A Sustainable Service-Oriented B2C Framework for Small Businesses

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Abstract

Electronic commerce is fast expanding all over the world. Currently most B2C (Business to Customer) electronic commerce focuses on retailing and other online services, such as online banking. Compared with large-scale enterprises and organizations, small businesses find it difficult to involve in electronic commerce because the cost is too high to be affordable. The cost for electronic commerce not only includes establishing cost but also drumbeating cost and maintenance cost.

This paper exploits modern service oriented architecture to develop and evaluate a novel low cost B2C framework particularly suitable for small and micro businesses. The framework enjoys the features such as easy to set up, low cost and high business agility, which are highly needed by small businesses. To reduce the cost and promote the business, the framework congregates similar services supplied by traditional small businesses into a common web interface; consumers can get the services via the common web interface and then communicate directly with the service providers. The framework has been implemented and evaluated in a domain of real life small businesses.

1. Introduction

The Internet presents an efficient and low cost channel for small and medium-sized enterprise (SMEs) to reach new customers. E-business technologies provide the possibility for SMEs to engage new effective methods to run their business and create better value with limited budget and resources. These new technologies offer the potential for creating entirely new ways of working, giving rise to a new breed of SMEs whose management and employees use a more flexible and more effective way of working. E-business is expected to become a key business driver at global extent.

However, whether these new technologies are put to efficient use by SMEs and what driving forces that push SMEs up the adoption ladder remains a question that attracts considerable attention of researchers and policy makers [9]. Studying e-business adoption in the SMEs sector is of particular importance. This is because SMEs have a history of continual growth and are regarded as significantly important on a local, national, or even global basis. The report for the Small Business Service Research Programme points out “SMEs play an important part in the UK economy with 3.7 million firms employing over 12 million people, which generates 55% of UK employment. These firms contribute approximately 51% to the UK GDP with an annual turnover of over one trillion GBP” [7]. However, e-business adoption in SMEs is a challenge since SMEs are not miniature versions of large firms; they are unique in their own right [2]. This includes multi-functional management, a small management team, strong owner influence, a lack of control over the business environment and limited ability to obtain financing. In addition, SMEs rely on an environment in which processes and structures must remain adaptable, flexible, and simple [4]. Firm and managerial factors are merged due to the high locus of control exerted by the key decision makers [3]. These unique characteristics affect Internet technologies adoption in SMEs. Research suggests that there is a correlation between the size of a business and the level of IT adoption [14]. The typical micro-enterprise exhibits much lower rates of e-business activities than larger firms when excluding smaller high-technology firms [19]. Large organizations are inclined to adopt the click and mortar model by integrating offline and online business or spin-off online operations. In contrast, small and medium-sized firms lack a general pattern on adoption of Internet technologies [5]. The extent of adopting Internet technologies may vary widely among small and medium sized enterprises [11]. This creates great demands and challenges to construct a clear picture of the level of e-business adoption in the SME sector.

There is a big difference in e-business adoption between large, medium and small/micro firms. Figure 1 shows the findings in an European Commission report that there is an obviously gap in e-business adoption between small firms which is up to 49 employees and medium-sized ones which is 50-249 employees [8].
In view of this, this paper first reviews the technological innovation literature and analysis the cases for selected industry sectors to identify factors influencing e-business adoption and success in small and micro business, and then based on service-oriented technology [13][15] proposes a sustainable service-oriented framework as a proper solution for small business’s adoption of e-business.

European Commission’s report (Table 1) shows a very impressive result of different percentage of e-business adoption between large, medium enterprise and small, micro firms.

<table>
<thead>
<tr>
<th>Firm Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro</td>
<td>35</td>
<td>23</td>
<td>41</td>
<td>45</td>
</tr>
<tr>
<td>Small</td>
<td>44</td>
<td>29</td>
<td>42</td>
<td>50</td>
</tr>
<tr>
<td>Medium</td>
<td>72</td>
<td>63</td>
<td>68</td>
<td>82</td>
</tr>
<tr>
<td>Large</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 1. The e-Business Index 2005 by firm size

\[ A = \text{Sub-Index "ICT infrastructure"} \]
\[ B = \text{Sub-Index "internal processes"} \]
\[ C = \text{Sub-Index "procurement and supply chain integration"} \]
\[ D = \text{Sub-Index "marketing and sales"} \]

Table 1 show that there is a peculiar gap in e-business adoption between the small firms and the large and medium-sized ones. Compare with large and medium enterprise, small and micro firms do not have the competence to develop their own software, or even to make major modification to existing ones. They have to acquire and implement standard software [12]. The small business owners were concerned primarily with securing an income to meet their immediate needs and that they did not usually engage in innovation [20]. In order to find essential reason of the peculiar gap, the next section attempts to shortlist the most important determinant factors of e-business adoption.

2.2 Adoption factors in small/micro enterprises

In technological innovation theories domain, the most widely accepted model by researches in identifying perceived critical characteristics is Rogers’ model [18]. The model identifies five significant characteristics of the innovation that influences technological adoption:

- **Relative advantage**: the degree to which an innovation is perceived as being better than its precursor;
- **Compatibility**: the degree to which an innovation is perceived as being consistent with existing values, needs and past experiences of potential adopters;
- **Complexity**: the degree to which an innovation is perceived as being difficult to use;
- **Trial-ability**: the degree to which an innovation may be experimented with before adoption.
- **Observability**: the degree to which results of an innovation are observable by others.

However, technology is not the only factor affecting e-business adoption in small and micro firm. Kraemer et al
(1989) concluded that both internal and external factors affect the IT structure changing in organizations, but they do so indirectly [12]. The environmental, organisational characteristics on information system adoption are also very important besides technological characteristics [17]. Nabeel A Al-Qirim in his recent research summarised technological context, organizational context, individual factors and environmental context are important factor to e-business adoption [1]. The technological context includes observability, trial-ability, relative advantage, cost, complexity, compatibility and image. In organizational context, user involvement, external/internal communications, specialisation, size, information intensity of products and top management support should be considered. Individual factors include the CEO’s innovativeness, CEO’s prior IS/EC knowledge, vertical linkages, the role of the government, competition from other companies, external pressure, external support from technology vendors.

However, these factors may play different roles in different cases. Nabeel A Al-Qirim also pointed out that certain industries could adopt e-commerce more rapidly than others as they discover the suitability of their products (information-content) to the Internet [1].

European Commission’s e-business report shows there is a big difference between different industry sectors for e-business adoption [8]. From figure 2, we can see that there is a very low percentage of e-business adoption in some traditional industry sectors like Footwear, Food and Construction, in particular in small businesses.

![Benchmark based on firm-weighted data**](image)

**) Firm-weighted data express e-business adoption as "% of firms in a sector with a certain activity", irrespective of the size of the firms (i.e. small companies and large ones count equally). Results are mainly determined by the situation in smaller firms, as there are many more small companies than large ones.

3. The Sustainable Service-Oriented Framework for Small Businesses

3.1 The framework

This paper proposes a holistic service based e-business framework for small and micro companies in business domains with a low rate of e-business adoption, such as food service industry sector. This framework is sustainable for small business as it supports low establishment and maintenance costs, high business agility and is easy to use. Users will simply choose the functions they needed in the establishment phase and the possible changing functions which they need after release.

2.3 Existing products in market

Our survey shows that there is no existing framework or products specially designed for the e-business adoption for small/micro businesses. None of the existing e-business models or platforms specifically addresses the e-business needs of small/micro business as their focus.

Taking food industry as a sample, although a couple of companies supply the e-business solutions but none of them suits the nature of small business. The POS system by Maitre’D POS is only an in-shop system, and it basically streamlines the operations and improves their speed and efficiency, but offers no e-commerce consideration and opportunity. The WebStore by UniPower integrates common retail platforms but its cost is very high. www.yhum.com is a centralize web site and supports on-line order service to restaurants and takeaway shops. However, it is only a web site for shop owners to advertise shops, online orders are passed to shops by fax, which causes delay or breaks in the e-commerce process. The yhum system also fails to support business flexibility and customer privacy.

In conclusion, the main barriers for e-business adoption in small businesses are high cost for establishment, daily running and maintenance, and low flexibility for high business agility. These small traditional firms cannot afford the relatively high cost compared with their revenue. They also cannot afford consultation service fees, and hence have to make the e-business decision based on their own knowledge. The lack of IT knowledge and the complexity of e-business system are the major hurdles to successful e-business adoption. Existing e-business model fails to provide the high system flexibility imposed by the very dynamic business pattern and requirement of small business.
The framework has a common web interface for all the small businesses using the framework. The interface locates at a web host which collects services. There is a server in each small business which supplies services to both in-shop devices and the web interface. The in-shop devices include several EPOS terminal, portable order device and delivery control terminal for the delivery company. There is also a remote management tool for the managers who has more than one shop and enable them to have remote control for all their branches.

As the framework is service-based, all functions are represented in services and converged in local servers. Each terminal can be viewed as an interface for several integrated services. Each service may be called by many terminals. There is no significant difference between internal and external (customer) terminals. Customer side terminals can access the same services as company internal terminals as long as security rules allow. It is possible for customers to involve in the e-business process directly.

The Common Web Interface is a customer portal. Each small business has its own local server, which is registered to the common web interface. Customer can browse the common web interface to find its favourite service provider and then access the e-business service directly from the provider. The common web interface does not involve in any e-business service directly, which guarantees the security and privacy for both the customer and the small businesses.

Based on service integration, a two-way communication channel can be set up between a customer and a small business services provider. Such a channel enables real-time e-business service, such as order making, processing and monitoring. The framework is particularly suitable for regional fast service industry sector, for example, flower delivery, food delivery, and taxi service.

3.2 Common Web interface

There is an individual sub-page for each small business. The company information like product description, open hour and general information is published in the sub-pages. The web also provides a search function to locate nearest related companies. The web does not store the product information at all; it acts as a service interface. Once the consumer wants to see the further details of the products or companies, the web interface will call remote service provided by the company and display the result to the consumer. This web interface also supports online services such as online ordering, which is achieved via remote service as well. There are different service forms for different category companies. The consumers selected their service; fill in their information in their web browser and then the service call will be directed to the server of the selected company. At the web interface side, no service call information will be stored. In this framework, the consumers directly communicate with the selected companies, the web interface host only provides a dictionary that stores companies’ network address list and a web interface for adding and deleting services that the companies provide.

The common web interface also has login and feedback system. The login system can reduce consumers input when they make service calling. Each consumer who registers to the system has its own profile; they can store their information and automatically fill in the service calling forms. A consumer can also store his favourite products and companies. The feedback system allows a consumer to give feedback to the companies. Customers can share their good and bad experience with others. The feedback system is helpful for both the companies and the consumers in achieving better services.

3.3 Local servers

There is a server in each small business company to supply all the services needed by the company. All other parts in this framework will communicate with the server and require services from the server. The server supplies
a full range of these services, which are expandable at run time.

3.4 POS terminal

The POS (Point of Sale) terminal can be seen as another interface for services provided by the server. The staff using POS terminal takes customers orders. There may more then one POS terminal in a company; all of them are connected to the local server. When the POS terminal starts up, it loads the product and customer information from the server. The POS terminal stores these data in a local copy. Every time the staff takes customer orders local data copy will be used to reduce communications between the POS terminal and the server. POS terminal has settings which let users customise the interface like adding a dish index button, changing dish index button’s layout, and changing the language for the interface.

Management functions like adding a new product or deleting a cancelled order can be located both in POS terminals and the server side. In some cases, the local server and POS terminals can be integrated to reduce the cost.

3.5 Mobile Terminal

Mobile Terminals are similar to POS terminals, however they only load product and order information and promotion list from the server. They do not involve in management functions but focus on sale and ordering.

3.6 Management Terminal

Management Terminals are an optional. All functions in these terminals can be integrated to POS terminals. Management terminals let user browse sales recorder and do different sales analysis. Management terminal can be located in different places and communicate with more then one servers.

4. Case Studies

The framework has been implemented in the food service sector around Edinburgh area in the UK. The framework has been fully tested and evaluated by real life users – customers and small businesses. Eight shops in Edinburgh used the first version of the system. Based on the feedback from the users, a significant restructuring was done, and a second version has been delivered.

The case studies and user feedback indicate that the cost factor play the most important role for e-business adoption in small and micro firms. By adopting the proposed framework, small businesses can increase revenues and meanwhile reduce operational costs. Increased revenues are achieved via a growth of potential customers attracted by the common web interface. Reduced costs, as the other way to influence this business ratio, are resulted from the sharing and service-based nature of the framework. Using the common web interface will be much cheaper in operation and maintenance than using individual web sites. The common web interface is maintained by a professional company. Compared with existing web portal for food and food service sector like www.yhum.com, the proposed framework has lower maintenance costs which are achieved by automated update of services and information. Each time customers request menu or other information for online order in the web interface, they actually communicate with the server in the shop directly. The web host doesn’t store the menu information. If the shop using this system wants to change its menu, they can just change it at the server side through a simple user friendly interface and need not to notice the company that maintain the common web interface. In comparison with the investment and implementation of a standalone solution at web site, this collaboration architecture will be more efficient in promoting and running the business, and cheaper.

Instead of traditional paper-based order processes, this framework provides a real-time electronic platform. The server can calculate delivery time accurately because all processes are recorded electronically. The customers can track their order online. Customer acquisition and retention rates will be improved due to the high flexibility and availability of real-time information.

This framework can provide real-time order processing, which gives the shop the possibility to work efficiently and make real-time response. The framework enables the small business to communicate directly to the customers, and it enables the orders to be processed at real-time. This new e-business collaborative framework increases customer satisfaction level, and reduces the human efforts. In general, staff of small and micro businesses does a lot of manual work which may cause frustration. This framework allows the staff to work under better conditions such as more efficient communication and collaboration. Therefore this framework improves not only the quality of work and the operational effectiveness but also the psychological state of employees.

In comparison to large enterprises, small and micro companies do not have the knowledge and the resources to adapt their systems in rapid reaction to the changing business requirements like process changes or
integrations of new services. This framework are highly reusable and scalable, and therefore allows small and micro companies to adapt their services easily, quickly and at little cost as all the services can be easily distributed to all different terminals. Investment in an e-business platform is a strategic decision for small and micro business with high financial pressure. This framework is easy to change for new technical requirement and standard.

5. Conclusions

The proposed framework largely facilitates the engagement of e-business in traditional small and micro businesses. Many of these businesses still use paper-based manual business process. The predominant e-business technologies are either rarely used or only used primarily as an internal operation tool to streamline the business process, or as a simple web site to display company’s products and services information, rather than as an integrated e-business platform to enable online transactions and organizational transformation. The problems causing the low level of adoption of e-business technologies include not only resource limitation, deficiency of IT knowledge and expertise at the business owners or management, but also the missing of a suitable e-business framework for these regional non-office-based small and micro businesses.

A sustainable and flexible user-friendly e-business platform could quickly change the picture of the level and the scale of e-business adoption in these small and micro businesses. However, our investigation has shown that existing general framework or model of e-business systems do not fit small and micro businesses. This paper proposed a service-based portal-centralised e-business framework with specific consideration of the business nature and needs of small businesses. The suitability of such a framework is evaluated via a pilot application in the food service sector, which receives very good feedbacks.

Further study of other specific industry sectors needs to be conducted, so that the unique needs and problems related to those sectors in e-business platform building based on the framework will be addressed. The new findings from those industry sectors will be used to refine and improve the current framework.

6. References