

# A Web Services based e-Commerce Business Model for Resource Constrained SMMEs

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## Abstract

**The web/grid services technology provides a lot of opportunities for resource constrained Small, Micro and Medium Enterprises (SMMEs) to have access to affordable and reliable Information and Communication Technology (ICT) infrastructures. Further to this, it also provides them with access to the global market for their products. Due to the overload of information and business players on the web, for these enterprises to remain in business, business models that give them the capacity to trade on the global e-markets are needed. One of the key features for such a business model is ability to handle personalisation issues in the process of marketing and offering the products. This paper presents a business model that takes away some costly business activities in the value chain, which include advertising, negotiation, ordering, payment and delivery, and assign them to cybermediaries (e-brokers). The architecture for the developed business model, business actors and their roles, and business processes thereof are also presented.**

## I. INTRODUCTION

Given the accelerating pace of globalisation and liberalisation, traditional boundaries no longer separate the vendor from the purchaser and competition amongst business entities has intensified. This makes it difficult for SMMEs to survive competition from other well resourced enterprises on the global market places. The adoption of enterprise-wide applications for devising an enterprise-wide IT strategy has not yet occurred for SMMEs around the world. SMMEs in South Africa are not left out of this trend. To remain in business, SMMEs must be able to identify the Information and Communication Technology (ICT) infrastructures required to improve performance and global competitiveness. But SMMEs lack the capacity to own ICT infrastructure and they are more conservative to adopt ICT infrastructures before they can be sure of the return on such investments. Thus in summary, SMME ICT solution should be affordable, easy to use, bring fast Return On Investment, and require a short implementation cycle whilst giving them a competitive edge at minimum cost. Our core research niche area is aimed at providing just that through the Grid Utility Infrastructure

for SMME Enabling Technologies (GUISET) architecture [10], which employs a service oriented on-demand computing paradigm based on the utility Grid technology. In this technology SMMEs need not own the infrastructure but they can pay for what they need when they need it. While GUISET gives SMMEs access to ICT infrastructure issues around which e-commerce business models should be adopted in order to give them access to global markets are not addressed. Further to this, due to the overload of information and business players on the web personalised product marketing and offering becomes very important. For SMMEs operating in a GUISET environment to become competitive in the cyberspace, a business model that supports personalised marketing and product offering have to be adopted.

The advent of nearly ubiquitous information infrastructures on the World Wide Web has led many to predict that one effect of electronic markets will be the bypassing of intermediaries in electronic markets [13] but over the past few years developments in e-market places reflect the emergence of new intermediaries for e-market places known as e-brokers or cybermediaries [8]. Examples of such intermediaries are ebay.com, amazon.com, etc. Leveraging on the emergence of web/grid services technology, ICT solutions and e-business models can be crafted to give SMMEs access to global markets without adding a lot of partners to the value chain. Web/grid services are regarded as one of the most promising technologies in distributed computing that could fully automate all the web operations of a business entity [1]. It is against this background that we propose an e-commerce business model for resource constrained SMMEs, based on the web/grid services technology and the e-broker business model aimed at giving SMMEs access to global markets. Our focus will be on how personalised marketing and product offering can be supported for resource constrained enterprises.

The remainder of this paper is organised as follows: Section II discusses some work related to the work presented in this paper. In Section III we present our solution approach to the problems raised in this paper. The design of a Product Registry to support personalised marketing and offering of products is presented in Section IV. Section V presents a scenario where the developed model can be applied. Section



VI concludes the paper and discusses some limitations of the proposed solution.

## II. RELATED WORK

E-commerce is regarded as one of the most efficient tools for business process optimization. It's now being treated not only as a means of achieving a competitive advantage but more as necessity [7]. Studies on the adoption of e-commerce business model in Europe have shown that collaboration with selected competitors, trying to improve customer service and personalisation are some of the reasons why e-commerce business model are being adopted [7]. Though no study have been conducted in South Africa on the adoption of e-commerce business models, it is a fact that adoption of such in the arts and craft industry will definitely give the SMMEs access to global markets without adding a lot of intermediary partners to the value chain. Given the fact that most of these enterprises do not have the capacity to market, sell and transport their products to international markets, we look at different business models that can be adopted to support them. E-commerce business models can be categorized into three groups B2B, B2C, and Transaction-based business models [11]. B2C models can be divided into three major models, the e-broker model, manufacturer model and the auction model [12]. In the e-broker model the cybermediary is essentially a middleman between the supplier and the buyer and the cybermediary adds no value to the product. In the manufacturer model the broker adds value to the product through the internal manufacturing process. In the auction model, potential buyers submit some bids, and a product is sold when the supplier accepts a bid. Based on the characteristic of the business environment under spotlight in this paper, we adopt the e-broker model. Varieties of e-broker models include e-shops, e-mall, third part market places, virtual communities, and Information brokerage [11]. We propose a hybrid business model based on 3<sup>rd</sup> party market places and virtual communities e-broker models. The SMMEs form a virtual community sharing some ICT infrastructure, which they access on on-demand basis. Third part entities, which are cybermediaries running e-commerce applications (e.g. ebay.com, amazon.com), will then come in as competing brokers between the virtual communities and the consumer.

To enable the cybermediaries to access SMME products, we take advantage of the web services technology. Existing service discovery standards such as the UDDI [2] and ebXML [4] already have provided techniques for making services accessible globally. However UDDI and ebXML focus on discovery of web services and business to business interaction respectively, and none of them provides a mechanism for accessing product details and descriptions. Hence these existing standards will not be able to support personalisation in the offering of the products. To enable the e-brokers to locate the product details and personalise the advertisement of the same to the consumers, there is a need for an e-commerce Product Registry through which the

suppliers can be able to register their products, thereby making them accessible to accredited cybermediaries.

## III. OUR SOLUTION APPROACH

Our solution approach to the issues raised in this paper is double-barrelled, in that it provides a business model for giving the SMMEs capacity to market, sell and deliver their products to both local and international customers and the design of a Product Registry that will provide a platform for personalised product marketing and offering for resource constrained SMMEs. The Product Registry gives the cybermediaries access to product details and their fully standardized description. This registry is accessed as a web/grid service by different cybermediaries.

As discussed in Section 1, the market for some SMMEs, especially those involved in the arts and crafts industry, is spread through out the globe. Advertising, selling and delivery of arts and crafts products to the intended market pose a lot of challenges since the bulk of the SMMEs in the industry lack the financial capacity to do so. Introduction of a lot of partners as intermediaries in the value chain often result in them being exploited by the middlemen. Our solution therefore eliminates the intermediaries and replaces them with the cybermediaries, who will sell the products for them over the internet and only charge them the service fees. It is against this background that we developed an e-commerce business model for SMMEs, where the cybermediary takes over the Advertising, Negotiation, Ordering, Payment, and Delivery services. In order for the cybermediaries to be able to advertise the products they need marketing information from the provider such as the description of individual products and product catalogue. Such information is also needed for personalised marketing of the products. As a platform to support personalised advertising of the products, there is a need of a Product Registry where the product details and descriptions can be accessed by the cybermediaries. Our solution to this, is a Product Registry which SMMEs access through a web interface to register their products. The registry is exposed to the cybermediaries as a web service giving them access to the product information that they can use for personalised advertising. The role of the provider in the value chain ends at this level. The subsequent services are taken by the cybermediary. For the process of negotiation to be fair a mechanism for making sure that the provider and the customer are not exploited by the cybermediaries is needed. We achieved this through the fact that the Product Registry is open and accessible to all accredited cybermediaries, i.e. a product in the registry can be traded by any intermediary who is giving the best offering to the customer. This means that market forces determine the price of a product. The order specification is completely done by the cybermediary. The cybermediary determines the attributes and the requirements of a syntactically and semantically correct order. Payment service is handled by the cybermediary and the payment service providers. The service providers will get the



payments of their sold products on agreed intervals. Our model is similar to ANOPD e-commerce model proposed in [9]; except for the fact that the one in [9] was dealing with intangible products that can be delivered over the internet and hence cost of delivery is minimal. In our case the cybermediary takes over the physical shipping of the product and the shipping cost is billed on the customer just as it is handled in popular e-commerce applications such as Amazon, eBay, etc.

A general e-Commerce business model is defined as [9]:

- An architecture for a product, service and information flows, including a description of various business actors and their roles.
- A description of the potential benefits for the various business actors
- A description of the sources of revenues

First we discuss the involved actors and their roles in the developed business model and then the business model architecture. A description of sources of sources of revenues is beyond the scope of this paper.

#### A. Business actors and their roles

Our business model has three key actors: suppliers, cybermediaries and customers. A supplier offers products. In our case suppliers will be resource constrained SMMEs. Their point of interface with the model is through a web interface which will provide a means for them to register their product in the Product Registry. Suppliers are the major beneficiaries of this model through the reduction of cost in marketing products, access to the global markets, and reduction of exploitation by the intermediaries. Cybermediaries are the key actors in this model. They are the agents through which the SMMEs are capacitated. They offer the Advertising, Negotiation, Ordering, Payment and Delivery services to the value chain. Personalised advertisement will be handled by the cybermediary with the help of the information from the Product Registry. The customer requests and views products from the intermediaries and then expects the product offerings to be personalised, and purchased goods to be delivered. The customer pays for both the products and their delivery.

#### B. The Business Model Architecture

Figure 1 shows the architecture for the e-commerce business model we developed. Emphasis is laid on how the Product Registry developed in this work will integrate into an operational environment. The SMMEs form virtual communities where they share ICT infrastructures. The Product Registry is part of the shared ICT infrastructure which provides functionalities for the SMME owners to register their products for global access by the e-brokers.

The SQLQueryProcessor handles the registrations functionalities. Registration involves retrieval of the information entered on the web interface, conversion of the entered text into update queries and updating of the database. The XMLQueryProcessor generates an XML file containing the retrieved products complete with their attributes, which

will be accessed through a web service by the cybermediaries.

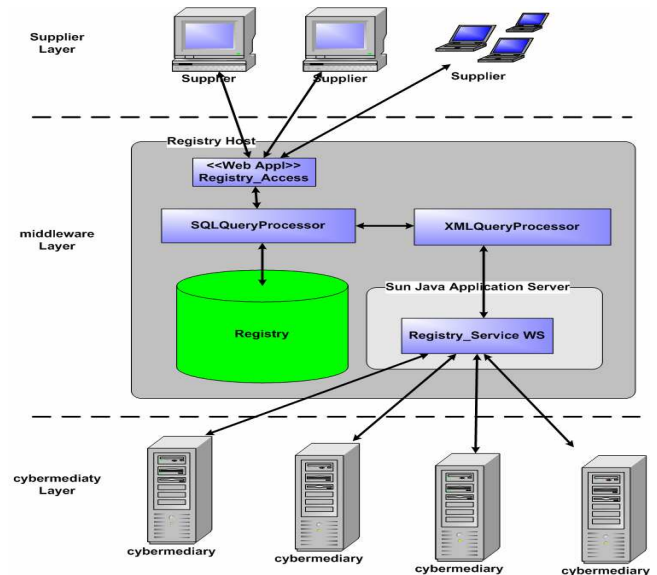


Figure 1: The Product Registry Architecture

#### C. Business processes

The business model discussed above have two major processes which are of concern to the scope of this paper: Product Registering and Personalised Advertising. The suppliers first register themselves with the Product Registry thereby providing their names, and personal information like physical addresses via a Web Application interface. During the registration process they are assigned user identities and passwords for authentication. Once the supplier is registered he/she can then add products into the Product Registry. The authentication helps prevent malicious users or intruders from updating the registry. The products can also be added by means of the Registry Access interface. Figure 2 illustrates how the registration process is done.

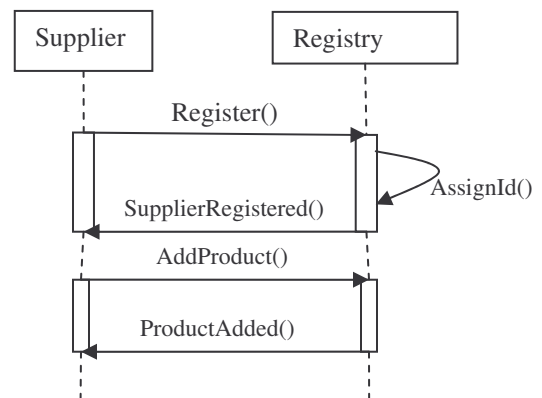


Figure 2: The Suppliers Registration Process

Once the product has been successfully added into the registry then it can be accessed by an e-Broker through the Registry\_Service Web Service. This business process involves three main participants namely: The Customer,



Cybermediary and the Product Registry as shown on figure 3. On customer login the cybermediary uses the customer's profile to recommend products available in the registry. The available products are recommended to the customer based on his/her preferences. If there are no products that can satisfy the customer's needs the customer submits a request for products he/she needs to the cybermediary. The cybermediary then checks for the availability of the product in the registry. The response is then sent back to the cybermediary which then presents some recommendations to the customer. To get the products available in the Product Registry the cybermediary system invokes the web service method (DiscoverProducts()). In response to this the Product Registry returns the details and descriptions of the products discovered. Figure 4 shows a schema of products that would be contained in the reply sent to the client under the requested domain.

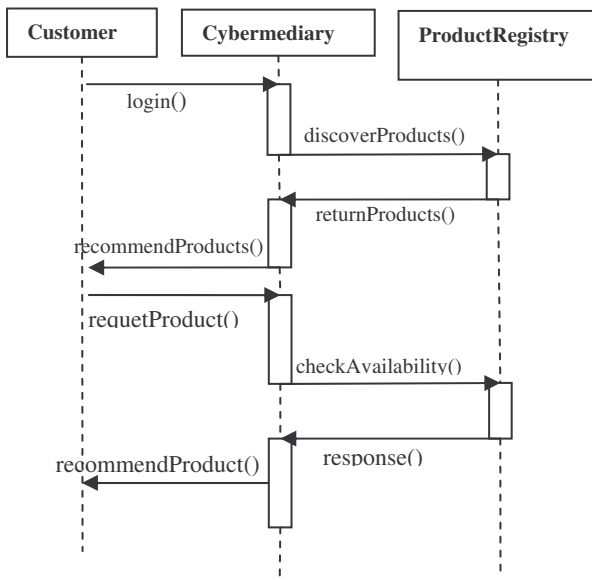


Figure 3: Personalised Advertising Process

#### IV. THE DESIGN OF THE PRODUCT REGISTRY

Taking inspiration from how existing service discovery standards, discussed in Section II, support discovery of services we designed, and developed an e-commerce Product Registry. For illustration purposes we prototyped a Product Registry with products that are popularly sold in most e-commerce applications in the following domains: automobiles, electronics, software, books. Entity-Relationship (E-R) modelling was used for representing the Product Registry. Generalisations were used representing relationships from one domain (super type) to its sub-domains (subtypes) and from sub-domains to the sub-sub-domains up to the indivisible entity types. All subtypes are generalised from the parent super type, "Product". The Product identifier is used for referential integrity down the hierarchy up to the indivisible entity types. The E-R diagram for the Product Registry is shown in Figure 5.

Another challenge that arose in the design of the Product Registry was the issue of indexing of the products in a way that will uniquely identify them and also map them to the supplier (i.e. definition of Product Identifiers). For the unique identification of the products in our system we adopted the technique outlined by ISO 11179-5[6]. ISO 11179 identifies a component as follows:

- Registration Authority Identifier-the identifier of any organization authorized to register a data element. E.g., 98675
- Data Identifier- A unique Identifier of a data element assigned by a Registration Authority. E.g., 65748
- Version Identifier- the identification of an issue of a data element. E.g., 01.

The element's unique identifier will thus be: 98675 65748 01. For our system we used the supplier's identity and the product number as composite key.

```

? xml version="1.0" encoding="UTF-8" ?>
Products>
:Domain name="Software">
<ITEM ITEM_NUM="2" SUPPL_ID="45674">
  <feature key="supplier_name" value="George" />
  <feature key="Address" value="po Box" />
  <feature key="Make" value="Microsoft Windows" />
  <feature key="Description" value="****" />
  <feature key="Price" value="670" />
  <feature key="Type" value="Operating System" />
  <feature key="Environment" value="x86 Machine" />
  <feature key="Year" value="2007" />
  <feature key="Version" value="XP" />
</ITEM>
ITEM ITEM_NUM="7" SUPPL_ID="786">
  <feature key="supplier_name" value="Sibossa" />
  <feature key="Address" value="PO Box" />
  <feature key="Make" value="JGrasp" />
  <feature key="Description" value="Java, C# and C++ editor" />
  <feature key="Price" value="434" />
  <feature key="Type" value="Application" />
  <feature key="Environment" value="Windows XP" />
  <feature key="Year" value="2005" />
  <feature key="Version" value="8.0.6" />
</ITEM>
</Domain>
</Products>
  
```

Figure 4: Sample data base schema

#### V. SCENARIO

Consider Mr. Mzimela, a very talented artist who relies on his art works for survival. Mr. Mzimela's art work is appreciated by people who are privileged to access his tiny gallery at his home. Most of Mr. Mzimela's clients are people from his impoverished neighbourhood. This is one of the reasons why his business is not taking off after so many years in the business. Once in a month Mr. Mzimela hires a van to transport him together with his products to Hluhluwe the nearest market place where he can display his art work to tourists who are his target clients. Transporting his gallery to Hluhluwe costs him almost the same amount of money he earns from the day's sales. In Mbazwane where Mr. Mzimela



lives, there are game reserves which are frequently visited by his target clients but they cannot

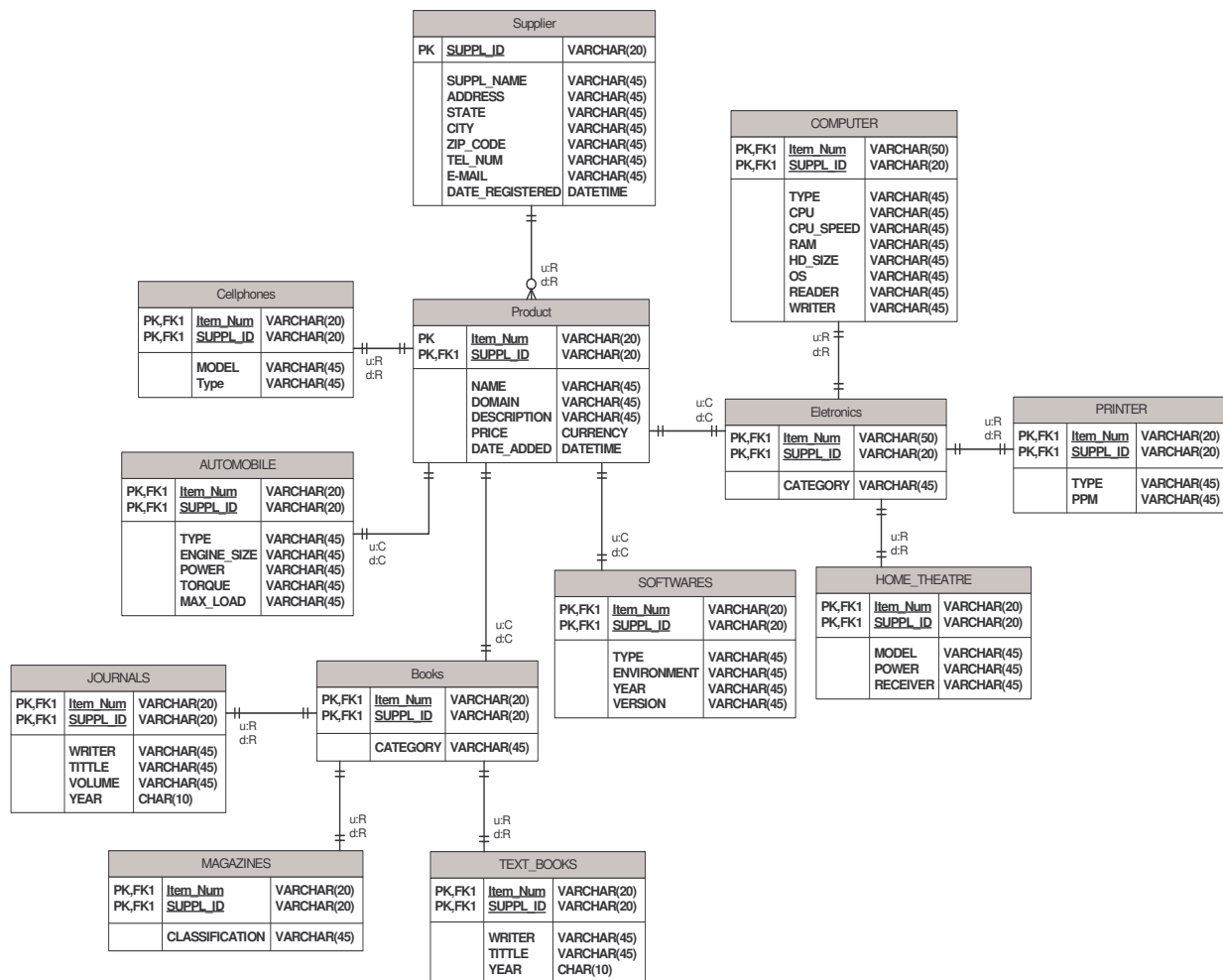


Figure 5: The Product Registry Entity-Relationship Diagram

access him because they don't even know of his existence. With the aid of the business model developed in this work Mr. Mzimela would be relieved of his advertising burden. With one internet shop in Mbazwane, Mr. Mzimela can access our Product Registry located at the University of Zululand. Our Product Registry is made available to online cybermediaries who would recommend Mr. Mzimela's Products to their online customers based on their preferences.

## VI. CONCLUSION

This paper presented a business model that gives resource constrained SMMEs capacity to trade competitively on the global market places. Our model is a hybrid model of the two e-broker models: the virtual community model and the third-party e-broker model, wherein the suppliers form some virtual community for sharing ICT infrastructures and the cybermediaries come in as the third parties. For successful

adoption of the model developed in this work there are still quite a number of issues which need to be addressed. Trust and security pose the greatest challenges. A greater deal of trust needs to be exercised between the suppliers and the e-brokers. Some ways of authenticating the entities involved are needed. Policies and codes of contact need to be formulated within the virtual communities, to avoid issues where suppliers register products that do not exist. Our business model also contributes towards the opening of opportunities for new business entities to act as cybermediaries. The need for delivery of the products sold through the cybermediaries, provides the business opportunities for companies in freight services industry.



## VII. REFERENCES

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