

Reference Model for the Implementation of an E-Commerce Solution in Peruvian SMEs in the Retail Sector

Julio Kauss, Miguel Cadillo, David Mauricio

Abstract—E-commerce is a business model that allows companies to optimize the processes of buying, selling, transferring goods and exchanging services through computer networks or the Internet. In Peru, the electronic commerce is used infrequently. This situation is due, in part to the fact that there is no model that allows companies to implement an e-commerce solution, which means that most SMEs do not have adequate knowledge to adapt to electronic commerce. In this work, a reference model is proposed for the implementation of an e-commerce solution in Peruvian SMEs in the retail sector. It consists of five phases: Business Analysis, Business Modeling, Implementation, Post Implementation and Results. The present model was validated in a SME of the Peruvian retail sector through the implementation of an electronic commerce platform, through which the company increased its sales through the delivery channel by 10% in the first month of deployment. This result showed that the model is easy to implement, is economical and agile. In addition, it allowed the company to increase its business offer, adapt to e-commerce and improve customer loyalty.

Keywords—E-commerce, retail, SMEs, reference model.

I. INTRODUCTION

THE retail sector is a sector in which the product reaches a final customer and is the perfect field for electronic commerce because the speed of a retail purchase fits with the technological solution. At present, the retail sector represents 73.1% of total trade in Peru. It is a sector that is growing an average of 12% per year [1], since modern retails reach around 8500 stores and their sales increase with the passing of days. It is a sector that contains, mostly, small and medium enterprises (SMEs), which represent 79.4% of the entire SME segment [2]. These companies focus their business in the physical sale to the customer (through a commercial store) and offer their products through traditional advertising [3]. An alternative to break the traditional scheme is electronic commerce. The E-commerce allows SMEs in the retail sector to open their market to a greater number of people, who are connected through the Internet and can see the company without physical contact [4]. However, it requires technical knowledge, financial feasibility, market analysis, IT infrastructure, among other factors, to achieve the implementation of electronic commerce in SMEs in the retail sector.

Several authors have developed different models that allow the adaptation of the company to electronic commerce.

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However, there is currently no defined standard that allows SMEs in the retail sector to implement electronic commerce. Therefore, a reference model for the implementation of an e-commerce solution is proposed, which will have as a first step the analysis of the company, from that, perform the modeling of the business (identify the future state of the company), to later implement the e-commerce solution which will allow to design and improve the Core processes of the SMEs through the platform's functionalities. Additionally, perform a pre-deployment post-deployment and, finally, identify the business indicators of the organization that show the results obtained and reach a correct decision making.

This article will initially present the literature review on the adoption models of electronic commerce in SMEs, to then describe the Reference Model that will be validated through a case study in a SME of the retail sector. Finally, a conclusion and recommendations for companies wishing to implement electronic commerce are given.

II. STATE OF ART

A reference model, in the field of Systems Engineering and Software, is an abstract representation that allows understanding the relationships between entities of some environment. It allows the development of specific references or architectures through the use of standards or specifications that support the environment in question [5].

There are two proposals for models of adoption of electronic commerce, which determine whether a company is suitable or not to adopt it. Among the main models of adoption was a model that indicates that for there to be a favorable implementation in the company, it has to go through three stages: Formulation (analysis of the company), Organization (see if the company is suitable for the e-commerce) and Implementation (deploy the technological solution) [6]. The model differed from others, by using the concepts of strategic planning as input for its development. On the other hand, we found a model of adoption of electronic commerce in SMEs in the retail sector [7] that includes the following factors: Technological (compatibility, advantages, security, complexity, IT infrastructure), Organizational (analysis of the company, support of the CEO, financial capacity) and Environment (competition, buyer pressure and external support). Finally, we reviewed the e-commerce adoption model for SMEs [8] that presents seven success factors for adoption: Organizational, Administrative, Technological, Individual, Implementation, Environment and

Security.

The adoption models described above have in common that, for there to be an adoption of electronic commerce in the company, a group of factors important for adoption must be taken into account (see Table I). These factors are decisive for the adoption of electronic commerce, since the compliance of each of them by the company is vital in the decision to implement e-commerce solutions.

TABLE I
FACTORS FOR THE ADOPTION OF ELECTRONIC COMMERCE

Factors	Source
Social Influence	[4]
Usability	[4], [6], [8], [16], [18]
Perceived Utility	[4], [6], [8], [13]-[15], [18]
Security	[4], [6], [8], [15], [18]
Perceived Risk	[4], [6], [8], [11]
Satisfaction	[4]
Company Resources	[6], [8], [13]-[15]
Size of the company	[6], [8], [15]-[17], [19]
Good Project team	[6], [8], [11]
IT Infrastructure	[6], [8], [15], [17]
Business Infrastructure	[6], [8], [11], [18], [20]
Communication	[6], [8], [11], [18], [20]
Skill en IT and experience	[6], [8], [14], [18], [19]
Education and awareness	[6], [8]
Products and Services	[6], [8], [12]
Delivery and Payments	[6], [8]
Customer experience	[6], [8], [12], [21]
Support from technology providers	[6], [8], [14]-[17]
Industry	[6], [8], [13], [14]
Competition	[6], [8], [15]-[17]
Loyalty	[6], [8], [11]
Privacy	[6], [8], [11]
Market Growth	[13]
Compatibility	[15]-[18], [20]
Complexity	[15], [19]
CEO support	[15], [16], [20]
Financial Capacity	[15]
Pressure of Buyers / Suppliers	[15]-[18]
Cost	[16]-[18]
Innovation	[14]

The factors can be divided into the following groups: Organizational (related to the current situation of the company), Environment (factors external to the company) and Technological (related to the existing technology in the company). Regarding e-commerce satisfaction factors (Post Implementation), [9] conduct an investigation based on the largest American retail firms, in which it is determined that the determining factors for online satisfaction are the following: price, customer expectations, quality received and loyalty to the store. Finally, for good practices for the implementation of electronic commerce in SMEs, three fundamental areas must be taken into account: computer security, legislation and electronic commerce [10]. These axes are related to each other and give as a product, the manual of good practices for implementation, which has the following structure:

- For the prevention and attention of disasters.

- For staff.
- For internet use.
- Practices applicable to physical and logical security.
- Practices applicable to the e-commerce web portal.
- For security in communications.
- For the protection of personal data.
- In contracting by electronic means.

III. REFERENCE MODEL

A. MISEP Model

The MISEP model (Reference Model for the Implementation of an E-commerce Solution in Peruvian SMEs in the retail sector) was developed so that the implementation of an e-commerce solution has the expected results and does not lead to the company's failure for those entities that opt for this technology. In addition, with the help of this model you can increase the number of companies that adopt electronic commerce as an additional sales channel. The MISEP model is developed through five phases such as the analysis of the company, the modeling of the business, the implementation, the post-implementation and the results. This model is based on the adoption factors of electronic commerce in SMEs and all the deliverables that were made in the implementation of the e-commerce solution. This model allows the company to implement an e-commerce solution correctly and not only diagnose if it is suitable for implementation

B. Phases

1. Analysis of the Company

Phase 1 begins with the knowledge of the current situation of the SME of the retail sector, in order to obtain key information that indicates if the company is suitable for the implementation of the e-commerce solution. A list of activities is proposed, as shown in Table II.

After collecting the information of the company, it is necessary to evaluate the current situation of the SME of the retail sector based on factors of adoption of e-commerce (see Table I).

The level of compliance of the adoption factors to implement e-commerce is valued in a range of one to three. The values that are located in one mean that the company does not have the adoption factor for the implementation of e-commerce. If it is located in two, it means that the company partially counts; finally, it is located in three if it has factor conditions. For the company to be suitable for the implementation of e-commerce, the weighted score of the factors must be greater than half (18).

2. Business Modeling

This phase begins if the SME of the retail sector is able to implement an e-commerce solution. In addition, it allows aligning the business process of the SME with electronic commerce. Business modeling is to improve what the company provides directly to the end customers. In this phase, the following criteria must be taken into account:

- **Evaluation of e-commerce platforms.** For the evaluation

of the best e-commerce platform for the company, the main selection criteria should be identified such as Prices of the e-commerce Platforms, General Description of the Platforms, and Technical Requirements of the Platforms and Evaluation of Functionalities of e-commerce. Commerce versus Platforms [22].

- **Business Transformation.** It refers to making changes in

relation to what the SME of the retail sector has to do with the business. All this leads to repowering the area that will be impacted with the help of deliverables such as the following: Design of To Be processes, To Be IT infrastructure and use case diagram; with the purpose of assigning functions and positions that allow the company to adapt to the e-commerce solution.

TABLE II
LIST OF ACTIVITIES TO IDENTIFY IF THE COMPANY IS SUITABLE FOR THE IMPLEMENTATION OF E-COMMERCE

Activities	Purpose
Business organization	Know how the company is organized (organization chart)
Strategy: Mission and Vision	The knowledge of your goals in the short, medium and long term
Analysis of the Sector	Know if the item you are in is in a growing market
Analysis of the Competition	Know if direct competitors already have e-commerce implementation
IT infrastructure	Know the resources available to the company
Design of the ASIS Processes	Know the core processes of the company
Indicators of the Company	Know what the company's results are
Product Portfolio	Sort the products that will be sold in the e-commerce
Digital Analysis	Know if you have Digital tools. (Facebook, Google Adwords, etc)
Sales channels	Know the sales channels they currently have
Financial analysis	Know how much is the spending limit to implement an e-commerce

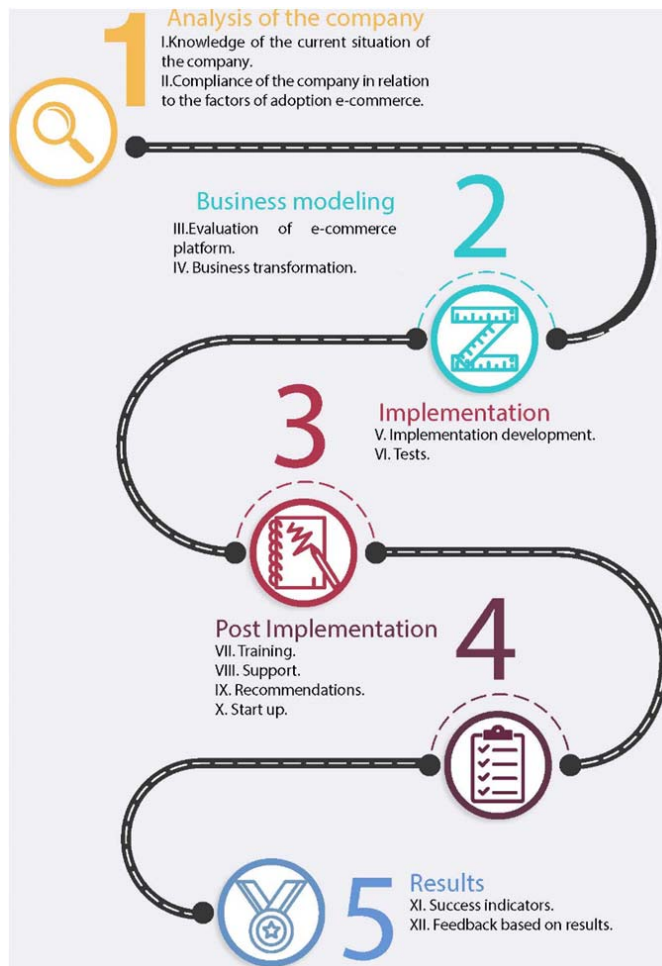


Fig. 1 Reference Model for the Implementation of an E-commerce Solution in Peruvian SMEs in the retail sector (MISEP)

TABLE III
COMPLIANCE OF THE COMPANY IN RELATION TO THE FACTORS OF ADOPTION OF E-COMMERCE

Group	Factor	Description	Question
Organizational	Company resources	Personnel of the company that will be involved in the administration of the e-commerce	¿ It has sufficient resources for the implementation of the E-commerce?
	Business Infrastructure	Business Processes that will be involved with the e-commerce	Does the company have processes that can be involved with the e-commerce?
	Education and awareness	Education necessary for a correct adoption	The employees of the organization know what an e-commerce is?
	Products and services	Products that will be involved with the e-commerce	Does the company have the amount of products needed for an e-commerce?
	Sales channels	Sales channels with which the company has	Does the company have more than one sales channel?
	CEO support	Interest on the part of the administration of the company for the e-commerce	Electronic commerce is within the strategic objectives?
	Financial capability	Financial resources for adoption	Does the company have the necessary resources for implementation?
Environment	Industry	Business activity	Is the item growing?
	Competition	E-commerce in the competition	Does the competition have e-commerce solutions?
	Pressure of Buyers / Suppliers	The e-commerce must meet the needs of these users	Customers or suppliers need a solution of e-commerce by the company?
Technological	IT infrastructure	Infrastructure that will support the e-commerce solution	Does the company have the IT infrastructure necessary for implementation?
	Skill in IT and experience	Necessary experience for adoption to e-commerce	The employees of the company have the necessary experience to use a platform e-commerce?



Fig. 2 Development of the implementation

3. Implementation

In this phase, it allows the implementation of the e-commerce platform in the SME, for this it must take into account aspects such as the development of the implementation and the tests that will be carried out before the start-up.

For the development of the implementation, it is proposed to identify activities such as the following: Platform Hosting, Installation, User Assignment, Web Interface Design, Massive Load of Products, Shipping Methods, Payment Methods, Installation of Plugins and Certificate SSL. This certificate allows encrypting the information that can be saved from clients so that it is stored securely and SMEs must integrate it to comply with good practices for the implementation of electronic commerce [10]. All the phases described above, will help the e-commerce platform have the necessary functionalities for its implementation.

It is important to indicate that the development of the implementation (see Fig. 2), focuses directly on the retail sector as it contemplates the phase of shipping methods; which is indispensable for the sector because it defines the way in which the product reaches the customer.

Before the launch of the e-commerce platform, it is necessary to perform tests on the platform such as the ones shown below:

- **Functional testing.** It refers to analyzing that the platform meets all the required specifications correctly.
- **Performance Tests.** It refers to analyzing the response time for the transactions or the functionalities of the platform.
- **Stress test.** It refers to analyzing if the platform works properly and without errors.

4. Post Implementation

Phase 4 of the model defines the set of activities that must be carried out after the implementation. First, prior to deploying the platform in a public way, it is necessary to train the personnel assigned to each module, according to the user assignment that has been made in the implementation development. After training the staff, a technical manual must be prepared that includes all the functionalities of the tool and how the user can handle them.

- **Training and Support:** After training SME employees in the retail sector, the company should be informed about the support that will be provided after deployment. Therefore, it is necessary to make a document that specifies the contact persons for the support and an additional document that shows the frequent errors that can occur in the platform and how the user can solve them.
- **Recommendations:** This activity tries to give recommendations to the SME so that the e-commerce platform has a good positioning on the Internet. A key example is the Marketing Strategy, for example, make campaigns with Google Adwords and get the positioning of the platform.
- **Deployment Strategy:** For this activity, the deployment strategy must be clear with the company, for this purpose, a document must be defined with the deployment date, the specific role that each employee of the organization will perform with the e-commerce platform and the conditions that will apply to the deployment.

5. Results

For the collection of results, after the implementation of the

e-commerce solution, indicators of success must be identified such as the following: Business Indicators, Platform Indicators and Customer Satisfaction. Finally, based on the results of the e-commerce solution, it is necessary to provide the SME of the retail sector with feedback, as well as provide a document of possible improvements to the future of the e-commerce solution, everything depends on the company, if you want to improve the solution in the short, medium or long term.

IV. CASE STUDY

A. Organization

In order to validate the MISEP model, an implementation of the model was carried out in a retail SME that sells batteries and accessories for automobiles and belongs to the automotive industry. The SME has 10 workers and presents monthly sales of \$ 75,000.00, approximately. He has more than 35 years in business and has the following problem: he wants to expand his sales channel using e-commerce, however, he does not know how to implement e-commerce and the general manager does not know if the company is suitable for adaptation to the e-commerce technology

Phase 1. Analysis of the company

Company information was collected through the list of activities to identify if the company is suitable for the implementation of e-commerce and the compliance table of the company was applied according to the adoption factors. A score of twenty-nine was obtained, with which it was defined that the company is suitable for implementation.

Phase 2. Business modeling

A benchmarking of the best e-commerce platform for the company was carried out, taking into account its possibilities and following the main selection criteria. Magento was defined as the platform that will be used for the implementation, since it obtained the highest score in functionalities (31) and is an Open Source platform, which will not mean an expense in licensing for the company.

For the activity of business transformation, the ToBe processes were designed, defining the macro processes of Logistics Management, Sales Management and Collection Management as those affected by the electronic commerce solution. Additionally, the use cases of the Magento platform in relation to the employees of the organization were diagrammed.

Phase 3. Implementation

For the development of the implementation, a form of hosting in a shared hosting was chosen, hiring the services of Fastcomet, since it is a hosting provider that provides 24/7 support, allows the installation of Magento in its latest version and presents an economic plan for the company. After the choice of hosting, the Magento platform was installed and configured so that each person involved in the organization has access and the mass loading of products was carried out. The delivery of the product was defined and the form of payment against delivery and integrating the PayU payment

gateway. Finally, an SSL certificate was installed so that the page is safe and inspires confidence in potential customers.

Regarding Tests of the Platform, functional tests were carried out with the help of the company, which defined that the necessary functionalities for the solution are fulfilled; Performance tests, Stress tests and Unit tests were also performed, giving as a diagnosis that the platform is at the desired loading times for the solution (four seconds).

Phase 4. Post Implementation

In this phase, the training of the personal was covered, the personal was trained in two sessions of two hours each and at the end of the training, and the user manuals were provided. The Support document was delivered, which resolves the frequent errors that can occur in the platform and the support contact is specified. Additionally, the necessary recommendations were provided so that the company can use a Marketing strategy, supported by a consultancy. Finally, the electronic commerce platform was deployed, as can be seen in Fig. 3.

Phase 5. Results

The implementation of the model in the company allowed it to have an e-commerce solution, and have as an end result, an increase in sales through the delivery channel, new customer acquisition thanks to the platform, and obtain a plus, by differentiating itself from the competition that does not have a solution of this type.

To visualize the results provided by the implemented model, tools such as Google Analytics (platform indicators), the Magento Board (business indicators) and Google Forms (to determine customer satisfaction and improvements in the future) were used.

To explain the results in more detail, a scoreboard was created (see Table IV), which compares the company's data without the model and with the model implemented in the first month since implementation.

TABLE IV
RESULTS OF THE MODEL IMPLEMENTED IN THE FIRST MONTH

Indicators	Before the implementation	After the implementation	%Variation
# Sales through the delivery channel	70	77	10%
Utility generated through the delivery channel	\$ 5,465.00	\$ 6,368.00	17%
Products sold through the delivery channel	90	102	13%
Number of new customers	25	32	28%

V. CONCLUSION

The MISEP model was developed in five phases: business analysis, business modeling, implementation, post implementation and results. The case study was carried out in order to illustrate the results that a company can obtain with the model, in this case, an increase in sales was obtained and the company was able to position itself on the internet, expanding its offer and its target audience. The model was

beneficial in time (it was implemented in two months, a shorter time than the average of e-commerce implementations, which are from four to six months), cost (Open Source platform and Hosting) and in final results.

This project presented the benefits that electronic commerce can offer to the organization, supporting a group of processes such as logistics, sales and collection management. The other

processes can be supported by an ERP (Enterprise Resource Planning), so it is recommended that in the future a model that can encompass the implementation of an electronic commerce solution and integration with an ERP be investigated and proposed, so the company can unify a single inventory and optimize the billing and collection process.

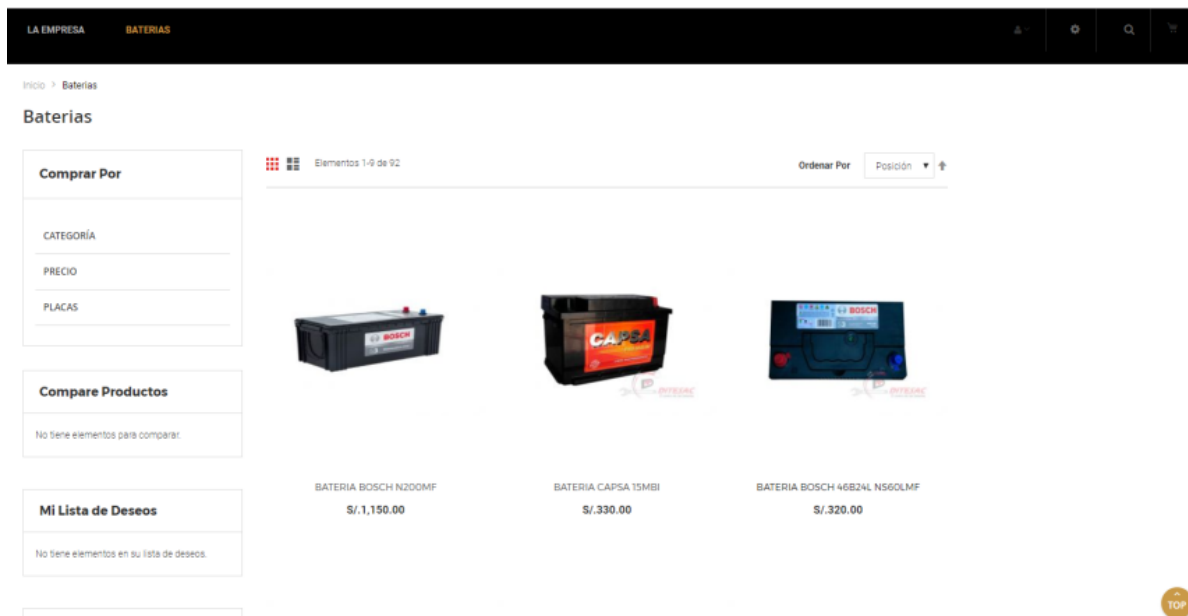


Fig. 3 Deployed e-commerce platform

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