A Multi-Criteria Taxonomy of Business Models in Electronic Commerce

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Abstract. Looking at the ongoing evolution in electronic commerce there are more and more business models becoming significant. E-shops, e-auctions or e-tendering are not the only possibilities for a company to be active in electronic commerce. This article presents many relevant business models and systematically classifies them. Mainly the classification is based on the type of business subjects like suppliers, customers and mediators and their active or passive role as initiators and carrier of a business model. Another basis for the classification is the breakdown of the concept of electronic commerce and an explicit modeling. This allows to build up a taxonomy using multiple criteria and the presentation and subsumption of individual business models. The taxonomy can be used to analyze and enhance existing systems and business models as well as to develop new internet strategies for companies. An example of the implementation of the business model *e-portal* concludes the article.

1 Introduction

The variety of business scenarios is one reason for the success of individual companies today. The activities in electronic commerce are also part of this variety. However, companies like established firms and internet-oriented start-up's have different requirements in electronic commerce. So the innovative possibilities need to be designed and customized at an individual level. We provide insights and help with these problems by presenting a systematic multi-criteria taxonomy for reference models, advances in modelling for the electronic business domain and a classification scheme for the business models. This provides help at the development of a successful internet strategy. In this context the detailed representation of single areas and models of the electronic commerce domain offer a practical consolidation of the subject matter.

1.1 Electronic Business

Under the ongoing development of a scientific realm the concepts / notions get manifold and also more detailed. Especially the notions are getting more exact. Talking of electronic commerce the notions are currently used with changing semantics and are overlapping each other. This is often caused by intensive marketing activities.

The notion of 'Electronic Commerce' (EC), which is used since years as a conglomerate with great publicity, should be defined more exactly and delimited from other notions. This is necessary as there are new notions like 'Electronic Business' (EB) which is now used as a comprehensive word for all electronically handled business activities. A subset of electronic business is the area of 'Electronic Cooperation' (ECoop) which is getting greater attention today, e.g. by the business model of virtual companies or collaboration platforms. Another subset is 'Electronic Information' (EI), which covers all processes in electronic business, which are primarily devoted to the mediation and transportation of information to customers. Important examples from this actually intensively pursued area are web-directories / catalogues, digital libraries and content management systems. In the context of this overall classification „*Electronic Commerce*" (EC) now is used again with the original sense – the electronic trade, where suppliers and costumers, eventually also mediators are involved and exchange goods or services for an equivalent value (money). By now, electronic commerce is the most important force in electronic business. Fig. 1 shows today's common notions in the field of electronic business.
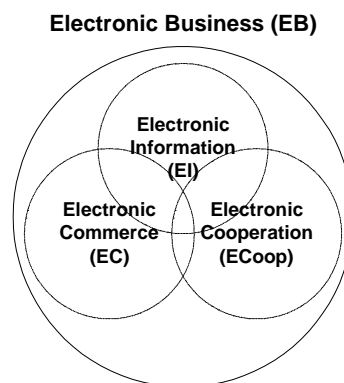

Fig. 1. Notions in Electronic Business (EB)

Concrete activities in electronic commerce can be characterized through business models, like Timmers suggest them for electronic markets [14, 15]. He defines a business model as 'an architecture for the product, services and information flows, including a description of the various business actors and their roles; and a description of the potential benefits for the various business actors; and a description of the sources of revenues' [14]. There has been only little work done to define an e-business model in a formal way. Alt and Zimmermann [1] highlight the need for a better understanding of business models in electronic business in their introduction to the special section on business models in the ten-year anniversary issue of the international journal on Electronic Markets. The same issue contains an article from Essler et al. [6] who emphasize interactivity in their modelling efforts. O'Daniel [11] introduces a value-added model in the same issue. Other relevant work comes from Gordijn et al. [8], who already define a semi-formal value-port based model (e³-VALUE).

In this article, Timmers' modelling approach is continued, enhanced, and a classification scheme is developed for the business models of electronic commerce in order to show the peculiarity of certain groups of business models. The scheme considers at the same time, which economy subjects (supplier, customer or mediator/trader) initiate and carry a business model, and in which manner (active or passive) they communicate with their trade partners. The relevant models introduced by Timmers and further actual business models are discussed and assigned to the classification scheme. More emphasis is given to the business models carried by the customers as their importance had risen substantially in the mean time (cf. [2]).

2   A Classification of Business Models in Electronic Commerce

An abstract classification in electronic business was already presented in the introduction. *Electronic Business* (EB) can be subdivided into the areas of *Electronic information* (EI), *Electronic Commerce* (EC) and *Electronic Cooperation* (ECoop). Besides this classification usually only superficial classifications are used. Activities are only classified into the areas of Business-to-Consumer (B2C) and Business-to-Business (B2B), using the economy types of the participants as criteria. But further combinations and groups already get relevant. Examples are Consumer-to-Consumer (e.g. eBay), or groups like administration and government. A detailed classification of the business models seems necessary.
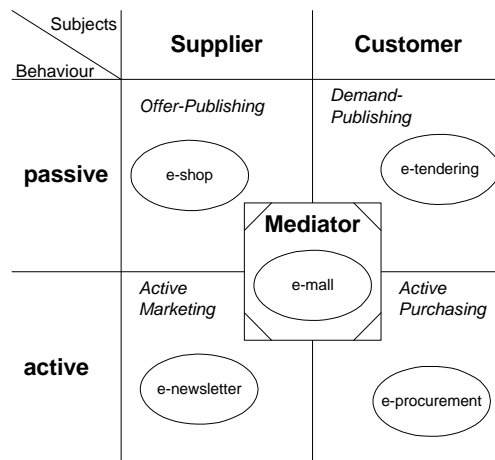

Fig. 2. Classification for Business Models (with typical examples)

Fig. 2 shows a possible structure for a classification of business models. Some business models are placed in the classification to show examples. The business models are classified at first after which (economy-) *subjects* carry the model. The most important subjects in electronic commerce are supplier and customer. For example the business model of an e-shop is carried characteristically by the subject *supplier*. Other relevant economy subjects can be mediators. A second classification criterion (*be-*

haviour) describes whether supplier or customer initiates the trade transactions. The subject can behave active or passive in the communication with its trade partners. Push-models like an e-newsletter may have active character. The customer may be contacted and then gets the information active delivered as a subscriber. An e-shop generates a passive offer; the supplier waits until a customer enters its shop, informs himself about the products, and initiates an order. A *mediator* is a subject that acts as an agent between the supplier and the customer. He can behave either *active* or *passive* to the supplier as well as to the customer. So there are four possibilities for the positioning of a mediator in the classification scheme. For example an e-mall, that is a union of several e-shops, is characteristically *passive* to the customers and also *passive* to the suppliers. This classification clarifies the position of a business model in electronic commerce.

3 Modelling in Electronic Business

Currently there is no systematic presentation and modelling technique for business models in Electronic Business. Based on Timmers [14] the modeling of actors and a phase model for trade transactions is presented. Also the possible revenue sources are analysed. Additionally function modules for applications in Electronic Business are discussed, which evolve as a basis for the implementation of systems for business models.

3.1 Modelling of Actors and their Roles

To model the most important actors in a business model, their roles and their relations to one another, a graphical diagram based interaction-oriented language is used. This schematic and clearly arranged presentation technique was chosen for better comprehensibility.
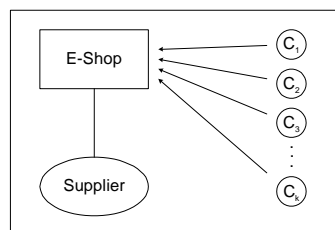

Fig. 3. Modeling Example**:** E-Shop

Fig. 3 shows the example of a scenario for the business model *e-shop*. A supplier usually carries this business model. The supplier presents it's products and services. Customers can access the offers and initiate trade transactions. The meaning of the graphical elements is now described in detail:
-   the roles of the actors are marked with small circles
-   possible roles are suppliers (S), customers (C) and mediators (M)

- the role of the actor / economy subject which carries the business model is marked with an ellipse
- software systems are shown with a rectangle
- basic connections between the elements are shown by simple lines
- the action of one actor contacting another is shown by arrows; the contact may lead to a trade transaction

3.2 Phase Model for Trade Transactions

Trade transactions can be subdivided into multiple phases. A simple and broadly accepted phase model spans the three phases of *search*, *negotiate* and *fulfil* (cf. [10]). To better understand the weaknesses and strengths of a business model in its support of trade transactions, it is investigated in which way and how much a business model supports each single phase. To gain more insights a more detailed model is used. It's adapted from Guttman et al. [9], who have developed the model on top of several descriptive theories and models to capture consumer buying behaviour.

Table 1. Phase Model for Trade Transactions

No.	Phase	Abbr.
1.	Need Identification	NI
2.	Product Brokering	PB
3.	Merchant Brokering	MB
4.	Negotiation	N
5.	Purchase and Delivery	PD
6.	Product Service and Evaluation	SE

Table 1 shows the six phases or stages of the model. As every model this is a simplification and single phases could overlap each other or become specialized forms in the concrete scenario. Nonetheless this helps to establish reference business models, which describe what phases are typically supported in an e-business model.
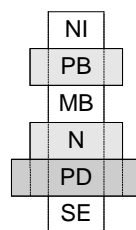

Fig. 4. Trade Transaction Phases of an E-Shop

The example in Fig. 4 shows the phase model for an e-shop to provide a better understanding. The width of the blocks (resp. their shading) stands for the level of support, which is provided from a business model for a specific trade transaction phase. In this example the phases NI, MB and SE are only poorly supported, while the phases PB and N have typically good support. The phase PD should have

excellent support by every e-shop, since the functions of purchasing and the organization of the delivery are most naturally to the character of an e-shop.

3.3 Revenue Sources in Electronic Business

Revenue sources are an integral part of an e-business model [15]. They are the basis for the economy of a business model and determine the direct incomes. In the internet economy revenues can also be generated by other sources than *sales of products and services*. There are sources like the marketing of *contacts* and *information* [13]. Actors could use their *contacts* to customers, e.g. for advertising purposes. Visitors of web sites generate *information*, which can also be used as a revenue source. Derived user profiles and web statistics may be used under the restrictions of legal standards for the protection of data privacy. Fig. 5 shows the three major groups of revenue sources.
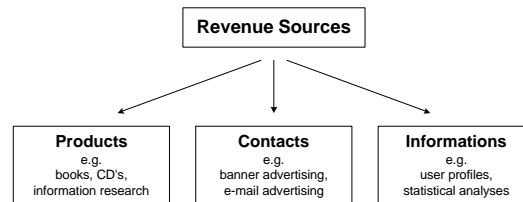

Fig. 5. Revenue Sources (cf. [13])

This revenue sources may be adapted nearly to all business models. The real usage and the revenue allocation depend on the real scenario and are tightly coupled with the price formation of the suppliers offers.

3.4 Functional Modules for E-Business Applications

E-business models contain functional modules, which can be identified and re-used in other models. Specific modules can be replaced by other modules, which have the same type. For example the module for *price discovery* may use module instances that use static prices, a discount system or an auction mechanism. By exchange and combination of such functional modules new business models can be created. The software implementation of functional modules can be accomplished, e.g. by component technology. In the following an e-catalogue / e-shop is taken as example. An e-catalogue is a reduced form of an e-shop, which is restricted to the marketing functions. Some possible modules of an e-catalogue are the *catalogue function*, *product presentation*, *search function*, and *available to promise*. An e-shop should contain additional modules for the purchase order processing. For example a *basket*, the *e-payment* functions, *logistics*, and *security functions* (e.g. encoding). Modules can be *required* to form a specific e-business model or can be *optional*. Using the viewpoint of modules and components it is possible to substantiate e-business models even further.

4 Important Business Models for Electronic Commerce

In this section, business models of electronic commerce are presented, which have already reached broad economic relevance or show a clear trend for major relevance in the future. In this paper only some of these models can be presented in detail. A broader range can be found in [2]. The models are integrated into the classification scheme developed in section 2. As a basis for the presentation typical instances of the models are identified, which help to develop so called reference models. These reference models can be combined with other models and can be customized easily to help implement a solution for a concrete real world scenario.

4.1 Business Models of Offer Publishing

The business models of this group are carried by the *suppliers*, who act only in a *passive* way to the customers. The suppliers publish their offers and wait for orders from the customers. Besides *electronic product catalogs* the most prominent business model of this group is the *e-shop*. The e-shop has already been used as an example in the modelling section above. See Fig. 3 and Fig. 4 for details. An e-shop is used by companies to distribute their products and services using the internet. The main functionalities provided are *marketing* and *purchase order processing*. See [3] for a detailed discussion on these subjects.

4.2 Business Models of Demand Publishing

The business models in the group of demand publishing are carried by the *customers*. The customers publish their demands, sometimes making use of mediators, and wait for the offers of the suppliers (*passive*). In the past these models were not suitable due to the relative high costs. But based on the cost savings from e-business solutions today, such business models seem to be promising now. A typical business model in this group is *e-tendering / e-sourcing* (Fig. 6).
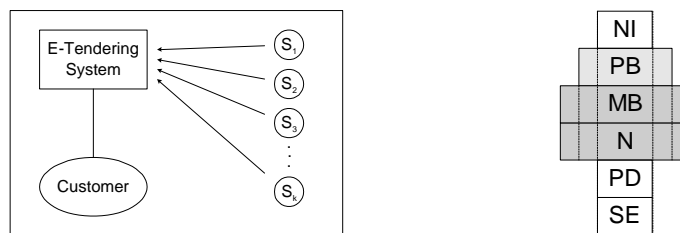

Fig. 6. E-Tendering / E-Sourcing

Examples of the e-tendering business model which make use of mediators are the Deal Assistant (www.Dealassist.com) and eWanted (www.eWanted.com), which currently use reverse auctions in the C2C area.

4.3 Business Models of Active Marketing

The business models of active marketing are carried again by the *suppliers*, but the suppliers contact the possible customers in an *active* manner. The suppliers provide information about their products, the prices or other conditions in an active manner. This marketing often uses the e-mail channel and may lead to undesirable effects like spamming. But there are many positive applications like active cross-selling mechanisms or alerting services about new products and prices. Also the *E-CRM* (customer relationship management) business model, which may have an emphasis on the service and evaluation phase, can be positioned in the group of active marketing. The *e-newsletter* (Fig. 7) is a typical example of active marketing in the information phase. When a customers register with additional profile information, or the information are derived from other sources, customized content can be provided in a personalized way to the customer.
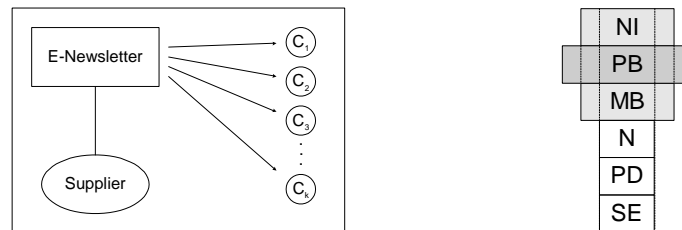

Fig. 7. E-Newsletter

4.4 Business Models of Active Purchasing

In the group of active purchasing the *customers* carry the business models, investigate *active* and communicate *active* with the suppliers. An innovative example are *shopping agents* [9], which automatically search for products and services in the name of the customer and under certain circumstances also buy the goods. An example is Jango (`www.jango.excite.com`), which evolved from the Netbot project [5]. A preliminary stage of shopping agents are *offer comparison services*. But shopping agents are designed as autonomous flexible software agents [16,17]. Due to a lack of adequate technologies shopping agents are not spread today. A more practical business model in the active purchasing group is *e-procurement*, where customers access the electronic commerce systems of suppliers using the service functions of an own e-procurement system.
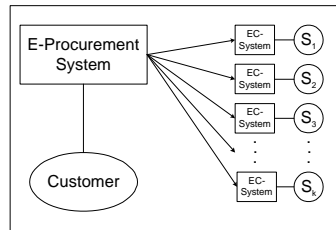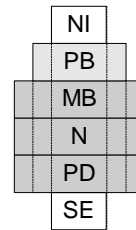
Fig. 8. E-Procurement

Currently basic e-procurement systems are used by big companies to reduce their procurement costs. The functions support internal processes, e.g. authorization issues, as well as external procurement processes. Business messaging, EDI or XML based, is an important interoperability issue in this context.

4.5 Business Models of Mediators

The business models for mediators and marketplaces are presently only ambiguously and fuzzy defined. Many of the already introduced business models can also be operated by a mediator and there are many possibilities to customize the reference e-business models. With the beginning of electronic commerce the concept of disintermediation, which fosters direct contacts between customers and suppliers, has become more relevant. But the process of bringing together the commerce partners can still be accomplished in various cases at a lower cost with a mediator. Also the mediator may allow to add some useful value-added services in the process. For mediators, various e-business models exist like the 3rd party marketplace [15], online exchanges, e-auctions [16], or full featured e-malls [2]. In the following the business model of an *e-portal* and the case study of the *PublicationPORTAL* will be described.
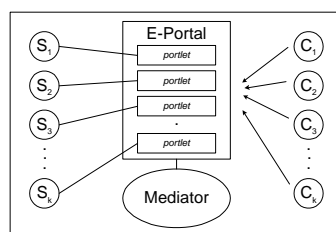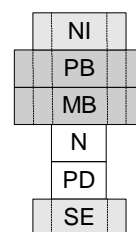

Fig. 9. E-Portal

E-portals (Fig. 9) support users with search and information discovery functions for the access to the manifold information on the internet. E-portals give access to information on products and trade partners in the phases of product brokerage and merchant brokerage. The suppliers present their information and services in so called portlets, small areas inside a web-portal. System portlets provide functions for user

convenience. Also the trade transaction phases of need identification and evaluation are typically supported. E-portals can be seen as a preliminary stage to marketplaces, which also allow and support to carry out the trade transactions, including settlement issues.

To further define the hype word 'portal' an e-portal can be defined as *a fixed start and return point in the web, which is personalized to the user*. Portals help users to cope with the information overload of the web. Portals do this by personalization of their information to individual users, by specialization to user groups, by specialization and expertise on special themes and by presenting a broad range of prepared information. E-portals are also predestinated to integrate other business models from electronic commerce or electronic information.

Looking from the viewpoint of *electronic information*, the processing of information is central. Fig. 10 shows a phase model [4] where at first information sources are *registered*, then the *content is opened up* for later access and usage, an *archive* stage can preserve information, the *search and discovery* phase provides meta information to the user and finally the *delivery* phase gives the user access to the desired information.
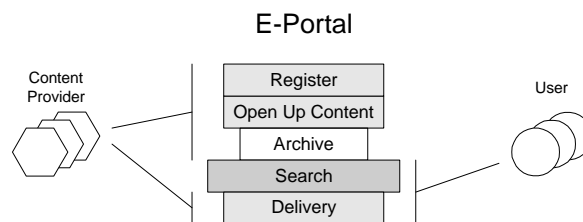
E-Portal

Fig. 10. Information Centric Phase Model for E-Portals

Special variants of the e-portal business model that appeared in this chronological order are *consumer-portals*, *portals special to a line of business*, *intranet-portals* and *enterprise-information-portals (EIP)*. *Consumer-portals* like 'Yahoo!' are highly used start pages into the web with services like search engines, directories, unified messaging, news from many areas, shopping-malls and auctions. Another variant are portals, which are special to a *line of business*. These are vertical portals that develop a high expertise in the area. *Intranet-portals* support employees through information and services specialized for the company. E*nterprise-information-portals (EIP)* join the functionalities of intranet-portals and the outward representation and communication of a company.

The implementation of portals requires complex web-technology and the integration of heterogeneous information and service sources. Different vendors try to create standard software for portals. Examples are *Viador*, *Oracle*, *BEA* and some other major commercial vendors. An example for an open-source framework is *Jetspeed* from the Apache group.

5 The PublicationPORTAL: Mediating Information and Services in Digital Publishing

Portals are mediators for suppliers and consumers and primarily provide integrated access to the technical implementation of the various business models of suppliers for the consumers. This applies also for the business models in the area of electronic information [4].

Applications of the business models from the area of electronic information, like digital libraries or content providers, help to cover the information demands that arise at work, in private life and in science. However large problems exist in the efficient utilization and development of the information market. A typical user has only a marginal overview of the information sources and services. The *PublicationPORTAL* [18] addresses these problems and offers an effective solution based on the mediation strengths of the business model of an *e-portal*, which was already presented above.

The *PublicationPORTAL* aims at the support of users that can be divided into different roles including authors, editors, publishers, distributors, librarians and readers. The users can be separated furthermore into the orthogonal categories of customers and providers. Providers use the Portal to promote their services exactly to the desired audience by specifying their *service types* and *offers*. Customers on the other hand are using the Portal as a starting point to achieve their domain specific goals. The *PublicationPORTAL* guides them using a process that is divided into three steps and assembles a generic procedure to accomplish different objectives in the application domain of e-publishing. The three steps are *orientation and mediation, integration*, and *access and utilization*.

In the first *orientation and mediation* phase, a mediation of task-related services based on individual characteristics and preferences of customers is done guiding users of different skills to a set of providers that together accomplish the desired goal. Here customers find out about the necessary processes, the related services and finally the most favourable providers ready available.

The second *integration* phase of the Portal guides the user in combining sub-services as to establish value chains. These combinations are deduced from the objectives and preferences as well as formerly chosen *service types* and providers, leading to optional or necessary additional services. Furthermore, coupling and coordination of partial services are supported on system level.

If concrete services are to be taken into account, this conventionally leads to proprietary procedures of use, including repeatedly registrations and different user interfaces. Where registering over and again is just inconvenient, different user interfaces can lead to severe failure due to semantically incompatibility. To cope with this, the *PublicationPORTAL* offers means for the support of *access and utilization*, which include initialisation, calling, and interactive control of services in a generic homogeneously fashion. An important part of this is semi automatic generation of generic Web interfaces (portlets) for categories of services. For further convenience, the phase can be backed by persistent customer profiles, enabling automatic service configuration and single-sign-on capabilities.

Individual user characteristics generally have an effect on support functions of a portal, as the elements of the three phases could be combined in a variable fashion.

They can be utilized to optimize the way assistance is carried out. Thus, temporary as well as persistent personalization is a desired feature of the *PublicationPORTAL*, backed by profile gathering and accounting. Beside its influence on the essential phases of assistance, personalization allows for some nice tools like bookmark lists or individual desktops. In order to allow the users to use services and composite-service in a semi automatic manner, we work on a broker architecture, which is mainly based on concepts of type management and automated negotiation for services. Fig. 11 shows the web interface of the prototype that was implemented using the framework *Jetspeed*, an open source project from the Apache group.
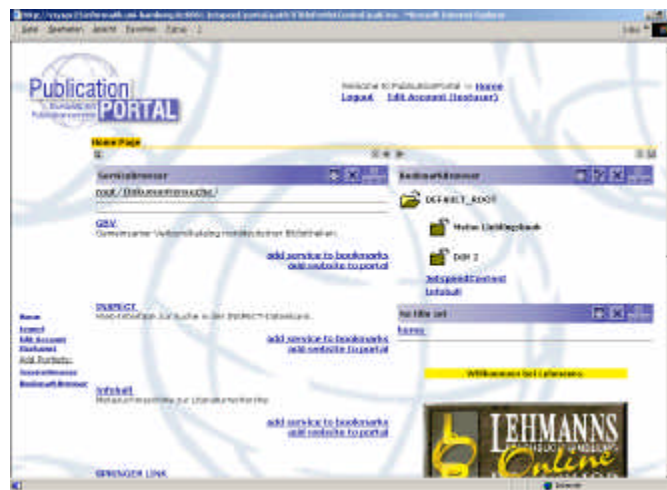

Fig. 11. PublicationPORTAL Prototype

The project is supported as part of the Global Info initiative of the German Federal Ministry of Education and Research (BMBF) [7]. It's the goal of the initiative to support the basic change in the scientific information infrastructure. Scientists should have efficient access to all the worldwide available electronic and multimedia information, that are digitally stored in distributed information systems, by their work place computers.

Conclusion

Current activities of companies in e-business change permanently and become very manifold. Therefore a systematic analysis of the basic structures in combination with the real usage of business models is important. As a result a multi-criteria taxonomy of e-business models has been presented. The modelling methods for e-business models were enhanced and concretely used. A case study with the e-business model *e-portal* has shown a real world scenario. The new classification and modelling methods help to analyse existing e-business models and to select and design e-business models for real world scenarios.

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