

Evaluating Open Source E-commerce Tools using OSSpal Methodology

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Abstract: E-commerce presents several advantages in relation to traditional retail, which reflects a better competitive advantage. Open source tools have the main advantage of not increasing costs for companies although it is necessary to choose an appropriate tool to meet their specific needs. For a more precise evaluation of open source e-commerce tools, the OSSpal assessment methodology was applied, which combines quantitative and qualitative evaluation measures. By using the OSSpal methodology, this paper compares three of the top e-commerce tools: Magento, OpenCart, and PrestaShop.

1 INTRODUCTION

E-commerce has changed the landscape of the traditional retail, which includes transactions conducted via networks, based on IP (Internet Protocol) and via other computer networks. Goods and services are ordered by these networks but payment and final delivery of the order goods or services can be made in or outside the network.

E-commerce is an appropriate strategy for marketing, selling and integrating online services. E-commerce main advantages over traditional retail stores are: greater convenience in purchasing the product or service; no standing in queue or being placed on hold evermore; 24-hour availability; access at any time for devices with an Internet connection; access to stores located remotely; easier to compare prices; reduce employee costs; along with the possibility of selecting the form of payment and the possibility of learning the preferences of Internet users by using tools to track and assess their behaviour (Niranjanamurthy *et al.*, 2013). This information helps to respond quickly to the market needs and adapt quotations to client expectations (Bredzel-Skowera and Turek, 2015).

However, this type of business also has several development inhibitors: the need for an Internet access device and connection; inability to experience

the product before purchase; vulnerability of confidential data; technical problems and possible delays or product damage during the delivery process (Niranjanamurthy *et al.*, 2013).

The increasing adoption of electronic commerce tools by businesses allows achieving efficiencies in production and marketing of products and services. The integration of e-commerce tools into business systems and processes increased the competitive potential of companies by exploiting supply and demand chain efficiencies.

In this paper, we apply the OSSpal methodology to the top three open source e-commerce tools (Magento, OpenCart, and PrestaShop) to determine which tool has the best score. The OSSpal open source software assessment methodology has recently emerged as a successor of the Business Readiness Rating (OpenBRR). This methodology combines measures of quantitative and qualitative evaluation for software in several categories, resulting in a quantitative value that allows the comparison between the tools.

The present paper is organized as follows: in Section 2 related work is presented. Section 3 describes the three open source e-commerce tools. Section 4 presents a description of the OSSpal methodology and Section 5 presents the evaluation of the tools with the application of the OSSpal

methodology. Finally, Section 6 presents the conclusions and future work.

2 RELATED WORK

E-commerce optimizes and enhances the relationship between producers, distributors, and customers. There are a number of key factors inside and outside organizations that affect the success of e-commerce and, for that, it must be taken into consideration. In (Choshin and Ghaffari, 2016), the authors proposed a model and a framework for specifying the effective factors on e-commerce success. For this, it was used structural equations with Partial Least Squares (PLS-SEM) to create the model. The results obtained from the paper allowed the authors to conclude that the infrastructures used, the challenge of retaining a customer satisfaction, and the customer's awareness and knowledge have a significant impact on the success of e-commerce.

In Tomljanovic, Turina, and Kurelovic (2016), the authors try to create a site through the comparison of selected open source tools (AbanteCart, PrestaShop, and OsCommerce) to make a comprehensive analysis of the possibilities offered by these tools. By creating an electronic commerce shop, the authors concluded that the tools AbanteCart and PrestaShop are better than the OsCommerce. One of the common handicaps to all the tools is the impossibility to adjust to the user's preferences and customize sites according to the user's preferences so that the tools can offer similar products on the customers' next visit according to their preferences.

The authors in (Sin *et al.*, 2016) intended to analyse key factors such as relative advantage and competitive pressure on e-commerce adoption among Small and Medium Enterprises (SMEs) in the Northern state of Malaysia. The authors analysed the data collected, from a total of 167 questionnaires, using frequency analysis, reliability analysis, descriptive analysis, correlation analysis as well as multiple regression analysis. Based on this set of analysis, the authors observed that the companies that implement e-commerce will be able to increase sales, expand market share, cut down costs, exploit new business prospects but also will improve the relationship with dealers and companion.

In Utami and Jamal (2017), the authors decided to compare five web applications based on open source Content Management System (CMS) e-commerce. The applications tested were: Prestashop, Magento, Woocommerce, Oscommerce, and OpenCart. To measure software quality of these tools, the authors

used traditional software quality and CK metrics (Chidamber & Kemerer suite parameters). CK Metrics Suite is a metric-oriented class. Through the application of the methodology described earlier, the authors concluded that Prestashop tool has the best quality in web applications, while Magento registered the lowest score.

In Ferreira, Pedrosa and Bernardino (2017), the authors used OSSpal methodology, which measures quantitative and qualitative evaluations, but to compare four of the top business intelligence tools: BIRT, Jaspersoft, Pentaho, and SpagoBI. With the application of the OSSpal methodology, the authors concluded that the tool with the best score was Pentaho, while BIRT presented a lower score, mostly because this tool is more focused on the report construction than on business intelligence.

From the best of our knowledge, this paper is one of the first works to use OSSpal methodology to evaluate open source e-commerce tools.

3 E-COMMERCE TOOLS

To apply the OSSpal methodology, it was necessary to find the best tools. Initially, we select three e-commerce platforms according to (*10 Best Content Management System for Ecommerce Sites*, 2016), (*19 Open Source Ecommerce Solutions for Your Store*, 2017) and (*Top 5 Open Source eCommerce Platforms for your store*, 2016).

The three platforms studied are Magento, OpenCart, and PrestaShop. Their main advantages and weaknesses will be presented in the next sections.

3.1 Magento

Magento is an e-commerce application based on open source technology. Magento provides a flexible online store with full control over the content, look, and functionality of the shopping cart system as well as it offers search engine optimization, robust marketing, and catalogue management tools (*Top 10 Ecommerce Platforms of 2016 Compared*, 2016).

Magento provides three CMS options packages, namely Enterprise Edition, Professional Edition and Community Edition. Enterprise Edition including its inherent store credit, gift cards (virtual and physical), member-only sales, clubs, multi-store (retail & wholesale) and support full time. Community Edition is a free version, available to experts and web developers (Teguh Prasandy; Eko Sedyono, 2013).

The main advantages of Magento are (*Top 10 Ecommerce Platforms of 2016 Compared*, 2016) (Lai, 2015):

- **Flexibility:** customization of templates to develop functionality according to the needs;
- **Features:** community version allows to manage multiple storefronts, multi-location, multi-currency, multi-language with a user-friendly user interface and easy navigation;
- **Community:** Large community of users, focused on developing plugins and extensions;
- **Mobile Devices:** the platform is oriented to easy-to-use configuration with mobile devices;
- **Integration:** easy integration with third-party software (e.g. Google Analytics and Paypal);
- **Security:** manage the internal access with an option to customize multiple levels of security permissions. Login screens are CAPTCHA (Completely Automated Public Turing test to tell Computers and Humans Apart) equipped, and a secondary password screen includes extra security against unwanted breaches.

Some of the inhibitors of the platform are (*Top 10 Ecommerce Platforms of 2016 Compared*, 2016):

- **Pricing:** the community version is free only for small and medium-sized businesses;
- **Hosting:** Magento needs a dedicated server. Using generic hosting platforms results in slow user experience;
- **Time:** even on having a flexible architecture, customization is hard to make because of its loading speed on different platforms.

On its website: <https://magento.com/> it provides documentation about the platform and a demo. Figure 1 illustrates a dashboard example when logging in to the platform as an online store administrator.

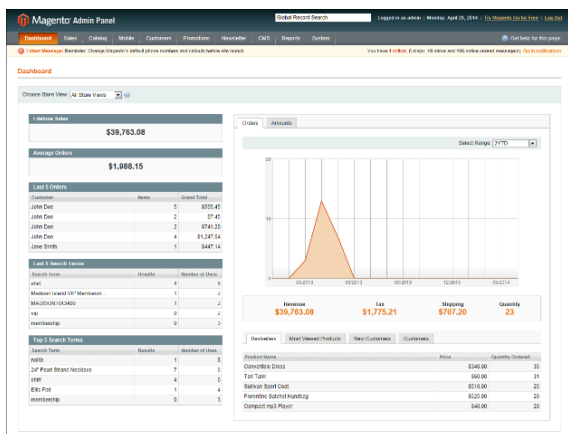


Figure 1: Magento platform dashboard.

The dashboard is usually the first page that appears when the user logs in as administrator and gives an overview of sales and customer activity. The blocks on the left provide a snapshot of lifetime sales, average order amount, the last five orders, and search terms. The graph depicts the orders and amounts for the selected date range. It is also possible to set the starting dates used in dashboard reports and disable the display of the charts section (*Magento*, 2017).

3.2 OpenCart

OpenCart is a popular open source shopping cart solution that provides written tools to establish a fully functional online store from scratch with intuitive screens. OpenCart is multi-currency, multilingual, development support to SEF (Search Engine Friendly) and offers more than twenty payment gateways as well as eight shipping methods. One feature most appreciated by users is that there is no need to mess with code at the start of the store. The OpenCart community is very active, providing support material for problem-solving and doubts (*19 Open Source Ecommerce Solutions for Your Store*, 2017) (Teguh Prasandy; Eko Sediyo, 2013).

The advantages of the OpenCart platform are (*Top 10 Ecommerce Platforms of 2016 Compared*, 2016):

- **Advanced Features:** offers a good set of features, including a robust catalogue functionality;
- **Pricing:** it is free to use (except some extensions which are paid);
- **Documentation:** OpenCart comes with its own documentation modules with 'How to' guides and step by step tutorials (videos and screenshots);
- **User-friendly Interface:** OpenCart's interface makes it more user-friendly even for beginners with its easy and simple dashboard.

There are several inhibitors such as the following (*Top 10 Ecommerce Platforms of 2016 Compared*, 2016):

- **Not Proving Cache:** need to install extensions in order to improve the website performance;
- **Complex Customization:** store customization is a hard process, which might keep away some sort of business.

The website '<https://www.opencart.com/>' provides documentation about the platform and a demo.

Figure 2 illustrates a dashboard example when logging in to the platform as an online store administrator.

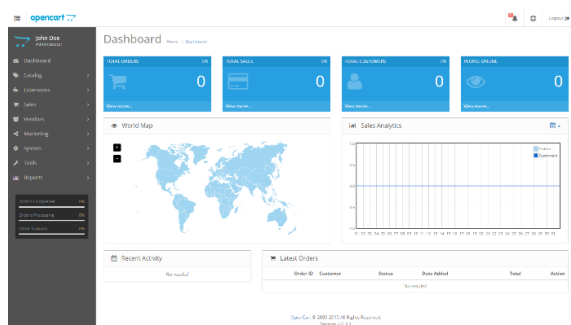


Figure 2: OpenCart platform dashboard.

Through the dashboard, the user can have an overview of how the shop is performing. There are sections of the dashboard that can help to understand the statistical data collected by store:

- **Overview:** there are four charts showing the status of the website - Total Orders, Total sales, Total Customers and People Online;
- **World Map:** a world map to show where the orders from website were coming from;
- **Sales Analytics:** a graph is provided to track the chronological progress of the store relative to a number of orders and customers over time;
- **Recent Activity:** a section to check the current activity from any customer from the store such as login, creating account or placing new orders;
- **Latest Orders:** a list that displays the last orders and their details.

Above the dashboard in the top menu is the administration navigation with the menus "Catalogue", "Extensions", "Sales", "System", "Reports" and "Help" (OpenCart, 2016).

3.3 PrestaShop

PrestaShop is an open source software that uses smarty template engine, combined with AJAX in its backend (Teguh Prasandy, Eko Sedyono, 2013). The platform gives businesses the resilience and eases to build an inexpensive but modern and updated e-commerce store (Top 10 Ecommerce Platforms of 2016 Compared, 2016).

PrestaShop has front office features that can customize website display, payment modules and gateway used by the buyer for how payment methods would be done, shipping option gives the buyer an optional delivery service that they can choose. When installing PrestaShop, all modules are installed automatically, as well languages and currency modules according to the location that was chosen (Teguh Prasandy, Eko Sedyono, 2013).

The installation and customization of the software are very easy and quick, being the interface very intuitive. There is a self-hosted version to get more technical control but can also download a fully-hosted one. Both are free to download and use. The customizability, however, is rather limited (10 Best Content Management System for Ecommerce Sites, 2016).

The main advantages of PrestaShop platform are the following (Top 10 Ecommerce Platforms of 2016 Compared, 2016):

- **Intuitive and User-friendly Interface:** gives users the ability to customize the platform;
 - **Official Market Place:** PrestaShop has an official market place with over 3500 themes and customizations to choose from;
 - **Multiple Currencies and Languages:** it supports multiple currencies and over 41 languages and counting.
- Some of the inhibitors of the platform (Top 10 Ecommerce Platforms of 2016 Compared, 2016) are:
- **Expensive Add-ons and Modules:** modules and plugins need to be bought from the marketplace and are very expensive;
 - **Not Scalable:** the platform, as it doesn't have a multi-store feature, is not suitable for big companies;
 - **No Options for Cross-selling:** there is no option to upsell or cross-sell, which is a common feature in most other e-commerce platforms.

The platform can be downloaded at the PrestaShop website: <https://www.prestashop.com/en>.

Figure 3 shows an example of PrestaShop dashboard.

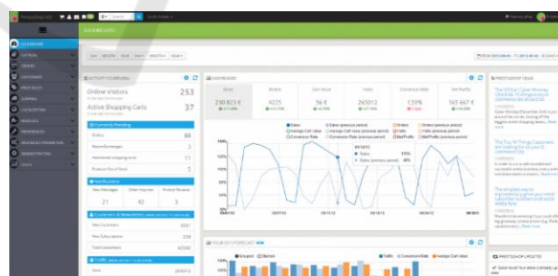


Figure 3: PrestaShop platform dashboard.

Through the dashboard view, it is possible to check the following metrics: sales (sum of all order totals); orders (number of orders received); cart value (sales/orders); visits (sum of all traffic to website); conversion rate (sum of orders/sum of visitors); net profit margin (sum of all revenue - sum of all expenses) and products and sales (recent orders, best sellers, most viewed, top searches) (Prestashop, 2017).

4 OSSpal METHODOLOGY

The OSSpal project intends to help companies, government agencies, and other organizations to find high quality Free and Open Source Software (FOSS) to match their needs. OSSpal is a successor of the Business Readiness Rating (BRR) methodology, combining quantitative and qualitative evaluation measures for software in various categories (Wasserman *et al.*, 2017).

The OSSpal methodology was selected for this evaluation because it is the successor of the OpenBRR methodology, classified in (Deprez and Alexandre, 2008) as one of the best methodologies to assess open source software.

The OSSpal methodology is composed of seven categories:

- *Functionality*: How well will the software meet the average user's requirements?
- *Operational Software Characteristics*: How secure is the software? How well does the software perform? How well does the software scale to a large environment? How good is the User Interface (UI)? How easy to use is the software for end-users? How easy is the software to install, configure, deploy, and maintain?
- *Support and Service*: How well is the software component supported? Is there commercial and/or community support? Are there people and organizations that can provide training and consulting services?
- *Documentation*: Is there an adequate tutorial and reference documentation for the software?
- *Software Technology Attributes*: How well is the software architected? How modular, portable, flexible, extensible, open, and easy to integrate is it? Are the design, the code, and the tests of high quality? How complete and error-free are they?
- *Community and Adoption*: How well is the component adopted by community, market, and industry? How active and lively is the community for the software?
- *Development Process*: What is the level of the professionalism of the development process and of the project organization as a whole?

This methodology is composed of four phases:

1. First Phase: it is necessary to identify a software component list to be analyzed, to measure each component in relation to the evaluation criteria and removing from the analysis any software component that does not satisfy the user requirements;

2. Second Phase: it should be attributed weights for the categories and for the measures:
 - i. Assign a percentage of importance to each category, totaling 100%;
 - ii. For each measure within a category, it is necessary to rank the measure in accordance with its importance;
 - iii. For each measure within a category assign the importance by percentage, totaling all the measures 100% of the category.
3. Third Phase: gather data for each measure used in each category and calculate its weighting in a range between 1 to 5 (1 - Unacceptable, 2 - Poor, 3 - Acceptable, 4 - Very Good, 5 - Excellent);
4. Fourth Phase: the qualification of the category and the weighting factors should be used to calculate the OSSpal final score.

The category 'Functionality' is calculated differently from the others. In this category is intended to analyze and evaluate the characteristics which the tools have or should have. The method to assess this category is as follows:

- A. Set down the characteristics to analyze, scoring them from 1 to 3 (less important to very important);
- B. Classify the characteristics in a cumulative sum (from 1 to 3);
- C. Standardize the prior result to a scale from 1 to 5.

Therefore, the Functionality category will have the following scale:

- Under 65%, Score = **1** (Unacceptable)
- 65% - 80%, Score = **2** (Poor)
- 80% - 90%, Score = **3** (Acceptable)
- 90% - 96%, Score = **4** (Good)
- Over 96%, Score = **5** (Excellent).

5 EVALUATION

Primarily, to evaluate the open source e-commerce tools, it is necessary to assign weights to categories in order of importance.

According to the characteristics that we considered most important in the open source tools, we selected the weights for the different categories.

To evaluate a tool, the most relevant characteristics are the functionalities that it has. Due to this, the category 'Functionality' is the most important and thus it was given the greatest weight (30%).

In the second position, the category 'Operational Software Characteristics' is defined with 20%. This

category includes quality related areas such as reliability, performance, scalability, setup, and usability: these areas are very important to evaluate a tool.

'Software Technology Attributes' is the following category with a weight of 15%. It measures if the project is designed to be extensible by third parties, the quality of project usage and measures how fast bugs are fixed.

The categories 'Support and Service', 'Documentation' and 'Community and Adoption' are assigned with 10% because a good tool should have good documentation to help in installation, configuration and maintenance processes. 'Support' and 'Community and Adoption' are essential to help users with problems and to get feedback from people who are using the software (general discussion lists). The existence of books is also helpful to use these tools and general discussion lists are also key to sharing hesitations.

'Development Process' is considered less relevant in this evaluation with a weight of 5%. This is because the tools to be analysed are supported by large companies and are generally an indication that the development process used is more robust and rigorous and therefore less susceptible to failures.

Table 1 shows the weights assigned to each category.

Table 1: Weight assigned to each category.

Category	Weight
Functionality	30%
Operational Software Characteristics	20%
Software Technology Attributes	15%
Support and Service	10%
Documentation	10%
Community and Adoption	10%
Development Process	5%

The next step is defining and evaluating important characteristics for e-commerce tools to analyze 'Functionality' category. The features chosen to evaluate the tools were based on the (DIMOU, 2014).

Only characteristics that fit in open source tools were selected in this phase. A relevance score was assigned to each one (1 - slightly important to 3 - very important).

Table 2 shows the weights assigned to each category, according to what we consider to be most important in an e-commerce tool.

After weights' attribution to all categories, each tool evaluation is performed to assess which is the tool that gets the highest score.

Table 2: Weights for the characteristics of the functionality category.

Characteristics	Weight
Cross-sell products	3
Up-sell products	3
Shopping cart	3
Order history	3
SEO	3
Stock level control	3
Related products	2
Multiple currencies	2
Multiple languages	2
Product reviews	2
Newsletter	1
Wishlist	1

The results of the evaluation for each category (evaluation from 1 to 5) are presented in Table 3.

Table 3: OSSpal score by category.

Category	Score		
	Magento	OpenCart	PrestaShop
Functionality	5	3	2
Operational software characteristics	2.4	2.3	2.5
Software technology attributes	2.5	2.15	2.7
Support and service	5	5	5
Documentation	5	4	5
Community and adoption	5	4.5	5
Development process	4	5	3

After analysing Table 3 it is possible to conclude that:

- In the 'Functionality' category the Magento tool stood out from the others, obtaining the maximum score (5), which means that the tool has all the features that we considered important in evaluating an e-commerce tool;
- In the category 'Operational software characteristics' the three tools obtained very close values, but PrestaShop obtained the highest score;
- In the next category evaluated, 'Software technology attributes' highlighted the PrestaShop tool and then comes the Magento tool;
- For the category 'Support and service' all the tools obtained the maximum value of the score (5), being, therefore, a category that does not allow to highlight any tool in this evaluation;

- In the Documentation the tools Magento and PrestaShop obtained maximum score (5), being, therefore, tools with much information made available to help the users;
- In the category 'Community and adoption' stand out the tools Magento and PrestaShop with maximum score (5), but soon after with 4,5 comes OpenCart. It can be seen that all three tools have an active community to assist users;
- Finally, in the 'Development process' category the OpenCart tool scored higher, then the Magento tool and finally the PrestaShop.

After the evaluation for each category, the last step in this methodology is to calculate the final score. For each category, it is necessary multiplying the score with the respective weight assigned in Table 1.

Lastly is necessary to sum the results and get the final score. These results appear in Table 4.

For example, the total score for Magento is calculated as follows:

$$\text{Magento (total)} = 5 \times 0.3 + 2.4 \times 0.2 + 2.5 \times 0.15 + 5 \times 0.1 + 5 \times 0.1 + 5 \times 0.1 + 4 \times 0.05 = 4.055$$

Table 4: OSSpal final score.

	Score		
	<i>Magento</i>	<i>OpenCart</i>	<i>PrestaShop</i>
TOTAL	4.055	3.283	3.155

With a score of 4.055 (evaluation from 1 to 5) Magento was the tool that obtained the highest score with the application of the OSSpal methodology.

Next, the OpenCart and PrestaShop tools occupy the second and third place, respectively. These tools are complete and have proven to have a lot of potential as open source e-commerce tools.

6 CONCLUSIONS AND FUTURE WORK

The business market has been undergoing a paradigmatic change. The rise of the Internet, market fragmentation, and increasing global competition is changing the "value" that business marketers provide. This transformation requires changes in the way companies are organized to create and deliver value to their customers. Business marketers have to continuously increase their contribution to the value chain.

E-commerce presents several advantages in relation to traditional retail, which reflects a better competitive advantage. Open source tools have the main advantage of not increasing costs for companies

although it is necessary to choose an appropriate tool to meet their specific needs.

In this paper, we analyzed the latest versions of the best open source e-commerce tools available in the market. The information for the evaluation was collected on the websites of the respective tools, in technical documentation and through the usability of the tools.

After applying the OSSpal methodology it is possible to conclude that the tool with the best score was Magento.

OpenCart and PrestaShop obtained close scores, indicating that they are similar tools with a lot of potentials.

The tools evaluated were selected according to previously described rankings, and it is possible to conclude that Magento is the tool that is in first place in all the rankings and therefore in agreement with the result presented in this work. The Prestashop and OpenCart tools appear in the ranking in this order. However, in this work when applying the OSSpal methodology it was found that OpenCart obtained a slightly higher score than the PrestaShop. Therefore, the rankings and the application of OSSpal methodology were not in agreement as shown by the results of this paper.

As future work, we intend to apply a greater number of measures for each category and also extend this study by including a higher number of open source e-commerce tools.

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