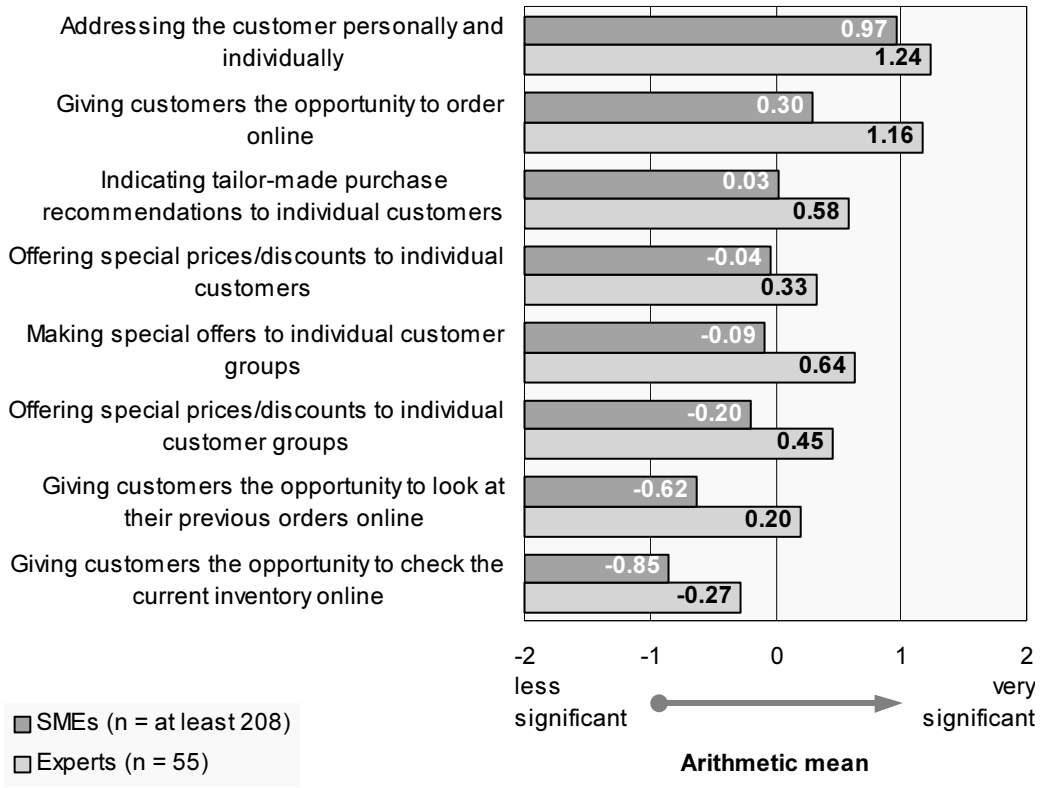

Figure 7: Significance of the functions of a personalized E-Commerce application; SMEs and experts in comparison

Out of the functions presented in figure 7 only a few are considered truly significant. On the five-part scale (from -2 = less significant to + 2 = very significant) only three functions score over zero, starting with *addressing the customer personally and individually*. In this case almost three-quarters of the SMEs questioned answer with '1' or '2'. Concerning the significance of *online ordering facilities* the score is 0.30, so that *online ordering facilities* can be classified under functions considered 'significant'. The same goes for *purchase recommendations tailor-made to the customer* (0.03), for the *opportunity to offer special prices/discounts to individual customers* (-0.04), and for the *opportunity to make special offers to individual customer groups* (-0.09).

Ranked among the functions judged rather 'less significant' we find *prices and discounts for individual customer groups* (-0.20), *access to previous orders* (-0.62) and *online access to inventory* (-0.85). In the last case we have to note that *access to inventory* is not of importance in certain fields (e.g. services, which comprised 14.4% of the sample).

In contrast to the SMEs, the experts award overall markedly higher scores for the functions of personalized E-Commerce applications (figure 7). The differences are most marked with *online ordering* (Δ = 0.86), with *previous orders* (Δ = 0.82) and with the *opportunity to make special offers to individual customer groups* (Δ = 0.73). This finding illustrates clearly that the potential of personalization is evaluated cautiously by SMEs – more cautiously than by the experts.

4.5 Additional functions of personalized E-Commerce

E-Commerce solutions support and offer a number of further functions. Figure 8 compares the opinions of SMEs and experts regarding the useful application of these additional functions. The questions were formulated abstractly to find out which additional functions future E-Commerce solutions should offer in order to provide effective back-up to marketing and sales processes.

Both groups in the comparison mentioned the following functions most frequently: *Newsletter via E-mail*, *analysis of customers' surfing and purchasing behaviour*, *evaluation tools* and *cross-selling functions*. However, the frequency of these answers is far lower among the SMEs than among the experts.

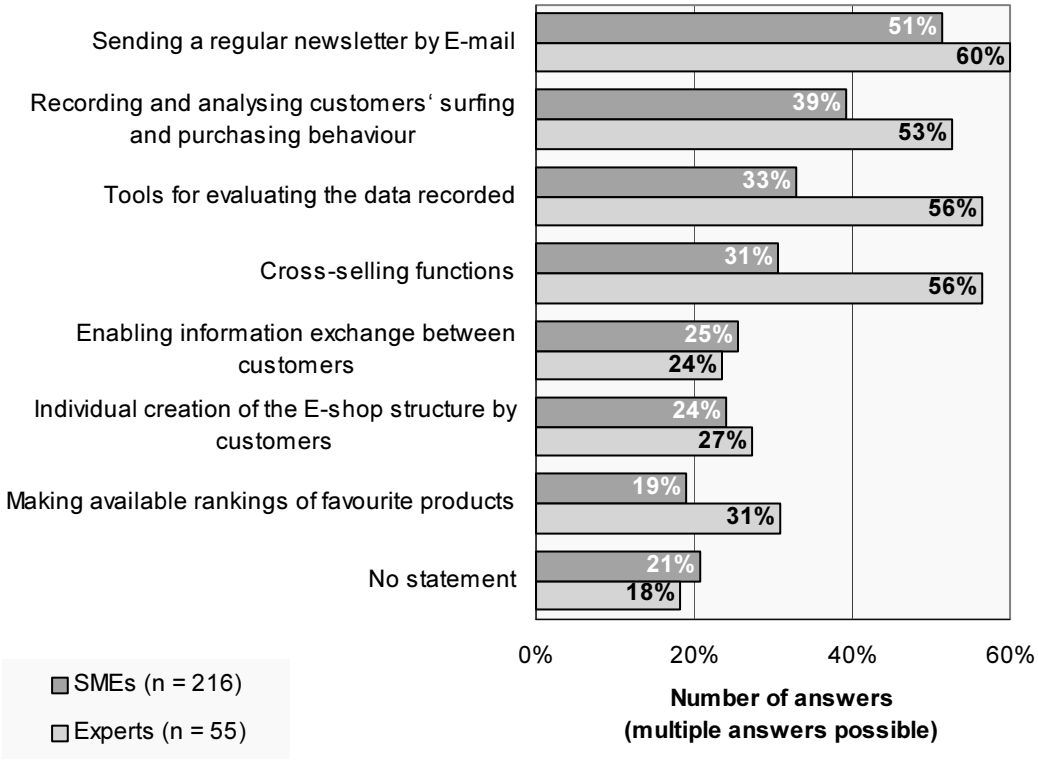

Figure 8: Additional functions of E-Commerce applications to support marketing and sales processes; SMEs and experts in comparison

Classified among the not-so-frequently mentioned answers in both groups we find *information exchange between customers* (a community function), *customer creation of E-shop structure* and *rankings of favorite products*. Clearly only a few companies can imagine the positive effects on the marketing and sales process. However, *rankings of favorite products* is mentioned by 31% of the expert-companies.

The results of the comparison between SMEs and experts clearly indicate that the SMEs are more skeptical towards the opportunities of personalized E-Commerce solutions. Possibly they cannot imagine how the application of a personalization tool can be concretely implemented. The purpose of a newsletter is certainly the easiest to understand. Nevertheless, the experts' statements plainly show that the personalization of E-

Commerce will have a thoroughly positive effect on the marketing and sales processes of SMEs.

4.6 Development and operation of E-shops

As far as the operation of a webserver is concerned, 64% of the SMEs and 69% of expert-companies replying prefer *operation with the provider* (figure 9). Consequently the majority of companies have hitherto opted for the outsourcing of this service. It is certainly surprising that almost a third of SMEs already use their *own server*.

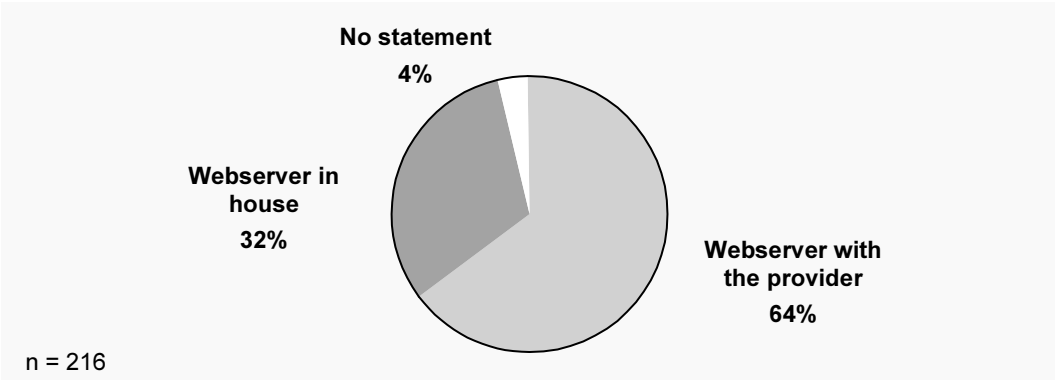

Figure 9: Outsourcing of webserver operations; based on statements of SMEs

For certain functions of an E-shop, such as online access to inventory or the direct start to processing the order immediately after receipt, integration into an existing ERP system is necessary. For this reason the companies were also asked which system they use for the planning and control of internal processes (so-called ERP system).

The findings make it obvious that there are very many different ERP systems on the market. The high proportion of the rubric 'other provider' (64%) makes this abundantly clear. Mostly in use are applications specific to the particular field. *ABACUS*, *SAP (R/2 or R/3* and *NAVISON* are the only systems which are widely used in SMEs. In the expert-companies *SAP* and *ABACUS* dominate, with 15 and 13 percent of mentions. The heterogeneity of the systems applied suggests the development of the functions of a standardized personalization tool for SMEs independent of the ERP-software used.

Online shops have not been very extensive in SMEs up to the present. 64% of SMEs and 47% of the experts state that they are not using any E-Commerce software. It is not possible to find any one E-shop system which could be considered a market leader.

Systems developed in-house make up the greatest share of E-shop systems carried out to date. Amongst companies which already have an E-shop and have supplied information on it, 59% use *individual software* and 41% *standard software* (figure 10). This applies equally to both groups in the comparison. With these findings it has to be taken into account, however, that the description 'individually-programmed software' may also include individually-parameterized shops which are based on a standard application.

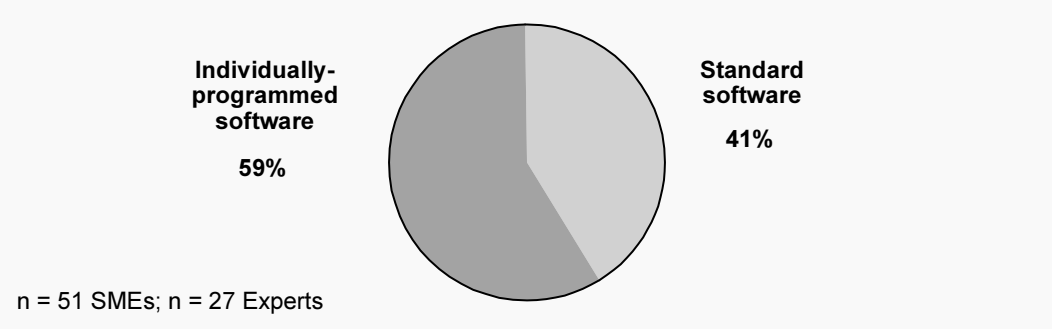

Figure 10: Standard software versus individual software in the E-shop field

In the future only 43% of the replying SMEs and only 31% of the expert-companies want to do without an E-shop (figure 11). The other companies plan to invest substantially in their E-shop in the next two years; most of these companies (15% of SMEs and 24% of experts) have opted for an investment sum ranging between 10'000 and 50'000 CHF per year (6'600 and 33'000 EUR).

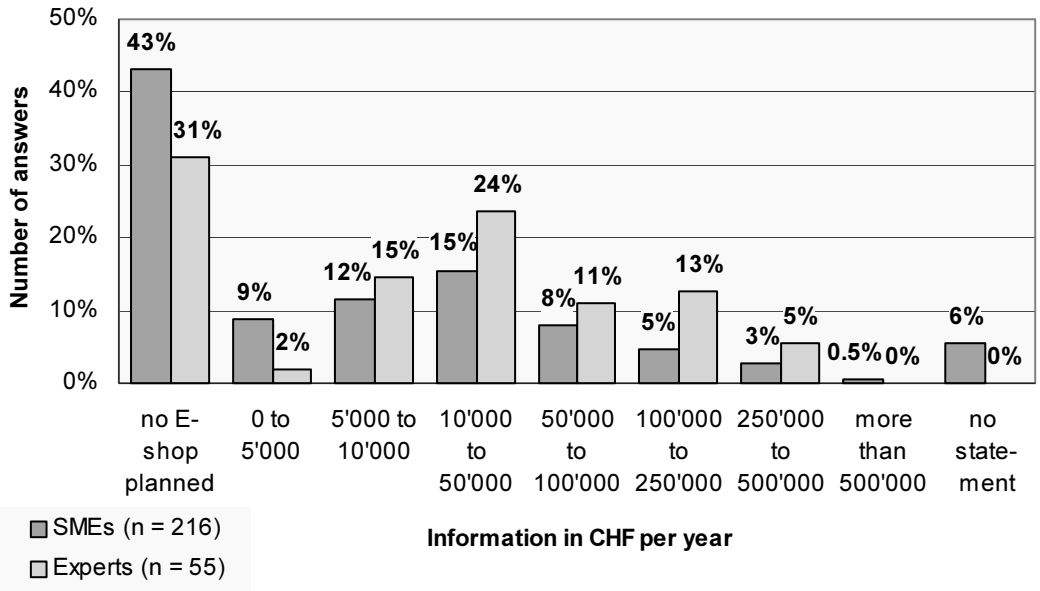

Figure 11: Investments in own online shop in the next two years

5 Interpretation of the findings

Two types of conclusion can be drawn from the findings of the survey. One includes statements about the need for personalization tools as expressed by SMEs in their answers. The other comments on the consequences for the development of a personal-

ization tool which – based on the results of the survey – would be suited to application in SMEs.

5.1 Need for personalization tools in SMEs

Some interesting statements about the need for personalization tools in SMEs can be deduced from the findings of the survey. SMEs value very highly – independently of E-Commerce – marketing and sales-related success factors: customer advisory service, delivery reliability and close customer relations are, according to their statements, of extreme importance for the success of the company. In the marketing and sales area the strengthening of customer relations and the quality of customer information are crucial.

In the specific area of E-Commerce applications addressing the customer individually and personally are also considered useful. The interviewees were very cautious with regard to the useful implementation of further functions of an E-Commerce application; apart from personal address the other functions were only barely considered 'useful'. The experts awarded positive scores to E-Commerce functions across the board.

These observations can be interpreted thus. For one thing it is conceivable that SMEs see the relationship to their customers as so significant that they do not want to risk any experiments with new technology in this area. They perceive the opportunity of personalization of Internet applications as an unsuitable instrument to address customers personally. It is furthermore conceivable that the SMEs cannot yet estimate the success potential of personalization, and so underestimate the opportunities. The high scores awarded by the experts would indicate that this is the case.

The partially contradictory answers on the part of the SMEs give some indication that the features and technical prerequisites of E-Commerce applications have not yet been fully understood (e.g. the point of an identified login, previous orders, insight into available inventory, server operating systems). The answers also show that several functions have been evaluated as useful, although their implementation is not foreseen. Hence there is a discrepancy between the expected use for the company and the implementation into concrete applications.

5.2 Development of a personalization tool

Basically the findings of the study have encouraged us to proceed with our project to develop a standardized personalization tool for SMEs. An overwhelming number of SMEs are planning to invest considerable sums in their E-Commerce solutions in the next few years. Many already have their offering up and running in the Internet.

The findings of the study show that the development of such a tool is no easy undertaking. Reality shows, however, that a world of widely-differing systems is being used by internal systems (ERP-software) on the one hand, and by E-Commerce applications (E-shop software) already in use on the other. The operating systems used also differ greatly. Furthermore, the majority of SMEs do not operate their own web servers, but have outsourced this task to an Internet service provider.

This has the following consequence. We cannot start with a particular software (e.g. the market leader) and extend this with additional functions. The only possible approach is the programming of easily integratable standard modules which offer open in-

terfaces to the multiplicity of software solutions offered today. In the last few years the Internet field has established standards which are favorable to our project. These include, e.g. standard formats for log files (CLF, ECLF), profiling standards for customer profiles like P3P, data exchange formats like XML, SQL as query language for different databases, LDAP for user administration. The aim of the software to be developed will be to assure an integration in multiple platforms by means of open interfaces and good documentation. The installation must be carried out parametrizably (operating system database and E-shop are chosen on installation). It would appear advisable to include Internet service providers as partners in the development, or to let the resulting product be offered via this partner. In this way personalization could be an additional offer of E-Commerce solutions for providers.

Personalization software is already available on the market. Powerful, expensive products, such as for example that of Broadvision, are increasingly being adopted by larger companies. These tools are too expensive and oversized for SMEs. Here there is the same need for adaptability as in the use of SAP (for large companies) and ABACUS (for small ones). SMEs need 'simple' solutions – preferably standard software products – which can be cheaply adapted for web servers or E-shops.

It is generally established that personalization functions in Internet applications are a must for large corporations. Users quickly get used to the opportunities of interactive applications and personal address will be a standard feature of high quality E-services in the future. In our opinion the SMEs must not miss the boat.

6 Concluding remarks

The conclusions of the study for the development of a personalization tool is encouraging as well as sobering. Altogether the results show that it is precisely personal customer address that SMEs consider to be a key function for company success. Wherever E-Commerce applications can be used at the interface to the customer personalization can play an important role. The difficulty in the development of a tool lies in the fact that SMEs are today cautious about the use of such systems, and the technical preconditions are not optimal due to the wide difference in the systems employed. Nevertheless, over the next few years, substantial investments are planned in this field by many companies. All in all the, study findings have confirmed us in our assumption that a need for standardized, inexpensive personalization tools for SMEs exists, or will arise within the next few years.

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Business Systems for Public WLAN Network Operators

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Abstract

WLAN is a radical technology, enabling new ways to provide mobile access. A number of established and new companies have entered the mobile market with new business models. It is yet not clear how these new business models affect the mobile industry and which of them will really succeed. In our article, we introduce a new framework to support the development of new business models driven by new and radical technologies and apply it to the WLAN technology.

1 Introduction

Short range wireless technologies such as IEEE 802.11, HyperLAN, HomeRF, Bluetooth, etc. are designed to cover areas with a diameter from 10 to a few hundred meters[1]. WLAN technologies cover - compared to mobile Internet access via GSM or UMTS - a small area at significantly lower initial costs. Access points are presently available for as little as 200 EUR. Due to their decentralized architecture, open Internet standards, and low cost base, these technologies have the potential to enable mobile telecommunication services using innovative business systems[2], independent of the respective standard (IEEE 802.11, HyperLAN, etc.). Thus, they can change the established value-added chain on a mid- or long-term basis.

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[1] In the following article, WLAN technologies will be used to refer to all short range wireless technologies, such as IEEE 802.11, Bluetooth, HyperLAN, etc

[2] Stähler [Stähler 2001b] defines a business model as a view on a business [business system] and a description of how the business [business system] functions. The business model is a tool for analysis on which strategies could be based. The business system is the object which is represented by the business model.

Together with the low level of complexity and the low-cost base, this technology has enabled new industry outsiders with - in some cases - new business systems to enter the mobile market. These new business systems range from the commercial provision of mobile Internet access for traveling business customers to coverage of entire city sectors by non-commercial associations.

In addition to the assumed technological competition for future data traffic, these new business systems also compete with the existing business systems of today's mobile phone providers. Moreover, they provide new commercial relationships within the value- added chain. Internet access has become ubiquitous and online services can be “added” to any conventional physical point of sale. This opens up a wide field for new services, innovative business systems and novel ways for traditional and electronic distribution and procurement channels to converge.

Our research focuses on the impact of the technology on the business systems and, in particular, on the business system of the network operator whose role is to provide and control the new channels. We have developed a new framework to support the development of new business systems driven by new and radical technologies[3]. The framework is based on different concepts and theories, which are integrated in the framework. In this article, we introduce this new framework in section 2 and apply the framework to analyze the WLAN technology in section 3.

2 Frame Concept

The frame concept supports the development of new business systems driven by new and radical technologies and helps in understanding the new industry. It consists of four modules. Each module, and its connection to other models, is described below.

[3] see definition Henderson and Clark for radical innovation [Henderson/Clark 1990, P. 12]

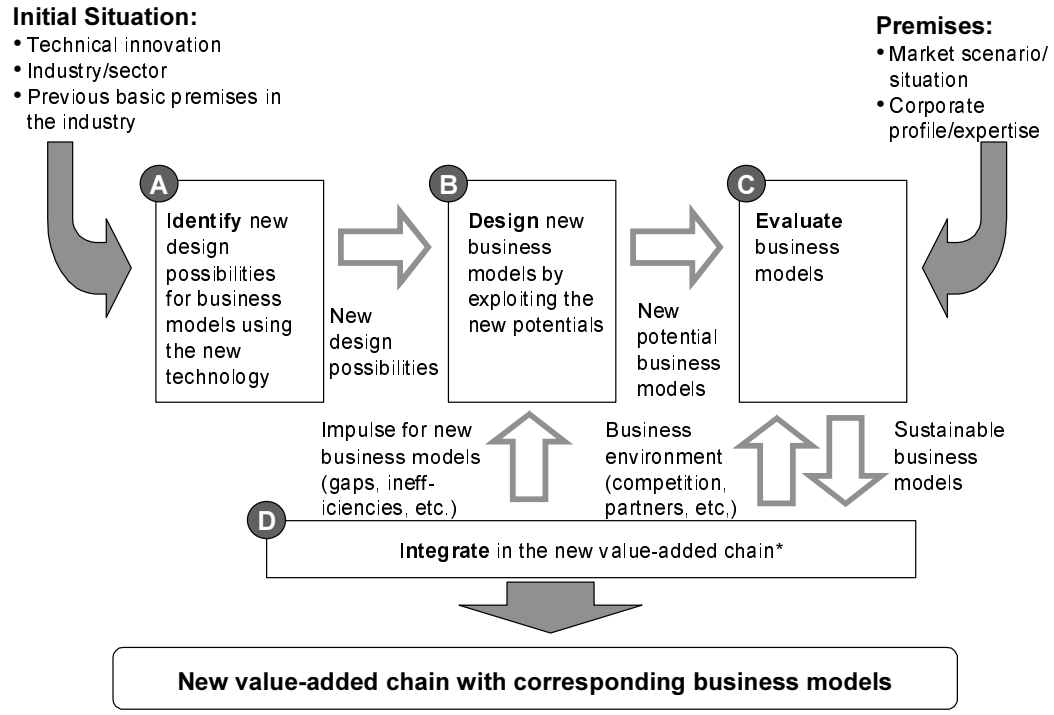

Figure 1: Frame concept

Note, that it might be necessary to iterate the process several times. Each iteration may provide a better understanding of the new value-added chain/ industry.

2.1 Module A - Identify new design possibilities

The output of Module A is to identify the new design possibilities for business systems resulting from the new technology.

The three key guiding questions in module A are:

- Which industries are affected?
- Which business models of those industries are most affected? In how far do the basic assumptions of each business model need to be rethought?
- What are the new business design possibilities of the new assumptions?

While the first question focuses only on the relevant industries, the second question is formulated on the hypothesis of Slywotzky [Slywotzky 1999, P. 32] that an industry and its business models are built on specific assumptions about the mechanism of the industry. As long as these assumptions are correct, the business models are not likely to change. A new technology that affects these assumptions creates an environment in which to improve the business models by utilizing new design possibilities. Therefore, the assumptions have to be tested as to whether they are affected or have been changed by the new technology.

● High potential
◉ Medium potential
○ Low potential

Part of business model \ New/rethought assumptions		1	2	3	…	n
	Value proposition					
Architecture	Product/market					
	Internal architecture					
	External architecture					
	Stability of architecture					
	Revenue model					

Figure 2: Identifying new design options; source: Stähler 2001, P. 47 and own work

After that, the new design possibilities enabled by the new assumptions with the potential to improve the performance of the business models have to be identified. The new business models will then evolve from the initial old business models by utilizing these new design possibilities.

The matrix presented in figure 2 supports the task of evaluating the effect of technology on the business model. The components of a business model[4] the value proposition, the product/market, the internal and external architecture, the stability of the architecture, and the revenue model are considered separately. The new assumptions are evaluated for each component as to whether there is a high, medium or low potential that an assumption affects a part of the business model. A new assumption that has a high potential on a component of the business model is a hint for design possibilities with high impact on the business model.

2.2 Module B - Design new business models

The output of Module B is a set of new business models using the new design possibilities identified in Module A.

The construction of the module is oriented on the morphological method of Zwicky [Zwicky 1966, P. 116] [5]. The core element is to identify the parameters/dimensions which determine the solution, and the corresponding concrete instances/options of

[4] Using the business model partition of Stähler [Stähler 2001, P. 47]

[5] the concept is also used for product development [Nieschlag et al. 1997, P. 265]

each dimension. Possible solutions to the problem are the combinations of the options along the dimensions. They are then evaluated.

The three key guiding questions in module B are:

- Which design possibilities are options of one dimension? Are all the relevant options of one dimension recognized?
- Which dimensions have the highest impact on the business model?
- What are the most useful combinations of options?

Let us expand on those three key questions.

The first question takes account of the fact that the resulting design possibilities from Module A are sometimes formulated as fragmented options. Therefore, the first step is to aggregate the fragmented options to one dimension. Design possibilities, which exclude each other, are options of one dimension. For design possibilities that are formulated as dimensions, the corresponding options have to be identified.

The aim of the second question is to reduce the number of combinations and, thus, the complexity of the problem. The dimensions are ranked according to their impact on the business model. Only those dimensions with high impact on the business model will be considered, as they determine most of the differences between the business models.

The third question is about formulating useful business models. Potential business models are constructed on the basis of combinations of options from dimensions with the highest impact on business models. To formulate the complete business model for each combination, the residual options with lower impact are added. Unpromising combinations should be eliminated in advance to reduce the number of combinations and, thus, the complexity.

2.3 Module C - Evaluate business models

In Module C, the potential business models are evaluated. Those business models are identified which have the potential to succeed in a market.

The three key guiding questions in module C are:

- What are the relevant market assumptions?
- What is the performance ranking of each business model assuming the different market scenarios?
- What is the minimum business model ranking that is likely to survive?

In module B, we have formulated the business models and the products/services they offer. In module C, we can now formulate the relevant dimensions of the demand for these products/services.

Components of business model (Stähler)	Components of business model (Afuah/Tucci)	Benchmark Questions	Rank
Value Proposition	Customer Value	• Is customer value distinct from that of competitors? If not, is the firm´s level of value higher than that of competitors? • Is the firm´s rate of increase in customer value high relative to that of competitors?	H/L
	Sustainability	Has the firm been able to maintain or extend its lead in its industry?	H/L
Architecture	Scope	• Is the growth rate of market segments high? • Is the firm´s market share in each segment high relative to that of competitors´? • Is potential erosion of products high? If so, in what segments?	H/L
	Connected activities	What is the extend to which activities: • Are consistent with customer value and scope? • Reinforce each other? • Take advantage of industry success drivers? • Are consistent with the firm´s distinctive capabilities? • Make the industry more attractive for the firm?	H/L
	Implementation	Is the quality of the team high?	H/L
	Capabilities	To what extend are the firm´s capabilities: • Distinctive? • Inimitable? • Extendable to other product markets?	H/L
Revenue model	Price	• Is the quality-adjusted price low?	H/L
	Revenue Source	• Are margins and market share in each revenue source high? • Are margins and market share in each revenue source increasing? • Is the firm´s value in each source of revenue distinctive? If not, is the level of value higher than that of the competitors?	H/L

Figure 3: Appraising a Business Model: Component Measures

It is not about giving a market forecast. It is like a break-even analysis - what market assumptions do we have to make to believe that the business models under consideration will endure. We suggest considering three market assumption scenarios: worst, base, and best case. The level of detail of the scenarios should be according to the level of detail of the business models. So, as the business model descriptions become more sophisticated with each iteration, so will the scenarios.

The business models are ranked against each other according to their performance in the different scenarios. The ranking mechanism should (like the market scenarios) adopt the same level of detail as the business model. So, as the description of the business models becomes more sophisticated in each iteration, the ranking mechanism should consider these new aspects. The ranking mechanism can range from quantitative business case calculations (e.g., discounted dash flow method) to purely qualitative benchmark questions.

One framework that supports a qualitative ranking has been introduced by Afuah and Tucci [Afuah/Tucci 2001, P. 80]. The framework supports the ranking of the business models by using benchmark questions for each part of the business model. In figure 3, we present the framework. To relate the model of Afuah and Tucci to that of Stähler [Stähler 2001, P. 47], which we used previously we give the two partitionings of the business models.

After having ranked the models, we draw a line between those business models which will probably survive and those which will not. Those which are probably not profitable, and will not survive, will not be considered in the following modules.

2.4 Module D – Integrate in the new value chain

In Module D, the business models are integrated in a value chain. The aim is to understand better the dynamics and the interaction between the business models and in the industry in order to identify new design possibilities initiating the next iteration. It helps us to better understand the environment of the business model.

The three key guiding questions are:

- How can the business models be ordered into a value chain?
- How do the business models interact and what are the dynamics of the industry?
- Do new design possibilities arise?

Porter [Porter 1996, P. 59] introduced the concept of the value chain. It is a good framework to compare the activities of the business models with each other and to analyze the interaction of the business models. The first step is, therefore, to identify the value-adding activities on the industry level. These activities have to be carried out to produce a service/product and to deliver it to the end user. The business models can then be structured according to the order of their activities. As a first orientation, the value chain of the initial business model or the value chain from the previous iteration can be used.

The second question is about the interaction of the business model and the resulting industry dynamic. There are three kinds of interaction: (1) Service relationships, (2) Competition, and (3) Alliances / Coalitions

Service relationships are the exchange of services, products or money between business models. These service relationships have to be coordinated. Coordination mechanisms are areas of new design possibilities.

Competition can be defined as the struggle between two or more units regarding a scarce resource [Academic Press 2002] - demand can be also seen as a resource. Porter's five forces [Porter 1988] is a good concept to analyze the intensity of the competition and predict the margin and, thus, the power allocated in an industry field. The five forces are: suppliers, buyers, industry competitors, substitutes, and the threat of new entrants. To analyze the five forces, we can use the service relationships we have identified previously. Suppliers and buyers can be identified through the service relationships. Competing business models have service relationships with similar suppliers and buyers as they compete for the same resources. The common activities and the common value added of these competing business models helped us to understand better, what other product/services might substitute these values, and what market barriers exist to protect the market. It also helps us to identify not previously recognized parts of the value chain.

Alliances or coalitions are the third kind of relationship between business models. Fuller and Porter [Fuller/Porter 1986, P. 325] describe four motivations for a coalition: gaining economies of scale, gaining access to knowledge, risk sharing, and shaping the competition. Coalitions can be made between enterprises that have common activities (Y-coalitions), or enterprises doing different activities (X-coalitions) in the value chain. When the value chain is analyzed, we have to ask how the business model can improve its position through a coalition and with whom it could cooperate.

The analysis of the interaction between the business models helps us to identify new industry assumptions and mechanisms. It is a preparation for the third question to identify new design possibilities and to initiate the next iteration.

3 Applying to WLAN

The framework presented in the previous section is now applied to analyze the business models related to WLAN technology.

3.1 Identifying new WLAN design possibilities

Two industries seem to be most affected by the new WLAN technology. One is the IT-Industry as it provides and has developed this new technology. The other is the mobile industry as its value proposition is to give their customers mobile data and voice access.

Although both industries are affected, an analysis of the degree of innovation has been conducted, according to the hypercube model of Afuah [Afuah/ Bahram 1995, P. 53] that the WLAN technology is more radical for the mobile industry than it is for the IT industry. This analysis is presented in figure 4.

The mobile network operator business model is the one in which basic assumptions are most affected by the WLAN technology (figure 5). We will, therefore, focus on the mobile industry and employ the network operator business model as the initial model. We restrict ourselves to one iteration of the framework

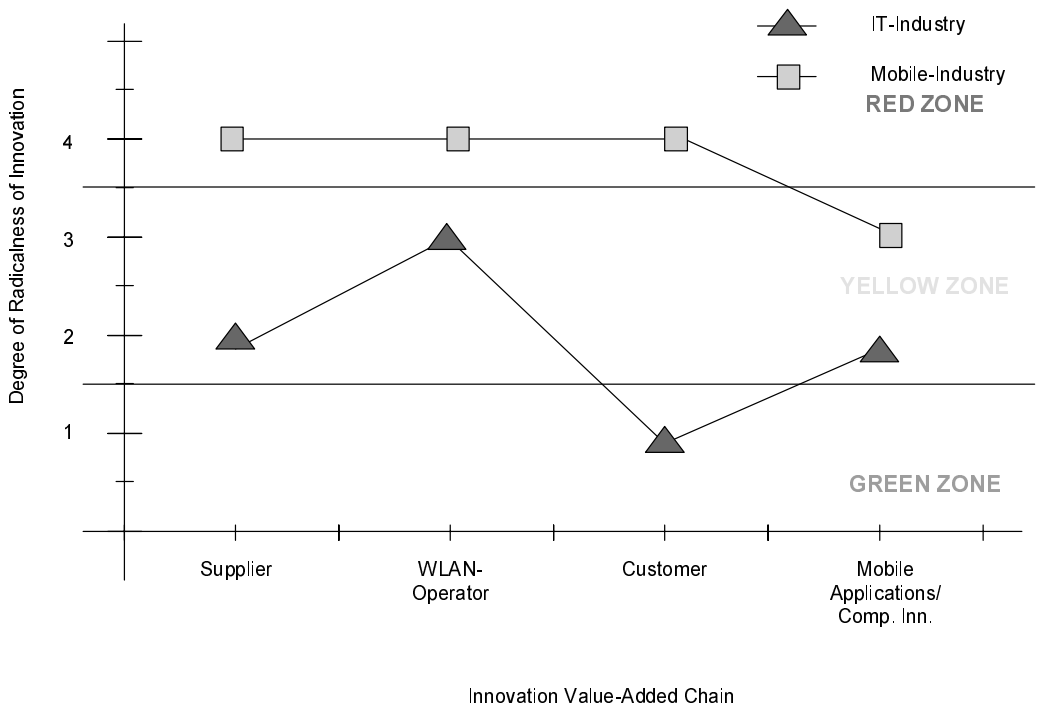

Figure 4: Hypercube of Innovation

Business Model	Old Basic Assumptions	New Assumptions
Mobile Operator		
Value Proposition	• Coverage is main quality criteria	• Limited coverage in exchange for high bandwidth is acceptable. Full coverage with low bandwidth is possible
Architecture of Production	• High specialized Know-How und Investments necessary => high market entry barrier and therefore control of the Value Chain by Network Operators	• No special Know-How necessary. Small initial investment. Using Standard-Technology
	• Limited programmable Client	• Flexible programmable Client.
	• High Fixed costs in Network Operations =>Scale effect	• Limited Scale effect. Already existing Infrastructure and marginal additional costs.
	• Allocation of a specific frequency spectrum	• Use of a free frequency spectrum
Revenue Model	• Subvention of the special Devices necessary	• Most of the users already have devices
	• High transaction costs (Account installation with SIM-card)	• Marginal Transaction cost (Online Account installation e.g. by using Username and Password)

Source: Own Work

Figure 5: Effect on the basic assumptions

Looking at the effects - the new assumptions enable new design possibilities in mostly all parts of the business model (see figure 6). Note that the new assumptions in figure 5 determine the columns in figure 6.

By examining the potential fields we have identified the new design possibilities. They are listed for each business model part in table 1.

Table 4: New design possibilities

Business model part	New design possibilities
Value proposition for	
End Users	Cheap broadband access in Hot Spots and wide area coverage through roaming with 2G and 3G
Partners (such as location owners)	Customer retention; Cross-selling; Specialized distribution channel; Increased customer information and Additional revenue stream
Architecture of Production	
Product Design	Local Internet Access / IP-Voice-Service; Integrated location based services; New local communication device for the customer (e.g., ordering in a restaurant, map for shops and products in the mall, etc.); Personalized local offers; Local downloads of digital products
Market Design	Region (local / national operation); Customer segments (business / consumer)

Internal Architecture	Ownership (Big national company /small local company /private person); Resource advantage through side production (location, infrastructure, personal) and Disaggregation of the internal value chain
External Architecture	Distribution channel for access (Physical POS/ Online - Internet, at POS as free access area/roaming with other operators, ISPs, special distribution for business customer, etc.); Distribution channel for digital Products (global content / local content); Customer information (use, save and sell user information / preferences); Direct communication channel to customers of the location owner (information, service ordering, advertising, etc.)
Level Stability	Increased flexibility in the value-chain architecture
Revenue model	
Additional Revenue source	Advertising; User information and Cross-selling
Pricing	No subvention of devices necessary; Increased number of options for pricing (no minimum contract time necessary / full variable billing possible / flat rate possible)

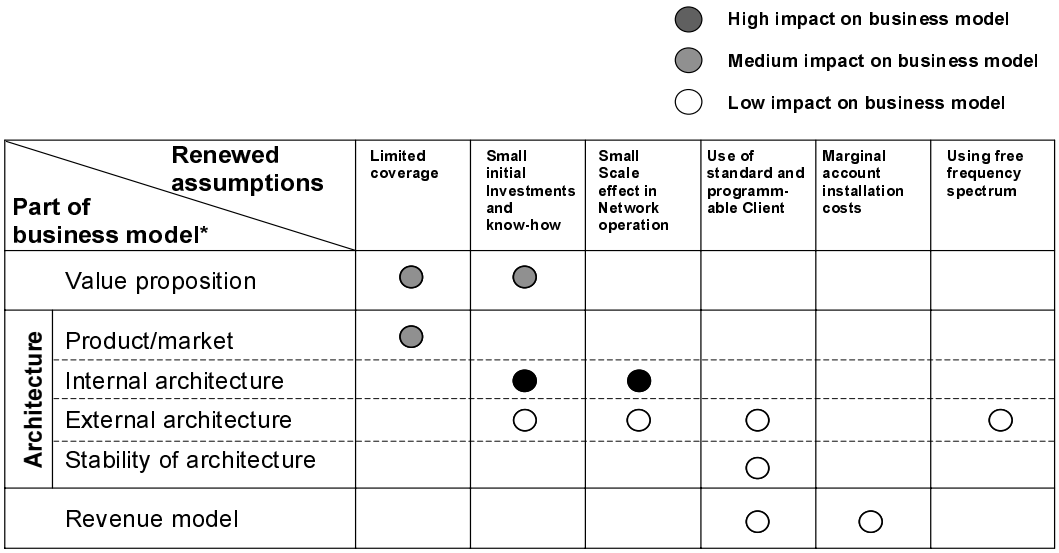

Figure 6: New WLAN design possibilities enabled by the new assumptions; source: Stähler 2001, P. 47 and own work

3.2 Designing new WLAN business models

The design possibilities have already been formulated as dimensions of the solution space. Figure 6 shows the ranking of the impact of the different dimensions on the business model performance. The dimensions of the internal architecture have the highest impact on the business model.

Table 5: Morphological Box

Dimension	Options						
Disaggregation of the value chain	(+ Network D&P), Access (+Backbone), Customer Mgt, Acquisition(+Content)	(+ Network D&P), Customer Mgt., Acquisition, (+Content)	WLAN-Content	Network planning and deployment	Customer Management	Access, Acquisition (+Content)	Access (+Content)
Ownership	Big National Company	Small Local Company			Private Person		
Resource Advantage	Exclusive Production	Side Production with unused resources (location, infrastructure, personnel)					

The morphological box with the options of these dimensions is presented in Table 2. Value chains parts, which are in brackets, are optional.

The following combinations can be excluded categorically as they do not seem to be promising:

- The value chain options "(+ Network D&P), Customer Mgt, Acquisition (+Content)", "Customer Mgt.", "Network planning and deployment" and "WLAN-content" only make sense in combination with a big national operating company with exclusive production, as these value chains rely on scale to be successful
- For a private person, only the value chain option "Access (+Content)" as a side production seems to be manageable

Thus, we have reduced the possible combinations from 42 to 17. Figure 7 shows the remaining useful combinations.

Resources		Owner Ship		VALUE CHAIN	#
Exclusive Production	X	Big National Company	X	• (+ Network D&P), Customer Mgt., Acquisition, (+Content) • WLAN-Content • Network Planning & Deployment • Customer Management	4
Exclusive Production Side Production with unused Resources	X	Big National Company Small Local Company	X	• Access (+ Content) • Access, Acquisition (+ Content) • (+ Network D&P), Access (+Backbone), Customer Mgt, Acquisition (+Content)	12
Side Production with unused Resources	X	Private Person	X	• Access	1
					17

Source: Own work

Figure 7: Remaining combinations

3.3 Evaluation of the business model

- The relevant market assumptions for our business models are the penetration of WLAN-Hot spots users in the segments of business and consumer customer. We will focus on a static penetration rates. The three market scenarios are:
- **Worst Case :** Only business travelers will take advantage of WLAN Hot-spots Low penetration (10-20% of mobile business customers) in the business segment. No penetration in the consumer segment.
- **Base Case :** WLAN becomes a common access for business customers to Internet and their company's intranet. Only technology affine consumers will use WLAN Hotspots. Medium penetration in the business segment (30-60% of mobile business users) and low penetration in the customer segment (10-20% of mobile business users).
- **Best Case:** WLAN becomes a common access for the business and consumer segment. High penetration in the business segment (60-90% of mobile business users) and medium penetration in the customer segment (30-60% of mobile business users).

To adapt the level of detail of the business models, we have set the following benchmarking questions to rank the business models:

Table 6: Benchmarking question

Focused business model part	Benchmark question
Revenue	
Value proposition and market/product	1. How distinctive is the value for customers compared to other business models with the same value chain activities?
	2. How big is the target segment?
Cost	
Internal architecture	3. How big is the cost advantage compared to other business models with the same value chain activities?
	4. How big is the assumed revenue compared to its investment needs?
Risk	
Internal and external architecture	5. How independent is the business model of other new business models? How stable are the new business models it relies on?

Each question can be evaluated with a mark between -2 (very poor) and +2 (very high) or K. K is a killer mark and means that the business model will probably not survive, regardless of the evaluation of the other questions. Although we use a very simple ranking mechanism, it helps us to understand better why we prefer one model to another and to see the strengths and weaknesses of the models.

Figure shows the evaluation and the ranking of the business models for the different market scenarios. Figure shows the business models, which will survive in at least one of the scenarios.

While in the worst case scenario only the business models, Fully Integrated Operator and Small Operator (big national and small local company) will probably survive. In the base and best case scenario all of these business models have the potential to survive.

3.4 Integration into the value chain

By integrating the new business models into the value chain, we get the following picture, figure 8.

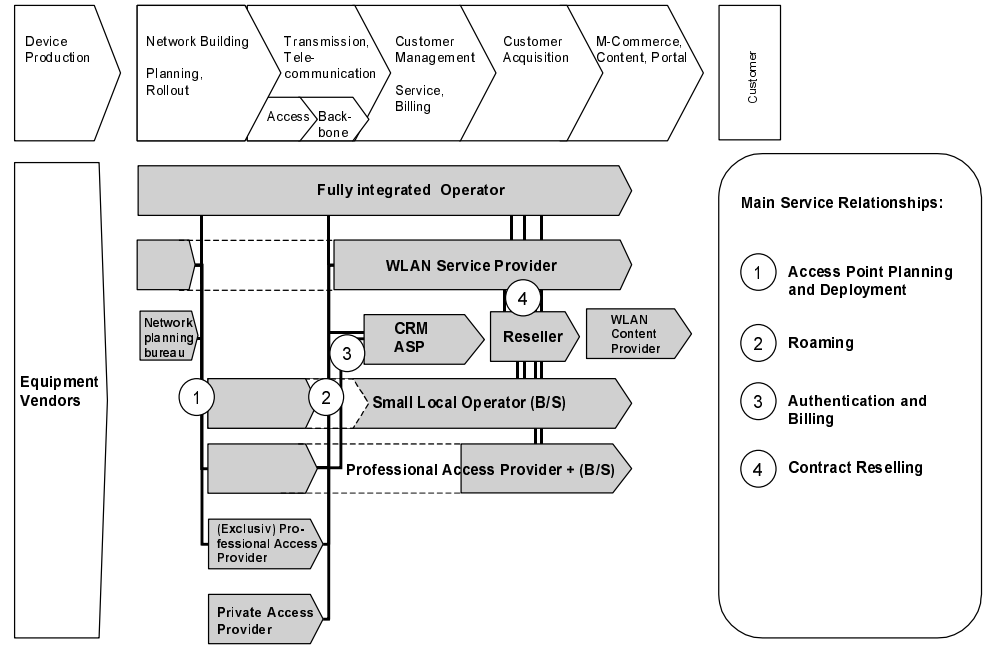

Figure 8: Value Chain

- **Service Relationships**
  Four main service relationships can be identified between the business models:
- **Access Point Planning and Deployment:** Network planning and deployment of a network with several access points is complex and needs some experience. WLAN service providers and Fully integrated operators offer their roaming partners (Professional Access Providers) help in the deployment of their network, as service providers and Fully integrated operators have the organization and the experience to do so and gain from the increased network quality of their partners. Also a network planning bureau offers these services as a neutral partner.
- **Roaming:** Roaming is the main service relationship between the identified business models, as mostly all business models need roaming to aggregate enough customers for their service. Three kinds of roaming agreements could be differentiated between. The first one is the exclusive roaming of an access provider to an access aggregator[6], the second one is the non-exclusive roaming of an access provider to an access aggregator, and the third one is roaming agreements between access aggregators.
- **Authentication and Billing:** Authentication and Billing especially in combination with roaming are rather complex. A specialized CRM ASP can provide the necessary infrastructure.

[6] Access aggregators are business models who want to provide their customers with an increased coverage through roaming

- **Contract Reselling**
  Fully integrated operators and WLAN service providers rely on nation-wide distribution of their service. For an efficient physical distribution channel, they have to partner with contract resellers. Resellers could be small operators and professional access providers +, who already have a selling point from their main business (hotels, restaurants, etc.), or general resellers.

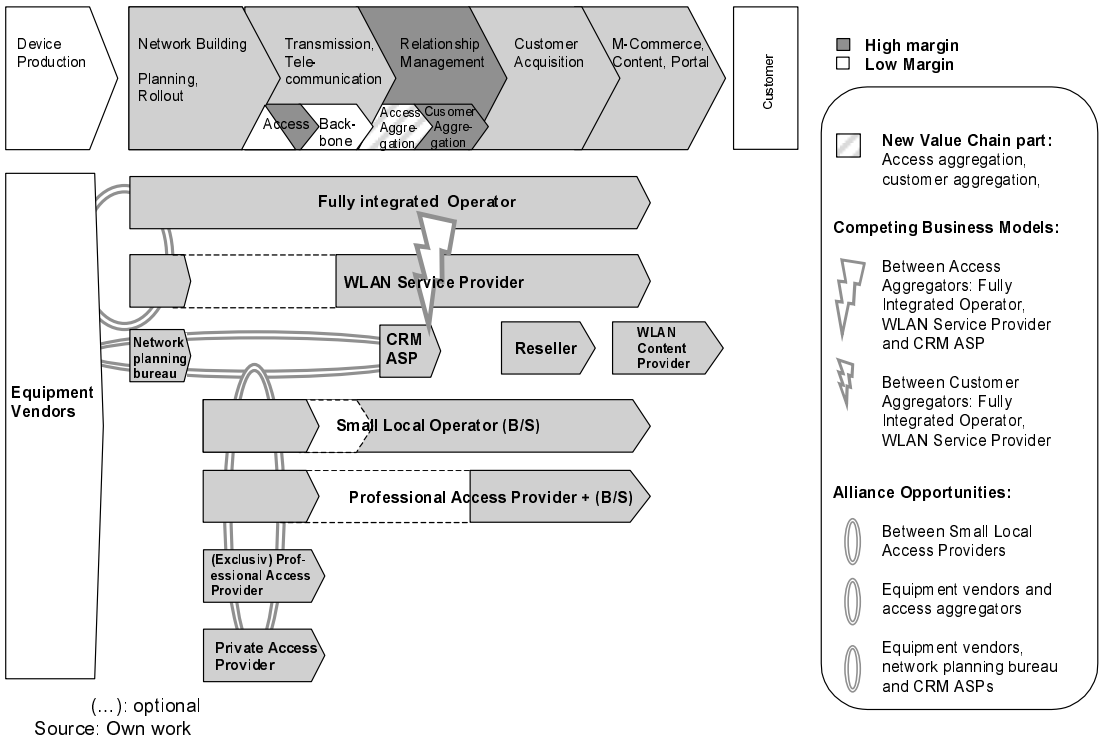

Figure 9: Analysis of the value chain

New value chain part
Looking at the business models, the activity access aggregation has to be introduced into the value chain. It provides a value added on its own and is also a competition field. Instead of customer management/customer aggregation, we will use the term relationship management which involves both activities.

Competition
Looking on the main activities of the value chain, we can identify two potential fields of competition: access providing and relationship management (access/customer aggregation).

With regard to access providing, the competition is very limited as access providers mostly do not offer substituting products (covering the same area[7]). The access pro-

[7] an exception are exclusive professional access provider, who also covers the same locations

viders also benefit[8] from one another as there is a network effect through any additional coverage which increases the overall value to the end users.

With regard to access aggregation, the competition is about providing the biggest coverage, to cover the area with the most traffic, and to sell it to a third party. The substituting product is their network coverage, as this is overlapping. A CRM ASP also becomes an access aggregator when he coordinates the roaming deals. As far as customer aggregation is concerned, it is about selling this network coverage to the end user and bundling as many customer relationships as possible.

Most power in the value chain will be located in the activities of relationship management and, in some cases, in access providing. Both activities have market barriers enabling higher margins. Access providers owning the location have a resource advantage which is not imitable. In high traffic areas, like airports, access providers can claim a supreme price. Relationship management (access and customer aggregation) is a scale business and, thus, companies can build market barriers through economies of scale.

Alliances
There are three potential alliance situations:

Between small local access providers
Competition between access providers is very limited as they do not have substitutable products. On the other hand, the value each access provider offers to the roaming partner is marginal (except in areas where there is high traffic - airports, railway stations, trade fairs, etc). Thus, they have very limited bargaining power and cannot set a price. By building an alliance with other access providers, they can aggregate their bargaining power and use it against roaming partners, and benefit from the additional value of the access aggregation.

Equipment vendors and access aggregators
A cooperation between equipment vendors and access aggregators could be also beneficial for both sides. Access aggregators could offer potential access providers/location owners an easy-to-install plug and play solution for a reduced price. Equipment vendors would benefit from increased sales. An example is Toshiba's cooperation with iPass [Grifith 2002].

Equipment vendors, network planning bureaus, and CRM ASPs
An example of this kind of cooperation is the alliance between Cisco, IBM, and monzoon [monzoon 2002]. While monzoon acts as a CRM ASP, it can also offer its access provider network planning and deployment through its cooperation with Cisco and IBM.

Impulses for the next iteration and new design possibilities

- The following impulses have been identified, enabling new design possibilities mostly in the value proposition of the business models:
- Most access providers have low power/margin in the value chain. There is a need for an aggregation mechanism to increase their power.

[8] See also Porter [Porter 1996, P. 267]. He describes the strategic benefit of competition which accrues when the competition covers less attractive segments (areas). Otherwise the original company would have to cover those segments on their own.

- There will be a high number of mostly unknown access providers. Thus, security and trust are becoming issues for users and WLAN operators/service providers who aggregate the access.
- The high number of access providers with multiple roaming contracts with WLAN operators and service providers increases the transaction complexity/cost for nationwide roaming. There is a need for a mechanism to decrease this transaction complexity/cost.
- Enhanced Network Services are too complex for small operators and access providers + who want to offer services like IP-Telephony and Push Services. There is a need for an enhanced Network Service ASP, offering an enabling platform.

4 Conclusion

Although the framework has not been validated in expert interviews and we applied only one iteration, it helped us to get first insights regarding:

- new design possibilities enabled by the WLAN technology
- potential business models and how viable they are
- the dynamics of the new WLAN industry and how the business model will interact
- impulses for the next iteration

The next step of our work is to validate the framework with experts. In the expert interviews, we will test the usability of the framework as a supporting tool and challenge the resulting WLAN business models.

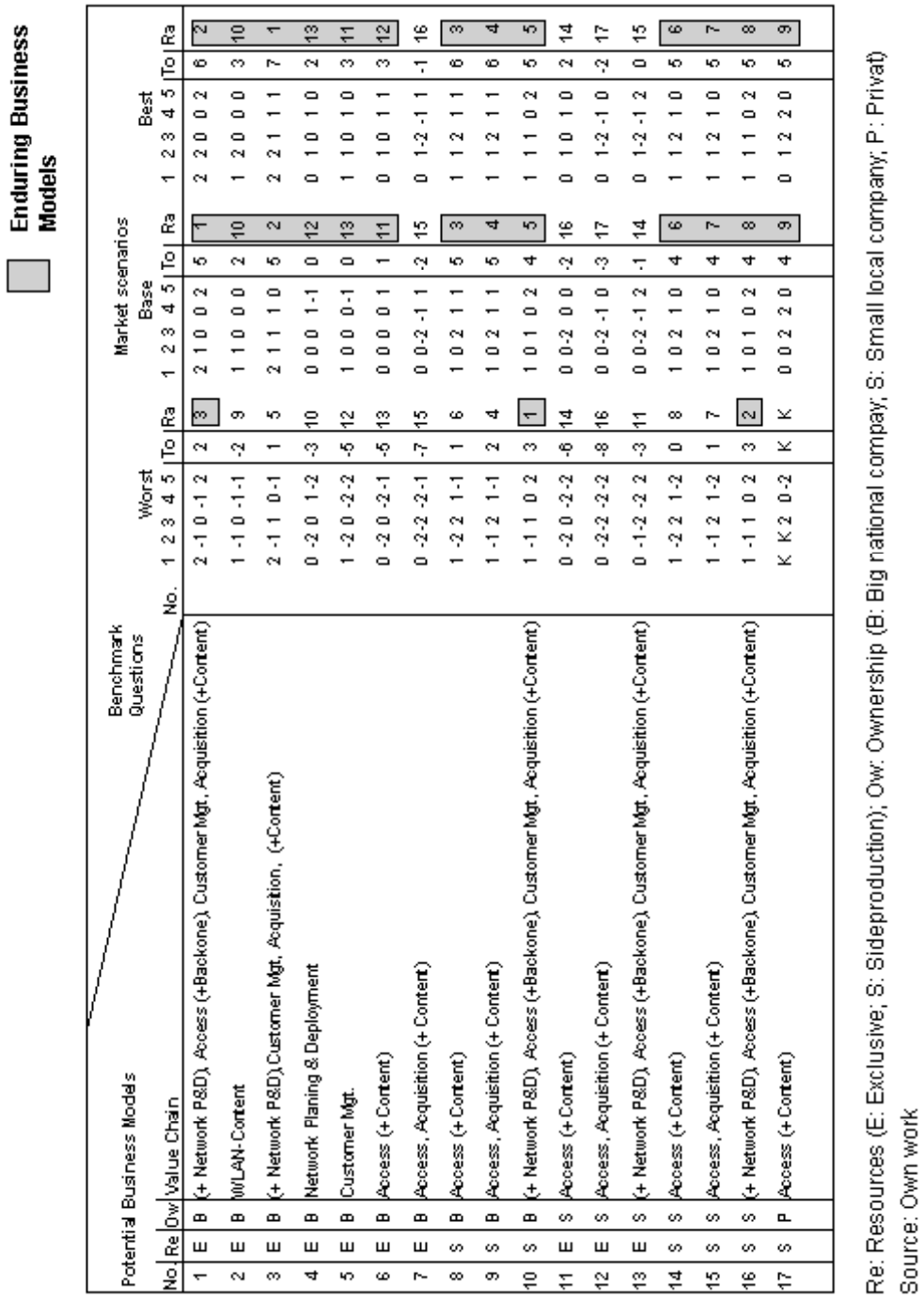

Figure 10: Evaluation and ranking of:the business models

Business Model	Value Chain	Owner Ship	Resources	Description	Examples
Full; Integrated Operator	All Parts	Big National Company	Exclusive Production	National offer of WLAN Internet Access in Hot Spots. Owning most Access Points as well having Roaming agreements with some access point owners.	BT, T-Mobile (Mobil Stat), etc.
WLAN-Service Provider	Customer Mgt, Acquisition + (Content)	Big National Company	Exclusive Production	National offer of WLAN Internet Access in Hot Spots. Relying only on roaming agreements with access point owner.	IPass
CRM ASP	Customer Mgt	Big National Company	Exclusive Production	Provides Access Point owner with customer authentication and billing functionality. Coordinate Roaming agreements.	monzoon
WLAN-Content Provider	WLAN-Content	Big National Company	Exclusive Production	Specialized in Location based Services and Content for WLAN.	-
Network Planning Bureau	Network Planning & Deployment	Big National Company	Exclusive Production	Specialized in planning and deployment of WLAN access points for third parties.	sigua
Small Operator (EKS)	Access, Customer Mgt, Acquisition (+Content)	Local Company/ National Company	Side Production with resource advantage	Offers existing customer base an additional service only in this location.	Hotels, Airline Lounges, Restaurants
Professional Access Provider + (EKS)	Access, Acquisition (+Content)	Local Company/ National Company	Side Production with resource advantage	Owns only the Access Points in their location. Sells contracts or prepaid cards for Service Provider with whatthey have a roaming agreement	Hotels, Air Line Lounges, Restaurants, Trade Fairs, Universities, Malls, Hospitals
Professional Access Provider (EKS)	Access (+Content)	Local Company/ National Company	Side Production with resource advantage	Owns only the Access Points in their location. Has roaming agreements with Service Provider, but does not have a sales force.	Trade Fairs, Universities, Malls, Hospitals, Building Owner
Exclusiv Professional Access Provider	Access (+Content)	Big National Company	Exclusive Production	Owns only the Access Points in their location. Has roaming agreements with Service Provider, but does not have a sales force. Location, personals and infrastructure is used for the service exclusiv.	-
Private Access Provider	Access	Private Person	Owns a private access point	Owns an private Access Point and offers Internet access for free or has a roaming agreement with a service provider.	WLAN Communities, Bay Org, etc.

Note: B = Big company; S = Small company; (...) optional value chain
Source: Own Work

Figure 11: Potential Business Models

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