

THE MODEL OF MANAGERIAL DECISIONS' SUPPORT IN THE PROCESS OF CHOOSING AN INTERNET SHOP APPLICATION

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Abstract: The paper presents the problem field regarding the choice of an Internet shop application. In this context it presents the methodology of defining the decision problem on the basis of the hierarchical structure. In the course of the analyzed issue a multi-criteria Analytic Hierarchy Process (AHP) method was applied. The decision alternatives of Internet shop application's choice were: free application, dedicated application, commercial application and application in the SaaS model. For such defined solutions, the Authors created a decision model described by criteria and sub-criteria groups. The pair comparisons of individual elements allowed choosing the most optimal variant – the commercial application.

Key words: Internet shop application, hierarchical model, AHP method

Introduction

The appropriate choice of the Internet shop application is one of the key decisions determining the success of the entire project of Internet sale. This choice should be perceived in terms of obtaining a remarkable resource for an enterprise. It is an equally essential activity in terms of facilitating the processes of information systems' management in an enterprise. The Internet shop software is a tool used to present an offer and to carry out the whole sale process (100SKLEPOW). In fact, choosing the software is only one of the stages of opening an Internet shop but it is a very important and simultaneously difficult element of the decision process for the manager. There are numerous solutions available on the market – starting from free applications up to dedicated software designed from scratch (Sala). The most frequent dilemmas of managers which intend to open an Internet shop or move an already existing one to another platform regard the following issues (Plutecki, 2011):

- Whether to choose a free version (*open source* software) or a paid one?
- If a paid system is chosen, then what to buy – a system's license, a dedicated system or a system available in the *SaaS* model (*Software as a Service*)?

Trying to classify the types of Internet shop applications, there may be distinguished two main groups of them:

- a) free solutions based on the *open source* license – this type of applications may be downloaded free of charge from a website and installed on one's own server. Additional modules, professional template of an Internet shop website, implementation aid and technical support may be purchased.

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b) paid solutions – an Internet shop application may be purchased for a one-time fee or in a form of a monthly or annual subscription. The advantages of paid solutions include extended functionality and quick implementation.

The aim of the article is to make an attempt to apply the Analytic Hierarchy Process (AHP) in the manager's decision process of choosing the appropriate e-commerce solution. Due to such a formulated aim, the area of choice was determined from the commonly available classes of Internet systems (CMS – Content Management System) dedicated to e-commerce. The elaboration discusses widely known platforms and systems which are applied worldwide. The Authors' assumption is to suggest a universal method which may be adapted in global dimension. For this reason, general criteria characterizing Internet shop applications were used in the article. As a result, it provides a possibility to apply the proposed model both in various branches and in different regions of the world. The used research sample limited to enterprises active on a local market was defined with the aim of initial verification of the proposed method.

Structuring the Decision Problem Regarding the Choice of an Internet Shop Application

The term e-commerce is often regarded identical with the term e-business. In fact, the term e-commerce is a narrower term than e-business considering their meanings. E-commerce is part of e-business and it involves realization of company's purchasing-selling transactions via the so called e-shops, while e-business constitutes much larger scale of business activities (Štefko et al., 2011; Hofmann, 2011; Bačík et al., 2014). The diversified markets of e-commerce solutions as well as personalized requirements of entrepreneurs determine the need for a detailed analysis of the available information systems in terms of making a proper purchase decision. Owing to a large number of web applications and in many cases their poor diversification (e.g. as regards functionality, price etc.), it was decided to present the problem on the basis of four aggregated groups.

While defining the decision problem, the following division, which also represents choice alternatives (decision options), was assumed:

- Obtaining a non-commercial (free of charge) Internet shop application – based on an *open source* license. Implementation of such a solution provides a basic advantage – one does not have to pay for a license or leasing the application itself. However, it is not an absolutely free solution. Such expenses as implementation, development and updating costs as well as lack of warranty and technical support must be taken into account. The providers of *open source* software do not offer free technical support to business environment. Obviously, there are enterprises on the market which implement shop software based on such a license. However, it frequently appears that in such a case the implementation cost may be higher than a commercial solution. Except for the shop software, all other services - e.g. designing new modules, technical support etc. are paid (Plutecki, 2011).

- Purchasing a commercial (paid) Internet shop application (buying a license or a “box” version) – one-time fee. A customer buys a license or a so-called “box” version and becomes the owner of the system, including a warranty (most frequently two-year long) and a technical support (usually provided for a shorter period than the warranty or paid from the beginning).
- Purchasing an Internet shop application available in the SaaS model – a monthly or annual subscription (leasing in other words). The most significant advantages of such a solution are: low costs of shop opening, constant and predictable leasing costs. The shop application is stored and provided to users by the service provider. It eliminates the need to install and open the shop by the user as well as moving the obligation to control and update the software, maintain its continuous work and technical support to the service provider. As a service, an Internet shop application is not very flexible (PLUM). The principal drawbacks of this type of solutions are (Plutecki, 2011): low functionality, too basic modules, limited possibilities of template individualization and dependence of software development on other customers of the platform. An Internet shop application in the SaaS model is addressed at a broad group of customers whose functionality requirements are basic. Furthermore, most frequently the agreement with the platform’s provider is made on the basis of a license. As a result, the user does not have the copyright for the shop and in case the provider withdraws from the market – the user loses the purchased product.
- Purchasing an Internet shop application in a form of a built dedicated system. Such solutions are fully flexible and the adjustable (PLUM), which is mostly related to the unique method of product ordering and configuration, non-standard and very complex price-lists, complex logistic process as well as complicated work organization in terms of the shop management and handling (Plutecki, 2011).

While choosing a specific type of Internet shop software, an entrepreneur should take into account a range of criteria. First of all, the main criteria include: economic, technical, integral, social and society. All the above criteria include the following aiding goals (so-called subcriteria) which make main criteria more precise:

- b) Within the economic criterion the following subcriteria may be distinguished:
 - The cost of an Internet shop opening;
 - Time of its opening (in case of choosing an advanced or far from the default functionality system the time necessary for the shop opening as well as its costs rise);
 - Time of the application’s use (the period of time the application may be used for which results from its license);
 - Responsibility for proper functioning (warranty for proper software functioning).
- c) Within the technical criterion the following subcriteria may be distinguished:

- Technical support (technical help in the software's operating and configuration);
 - Software update (it allows to delete errors in the shop's software and increases the security of its functioning);
 - Software's functionality which may be discussed from the customer's level or from the level of the shop's administration panel. From the customer's level the following functionalities can be enumerated: cart and storage operating, the "recommended products" and "bestsellers" modules, product enquiry form, shipment tracking and *FAQ* module. From the level the administration panel there are: orders, invoices and shipment management, introducing new goods and offer's structure management, uploading products' photos, adding water signs to photos, giving discounts to customers and discounts depending on the value of an order, offers, customers and orders filtering and sorting according to certain criteria, detailed statistics and reports (Štefko et al., 2011). The important functional elements of the shop's software are also: the possibility to edit the shop's website template, the access to the shop's responsive templates, *SEO* (Search Engine Optimization) tool and website's map for Google;
 - Maintaining the continuity of software's work (making and restoring backup copies as well as the Internet shop's database etc.);
 - Independence in administration (controlling the shop's functionality from the level of the administration panel);
 - Providing service to mobile devices (the simplified shop template adjusted to mobile devices – tablets, smartphones etc.).
- c) Integral criteria which include:
- Integration with price comparison websites (generating XML files for the entire assortment, selected categories or individual products);
 - Integration with electronic payment mechanisms (makes it easier for customers to pay for online shopping, co-operation with such systems as PayU, PayPal, Przelewy 24 etc.);
 - Integration with online auction websites (integration with such services as Allegro.pl, Ebay, Amazon etc. – using the WebAPI source of services);
 - Integration with shipping companies (the possibility to automatically generate shipping, order a courier and print shipping documents);
 - Integration with affiliation networks (affiliation networks gather advertisers and partner parties which sell products and earn the established margin).
- d) The social criteria include:
- Links to social services (integration with social portals in order to extend the range of the offer);
 - Recommendation system;
 - Opinion bookmark (adding comments to a specific product or the entire order).
- e) The society criteria include:

- A shop in a multilingual version (as a rule shops offer two language versions: Polish and English, but there are shops where the number of offered languages is unlimited);
- Availability for the sand-blinded (appropriate color contrast and so-called intact line of text – a text may be freely read horizontally without the need to frequently move down to another line);

The large number of criteria and subcriteria leads to a situation in which the choice of the most appropriate version of the Internet shop application (closest to the optimum) becomes a complex decision process. Therefore, it seems necessary to apply the multi-criteria optimization method and a specialist computer program which aids such optimization.

The Characteristics of the Analytic Hierarchy Process of Decision Problems

Before the proposed hierarchical decision model structure is constructed to support making the decision regarding the choice of an Internet shop application, it is recommended to discuss the notion of optimization. It is generally perceived as aiming to achieve some ideal state which meets certain requirements. It results in choosing the best solution in terms of the assumed criterion. Optimization can be divided into one-criterion (when the ideal state is achieved according to one criterion) and multi-criteria (when achieving the ideal state depends on many criteria).

In literature there are numerous concepts and attitudes towards formulating and solving multi-criteria optimization tasks (Ameljańczyk, 1984). One class of concepts are those which assume forming (usually arbitrarily) one common criterion, for example in the form of a weighted sum of individual criteria or other scalar functions and as a result solving a “substitute task” with one criterion – these are among others the following methods: weighted criteria, global criterion or usefulness function. The next class includes proposals of solutions which in advance are expected to possess special features. In this way methods involving “cutting” the set of the acceptable solutions, hierarchical methods and many methods in the multiplayer game theory (such as hierarchical optimization methods or limited criteria etc.) are created. Particular attention should be also paid to the multi-criteria optimization method with the use of fuzzy evaluation and the evolutionary algorithms method. In the field of economics, a very popular and effective method is the multi-criteria optimization based on the AHP (Analytic Hierarchy Process) (Adamus and Gręda, 2005).

It was elaborated in 1970 by T. L. Saaty. The AHP method involves decomposition of the decision process within a defined set of variants and creating their rank list. The specifics of this method enable joining the quantity and quality criteria as well as defining weighs among individual criteria.

The construction of an AHP hierarchy model requires defining the goal, criteria and decision variants. Complexity of the analyzed problems usually needs defining

subcriteria which are assigned to each of the criterion. Thus, the model's structure has a form of the hierarchy of predomination, where individual elements are ordered from the most general to the most detailed according to the rule saying that the more general an element is, the higher its position in the hierarchy is (Saaty, 1980). Such a structure enables evaluation of the impact of lower-rank elements on higher-rank ones. The intensity of this impact is defined within comparisons of pairs of elements located on a lower level of the structure in relation to their mother element (Prusak and Stefanów, 2014).

The above relation is expressed in a bipolar nine-degree scale of pair comparisons. Bipolarity allows determining the degree of one element's advantage over another one of the same pair.

After comparing all the pairs of elements included in the hierarchical AHP model, the received results are introduced into the square matrix which measures $n \times n$ where n means the number of the compared elements.

As a result of the calculations, the values of weigh indexes are defined which describe the importance of elements. The indices value in the range from 0 to 1, whereas the sum of their values equals 1. It must be stated that the higher the weigh index value is, the stronger impact it has on the analyzed criterion.

The elementary part of the AHP analysis is the examination of the consistency of the received results. It is realized for each matrix of pair comparisons with the use of *CR* (*Consistency Ratio*). T. Saaty suggested that the ratio's value should not exceed the level of 0.1, however in practice sometimes its value is assumed arbitrarily depending on the specifics and complexity of the problem (Saaty, 2000).

The Use of the AHP Method in the Process of Choosing the Internet Shop Application for SME Enterprises

Within the utilitarian use of the proposed hierarchical model it was decided to analyze the presented decision problem of choosing the Internet shop application for a specific industry branch. At this place it was decided to apply the presented model within the multi-criteria AHP method in the group of small and medium-size enterprises concentrated in the metal branch, dealing with non-ferrous metals' and stainless steel's sale and operating in the city of Czestochowa. The choice of the group was not accidental because the topic analysis of the area showed that e-business solutions related to running an Internet shop are hardly used in the commercial activity and simultaneously there is a lot of interest in starting this product sale channel. Five representatives from five different enterprises of the above mentioned group were invited to participate in the research and they were asked to fill in the earlier prepared AHP questionnaire as regards making pair comparisons of individual component model elements. All the representatives dealt with product sale in their enterprises. Additionally, through a direct interview, it was stated that the respondents possess sufficient knowledge of online sale solutions available in the market. The key element on this stage is to properly present and define the component elements of the constructed hierarchical structure

of the decision process. Therefore while filling the questionnaire; each of the respondents had a possibility to take advantage of the essential support from the paper's authors as regards the appropriate interpretation of all the criteria, subcriteria and decision variants.

The AHP analysis was carried out with the use of the *Super Decisions* application. The software is created by the Creative Decisions foundation established by T. Saaty in order to promote rational attitude towards decision making. The *Super Decisions* application is a tool applied in the process of making multi-criteria decisions with the use of the AHP/ANP method (the specifics of some decision processes not always meets the hierarchical structure's assumptions and thus a few years after he had created the AHP method, T. Saaty elaborated a tool called ANP *Analytic Network Process* which allows defining mutual relations between elements located in different groups of hierarchy).

The program's functionality enables to construct clusters in which specific goals, criteria, subcriteria and decision variants are grouped. The pair comparison may be illustrated in a graphic, verbal, matrix or questionnaire form.

The first element of the analyzed decision problem was to construct in the application an earlier prepared hierarchical model. The model was used in each of the five independent analyses carried out with participation of the appointed representatives.

The next step of the realized research problem was defining individual pairs which were subsequently compared by each of the respondents in the AHP questionnaire. The obtained information was inserted in the application, complying the control of the appropriate consistency ratio value.

In the course of the research, due to the group character of the made decision as well as the individual fill-in of the questionnaire by respondents, it was decided that in order to collect the results, the individual priorities' aggregation method should be applied. Every individual model for each of the respondents was analyzed and the values of weigh indices obtained from five independent analyses were aggregated. The arithmetic average was used as the aggregation tool. Table 1 presents final results determining group's preferences regarding the choice of an Internet shop application.

Table 1. Aggregation of priorities with the use of the arithmetic average method

	Enterprise A	Enterprise B	Enterprise C	Enterprise D	Enterprise E	Average
Free application	0,15431	0,13753	0,14382	0,16078	0,14252	0,14779
Dedicated application	0,17556	0,15625	0,14818	0,14965	0,16937	0,15980
Commercial application – one-time fee	0,33928	0,46343	0,36485	0,42084	0,39335	0,39635
Application in SaaS model	0,22611	0,32011	0,41046	0,33243	0,19117	0,29606

On the basis of the above ranking it may be definitely stated that entrepreneurs from Czestochowa who operate in the metal branch oriented at non-ferrous metals' and stainless steel's sale prefer commercial Internet shop applications (almost 40%). The second preferred solution is the one based on the SaaS model (almost 30%), whereas the least demanded option in this juxtaposition is the free application (over 14%). Despite referring to the local market, the received conclusions in this stage of research can be adapted on a wider regional or international scale owing to the universality of the acquired criteria as well as their wide range and availability of the indicated system classes.

Conclusions

The above research, despite its local dimension, is characterized by adaptability as well as the possibility to be used both on the local and global scale. The principal aim of the paper was to prove the effectiveness of the AHP application in the field of decision processes regarding the choice of an effective e-commerce solution. Owing to such a form of the research problem, the solutions' domain was defined as the space of choice among commonly available classes of Internet systems dedicated to electronic commerce. Therefore, the elaboration includes well-known platforms and systems applied worldwide. Nevertheless, their implementation carried out within the research was done on the local scale due to the fact that it was possible to define the available research space. The Authors focused on the local implementations which were possible to be observed and were based on information solutions that belong to world standards, e.g. the analysis of the SaaS model as well as systems defined within the open source philosophy.

E-commerce solutions are a constant element of various areas of the modern economy functioning. Allocation and searching for solutions of the effective product sale in the Internet have become an essential need which not only leads to an enterprise's success but also determines its existence on the free competent markets. The specifics of non-ferrous metals and stainless steel enterprises' functioning is related to their financial possibilities, available competences and applied technological solutions. In this type of enterprises it frequently happens that they lack specialist cells responsible for the process of company's structures' computerization. Decisions regarding the choice of appropriate IT solutions are often made by the managing staff or sales departments.

The results' analysis allowed formulating synthetic conclusions indicating the fact that the most effective application for entrepreneurs appears to be the option which combines the following features: independence and full control over future functionality, providing the functioning continuity, safety and technical support, friendliness and intuitiveness of operating, updating and the possibility of platform's development (flexibility). The above criteria are fully met by commercial solutions (Tab. 1 commercial applications 0.4) which in a long-term prospect decrease potential additional costs of Internet shop's use and first of all

assure its stable functioning. An important aspect for small and medium enterprises is to identify and implement such solutions which will not require specialist IT knowledge to be used in the future. According to the conducted research (Tab. 1), it can be achieved when applying free applications (0.15) and dedicated applications (0.16).

In such a case, it would be advisable for the entity to extend its organizational structure with an IT cell or decide on the outsourcing support. However, both alternatives require extra financial resources which could be located in the strategy of marketing promotion instead. This, in turn, would raise the effectiveness of the e-commerce platform's functioning. As a continuation of the research it is planned to make an attempt to adapt the proposed model in other business sectors both in the local and global dimensions on the basis of the AHP method.

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MODEL WSPOMAGANIA DECYZJI MENEDŻERSKICH W PROCESIE WYBORU APLIKACJI SKLEPU INTERNETOWEGO

Streszczenie: W opracowaniu przedstawiono obszar problemowy związany w wyborem aplikacji sklepu internetowego. W tym kontekście zaprezentowano metodologię definiowania problemu decyzyjnego w oparciu o strukturę hierarchiczną. W toku analizowanego zagadnienia zastosowano wielokryterialną metodę hierarchicznej analizy problemów decyzyjnych –AHP. Wariantami decyzyjnymi wyboru aplikacji sklepu internetowego były: aplikacja bezpłatna, aplikacja dedykowana, aplikacja komercyjna, aplikacja w modelu SaaS. Dla tak określonych rozwiązań stworzono model decyzyjny opisany grupami kryteriów i subkryteriów. Przeprowadzone porównania parami poszczególnych elementów pozwoliły na wybór optymalnego wariantu – aplikacji komercyjnej.

Słowa kluczowe: aplikacja sklepu internetowego, model hierarchiczny, metoda AHP

管理決策的支持在選擇一個網上商店應用程序的過程模型的研究

摘要：本文介紹了有關因特網商店應用程序的選擇問題字段。在這方面，提出了分層結構的基礎上限定所述決策問題的方法。在分析問題的多準則層次分析法的過程（AHP）方法的應用。網上購物應用程序的選擇的決策備選方案是：免費的應用程序，專用的應用程序，商業應用和應用在SaaS模式。對於這樣定義的解決方案，作者創建的標準和次級標準組描述的決策模型。各元素的一對比較允許選擇最優化的變體 - 的商業應用。

關鍵詞：網絡商店的應用程序，層次模型，層次分析法