Characterization of business model for federated ERP systems

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Abstract

In the last few years' business in internet become more and more significance. On other hand new development of internet technology is rapid and changed every day. Thus Business models have to be continually adapted to meet the requirements of new business idea. One of these new and important business ideas is: how to supply the needs of small and medium sized enterprises (SME) with business software (E.g. Enterprise resource planning System (ERP)).

This work aims to classify this business idea in order to apply it in an appropriate business model. The classification is done through the projection of the business idea into different characteristics and their attributes. By researching the literature on this topic, we have identified five relevant characteristics and their attributes that are suitable to lead us to the appropriate characterization of this business model.

Keywords: *ERP system, FERP System, FERP Web Services, Business model.*

1. Introduction

An ERP system is a standard software system which provides functionality to integrate and automate the business practices associated with the operations or production aspects of a company. The integration is based on a common data model for all system components and extents to more than one enterprise sectors. Figure 1 shows the architecture of today's ERP systems [2][13][18][19].
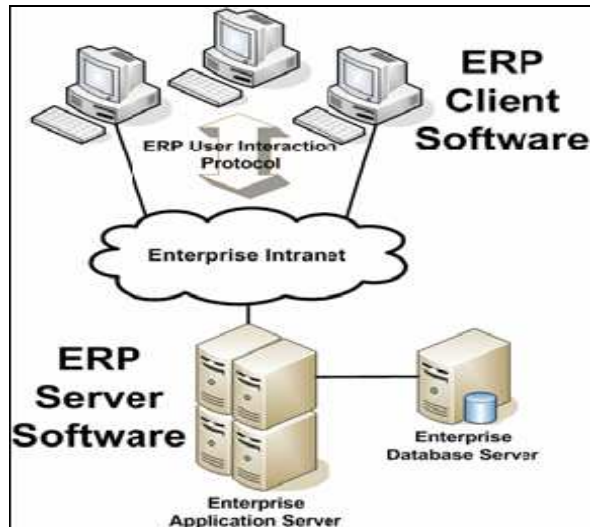
Figure1 : Conventional ERP system architecture

The increasing number of the small and medium companies' employees, extended the need for flexible functionalities in ERP systems. SMEs face different problems when they buy the ERP systems, like [1][8].

- Not all downloaded components are required.

- The usage, conditioning, and maintenance of these products are too expensive.

Therefore, in the last few years the idea of the Federated ERP-System in the basis of Web-Services has evolved.

A federated ERP system (FERP system) is an ERP system which consists of system components that are distributed within a computer network. The overall functionality is provided by an ensemble of allied network nodes that all together appear as a single ERP system to the user. Different ERP system components can be developed by different vendors. Figure 2 shows a federated ERP system architecture where ERP components are provided as services by external component providers [1][8][9].

Through the FERP system, companies pay only for components deemed necessary. Also, the needed End-Hardware is made available by the service provider which in turn, reduces costs [8].

An ERP system component in this case is a reusable, closed and marketable software module which provides services over a well-defined interface. These components can be combined with other components in an unpredictable manner [25]. Those components are described, published and used as Web services
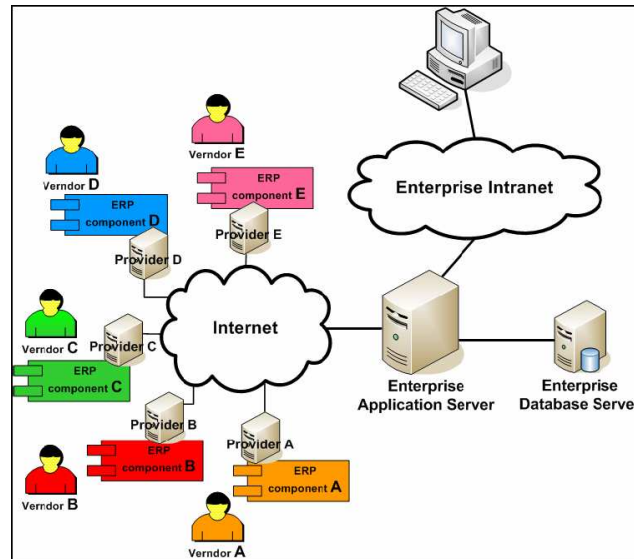
Figure 2: Federated ERP System auf Basis of Web-Services

A web service is a software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format (specifically WSDL). Other web systems interact with the web services in a manner prescribed by its description using SOAP-messages typically conveyed using HTTP with an XML serialization in conjunction with other web-related standards [27]. The search for these services by FERP Systems is covered by the functionality which is considered as the logical and stable construction stone in ERP system [8]. Figuer 3 shows the FERP phases:
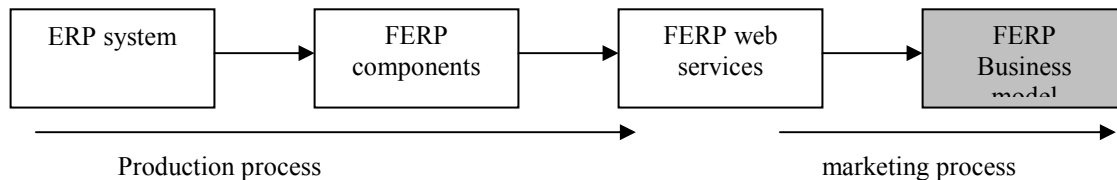

Figure3: FERP phases

These phases are divided into two processes:

- Production process includes the isolation of ERP components, description, and publishing those components as web services through the web standards (eg. WSDL and UDDI).

- Marketing process includes the Exchanging of ERP components as web services need through a suitable business model. Therefore, businesses should be adopted to fulfill the new idea's need.

A Business model involves [24]:

• The architecture for the product, service and information flows.

• The business actors, their roles, their potential benefits from the business model, and the revenue streams.

In the second section of this work we will define five relevant characteristics and their attributes and summarize it in one table. In third section we will characterize appropriate business model for distributed ERP systems. This work will be summarized in the fourth section.

2. Characteristics and attributes

By researching the literature on this topic, we have identified three relevant characteristics and their attributes that are suitable for the partial economical characterization of this business model. Through these characteristics and their attributes, one can answer the following questions [3]:

1) In which domain is this business model applicable?

2) Which type of goods can be exchanged through this business model?

3) To which extent will this business model integrate into the Internet-economy?

4) To which type of basis model does this business model belong to?

5) What is the source of revenue of this business model? And what are the forms of this revenue?

There are many business models, e.g., business to business (B2B), business to customer (B2C), customer to customer (C2C), customer to business (C2B), administration to administration (A2A), administration to business (A2B), business to administration (B2A), etc. In this paper we will focus on the most popular models which are (B2B), (B2C) and (C2C), which will be defined below as well:

2.1. Business fields

- *Business to business (B2B)*

This model describes relations between two companies. One company plays the middle role so it will be in a way customer (when it buys from the first company) and in other way it will be provider (when it will sell products to consumers) [17].

- *Business to customer (B2C)*

This model describes relations between vendor and many end customers. It grows rapidly in product and service providing sectors, which are standardized and can be delivered via post or in electronic form through the internet [17].

- *Customer to customer (C2C)*

Person-to-person transaction, which is one of the oldest forms of E-Business. In this model any customer could sell or buy products or services, using an electronic platform (like ebay) or any regular market place [17].

2.2 Exchanged goods

Not all products or goods can be traded alike through E-markets. There are many factors (related to the vendor or to the customer) that could effects the trading processes [22]. Table I below shows goods' categories that can be traded in E-markets [16][20]:

Table 1: Goods categories

Material	Immaterial
Physical products (e.g. cars)	Digital products (e.g. Software)
Physical services (e.g., Transportation)	Digital services (e.g. consultation)
	Information
	Special goods (e.g., licenses, patents, etc.)

- Material goods: are physical products or services, which could be consuming or investing goods (e.g., car, home, food, transportation, etc.)

- Immaterial goods: are products or services, which could be shown, provided or processed in form of binary data. Because of this binary nature, these kinds of goods are the most suitable for electronic business (e.g., Software, music, copy rights, etc.) [22].

2.3 The Integration's Degree in the Internet's Economy (ID in IE)

The integration's degree in the internet's economy depends on the ability to implement the transaction phases electronically. Two forms are distinguished below:

- Full Integration which implies that all transaction phases can be implemented online. This is particularly popular for digital goods.

- Partial Integration which implies that not all transaction phases could be implemented online. Some transaction phases require offline implementation. This is particularly popular for physical goods.

2.4. Business models types

Table 2 below presents the 4-basic business models types which are "content", "connection", "commerce" and "context"[23][26].

Content	Commerce
Packaging, presenting and arranging the contents on special platform.	Attracting, negotiating \ bargaining, payment and delivering.
Context	**Connection**
Classifying and categorizing existing information in the Internet.	Providing a way for exchanging information through networks.

Table 2: the 4-basic business models types

The fact that most of business models belong to one of the 4-Basics types, a business model could be a hybrid of more than one type. In the next paragraph we will present different variants of the 4-Basic types.

2.4.1 Content based business models: This term refers to the collection, selection, systematization and compilation as well as allocation of contents in order to make the use of these contents simpler, more comfortable and easier to be accessed online. This type contains: E-information (e.g., online news paper), E-Entertainments (e.g., online games), E-Infotainment "hybrid form of E-information and E-Entertainments" (e.g., sport.de, bigbrother.com), and E-Education (e.g., virtual universities, onlinelearning.net)

2.4. 2 Connection based business models: This term offers the communications, which could have a technical, commercial and a communicative nature. This type contains two variants': Intra connection as:

- Community

o Customer Opinion Portal (e.g., ciao.com)

o Customer Exchanges (e.g., hotjobs.com)

o Customer chat interest (e.g., chat4free.com)

- Mailing Services (e.g., hotmail.com, gmail.com)

And Inter connection as: Fix Connection (e.g., T-Online, aol.com), and M-Connection (e.g., i-mode, wap, gprs).

2.4.3 Context based business models: This term means the classification and the systematization of information, which is available online. These will be prepared, built in a logical method and will be then presented to the user in order to improve the market transparency as well as the orientation of the user. This type contains:

Web catalogues (e.g., yahoo.com, web.com), and Search engines (e.g., google.com, metager.de).

2.4.4 Commerce based business models: Such a Business-Model supports and supplements or even substitutes the phases of a transaction (the attraction-, Bargaining\Negotiating and/or transaction-phase) between the provider and the consumers by means of the internet. This type contains:

-Attraction: Banner-advertisement (e.g., banner.ch), and E-Shops (e.g., amayone.com)

-Bargaining\Negotiating: Demand aggregation (e.g., accompany.com, mercata.com), Auction "Sale" (e.g., ebay.com), Price seeking (e.g., dealtime.com), and Haggling (e.g., nextag.com)

-Transaction: Payment (e.g., visa.com), and Delivery (e.g., ups.com).

This basic- business model type is sorted also on basis of who is doing the commercial operation if it was the proposing model, the customer, or the agent, also the differentiation between the known and unknown act of the practitioner of the model on this bases. The business model is divided into three groups [6]:

- Supplier model:

This group divided into:

- Supplier model with unknown acts: In this model the demonstrator acts with the customer in unknown ways. So he proposes his commodities then he waits the order from the customer, for example: online shopping.

- Supplier model with known acts: In this business model the demonstrator acts in known ways towards the customer and wait for the customer to advertise his commodities, for example: E-newsletters [6].

- Consumer model

This group divided into:

- Consumer model with unknown acts: In this business model the customer demonstrates his needs and wait for a proper offer from the demonstrator, for example: E-tending.

- Consumer model with known acts: In this type the customer inquires and connects directly the proper demonstrator, for example: shopping agent, and e-procurement [6].

- The intermediary model:

In this model, the agent is the element which stands between the seller and the customer and he can act towards both, in known or unknown ways. The importance of this element comes from reducing and facilitating the commercial and practical cost and the tow most famous examples are the E-mall and E-auction [6].

2.5. Revenue model

Revenue model includes the Sources of Revenue and form of revenue.

2.5.1. The sources of revenue: The sources of Revenue of business models fall into three categories as illustrated in Table 3 [21]:

Sources of Revenue		
Products e.g., Books, CDs, Search for Information, etc.	Contacts e.g., Banner-ads, e-mail ads, etc.	Information e.g., user profiles, panel data, etc.

Table 3. Sources of revenue in internet

Below is an illustration of the source of revenue for each entry in the table:

- The revenue from "Products" is generated by selling tangible and intangible goods.

- The revenue from "Contacts" is generated from ads or sponsoring to reach customers.

- The revenue could also be generated by collecting information about consumers and selling this information to a third party.

2.5.2. Forms of Revenue: The forms of revenue were classified by Wirtz on one hand according to the players (i.e., buyers and sellers) into direct and indirect revenue and on the other hand according to the pricing conditions into transaction-dependent and transaction-independent. Table 4 illustrates the classification outlined above [26]:

Revenue	Direct	Indirect
Transaction-dependent	Connection fees, service fees, revenue from transactions	Provisions
Transaction-independent	Base fees, premiums	Banner ads, Data mining, Sponsorship

Table 4. Forms of revenue in internet

Below is an illustration of the source of revenue for each entry in the table:

- Direct revenue: corresponds to direct revenue from a costumer.

- Indirect revenue: corresponds to revenue from a third party.

- Transaction-dependent revenue: stems from interaction between a customer and an institution.

- .Transaction-independent revenue: refers to the revenue which stems from individual marketable transactions.

The intersections of these 4 categories in the aforementioned table yield 4 characteristics of revenue:

1. Direct transaction-dependent Revenue which consists of revenue on transactions, connection fees and service fees. Revenue on transactions results from customer payments against using or accessing the products and services of the company/institution.

2. Indirect transaction-dependent revenue is generated from an intermediary institution as a third party (provision)

3. Direct transaction-independent revenue refers to the base fees and premiums on a continuous basis for using a product or service.

4. Indirect transaction-independent revenue, e.g. banner ads, data mining and sponsorships - Banner ads refer to using a designated advertisement space on a website under the control of a third party. Revenue from data mining is generated by selling collected information about customers to a third party. Revenue from sponsorships refers to renting an advertisement space exclusively by a third party.

The five characteristics and attributes used to project the new business idea are summarized in Table 5 below [3]:

Characteristics	Attributes					
ID in IE	Full		Partial			
Business Field	B2B		B2C		C2C	
Basic-BM	Content	Context	Commerce		Connection	
Offered Goods	Tangible Goods		Intangible Goods			
	Physical Goods	Physical Services	Digital Products	Digital Services	Information	Special Goods
Revenue Sources	Products		Contacts		Information	
Revenue Forms	Direct and Transaction-dependent	Direct and Transaction-independent	Indirect and Transaction-dependent		Indirect and Transaction-independent	

Table 5: The selected characteristics and their attributes

In the next sections we will present the characterization of appropriate business model for distributed ERP systems through logical steps.

3. Characterization of business model for distributed ERP systems

This characterization will be done in tow steps:

3.1. Finding the appropriate business model for the FERP systems

In the case of web service base ERPs, the needs of small and medium companies are supported by the ERP functionality through many components. These components in the form of web Service are being treated by different sellers and not always by the same seller.

The connection between a customer and several ERP's providers is difficult and take a lot of time; therefore the intermediary commercial model is a suitable model [4]. This intermediary presents the ERP components of different providers and organizes a cross vendor to satisfy the functionality demanded by the customers [2][8].

The main role of the intermediary is publishing and searching for the web services. This scenario for the intermediary is shown in the Figure 4.

The acting elements in this business model are:

- The ERP web service providers.
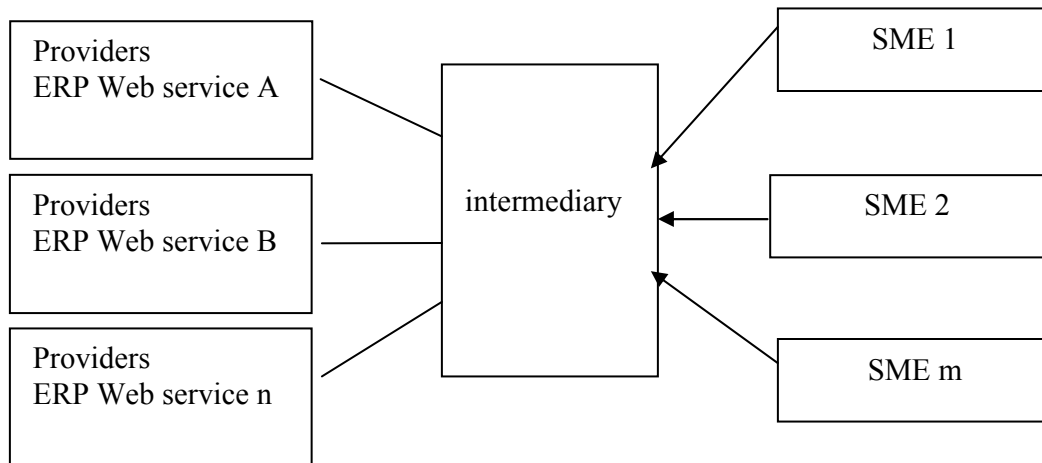
- The intermediary.

Figure 4: The intermediary – Scenario

In order to be able to define the suitable intercession form, we will present two possible forms, compare their properties and choose one of them.

3.1.1 The first possibility, E-Auction-Platform: In this case the intermediary publishes the information about the ERP web service and its provider it also supervises the deal between the provider and the customer "the price". The delivering and payment phase is done directly between the intermediary and the customer. Figure 5 shows this business model scenario.
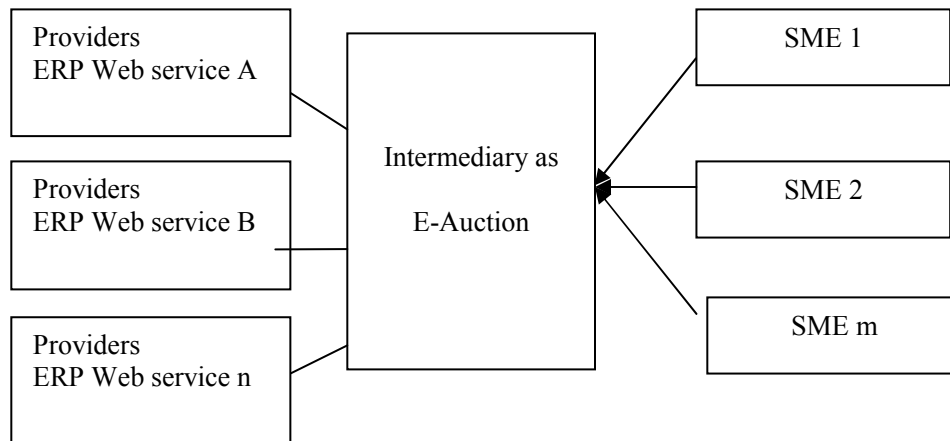

Figure 5: Business model for exchange ERPs' components as E-Auction

Some of the advantages of this form are:

- Consumer (SME) could find easily the providers of ERP web services who provide its needs from the ERP functionality.

- The providers could easily reach many customers.

- The intermediary has the chance to achieve additional revenue through offering supporter services.

- Good chance for small and medium providers to compete in the market

Some of the drawbacks of this form are:

- The consumer (SME) must sign many contracts when its needs of the ERP web services are covered by different providers.

- Every provider is partially responsible. In other word, there is no "one" responsible party which SMEs should deal with in case of failure or any accident.

As a result of these problems, beside the high prices of ERPs software, we consider this possibility practically inapplicable.

3.1.2. The second possibility, E-mall-platform: The E-mall platform is the result of grouping more than on ERP shop related to more than one provider on one platform. E-mall uses one system for most of the transactions. Those transactions could be like presenting and offering the product, delivery system, paying system, etc.... In this case all the ERPs' shops look like one shop (see figure 6 below). The E-mall owner "mediator" is the only responsible party, and the SMEs deal directly with this intermediary, and complete all the transactions or the phases with the mediator.

Then an ERP's E-mall as a intermediary business model between the providers and the end-customer is the reasonable and appropriate business model type, which can fulfill the needs of (SMEs) through an appropriate adaptation.
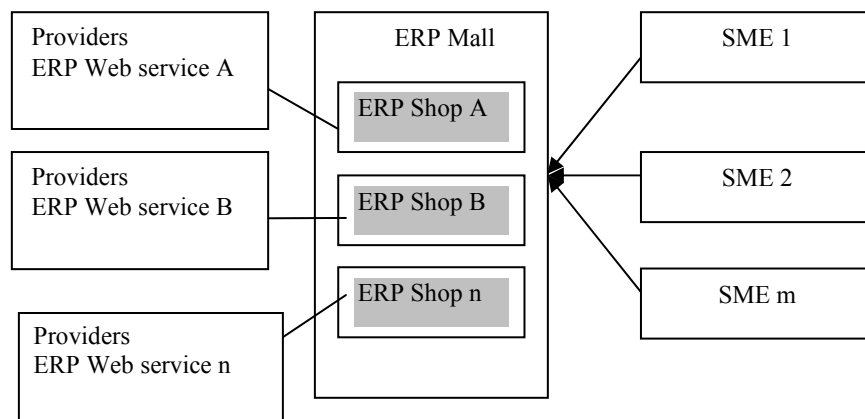
Figure 6. Intermediary as E-mall

This e-mall contains several professional ERP shops every shop represents an functional enterprise sector (eg. Logistic, accounting, materials management, …etc).

After this primary determination we will characterize suitable form for this intermediary (E-mall), we will identify the possible and offers and revenues through this mall along the FERP value chain.

3.2. Possible Offers and revenues by FERP Mall

To characterize the FERP Mall, we will define the possible offers in case of FERP system. These offers depend on the requirements of FERP system. Figure 7 represents the requirements of FERP system along the value chain. In this context, we can distinguish between two categories of requirements:

1 - Main requirements of FERP system.

2 - Supporting requirements of FERP system.

The characteristics of our FERP Mall could be achieved through the determination of the possible offers along the presented FERP value chain. We must determine who can offer which requirements of these?
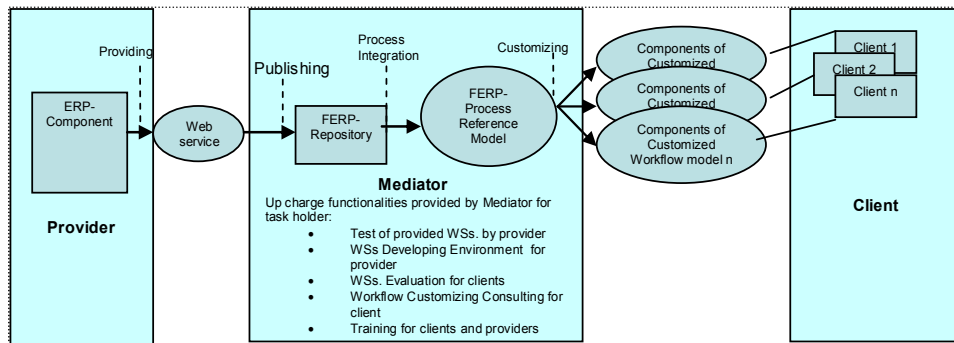

Figure 7. FERP value chain

In the next section we will logically discus the content of this table to determine the domains of the FERP mall (intermediary or mediator).

3.2.1. The Main requirements of FERP system: The main requirements are the necessary parts for the realization of FERP systems. This could be derived through the FERP scenario (or FERP value chain) to:

- FERP Web Services (FERP WSs): This web services are implemented by the suppliers (developers) and their interfaces are described by the WSDL-standard (WSDL = Web Services Description Language). These services are reusable and offer the FERP functionality as operations, which are required by user companies. The development of FERP WSs is open for all; therefore, any player could be as a FERP WSs developer in the market. The providers are responsible for the quality of FERP web services. The revenue generates here *indirect and transaction-dependent* through as ratio from the supported WS functionality (see table 6 below)

- WS-publishing: The WSs developers publish the WSDL interface descriptions in the online directories (repositories), which are structured by the UDDI standard (UDDI = Universal Description, Discovery and Integration). The main role of the FERP malls is as online directories provider, where providers can publish their FERP WSs and the customer enterprises can find the appropriate FERP WSs. FERP WSs in these repositories are classified based on the functional enterprise sectors (Accounting, Logistic… Sector) and every sector represent a different shop

in our FERP Mall. In this case, the FERP mall receives in*direct and transaction-independent* for the publishing of WSs (see table 6 below).

- ERP Workflow-Definitions (WF-Definitions): Workflow is a plan of sequential or in parallel chained functions as working steps in the mining of activities which lead to the creation or utilization of business,, [7]. By standardizing these types of activities in a workflow language (e.g. BPEL: Business Process Execution Language), it is possible to use workflow definitions in different companies, and to market it separately. FERP workflow combines Web services from different providers FERP for the support of the whole of FERP business process in user companies. Therefore, our FERP Mall appears as a provider of workflow reference model, which represents all possible scenarios (workflow descriptions) of a company. FERP mall can customize, through this reference model, the suitable workflow for each enterprise. FERP workflows can also be described by the user companies themselves, but in this case, FERP Mall is not responsible for the qualitative aspects of these workflows. The revenue generates here *direct und transaction-dependent* (see table 6 below) through the selling of FERP workflows with deferent sizes and complexities [5].

3.2.2. The Supporting requirements of FERP system: The supporting requirements here mean requirements which can support the FERP WS developers and the customer companies along the FERP value chain. These requirements can be offered either as fee-based services or as a free service to support the core business. In case of FERP systems, we can distinguish the following requirements:

- Web Services Developing Environment (WSD-Environment): Because of the importance of Standardized Web Services description in case of the FERP systems, we can support the developers with tool which help them by the implementation of Web services. This tool (or development tool) could be used by standardizing the specification to describe functional and non-functional (qualitative) properties of Web services and to manage the development process for the reduction of development time and the potential errors by the WS development [12][15]. This tool is offered in FERP as service to be used by the developers, who seem to be costumers in this case. The providers pay per using time and volume of this tool as *direct and transaction-dependent* (see table 6 below).

- The Testing Services (T-Services): The intermediary (FERP Mall) offers web services test and Integration test for the user to find the error in the cooperation of various FERP Web Services [14]. This increases the intermediary safety in his relationships with the large number of FERP Web Services providers and increases the costumers' trust in the reliability of the FERP systems. This test service could be offered by partners (third party) too. This service is offered *free of charge* for supporting the core business by our FERP mall.

- WS evaluation information (WSE-Information): FERP WSs are reusable products and every one could be provided from different developers with different prices quality levels. In our case the market is open to small and private developers for the development and offering of individual FERP WSs. In this situation the intermediary meets many risks because of the large number of foreign suppliers

(developers). Therefore, the reputation of these developers has relevant role in increasing the trust and security between the intermediary and the providers (developers) and for the continuous assessment of the quality of a service. This has been considered in [10][11] through a secure protocol for exchange of the evaluation information between the provider, the customer, and a trusted third party. This collection and summarizing of historical evaluation information of FERP WSs is offered by intermediary (FERP mall) as trusted party as a quality - and safety information. The aggregation of this information could be by selecting and adapting an appropriate FERP workflow. This consulting could play also important role for solving of the possible problems in using of FERP system. These information are offered *free of charge* to increase the trust and the quality of the providing.

- Training service: the decision of the company to be a costumer by our FERP mall, the employees, who can use the FERP system. FERP Mall offers in FERP training courses to cover the lack of knowledge by using the new offers by external parts either. The end user enterprises pay per training course that could generate *direct and transaction-dependent* revenue for intermediary. The offering of training service belongs to content business model type (see table 6 below).

- Consulting service: After the decision of the company to be a costumer of our FERP mall, we offer supporting advices to this company by selecting and adapting an appropriate FERP workflow. This consulting could play also important role for solving of the possible problems by the using of FERP system. FERP mall can generate additional revenue *directly* when the user need this service (see table 6 below).

As a result of this work, we will characterize an FERP Mall as appropriate business model for distributed ERP systems through figure 8 and table 6 below.

This mall offers FERP Web service through the online directory and work as an integrator of FERP WSs in FERP processes through workflow reference model, which provides all the possible scenario of business in an enterprise. This integrator can fulfill the needed FERP functionality as one hand and he is responsible to the user companies for the quality of ERP processes. The all FERP shops in FERP mall appear as single shop to the costumer companies, which supports all phases of transaction, but only the using of WS functionality execute directly between the FERP WS providers and the end-user.
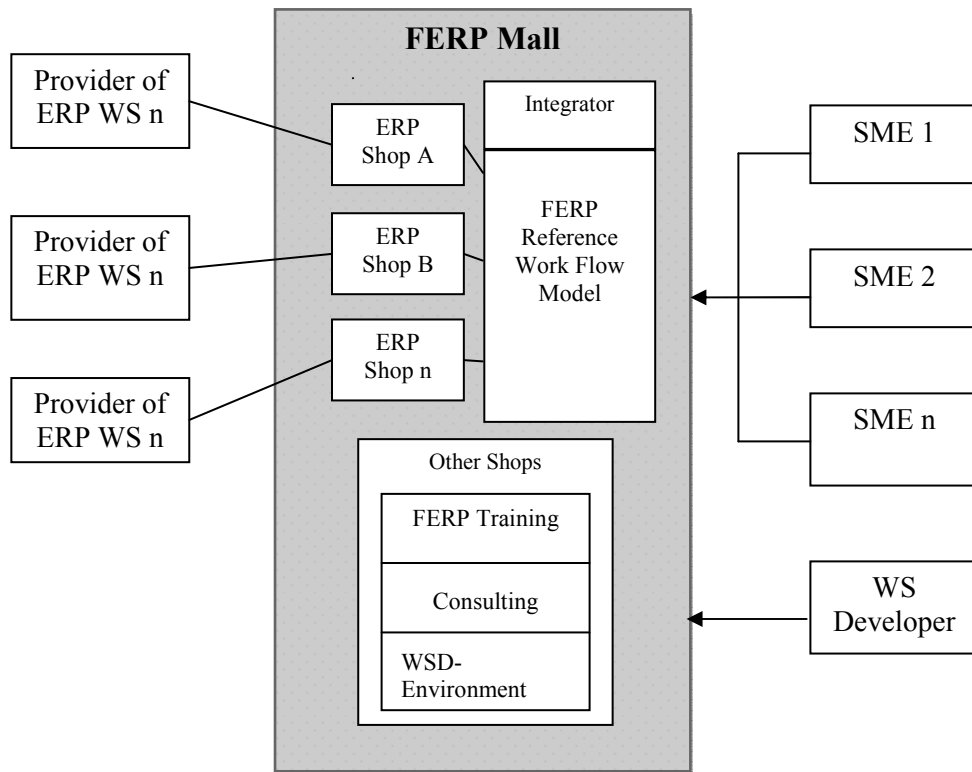
Figure 8. FERP Mall character

This mall also offers services (as service providers) which are needed for the marketing of FERP Web Services. These services appear in other shops. All shops in the FERP Mall have a single shopping and payment system. FERP mall. All the transaction phases by FERP mall could be done online because of the digital nature of the offered goods by this mall.

This intermediation form provides many advantages for both providers and clients:

For providers or suppliers:

- The compatibility with the other FERP WS provider.

- Easier and faster way to reach the market, especially for small providers.

- Every Provider can offer services depending on selected competences.

- Increasing the level of trust where the business relation becomes business-to-business.

For clients or customers:

Pay only for the used components.

- FERP mall are more flexible to meet any change in the client's business processes.

- No need for high-end computer hardware

- User companies' can select the needed components from different providers directly through the mall as one ERP package.

- Benefit from the support services (eg. training and consulting) offered by the intermediary.

Table 6. Economic characterization of FERP mall as business model for distributed ERP systems

Characteristics	Attributes					
ID in IE	Full		Partial			
Business Field	B2B		B2C		C2C	
Basic-BM	Content	Context	Commerce		Connection	
Offered Goods	Tangible Goods		Intangible Goods			
	Physical Goods	Physical Services	Digital Products	Digital Services	Information	Special Goods
Revenue Sources	Products		Contacts		Information	
Revenue Forms	Direct and Transaction-dependent	Direct and Transaction-independent	Indirect and Transaction-dependent		Indirect and Transaction-independent	

In the future works we will discus the methods, which can increase the softy and the trust between the actors (provider, intermediary and client) through increasing the intermediary roles in the FERP market.

4. Conclusion

The kernel conclusion of this work is to present a characterization of a business model for selling components of FERP Systems. This characterization was done through the projection of the new business idea on the suitable characteristics and their attributes. These characteristics were: the integration grad in internet economic, the business fields, business model types, the exchanged goods and the model of revenue.

As a result, it has been determined that the ERP mall is the suitable type of business model which leads to achieve the best business model for this new idea. This business model must

be adopted through identifying the roles of the actors according to the needs of FERP system-users new product's nature.

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