Multi-Channel E-Retailing Information Technology Management System (ITMS)

1 Muneeb Iqbal, 2 Atif Ali Khan

1 The School of Architecture, Computing and Engineering, University of East London, London, UK
2 School of Engineering, University of Warwick Coventry, CV4 7AL, United Kingdom

muneeb.iqbal@live.co.uk, Atif.Khan@warwick.ac.uk

ABSTRACT

With the emergence of internet technologies, electronic shopping is rapidly increasing across the globe. A large number of retailers including small and medium enterprises (SME's) are switching to online sales. This paper points out some of the major technological issues faced by online sellers along with the most affected areas. 6W’s are discussed for a proposed ITMS to facilitate electronic selling to reduce operational costs. This proposed system has capability to reduce running costs by automating many business processes while providing accurate information to the customers and making multi-channel electronic retailing accessible for increased turnover. This is followed by listing many off the shelf solutions provided by various vendors that can be customized according to the business needs. Moreover, their functionalities are improved through API to meet the requirements. This research points out main issues regarding online selling and proposes appropriate system requirements. It also highlights the available solutions in the market to enhance the functionality through further development using systems API.

Keywords: Information technology management system (ITMS); Small and medium enterprises (SME); Application programming interface (API); Best practice.

1. INTRODUCTION

Multi-channel E-Retailing ITMS is a proposed solution to the problems faced by many online sellers. This paper describes infrastructure of information technology management system for the online retailers and in-depth review of the issue occurring in this area. Later sections will look at the most cost effective solution to the problem. The possibilities include using an open source already available system and enhancing its feature to achieve the desired results and hit the goals. A major concern is whether to develop in-house or outsource its development. The authors are actively involved in developing a comprehensive ITMS to manage huge numbers of orders placed every day across multiple selling channels, inventory, customer services and other issues surrounding this area. Later discussion will cover 6 W’s, set of concepts and practices for Information Technology Services Management (ITSM), advantages and disadvantages of in-house development and outsourced development etc. Some of the available ITMS are also analyzed as short case studies. The proposed system is named as “Multi-Channel E-Retailing ITMS”. This system is aimed to automate several daily activities essential in proper functioning of the business such as inventory adjustments, order processing etc.

2. 6 W’S OF INFRASTRUCTURE PLANNING

This section explains 6W’s of information technology infrastructure planning. The case study chosen for this purpose is an “Order Management System” to assist those businesses who are selling different products online at multiple channels to maximize their turnover.

2.1 What

There are many areas to use extensive Information Technology (IT) products and services in today’s business management world. IT infrastructure is increasingly seen as a fundamental differentiator in the competitive performance of firms [3]. It is right to say that the race in the field of IT is a key factor to the success or failure of any organization in the modern world. There is now a Race of IT among businesses. This race began nearly three decades ago when businesses started making use of Information Technology to increase the efficiency of their services. Those businesses who have well-planned Information Technology Infrastructure are able to provide their customers with better services and accurate information. This race is about using cutting edge technology to increase their efficiency and be trendsetters in the respective industries.

2.2 Why

Consider the scenario of a company which is expecting to take thousands of orders every day by customers all around the world. In the absence of ITMS, one can’t even imagine going close to the kind of size mentioned above. And even a poorly planned and designed ITMS can’t help; in fact that will create further issues in day-to-day running of the business. It is vital to analyze the requirement of any new IT system to be brought in thoroughly and deeply accessing its needs.

2.3 Who

In the context of online retailing ITMS, the issue of IT Infrastructure has its impacts on a vast groups of people as well as organizations surrounding that particular business. E.g. People who are affected by this are the employees who use the system every day. Also the customers who are
shopping online are affected by the infrastructure as well as user interface of the product. The users of the system are the global users and the staff members who use the system on daily basis to perform various activities.

2.4 Where

In the context of this research, the plan is to grow faster with IT investment. As the business is based online, the issue of infrastructure occurs globally. The beauty of being online is that it doesn’t have boundaries. With this beauty come global issues which should be addressed while infrastructure planning, such as internationalization. The issue of concern also arises where the turnover of the business increases rapidly and traditional manual processing becomes tedious. That’s where an information system steps in and makes life easier. Multi-Channel E-Retailing ITMS is just another system to support a business survival and help its growth.

2.5 When

The issue of infrastructure planning in the context of a need of an ITMS arises in the early stages of a growing online business. It is essential to bring it forward fairly quickly and discuss the aims, objectives and vision of the system by senior management. This sort of planning plays a key factor in development and addresses a continuous improvement process. Infrastructure planning is an early issue of concern and stays alive through the complete life cycle of the overall system.

2.6 How

In the process of development and maintenance of a successful ITMS, the issue of infrastructure is surfaced as a backbone of the entire system. The continuous attentions to research and development and careful planning of infrastructure will help overcome this issue and instead make it a key factor in overall success.

3. BEST PRACTICES FOR STRATEGIC INFORMATION TECHNOLOGY MANAGEMENT

In modern world, Information technology has so much influence in the success of almost every business. Infrastructure of any company’s IT Management provides a base to the integrity of entire organization as the involvement of ITMS in businesses is now inevitable. Best practices for Strategic Information Technology Management are discussed below. To get better results from an IT Management it is a good idea to follow best practices described by [5] which identify key practices for strategic information technology such as:

i. Use performance measures as a proxy for return on investment.

ii. Take advantage of leading (but not bleeding) edge technology, and

iii. Make use of proven project management techniques.

The above identified points are vital in the success of an IT System for the business. When setting goals, the people who are making decisions should consider economic reasons for the funds to be spent on any proposed technology advancement or innovation to be carried out. The return on investment is a key measuring factor while deciding for spending in technology and innovations.

To stay ahead in the industry, a thorough SWOT analysis should be carried out with making use of leading-edge technologies to provide products and services. New technologies are often expensive. A clear line should be drawn to figure out whether the use of proposed technology is cost effective or not. Project management has always been an important aspect of a successful project. Best practices must be carried out in order to achieve the aims and objectives. The Information Technology Infrastructure Library (ITIL) provides the concepts and best practices for Information Technology Services Management. Iqbal and Neives [8] described the overview of ITIL as follows:

- Service Support
- Service Delivery
- Information & Communication Technology Infrastructure Management
- Security Management
- Application and Software Management
- Continual Service Improvement

4. ITMS FOR AN ONLINE RETAILER; INFRASTRUCTURE PERSPECTIVE

The focus of the research was on the infrastructure of an ITMS for online retailers. This is a very fast growing industry.

More and more people are switching to buy online. On the other hand more and more businesses are rushing towards online selling. Big high street companies such as Maplins, Foot Locker, and many other are selling online on their websites as well as on two of the most famous online selling platforms i.e. eBay and Amazon. With such fast growing side of sales (online selling) and multi-channel selling, it is becoming complicated to manage day-to-day activities for businesses in order to provide the products/services to the customers. Information technology infrastructure is increasingly seen as a fundamental differentiator in the competitive performance of firms [3]. Infrastructure planning begins with the identification of the aim and objectives of the ITMS. These should be clearly defined and realistic/achievable goals should be set.

4.1 Aim

The aim of ITMS is to develop an online selling platform which provides facilities to different area of business from supply chain and cash flow management to products/services delivery to end customers. The system
should also reduce operating costs as well. In online selling there are two divisions of the ITMS:

- Front End for customers to visit e-shops.
- Back office IT system to operate the e-shops

4.2 Objectives

This paper mainly focuses the infrastructure planning and implementation of the backend side of the business IT System. To achieve the aim following objectives are set:

- To research the concepts and best practices for strategic information technology management.
- To research the Information Technology Management systems available in the market.
- To outline the requirements and the analysis of the proposed system.
- Design and Implementation
- Testing and Continual Improvement
- Future Research and Development

5. REQUIREMENTS AND ANALYSIS

For strategic infrastructure planning, the first step is to identify the requirements of the system and then analyze them accordingly to explain why the issue of concern i.e. infrastructure of ITMS is so important. The requirements of the system are as follows:

- The system should be able to list products with their pictures and description along with their prices.
- There should be a backend system to add, edit, and delete product listings.
- A database which holds the inventory.
- There will be multiple selling channels such as multiple websites and other selling platforms such as eBay and Amazon.
- The system should be able to list products on multiple channels.
- Electronic payment facilities such as Credit/Debit card payments, PayPal, Google Checkouts and other widely used options.
- Stock synchronization among all selling channels.
- Taking orders.
- Order fulfilments.
- Customer Services including messaging systems, emails and live chats.
- Reporting.

This is a complicated system within itself as attention to minor details is important to provide effective services to customers. The core of the system is its Design Infrastructure, how well the ICT infrastructure is implemented to facilitate every area of the business activities. [7]. To show why this issue is important a brief analysis of the requirements mentioned earlier is carried out below:

1) Product listing is important and the display on the multiple channels has to be eye-catching. A nicely presented product with more details and high resolution pictures tempts the customer to go ahead and make the purchase. As the customer cannot physically see the product and have a feel of it, the only way to convince them to buy is to make the appearance attractive.

2) To work on the product listings, the back end system should be easy to use, faster and robust. With thousands of products listed things can become tedious very easily.

3) A database design is also crucial to hold thousands of products and hundreds of thousands of transactions and their details as where the products are going, which channel the product orders are coming from etc. This can become a knowledge base. With the use of this a comprehensive knowledge management system can be put in place. This will help in making key decisions for the business from the results drawn by the knowledge base.

4) As one of the main aspects of online business is to sell at multiple channels, things become easily complicated and data redundancies can occur. The systems should be able to list products on channels in one click. All of the major selling channels such as eBay and Amazon provide their own Application Programming Integration (API) to connect with them. Integrating these channels with the backend system/ content management system can make life easier for online merchandisers to see the products at a glance.

5) Electronic payment facilities are also vital. There are several worldwide famous e-payment channels as mentioned above. The vendors of these electronic payment providers have made it very easy to integrate the CMS with them. The more payment option buyer have, the better will be the chances of sales.

6) The products to be listed at multiple channels stock synchronization are important. Consider the case of one item of a particular product being left in stock. It should show one item left across all sales channels. As soon as someone has bought it from one of the channels it should change everywhere to “out of stock” in real time. Otherwise there will be unwanted purchases which could result in problems and disappointments for the customer. Accuracy is vital in this business system to provide excellent services to the customers.

Other requirements related to order management, fulfillment and reporting have their own importance. Reporting will help the management see the performances of work being done.

6. DESIGN AND IMPLEMENTATION: USERS PERSPECTIVES

The Multi-Channel Online E-Retailing ITMS is a user-oriented system with a vision to provide excellent services to its customers and effective working environment for its staff to work with. The design of the system has to be very
precise to reduce the work-load of its staff to save operation costs and at the same time provide accurate information to its customers about different products. Therefore the issue of concern impacts its customers, staff and the whole of the organization using the system. Comprehensive and robust design and the systems infrastructure will help the business to run effectively.

The design was first created to visualize the requirements of the system and make its implementation possible. The following figure illustrates the bird's-eye view of the system.

Fig 1: Multi-Channel Online E-Retailing ITMS

6.1 Implementation

To implement such a system, several options need to be considered along with various aspects of the future use of this system. There are many shopping carts available to buy or under open source license. One had to consider whether to pick such a system from the shelf or develop one’s own. For the development of such a system in-house and outsourced development was considered. The pros and cons of outsourced development and in-house development will be discussed later. Here are the various shopping carts available to use along with software and plugin to enhance a basic shopping cart to achieve the requirements of the system.

6.1.1 Magento

Magento is one of the market leading open source e-commerce solutions and has won many awards. The community edition is free (which means there is no support) and the professional level starts at $2,995 per year. It is very easy to modify the system according to our requirements and integrate with other selling channels. [1]

6.1.2 osCommerce

osCommerce has built an impressive customer base of 230,000 plus online storefronts. They have a strong community and Live Shops directory where you can see what others have built. OsCommerce is another open source system available to take off the shelf and enhance its features to achieve the required functionalities. [10]

6.1.3 Prestashop

Prestashop is a rapidly growing open source solution with an active user community. They have a good site with good demos and feature explanations. They have a bug tracking tool that shows they are responsive to customer input. [11]

6.1.4 Zen Cart

Zen Cart promises a very easy user-friendly installation. Often open source is viewed as more difficult for the end user, but not according to Zen as they explain anyone with basic website building skills can do it. [13]

6.1.5 Open Cart

Open Cart, as the name implies offers an open solution. It sounded like one of the easiest to install, out of the box. But, there is no box. They offered some great features like search engine optimization (SEO), auto image resizing, unlimited products and more. [9]

6.1.6 Spree Commerce

Spree Commerce is an open source flexible commerce platform built on the Ruby on Rails programming language. It is completely free to use. [12]

6.2 Ready to use software and their issues

6.2.1 Linnworks Order Management

Linnworks is software which is based on the same vision as of the system being discussed earlier. They have developed a detailed system to provide comprehensive set of features to its users. Linnworks is not free but the charges are very nominal. The implementation of ITMS was analyzed in detail. There were several drawbacks noticed and because of it the decision was made not to use Linnworks. A few of them are:

- Linnworks is not free. Although the costs involved in developing/enhancing open source system would be more but with the passage of time, the cost will be reduced. As Linnworks can start charging more amounts in future once they are stable in the market.
- The care of the business may become dependent on the infrastructure of the Linnworks. Therefor, to stay independent the system would be developed on our own.

osCommerce is selected to use as the core of the system. Its features can be enhanced according to the business needs by the use of plugins and additional component integration. This will give a flexibility to keep on modifying the infrastructure of the system according to the changing needs of the business as it grows bigger. [6]

6.3 Implementing osCommerce to build the required ITMS

As discussed in the previous section that osCommerce was selected to be used as the core of the
ITMS. This is open source and there are lots of plugins available. It is also very easy to develop own plugins according to the business needs. osCommerce is PHP based and connects to mySQL Database. eBay provides Application Programming Interface (API) to connect to their database XML format. [4] “Using eBay API, you can create programs that:

- Submit items for listing on eBay
- Get the current list of eBay categories
- View information about items listed on eBay
- Get high bidder information for items you are selling
- Retrieve lists of items a particular user is currently selling through eBay
- Retrieve lists of items a particular user has bid on
- Display eBay listings on other sites
- Leave feedback about other users at the conclusion of a commerce transaction

Figure 2 illustrates an overview of the implementation that could be achieved using their API. Because the API is not dependent on the eBay user interface, it allows the user to create stable, custom functionality and interfaces that best meet the user’s business needs.

![Fig 2: EBay’s API](Image)

Similarly Amazon provides their web services to connect the application (osCommerce). Using these API osCommerce can be modified to achieve enhanced features as described in the requirements sections of this paper. Once these APIs are implemented any product which is listed on the website using osCommerce store can be listed to eBay and Amazon at the same time, saving hours of work and reducing the human resources needed. Similarly orders placed on multiple channels can be displayed under one system at a glance. Order fulfillments can be updated as well as customer services can be provided easily by viewing all the messages from customers at one go.

### 7. STAFF AND GLOBAL CUSTOMERS

Multi-channel e-retailing ITMS is to be used by staff members that are based at multiple locations. Front-end users of the system are based globally as online market has no boundaries. The distributed nature of the business as well as huge exposure to global customers brings benefits to the company; that is, company can supply its products in larger quantities. This also brings some issues as well. The infrastructure of the ITMS needs to address such issues. Some of the issues occurring are; that the staff members of the company who will be using this system are based at distributed locations. The system should therefore be accessible from remote locations. Web based front is the best and low cost option. The infrastructure of osCommerce is web based. This solves the issue of accessibility from the remote locations. The security of the system and database is very important. As the system is expected to receive hundreds of orders every day a lot of customer personal information would be gathered. According to Data Protections Act 1998 companies are required to protect customer’s information and it may only be used for the purpose for which customer have supplied it. For example in this case customers provide their name, addresses and financial details. Therefore it is the company’s responsibility to ensure the security and safety of customer’s data. Certain measures and steps needs to be taken to secure the MySQL database from unauthorized access. The next section will point out some security measures to be taken.

#### 7.1 Securing MySQL Database

In order to achieve the highest possible level of security, the installation and configuration of MySQL should be performed in accordance with the following security requirements: These points are discussed by Artur Maj [2]:

- MySQL database must be executed in a chrooted environment;
- MySQL processes must run under a unique UID/GID that is not used by any other system process;
- Only local access to MySQL will be allowed;
- MySQL root's account must be protected by a hard to guess password;
- The administrator's account will be renamed;
- Anonymous access to the database (by using the nobody account) must be disabled;
- All sample databases and tables must be removed.

### 8. IMPORTANCE OF MULTI-CHANNEL E-RETAILING ITMS

The need of the Information Technology Management System originates with the expansion of the business. At the early stages of any business, most of the activities are performed manually. They are time consuming and require more human resources but this is usually where it all begins. With the growth of business especially in online retailing where the competition is very high, an ITMS which could automate majority of online activities such as transaction management, inventory adjustments etc. are done automatically. A greater amount of resources and costs are saved to maximize the profit margins. Multi-channel E-Retailing ITMS is based on such vision. This
issue of concern arises soon after the growth of the business. If it is done in a right way at a right time it could become a key factor in the success of any business. Multi-Channel E-Retailing ITMS is a proposed solution for online selling businesses. It suggests that it should be able to manage the day-to-day activities essential in the effective running of the business. If the proposed ITMS is capable of handling the requirements in an effective manner to achieve the aim, it will no doubt become the core of the success of the business.

9. OUTSOURCING VS IN-HOUSE DEVELOPMENT

Development and maintenance of such a system is a complicated process on its own. Outsourcing is an old idea which has played a major part in industry. The main advantages of outsourcing IT over in-house development are lower costs, robustness, and timely and complete solutions. These days, more and more companies are taking the option of sourcing the services provision in order to meet their operational goals. In addition, outsourcing allows concentrating on the core business process instead of worrying about the non-core areas. Choosing for-in-house solution for the non-core areas can turn out to be inefficient. However by outsourcing, these tasks can be performed efficiently by the industry professionals who have the relative expertise and experience. Outsourcing eliminates the need to set up a new department, which reduces the overall costs in the long run like hiring and training new staff plus any other fixed costs of running a whole separate department. Another advantage associated with outsourcing is that of faster development. Outsourcing company would be able to provide complete system developed in lesser time because of their expertise and experience.

On the other hand outsourcing has several disadvantages associated with it. Business loses direct control over the part of business outsourced. Naturally, there is an agreement signed between both the companies, but management control certainly stays with the outsourced company. This outsourced company may not have motivated and ambitious employees. Privacy and confidentiality are some other disadvantages of IT outsourcing. For any type of business to remain successful, there are certain private and confidential information that cannot be leaked out of the company but some projects might require disclosure of that secret information. Another danger is that project may not stay unique; the outsourced company might create a shareware license of that software and selling which would eventually create more competitors. Sometimes issues with quality might arise if mistakes have been made in selection of outsourcing company. The company might provide you with buggy software while trying to reduce their expenses and earn more from that project.

In-house development has several advantages as well. In-house development utilizes the unmatched expertise available within the business. For example if a company has unique idea the company can bring it to life and the competitors would not know it. In-house development gives complete control over the project and can be modified to company needs easily and it would be more advantageous to have trusted resources dealing the project that involves sensitive information. In-house development removes the communication gap and the project would definitely meet business’s requirements. Collaboration would be viable as all the departments would be working parallel to the in-house developers. This would also increase the pace of development as flow of information would be faster. The business would get better control of timing and resources. Changes and modification would be much easier and faster. There would be no need to re-outsource the project for modification and additions. Development team would be readily available for managing modifications, changes, upgrades and addition of new features.

On the other hand in-house development might have many disadvantages as well, like the cost of running a separate department. Cost of training the staff and keeping their skills up to date would also add up to the cost. In beginning the development may also be slow because of newly hired staff and they might take time to adjust within the company. Looking at the pros and cons of both the options, it is suggested that in-house development would be a better solution. An online business is technical in nature itself and by successfully developing the system in-house it would give the mind set to its employees which would be useful for the rapidly changing technology trends. Internal Research and Development would also be easier and the business quickly adapts to new cutting edge technologies in online selling industries.

10. CONCLUSIONS

In this paper, Information Technology Infrastructure planning has been discussed from various aspects. Multi-channel E-Retailing ITMS was selected as a case study to do the critical analysis of the importance of infrastructure planning for a successful ITMS which can contribute to the success of a company or organization. This system will be helpful for those who are already selling online and are in their growing phase. To rapidly increase the turnover of online sales, the best strategy is to sell at multiple channels which include website stores, eBay and Amazon etc. This strategy certainly brings an increased turnover and on other hand some complications in providing basic product information to the customers such as inventory. The proposed system is aimed to assist online businesses and help them automate these features to reduce operating costs and increase their overall efficiency. It is also concluded that it would be a better option to develop such a system in-house as it will bring special IT development skills set in the company which would be beneficial for future internal research and development programs in the rapidly changing and newly emerging technologies.

REFERENCES


