Turkish Journal of Engineering

A COMPARATIVE STUDY TO EVALUATE OF SAP AND LOGO ERP SOFTWARE'S FOR SMES AND BIG BUSINESSES

Emel Yontar *[1]

Mersin University, Tarsus Vocational High School, Mersin, Turkey
ORCID ID 0000-0001-7800-2960
eyontar@mersin.edu.tr

ABSTRACT

Considering that there are hundreds of Enterprise Resource Planning (ERP) software on the market, it is of utmost importance that businesses choose the ERP system for which they will be most profitable. Existing business areas are similar in many respects, but each job has its own special qualities. If perfect harmonization is expected from a system, all details should be analysed from the point of view of the operator. In this study; to select the most suitable ERP software for businesses, ERP software from SAP is a global brand, with the LOGO of the leading software in Turkey, was intended to make a comparison for SMEs and big businesses. Using the Analytical Hierarchy Process (AHP) method, which is one of the Multi Criteria Decision Making Methods, an evaluation for the SMEs was first made in the Expert Choice program; followed by the same evaluation taking into account big businesses. It is analysed and the results are displayed, which is a better choice among the two ERP programs for SMEs and big businesses. Differences and similarities between evaluation criteria are presented. According to the results obtained from Expert Choice program, LOGO ERP software is the most suitable choice for the SMEs with 56,9% ratio in the selection of SAP and LOGO ERP Software. For big businesses, SAP program with 62.5% is more suitable.

Keywords: ERP, SAP, LOGO, Expert Choice, AHP

1. INTRODUCTION

Developments in information technologies and information systems have begun to take place in the forefront. Software for companies and the information they contain are a condition for survival in a competitive environment. One of the biggest developments in the field of information technology is Enterprise Resource Planning (ERP) software which is among the indispensable companies.

ERP, emerging in the 1960s is system that production-oriented Materials Requirement Planning (MRP) and extension of Manufacturing Resource Planning (MRP II) systems to include other production related functions. These systems have a technologically augmented structure that allows all business functions to be integrated through a common database instead of independent business functions appearing in classical enterprises. These commercial software packages promise the seamless integration of all the information flowing through a company-financial and accounting information, human resource information, supply chain information, customer information. For managers who have struggled, at great expense and with great frustration, with incompatible information systems and inconsistent operating practices, the promise of an off-the-shelf solution to the problem of business integration is enticing (Davenport, 1998).

Offering a comprehensive information management system for organizations, ERP's work integrates the different processes of the business by eliminating redundant elements while allowing data sharing between business functions. The coordination of an organization's global and geographically distributed planning and audit activities and the integration of top-level information can be achieved through ERP. ERP is a system that uses the most sophisticated information technologies that respond to all of these needs (Beşkese, 2004).

A successful ERP system benefits process rationalization, standardization, error reduction and cost reduction (Su and Yang, 2010). In the opposite case, the inability to create an effective ERP system will not only lead to cost and time loss, in addition, ERP can lead to serious loss by causing damage to company cultures, minimizing production, introducing excessive training needs, and misleading customer requests. The researches revealed that the main reason for the emergence of these problems is that the enterprises regard this system as a technology investment and they cannot be harmonized with their aims, objectives, business processes, they are more interested in purchasing costs. Therefore, when ERP projects are structured, firstly the objectives and future goals of the business should be clearly defined, the general operation and business processes should be examined and then the ERP software should be targeted for the enterprise's organizational structures (Görener, 2011).

In addition, in the increasingly competitive and globalizing markets, SMEs are forced to take advantage of ERP systems, which enable them to live their lives, organize in-house processes and provide integrated solutions in coordination between departments. The first step in doing this is to ensure that the appropriate ERP program is selected to be compatible with the operation.

At the same time, it is very important to select the appropriate ERP software because the installation of the ERP system is very costly, the installation and recycling takes a long time, and the wrong operation of the process leads to serious loss in the short and long term, because each ERP system has its own unique structure.

In this study; to select the most suitable ERP software for businesses, ERP software from SAP is a global brand, with the LOGO of the leading software in Turkey, was intended to make a comparison for SMEs and big businesses. Using the Analytical Hierarchy Process (AHP) method, which is one of the Multi Criteria Decision Making Methods, an evaluation for the SMEs was first made in the Expert Choise program; followed by the same evaluation taking into account big businesses. It is analysed and the results are displayed, which is a better choice among the two ERP programs for SMEs and big businesses.

2. LITERATURE REVIEW

The academic study on ERP, a short history, has gained momentum in the last few years. In our country, ERP software is becoming increasingly popular especially in large-scale enterprises and becoming popular in many sectors.

Many studies have been done in the literature about determining the criteria and choosing the appropriate software. Evaluation methods between SMEs and big businesses, installation process analysis and selection criteria have been evaluated by different authors. Wei *et al*. (2005) present a comprehensive ERP selection method using AHP by presenting a seven stages procedure of ERP system selection framework. Özbir (2006) examined the approaches that Turkish firms have shown in the selection and installation processes of ERP systems. Köktener (2009), has announced key decisions taken at the initial stage of the ERP project carried out in SMEs in Turkey. Köstence (2009) tried to determine the distinction between ERP software system selection and installation points, and differences between ERP packages and institutional preference. Özdemir (2009) analyzed SMEs implementing ERP systems operating in the manufacturing sector in Kayseri and perceived performance changes after ERP implementation. Yeşildağ (2010) conducted a survey on the selection and implementation of correct software for selected SMEs in the province of Muğla in Turkey. Turan (2011) examined the adaptability of ERP software to SMEs. Kılıç *et al*. (2015), applied ANP and PROMETHEE method for SME selection of ERP.

In addition to these studies, ERP selection has been emphasized by drawing attention to different sectors. Gül (2010) analysed the problems encountered during the selection and implementation of ERP software in the textile sector. Tanrıverdi (2010) examined the implementation of ERP systems in the retail sector. Hidalgo *et al*. (2011) studied about ERP selection in Metal transformation sector. They used AHP as the decision-making approach for a firm in Spain using ERP success factors. Çolakoğlu (2012) investigated the stock management process of a company operating in the automotive subsidiary industry in Aksaray and using the SAP R/3 ERP system. Yontar (2014) has been working on the company that manufactures harvester spare parts in the agricultural machinery sector. Kasay (2016), studied the ERP selection for the railway sector in Turkey.

Authors who refer to SMEs and big businesses and

different sectors often want to incorporate innovation into their literature by using different methods in their work. These studies have improved day by day, but ERP selection studies seem to use approaches based on the Analytical Hierarchy Process (AHP) method, which was developed mostly by Saaty (1980). Of them; Alanbay (2005) and Rouyendegh *et al*. (2011) reached the resolution using Expert Choice software for AHP. Başlıgil (2005), Lien and Liang (2005), Ayağ and Özdemir (2007) and Razmi *et al*. (2009), evaluated the application by combining the fuzzy logic theory and the AHP method. Büyüközkan *et al*. (2004), used the extended fuzzy AHP method. Kahraman *et al*. (2010), combines blur theory with AHP. Onut and Efendigil (2010) used the fuzzy AHP method under cost and quality constraints. Hamidi (2015) used Fuzzy AHP in order to select the most suitable ERP system because the chosen selection criteria were numerous and fuzzy. Lesani (2016) performed its work using the AHP and the Fuzzy Analytic Hierarchy Process (FAHP). Kasay (2016) conducted a study combining AHP and TOPSIS methods. After examining these studies with AHP method, it is aimed to solve the method applied in this study more complexly in Expert Choice program. At the same time, no comparison has been made between SMEs and large enterprises regarding the ERP program, emphasizing the originality of the article.

3. SAP AND LOGO SOFTWARE

SAP and LOGO ERP software are programs that are open to evaluation to choose between different criteria and different types of businesses. The SAP firm is a software company with world-wide recognition; LOGO firm is a software company with the highest revenue and awareness in Turkey.

Founded in 1972, SAP (System Analyse und Programmentwicklung) is a global company headquartered in Walldorf, Germany. The legal corporate name is SAP SE. SAP is the market leader in enterprise application software. The company is also the fastest-growing major database company. Globally, more than 76% of all business transactions worldwide touch an SAP software system. With more than 345,000 customers in more than 180 countries, the SAP Group includes subsidiaries in all major countries and employs more than 84,100 people.

The SAP firm has carried out its first major product, R/1, which made instant accounting transactions in 1973.

The SAP firm introduced R/2 for 6 years, and R/3 (R: Real-time data processing) ERP system in 1992 (Farhoomand, 2007).

With strong business partners, strong research and development capabilities, strong financial position, ability to reach different geographies and markets, big data, cloud computing and mobile application needs continue to make the SAP company strong in this market (Saylam *et al.*, 2016).

Logo Software is very advantageous with its wide, experienced and knowledgeable distribution network, simple and easy to use products and low prices according to international competitors. In this regard, Logo, and it focuses on SMEs in Turkey's market.

Having entered the industry in 1984 by developing application software for personal computers, Logo is one of the largest software companies in Turkey. It is the innovative leader in the Turkish software industry with various solutions, services and innovations. As one of the fastest growing companies in the industry with more than 800 dealers and an extensive network of distribution channel, more than 85,000 companies are actively using Logo products.

Having invested in new business models and technologies throughout its 30 years of software industry experience, Logo has strengthened its position in the market with strategic acquisitions since 2010. Market share, which is 14.4% in 2012 as shown in Fig.1, has expanded both its product range and its geographical presence by adding Netsis to its portfolio in 2013 and followed by a market share of 23.3%. Logo, which operates with the goal of becoming a global brand, operates in 41 countries.

4. AHP METHOD-EXPERT CHOICE

The enterprise that will select ERP software should first decide whether an ERP solution will give positive results in terms of business. Deciding whether the implementation of the ERP system is necessary is as important as choosing the right system. Although there are no strict rules for implementing an effective electoral method, there are certain criteria that the business operator should particularly consider and some steps that must be taken to successfully complete the electoral action. At this point, selection can be concluded by adopting Multi Criteria Decision Making Methods.
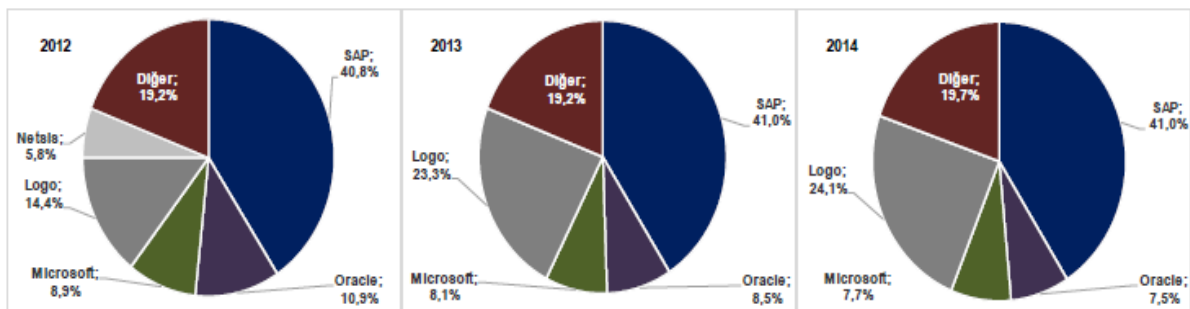

Fig. 1. LOGO Software market share by years

The Analytic Hierarchy Process (AHP) used in this study is one of Multi Criteria Decision Making Method that was originally developed by Prof. Thomas L. Saaty. Also, in 1983, Dr. Saaty joined Dr. Ernest Forman, a professor of management science at George Washington University, to co-found Expert Choice.

The Analytic Hierarchy Process (AHP) is a powerful and flexible decision-making process to help people set priorities and make the best decision when both qualitative and quantitative aspects of a decision need to be considered. By reducing complex decisions to a series of one-on-one comparisons, then synthesizing the results, AHP not only helps decision makers arrive at the best decision, but also provides a clear rationale that it is the best.

The AHP is based on three basic principles used in problem solving. These principles are decomposition, comparative judgments and synthesis of priorities (Başkaya and Akar, 2005). Decomposition principle consists of structuring the hierarchy to determine the basic elements of the problem. An effective way of doing this is by going from the upper level criterion to the lower level criterion connected to it. After that, go to the third level subcriteria and then alternatives (Saat, 2000). This leads to a more general and sometimes vague, more specific and distinctive one.

Comparative judgments principle is used in the construction of a matrix to make binary comparisons of the relative importance of the elements of a level of the hierarchy in terms of common criteria at a higher level (Saaty, 1988). The eigenvector of this matrix gives the priority of the criteria (Yetim, 2004).

Synthesis of priorities principle is to set priorities for the whole of the problem, or for the target at the top of the hierarchy, moving from the priorities derived from the lowest level of the hierarchy (Saaty, 1988).

The AHP identifies the set of criteria that will affect multipurpose decisions in real life, and the relative importance of these criteria to the relative importance of their actions, based on the evaluations of experts. Thus, a quantitative performance measurement with a systematic approach is combined with subjective evaluations to obtain healthy results (Tektaş and Hortaçsu, 2003).

The Analytical Hierarchy Process decision stages are generally given as follows (Saaty, 1988):

- Defining the Decision Problem
- Establishing Hierarchical Structure
- Creating Binary Comparison Matrices
- Transformation to Priorities Vectors
- Calculation of Compliance (Consistency) Ratio
- Sorting of Options

The Expert Choice program, which is based on the AHP methodology, helps us to export through the correct computer without dealing with calculations. Each step used in the AHP method gives us convenience in the Expert Choice program.

The AHP and Expert Choice software engage decision makers in structuring a decision into smaller parts, proceeding from the goal to objectives to sub-objectives down to the alternative courses of action.

Decision makers then make simple pairwise comparison judgments throughout the hierarchy to arrive at overall priorities for the alternatives. The decision problem may involve social, political, technical, and economic factors.

4.1. ERP Selection Application for SMEs and Big Businesses

The success of the information system projects in the enterprises is ensured by choosing the right software. A properly selected software will support the business processes of the business, and the decision maker will provide accurate and up-to-date information.

The problem created in this study is to identify the best SAP and LOGO ERP Software for SMEs and big businesses. A hierarchical structure (Fig.2) was created in order to select the most suitable ERP software system for these two business groups and this hierarchical structure has been used for both SMEs and big businesses. With the same evaluation criteria, SAP and LOGO ERP Software were selected.
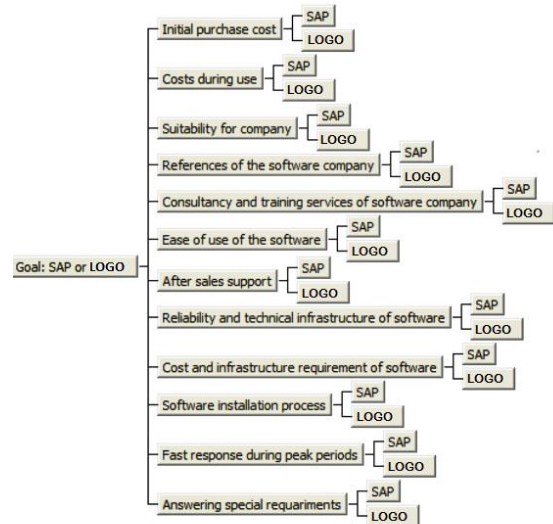

Fig. 2. Hierarchical structure for ERP selection

The hierarchy consists of the following components:
I.   Goal: SAP or LOGO
II.   12 Criteria (Initial purchase cost, costs during use, suitability for company, references of the software company, consultancy and training services of software company, ease of use of the software, after sales support, reliability and technical infrastructure of software, cost and infrastructure requirement of software, software installation process, fast response during peak periods, answering special requirements)
III. 2 Alternatives (SAP, LOGO)

Criteria considered in the study were placed in the hierarchy by determining the most important and the common issues that constitute the basis of ERP in the final ERP selection of the literature review. For the solution, the Expert Choice program was used, following the steps of the AHP method. Expert Choice is a program developed for the AHP technique and used effectively.

	Initial purch	Costs durin	Suitability	References	Consultanc	Ease of us	After sales	Reliability	Cost and in	Software in	Answering	Fast respo
Initial purchase cost		1.3	1.95	5.78	3.94	3.84	5.23	2.51	3.28	3.26	3.44	4.08
Costs during use			1.75	4.02	2.71	2.48	4.02	2.17	1.42	2.65	3.24	4.63
Suitability for company				6.05	1.42	1.22	1.32	4.14	2.12	1.33	3.82	1.71
References of the software company					2.91	3.59	2.93	7.12	5.33	1.77	2.12	1.77
Consultancy and training services of software company						2.36	1.88	2.93	1.92	1.09	2.56	1.54
Ease of use of the software							2.10	1.79	2.37	2.75	3.64	2.00
After sales support								2.55	1.95	1.28	2.04	2.16
Reliability and technical infrastructure of software									3.55	4.9	4.99	5.43
Cost and infrastructure requirement of software										6.01	6.48	7.81
Software installation process											4.66	3.09
Answering special requariments												1.17
Fast response during peak periods	Incon: 0.06											

Fig. 3. ERP criterion comparison matrix

Initial purchase cost	,198
Costs during use	,139
Suitability for company	,068
References of the software company	,023
Consultancy and training services of software company	,051
Ease of use of the software	,096
After sales support	,044
Reliability and technical infrastructure of software	,161
Cost and infrastructure requirement of software	,120
Software installation process	,049
Answering special requariments	,023
Fast response during peak periods	,028

Inconsistency = 0,06
with 0 missing judgments.

Fig. 4. Weights of criteria

Criteria and alternatives are entered into the program to form a decision application. It allows to enter verbal and numerical data in comparison of criteria and alternatives. Once the decision structure is established within the program, Expert Choice calculations are made. In the study, 12 hierarchical matrices (Fig.3) were created in Expert Choice after the hierarchical structure was established. At this point, the opinions of 5 decision makers who are experts in the field of SMEs (3) and large enterprises (2) were consulted. The evaluation of the criteria was scored by taking the opinions of these experts.

As shown in the matrix created in the Expert Choice program (Fig.3), some of the data are colored red and some are colored black. The comparison matrixes are constructed on the basis of the comparison of row element and column element. The Expert Choice program makes it easier to understand the data in matrixes; the row element is black if it has a higher weight than the column element; the column element is colored in red if it has a higher weight than the row element.

By entering the programme matrixes and the data, the program calculates the weight of each criterion and the alternative, and the consistency ratio, which is the reliability of the matrix. For example, according to the weights of the comparison matrices of the criteria in Fig.4 the first purchase cost criterion was 19.8% more important than the other criteria. The consistency rate was 0.06. Thus, it has been found that the comparisons result in evaluations and the reliability of the result obtained. Because the consistency rate is 0.06 <0.1.
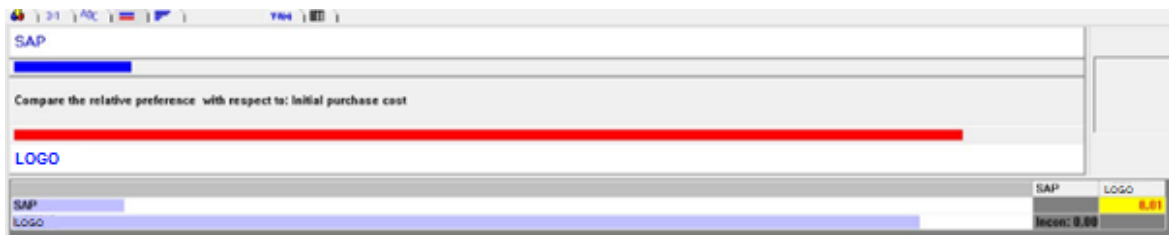
Fig. 5. Initial purchase cost for SAP and LOGO software selection for SMEs

Fig. 6. Software installation process in SAP and LOGO software selection for big business

After the criteria, alternatives (SAP and LOGO) are added at Expert Choice. Then, each matrix of alternatives has been constructed in terms of all sub criteria, the weight of each alternative is calculated. First, a matrix of criteria for alternatives to SAP and LOGO was created, taking into consideration the ERP choice for SMEs. Then the weights of the alternatives are calculated as a result of the matrixes created. Then the same operations were done considering ERP selection for big business. In Fig. 5, the initial purchase cost for SAP and LOGO software selection for SMEs was determined as 8.01 for LOGO. In the same way, LOGO's SAP weight is determined to be 2.25 in comparison to big business.

Again, in Fig. 6, SAP and LOGO software for large enterprises are evaluated in the software installation process criterion comparison matrix, and SAP's LOGO software has a weight of 3.33. When SMEs are considered, SAP's LOGO software has a weight of 1.45. Thus, two separate results emerged from the same evaluation criteria on two separate problems.

In addition to these differences, references of the software company, consultancy and training services of software company, after sales support, reliability and technical infrastructure of software, answering special requirements, fast response during peak periods criteria have the same values in the comparison matrix.

By entering the comparison matrices generated as a result of the programme evaluations and calculating the weight of each alternative, the final result tables given in Fig.7 are used to decide on ERP selection for SMEs, Fig. 8 are used to decide on ERP selection for big business.
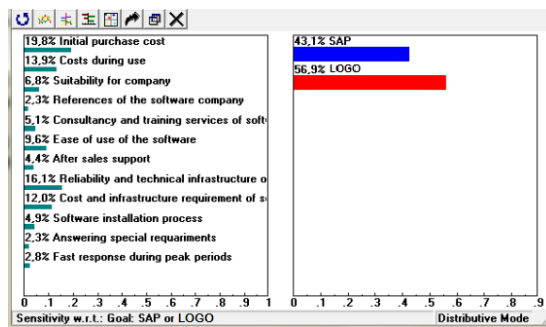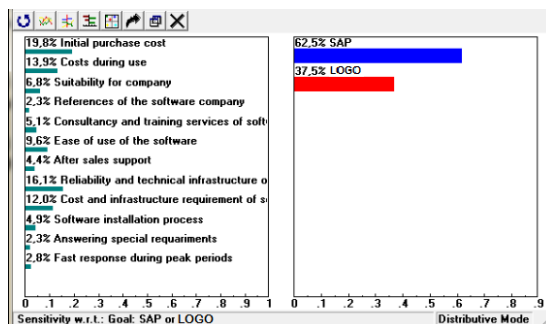

Fig. 7. SME-Results table

Fig. 8. Big businesses-Result table

According to the results obtained from the Expert Choice program for SMEs in Fig.7 SAP and ERP software selection LOGO with a rate of 56.9% in the first rank, SAP was included in second with 43.1%. In other words, as a result of evaluating the criteria by comparison, it is concluded that the most suitable choice for SMEs is LOGO.

In Fig. 8 SAP and LOGO ERP for big business SAP ranks first with 62.5% and LOGO second with 37.5%. Here again, SAP program is more suitable for big businesses by evaluating the same criteria.

5. CONCLUSION

The choice of ERP software for businesses is a strategic decision that requires a large number of factors to be taken into consideration. The most important feature of successful companies in ERP projects; they choose their solutions in accordance with their own sectors, institutional structures and technological systems. Errors in software selection will not only cause time and cost loss but will also result in problems in terms of effective and efficient use of the system.

In this study, it is desired to make an ERP selection for SMEs and big businesses, taking into consideration the different criteria that play a role in the selection of ERP software. SAP and LOGO ERP Software programs which were compared with the 12 criterias that were created as a result of the literature review were evaluated. For the solution using the AHP method, the Expert Choice program was applied.

According to the results obtained from Expert Choice program, LOGO ERP software is the most suitable choice for the SMEs with 56,9% ratio in the selection of SAP and LOGO ERP Software. For big businesses, SAP program with 62.5% is more suitable. Also, Kasay's (2016) study showed that the best ERP alternative for both Private Sector Company and state-owned company according to selection criteria is SAP. At another study Özdemir (2009), 90% of manufacturing SMEs in Kayseri who participated in the research went to provide ERP systems from domestic firms. Only the global ERP suppliers were able to take part in the SAP Kayseri market. At the same time, Uluköy and Vatansever (2013), the SAP with the highest ranking among the 5 software alternatives in the ERP selection in the big business, and LOGO 3rd place.

The proposed method can enable companies to analyse the problem by taking into consideration the factors that affect ERP software selection decisions (SME or big businesses) and to choose the most suitable ones from among the alternatives. On the other hand, the easy and flexible use of the method makes it possible to adapt it to real life problems. The proposed approach can be applied to all software selection problems, with some changes specific to the firm, by providing the managers with a perspective on how to make software selection decisions.

REFERENCES

Alanbay, O. (2005) "ERP Selection Using Expert Choice Software." *Honolulu, Hawaii, July*: 8-10.

Ayağ, Z., and Özdemir R. G. (2007) "An Intelligent Approach to ERP Software Selection Through Fuzzy ANP." *International Journal of Production Research* 45.10: 2169-2194.

Aydın, G. (2008), Analitik Hiyerarşi Prosesi (AHP) ve Bir Sanayi İşletmesinde Uygulaması, Kocaeli

Üniversitesi, Sosyal Bilimler Enstitüsü, Yüksek Lisans Tezi, Kocaeli.

Başkaya, Z., and Akar, C. (2005), To Select the Best Production Alternative by Using Analytical Hierarchy Process: The Case of Textile Company. *Anadolu University Journal of Social Sciences*, 5(1), 273-286.

Başlıgil, H. (2005/3) "The Fuzzy Analytic Hierarchy Process for Software Selection Problems", Yıldız Teknik Üniversitesi, Mühendislik ve Fen Bilimleri Dergisi.

Beşkese, B. (2004), Bilişim Teknolojisi Yatırımlarının Değerlendirilmesine Yönelik Uygun Yöntemin Seçilmesi Modeli-ERP Yazılımı Seçimi Uygulaması, Doktora Tezi, İstanbul Teknik Üniversitesi Fen Bilimleri Enstitüsü, İstanbul.

Büyüközkan, G., Kahraman, C., and Ruan, D. (2004), A Fuzzy Multi-Criteria Decision Approach for Software Development Strategy Selection. *International Journal of General Systems*, 33(2-3), 259-280.

Çolakoğlu, N. (2012), Stok Yönetiminde Yazılım Kullanımı: Otomotiv Yan Sanayi Sektöründe Bir Firma Uygulaması, Yüksek Lisans Tezi, Aksaray Üniversitesi Sosyal Bilimler Enstitüsü, Aksaray.

Davenport, T. H. (1998), Putting the Enterprise into The Enterprise System, Harvard Business Review.

Farhoomand, A. (2007), Opening up of the Software Industry: The Case of SAP. In *Management of eBusiness, 2007. WCMeB 2007. Eighth World Congress on the* (pp. 8-8). IEEE.

Görener, A. (2011), Bütünleşik ANP-VIKOR yaklaşımı ile ERP yazılımı seçimi. *Havacılık ve Uzay Teknolojileri Dergisi*, 5(1), 97-110.

Hamidi, H. (2015), Selecting Enterprise Resource Planning System Using Fuzzy Analytic Hierarchy Process Method. Information Systems and Telecommunication, 3 (4).

Hidalgo N., A, Jose Albors Garrigos, and Luis Gomez. (2011), "ERP Software Selection Processes: a Case Study in The Metal Transformation Sector." *Intelligent Information Management*. Vol. 3. No. 1. Scientific Research Publishing.

Kahraman, C., Beskese, A., and Kaya, I. (2010), Selection Among ERP Outsourcing Alternatives Using a Fuzzy Multi-Criteria Decision-Making Methodology. *International Journal of Production Research*, 48(2), 547-566.

Kasay, A. (2016), *Enterprise Resource Planning Selection for Railway Industry*., Phd Thesis. Atılım University.

Kilic, H. S., Zaim S, and Dursun D. (2015), Selecting "The Best" ERP System for SMEs Using a Combination of ANP and PROMETHEE Methods. *Expert Systems with Applications* 42.5: 2343-2352.

Köktener B. (2009), *Genişletilmiş Kurumsal Kaynak Planlaması Projelerinin Başlangıç Aşamasında Alınan Kararların Açıklanması: Türkiye'deki Kobilerde Kalitatif Bir Çalışma*, Fen Bilimleri Enstitüsü.

Köstence, N.T. (2009), Kurumsal Kaynak Planlama Yazılım Paketleri ve Kuruma Özel Yazılımların Seçim Aşamasında Karşılaştırılması. Yüksek Lisans Tezi, Bahçeşehir Üniversitesi, Fen Bilimleri Enstitüsü, İstanbul.

Lesani S. H. (2016), Analytical Hierarchy Process Approach For Selecting Enterprise Resource Planning Software Package In Oil And Gas Equipment Manufacturing Firms, Master Thesis, The Department Of Industrial Engineering, Atilim University, Ankara, Turkey.

Lien, Chi-Tai, and Shing-Ko Liang (2005) "An ERP System Selection Model with Project Management Viewpoint–A Fuzzy Multi-Criteria Decision-Making Approach." *International Journal of the Information Systems for Logistics and Management* 1.1: 39-46.

Onut, S., and Efendigil, T. (2010), A Theorical Model Design for ERP Software Selection Process Under the Constraints of Cost and Quality: A Fuzzy Approach. Journal of Intelligent & Fuzzy Systems, 21(6), 365-378.

Özbir, Ş. (2006) "ERP Sistemlerinin Seçim ve Kurulum Prosesi ve Bir Uygulama." Marmara Üniversitesi, Sosyal Bilimler Enstitüsü, Yüksek Lisans Tezi, İstanbul.

Özdemir, A. İ. (2009) "ERP Kullanımının Kobilerin Algılanan Performansı Üzerine Etkisi: Kayseri İmalat Sektörü Örneği." *Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi* 33: 173-187.

Razmi, J., Sangari, M. S., and Ghodsi, R. (2009), Developing a Practical Framework for ERP Readiness Assessment Using Fuzzy Analytic Network Process. *Advances in Engineering Software*, 40(11), 1168-1178.

Rouyendegh, B. D., and Turan E. E. (2011) "ERP System Selection by AHP Method: Case Study From Turkey." Int. J. Bus. Manag. Stud 3.1.

Saat, M. (2000), Çok Amaçlı Karar Vermede Bir Yaklaşım: Analitik Hiyerarşi Yöntemi, Gazi Üniversitesi İktisadi İdari Bilimler Fakültesi Dergisi, (2).

Saaty, T. L. (1980), The Analytic Hierarchy Process, McGraw-Hill, USA.

Saaty, T. L (1988)., Mathematical Methods of Operations Research, Dover Publications, New York.

Saylam, R., Keskinkılıç M., and Timuroğlu K. (2016). "SAP Uygulamalarının SWOT Analizi İle İncelenmesi." *Yönetim Bilişim Sistemleri Dergisi* 1.3: 78-86.

Su Y., and Yang, C. (2010), A Structural Equation Model for Analyzing The Impact of ERP on SCM. Expert Systems with Applications 37: 456-469.

Tanrıverdi, S. (2010), Perakende Sektöründe Kurumsal Kaynak Planlama Uygulaması, Yüksek Lisans Tezi, Marmara Üniversitesi Sosyal Bilimler Enstitüsü, İstanbul.

Tektaş, A., Hortaçsu, A. (2003), Karar Vermede Etkinliği Artıran Bir Yöntem: Analitik Hiyerarşi Süreci Ve Mağaza Seçimine Uygulanması, İktisat, İşletme ve Finans Dergisi,18: 209.

Turan, S. (2011), Kobi'lerin Kurumsal Kaynak Planlama Yazılımlarından Beklentileri ve Sektörel Bazda Yazılım Geliştirilmesi, Yüksek Lisans Tezi, İstanbul Ticaret Üniversitesi, İstanbul.

Uluköy M. and Vatansever K., Determining Enterprise Resource Planning Systems Through Fuzzy Ahp And Fuzzy Moora Methods: An Implementation on Manufacturing Sector, Celal Bayar University Journal of Social Sciences, issue: 11-2 / 2013, pages: 274-293, 2013.

Wei, Chun-Chin, Chen-Fu Chien, and Mao-Jiun J. W. (2005) "An AHP-Based Approach to ERP System Selection." *International journal of production economics* 96.1: 47-62.

Yeşildağ, B. (2010), Muğla İlinde Küçük ve Orta Büyüklükteki İşletmelerde Kurumsal Kaynak Planlama (ERP) Yazılımları Kullanım Düzeyi ve Verimliliğinin Araştırılması, Yüksek Lisans Tezi, Muğla Üniversitesi, Sosyal Bilimler Enstitüsü, Muğla.

Yetim, S. (2004), Analitik Hiyerarşi Sürecine Ait Bazı Matematiksel Kavramlar, Kastamonu Eğitim Dergisi, 12(2), 457-468.

Yontar E. (2014), ERP Kurulum Sürecinin Modellenmesi ve Tarım Makine Sanayinde Uygulanması, Kırıkkale Üniversitesi, Fen Bilimleri Enstitüsü, Endüstri Mühendisliği Anabilim Dalı, Yüksek Lisans Tezi, Kırıkkale.