

## A CONCEPTUAL RESEARCH FRAMEWORK FOR ANALYZING THE EVOLUTION OF ELECTRONIC MARKETS

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### ABSTRACT

Main goal of the research framework presented in this paper is to support future business decisions on electronic markets. Until now, little is known about the success factors of electronic markets in general and Web-based Mass Information Systems (WMIS) in particular. The ongoing research on virtual business models is a good theoretical basis for conceptual modeling, but the specific aspects of private customers and their WMIS usage patterns are not covered adequately.

### INTRODUCTION

With the continuing evolution and convergence of previously disparate functions around electronic commerce Web-based Mass Information Systems (WMIS) have become the basic infrastructure for global transaction-oriented applications. Every transaction process occurring in the electronic marketplace goes hand in hand with the access, absorption, arrangement, and selling of information in very heterogeneous ways. Accordingly, designers of WMIS have to address the needs of the newly empowered customers in order to exploit the potential of on-line trading of information, services, and physical goods.

At the MIS Department of the Vienna University of Economics and Business Administration<sup>1</sup> research has been directed towards mass information systems (mass IS) since 1993. By mass information systems we refer to systems that support on-line information retrieval and routine tasks by way of self-service for a large number (thousands or millions) of occasional users who are spread over various locations (Hansen 1995). In contrast to systems supporting Electronic Data Interchange (EDI) and wholesale trading, mass information systems exclusively target individual customers. Considering its increasing impor-

tance, we now focus our efforts on WMIS which – as a sub-category of mass information systems – rely on the hypertext functionality and transfer mechanisms of the World Wide Web. Being characterized by interactivity, dynamic updating, hypertextuality, and global presence they are very similar to the concept of electronic catalogs (Palmer 1997). The strong specialization of academic research and prac-

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tion in formulating, analyzing and implementing marketing strategies for WMIS was a direct result from the insight that abstract marketing instruments cannot generally be applied to different sectors and industries without taking into account the specific features of these heterogeneous segments. The necessary consideration of core competencies is reflected in a number of highly specialized approaches for analyzing market-oriented decision behavior. In addition to that, a few empirical studies have reported the influence of selected factors on WMIS adoption in certain industries. However, almost no studies exist with a broader approach. A comprehensive analysis of the environmental conditions and their impact on the basic development decisions of WMIS are still missing.

In a first step (1993/94), we have developed a classification scheme and a research framework for mass IS (Hansen 1995). Existing mass IS and implementation strategies of U.S. and European companies were analyzed to deduct and test hypotheses about the success factors of mass IS in different industries (1994/95). The objective of the recent phase since 1996 has been the development of industry-oriented reference models to guide mass IS investments as well as to apply and empirically validate these models. As one of the primary means of standardized communication, these models provide an invaluable opportunity to strengthen the ties between academic research and industry practice. In cooperation with renowned Austrian and German companies (e.g., Austrian Airlines, Austrian Automobile Club, Bank Austria, Billa, Lufthansa Austria, Olympus Austria, Rank Xerox Austria, Tarbuk, Taurus Video) success factors of deployed WMIS were analyzed. Prototypes of such systems were implemented on department servers, and for some of the mentioned companies the final version of their WMIS was developed as well. The technical implementation was established in cooperation with various Austrian Internet service providers. To broaden the perspective, empirical studies regarding Internet strat-

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egies of Austrian companies and the household acceptance of interactive services (Hansen and Schweeger 1995) as well as the market potential for electronic food retail trade (Schuster and Sporn 1998) were conducted.

**THE ECOLOGY OF ELECTRONIC MARKETS**

To understand the complex dynamics of modern companies James F. Moore provides an ecology-oriented framework. He concludes that businesses are not just members of certain industries but parts of a particular business ecosystem that incorporates a whole bundle of different industries. The driving force is not pure competition but co-evolution, implying that businesses work cooperatively and competitively at the same time. Their efforts are centered on innovation and the development of new products in order to create and satisfy individual customer needs (Moore 1993).

Such a business ecosystem is seen as "an economic community supported by a foundation of interacting organizations and individuals – the organisms of the business world. This economic community produces goods and services of value to customers, who are themselves members of the ecosystem. ... Over time they co-evolve their capabilities and roles, and tend to align themselves with the direction set by one or more central companies" (Moore 1997, p.26). If we analyze the chronological development of such business ecosystems the four distinct stages depicted in Table 1 can be identified (Moore 1993; Moore 1997):

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The process of co-evolution is a complex interplay between cooperative and competitive business behavior. In the pioneering stage ("Birth") cooperative behavior usually represents the preferable option. Business partners help each other to create a full new value package for the customers. If the new ecosystem provides enough new value it will become larger because of new members respectively customers. This will attract other companies who might become followers. Since these followers heavily depend on the leader they usually do not intend to create other, eventually competing business ecosystems. In the expansion stage, however, the ecosystem has to broaden its concept in order to reach a global audience. The authority stage is characterized by the fight for control in the particular business ecosystem while in the renewal stage tracking new trends and anticipating them with corporate strategies deserves highest priority (Moore 1993). After generally identifying the major components of virtual business ecosystems this paper will demonstrate how to apply the stages mentioned above to analyze the evolutionary development of electronic markets and WMIS in particular. Virtual business ecosystem for electronic markets are characterized by (see Figure 1):

- ◆ the application "WMIS" running on the platform "World Wide Web",
- ◆ the required technical and organizational infrastructure,
- ◆ contents, products, and services offered,
- ◆ the company's customers and its suppliers.

EcoSys Stage	Leadership Challenges	Cooperative Challenges	Competitive Challenges
Birth	Maximize Customer Delivered Value	Find & Create New Value and Provide it in an Efficient Way	Protect your Ideas
Expansion	Attract Critical Mass of Buyers	Work with Suppliers and other Partners	Ensure that your Approach is Market Standard
Authority	Lead Co-Evolution	Provide Compelling Vision for the Future	Maintain Strong Bargaining Power
Renewal or Death	Innovate or Perish	Work with Innovators	Develop & Maintain High Barriers

Table 1 The stages of business ecosystem

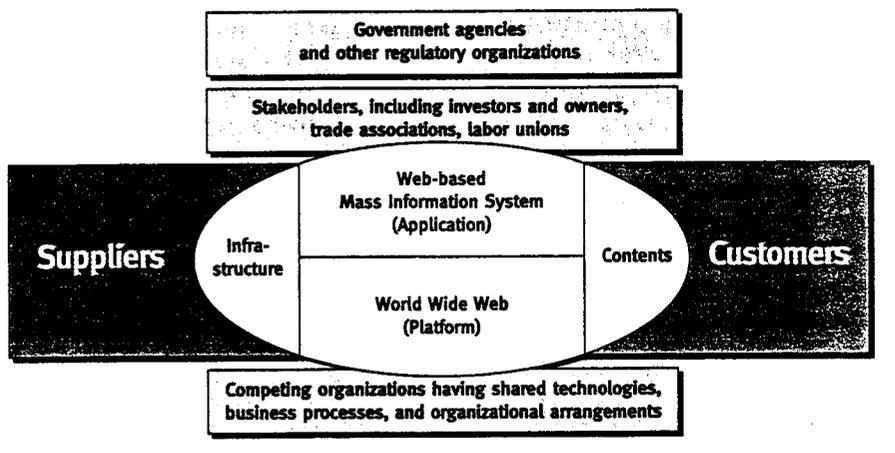


Figure 1 The business ecosystem for electronic markets

The whole business ecosystems also includes the parties mentioned in the shaded areas of Figure 1. All members of such an ecosystem are responsible for the prosperity of this particular system, i.e. for the prosperity of a certain company, too. For establishing a new business ecosystem even competitors have to cooperate. Competitors are allies in the competition with other business ecosystems but they are rivals within the boundaries of their system (Moore 1997; Brandtweiner 1997).

Our basic assumption is that the development of electronic markets follows the stages identified by Moore and that we currently find ourselves at the beginning of the expansion stage. On the one hand, we are confronted with strong cooperation within the scientific community and between practitioners and academics but, on the other hand, with a strong competition between electronic and traditional commerce. Using Moore's terminology we are dealing with two competing ecosystems. The most important task in this stage is the creation of a world-wide critical mass of customers in electronic markets. To create this critical mass there must be dramatic and unique advantages for the customer in the case of using electronic commerce applications instead of traditional retailing networks. These advantages can only be provided by adaptive technologies which have to co-evolve with the changing and heterogeneous demands of electronic markets.

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#### WMIS CUSTOMIZATION

Delivering customized contents with adaptive WMIS aims at identifying profitable potential customers and presenting them an offer tailored specifically to their individual needs and preferences. While being motivated by a user-centered design perspective, the question goes beyond the scope of WMIS interfaces or document presentation and includes the development of flexible software architectures and corresponding business models to take advantage of adaptive system behavior. However, due to the heterogeneous character of customer profiles and market coordination and allocation mechanisms, it remains difficult to adequately consider them using traditional system architectures. Change in information technology, organizational structure, and the corporate value chain strongly influence electronic commerce as a new business paradigm. Since the invention of the World Wide Web in 1993, adaptability has represented an inherent feature of WMIS (Figure 2).

#### BIRTH / PIONEERING

In the first stage (S1) stand-alone servers delivered simple hypermedia compound documents being displayed by the browser. At least to some extent every user was able to specify the general appearance of documents by setting standard browser preferences. But with the progressive commercialization of the Internet and the integration of additional layout options companies have increasingly tried to determine the exact design of their documents due to strategic marketing considerations and in order to maintain a consistent corporate identity. But adaptability is not limited to visual design. Available attributes and preferences of registered users may be stored in profile databases and incorporated into WMIS using simple rule-based constructs. Granting different access privileges according to IP domain, personally addressing known customers with dynamically generated documents, or determining purchase conditions according to user category are typical scenarios which require the server-side

database and application interfaces of stage two (S2). If we compare the evolution from S1 to S5 with Moore's sequential approach, strong similarities are revealed. S1-S2 correspond to the pioneering stage of the Moore model since WMIS create new value for customers and deliver this value in an innovative and highly efficient way (see Table 1).

**EXPANSION**

However, in most cases little is known about the users themselves. Although customer profiles frequently remain incomplete and do not reflect economic reality, they have to be processed instantly within the expected WMIS response time. It goes without saying that scaling such a task becomes difficult to handle with exponentially increasing numbers of on-line users. Therefore, client-side scripting languages and applets for integrated transaction processing gain popularity in stage three (S3), overcoming the poor performance and other limitations of S2-applications solely based on Perl, CGI, and HTML.

More ambitious efforts focus on intelligent digital agents of stage five (S5), especially as far as information retrieval and complex negotiations are concerned. Mobile agents as proactive, intentional systems promise to further increase flexibil-

ity and will radically change inherent characteristics of electronic commerce. In the meantime, adaptive technologies like neural networks or related soft computing approaches represent an established field and will start to influence electronic commerce substantially in stage four (S4) - increasing the functionality of deployed applications, independent of the complex infrastructure being necessary for mobile agents.

Considering the recent developments as far as electronic markets are concerned, S3-S5 belong to the expansion stage of Moore's framework. In order to develop all these new technologies, cooperation as precondition of co-evolution is absolutely necessary. The business ecosystem for electronic markets has not reached the stages authority or renewal until now. It goes without saying that some companies are prospering very well and may be regarded as innovators or technical leaders but there is no formal or informal leader in the ecosystem of electronic markets yet. There are a lot of ambitious efforts to succeed in this field but the real battle for leading the whole ecosystem has not even started yet. As the sequence of stages represents a chronological process, the renewal (or death) stage cannot appear until the authority stage has taken place. Furthermore,

when looking at the absolute number of deployed applications it becomes completely clear that electronic markets are highly progressive ("Expansion") rather than declining artificial structures.

**CONCLUSION**

Standard software for electronic commerce incorporating adaptive components will reduce the barriers between productive data processing (transactions) and dispositive data processing (market analysis, WMIS-tracking, data warehouses, etc.). By providing a conceptual research framework for analyzing the evolution of electronic markets as well as their business ecosystem we set the stage for a number of future research efforts. These projects will focus on retailing transactions via WMIS and support technology-oriented business decisions by predicting future developments in the business ecosystem of electronic markets as accurately as possible.

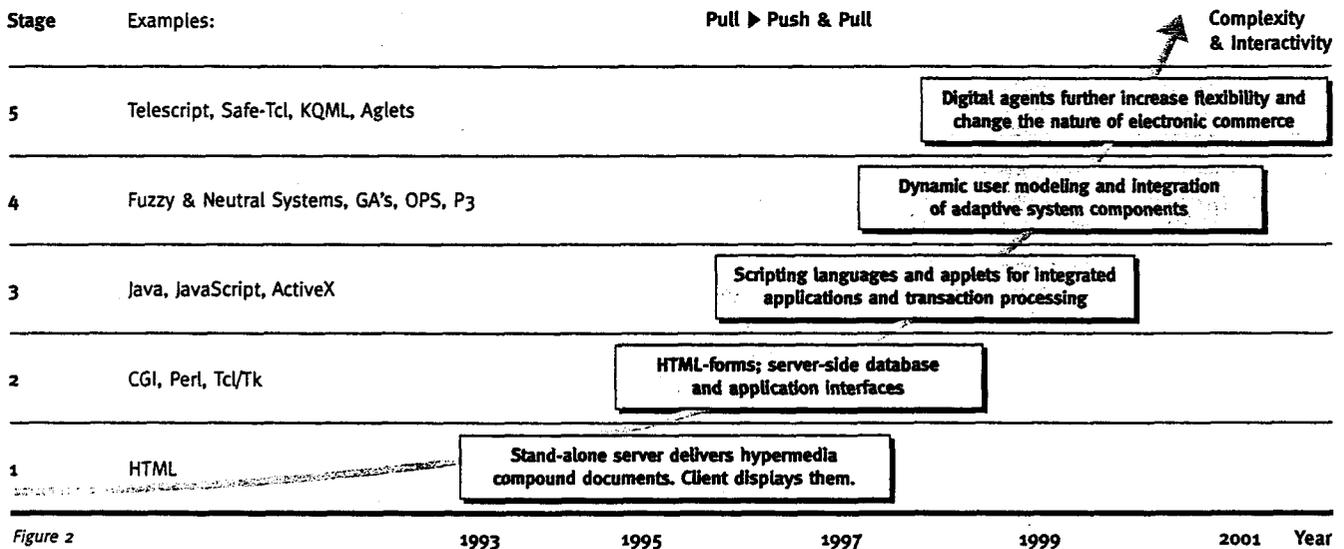


Figure 2 Evolution of the WMIS infrastructure (Scharl 1997; Hansen and Tesar 1996)