

Comparison of ERP's Software Qualities in Airlines Industries Using Delone Model by AHP Method

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Abstract: Software system qualities at Enterprise Resource Planning (ERP) play an important role in the business sector. The aim of this study is to determine if airline companies are successful in application of ERT. Here likert scales are utilized and analyzed by means of the Analytic Hierarchy Process (AHP). Accordingly, two regardable airline companies in Turkey with 60 workers from pre and up positions are participated in the questionnaire process of this research. According to the comparison results, strong and weak aspects of these companies based on their different software systems are found to be as preferred priorities in aviation sector competition.

Keywords: ERP, Implementation, Aviation Sector, Software System, Delone Model, AHP

1. Introduction

The Enterprise Resource Planning (ERP) is a kind of expanding technological aspect that includes more vital scientific layout of information system. ERP system supports so many functions in an organization framework. Information system (IS) is likely on a connection line and it collects, operates and deploys all data in many ways (Chen & Zeng, 2012). Information system occurs in an investment that ERP system needs to be upgraded as an implementing stage. Various companies produce ERP system for this reason (Robey, & Boudreau, 2002). ERP system is a combined module application that companies or organisations use it as a data device for setting process and passing the external and internal information connections (Ali, 2013).

Furthermore, for companies it is necessary to utilize ERP software system to be successful in the existed competitive situations in the corresponding sector (Vlachos, 2006). Evaluation of the facts and risks of the application of ERP and its upgrading approach is essential as the operational department and enduser perspectives are important to be successful. In addition, the main purpose of this study is to examine the selected ERP software package performance in companies. Consequently, more

critical questions have been established to determine the powerfulness of software selection in operational land.

The purpose of this study is to examine and analyze the factors of utilizing the software influencing workers and their intention, operational process, acceptance and flows in aviation sector to get the best solution. For this purpose, two different software users have been chosen. Accordingly, to explore the best ERP suppliers in Turkishairlines the Analytic Hierarchy Process (AHP) approach is utilized. After the main researched questions determined, both of them will be asked for six main questions, having 30 sub-criterias. Meanwhile factor results will be tested by AHP method to rank understudy companies. Accordingly, firstly ERP background and then aviation perspectives after Delone model will be investigated in this research. With the analysis of the underlying relationships, the software system importance for companies will be declared with the main attention of aviation sector in Turkey.

2. The Importance of ERP

ERP covers considerable information parts connected with so many sectoral aspects such as human resource, production planning, purchase and sales units (Umble, 2003). ERP systems are a kind of software packages which is comprised of modul units with a complicated system. For business administration, ERP is the more qualified information technology to get a desired answer. The working processes of the companies combined to various information network to get and comply with the perfect fit. ERP systems are mentioned to complement all aspects like management, staff, and equipment in one system to access the business goals (Davis, 2005; Bishnoi, 2011). The evolution process of the ERP from the 1960s until 2010 is presented in Figure 1 (Han, et al., 2009; Ngai, et al., 2008).

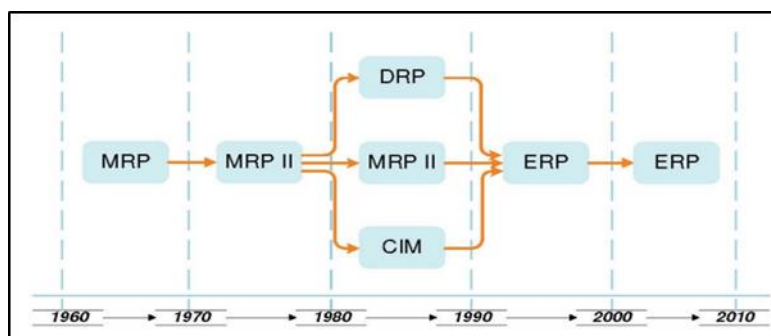


Figure 1. Chronology of ERP, Material Resource Planning (MRP), Material Resource Planning II (MRP II), Distribution Resource Planning (DRP), Computer Integrated Manufacturing (CIM)

Some management systems have been appeared in ERP systems and experts are focused to manage the sources of companies for all department connections automatically. Hence, all databases can be reachable in the same time of the recent situation (Themistocleous, 2001).

3. Methodology

This study uses two case study approaches . Firstly, it is aimed to define the deepest appropriates of ERP software system in perspectives of the airplane industry. Also, it can be planned to understand the main level up-and-down factors and to improve based on the underlying facts.

AHP approach is utilized here to determine the relationship between the interested parameters for the purpose of current study. All selected criteria and sub questions are defined by managers and experts in companies. Moreover, the research method is a qualitative case study. In brief, current study is consisted of two main stages. Firstly, to collect the primary data through questionnaires (the exploratory study) and then, to make the relationship assesment based on the result (the main study).

All steps of the project management processes can be expressed as a traditional methodology. In the guideline of the basic project management system, there are five main steps. These steps which can be replaced by themselves are summarized in Figure 2.



Figure 2. The basic steps of the project management system

Not only the modern methods are not centered in a line of process but also they look for a new aspect in the project management. Some software developments, process improvements and product engineering can be upgraded to get the best solution for IT department.

4. Implementing Appears

It is emphasized that the most vital purpose is to combine all different statuses and processes at sufficient levels among the cloud systems in ERP project that contains superb functions that manages the central line. The second one is tracing (automation) that intends to get rid of some mistakes done by people and also derogate the manual workings around the purposes (Yılmaz & Ozcan, 2011).

There have been several important aspects and contents to help us to define the implementing strategy which addresses the processes of the company or business politics in the lie of the organization requirements. The most important issue here is to determine the exacted pattern for ERP deployment. The second main concept is to choose the leadership to cover or direct all ERP system involved implementation. On the other hand, they have some stages to recover the system as well as the structured approach. The key aspects of an ERP implementation strategy is presented in Figure 3.

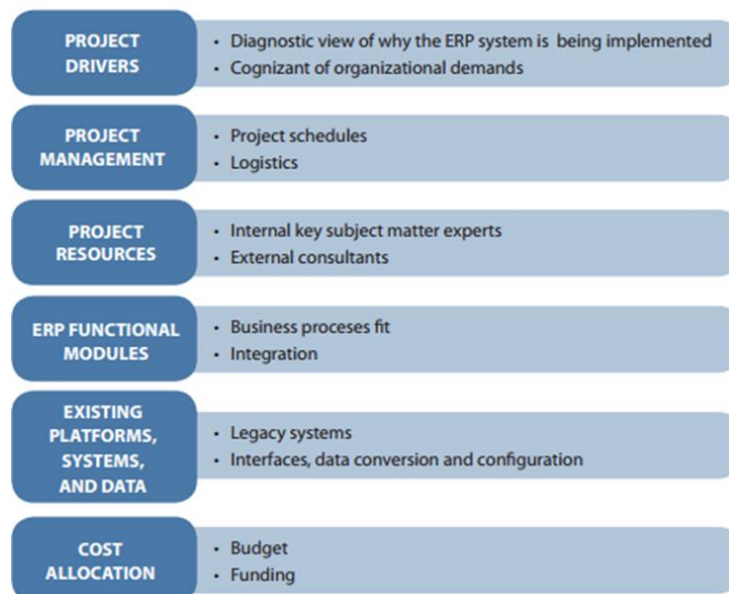


Figure 3. Key Aspects of an ERP Implementation Strategy

5. Research Scale and Model

In this study, two ranked airlines are chosen to examine the growing performance of the interested companies and to define how to deal with their software applications or required preferences. To survey the rank of these two airlines, the Likert scale is utilized as the most trustable measurement approach. It is formed as 5 points scale base so that they aren't close to each other and this means strongly agree is certainly away from agree.

Table 1. Likert table scores adapted from (Gail M. Sullivan, 2013)

POSITIVE EXPRESSIONS				
5	4	3	2	1
Agree	Partly Agree	Unstable	Partly Disagree	Disagree
1	2	3	4	5
NEGATIVE EXPRESSIONS				

The Likert scale, utilized in this research, has been designed to find and balance the attitude in academic perspective purposes and has got the global confirm and validity (Ankur Joshi, 2015; DR, 2005). Accordingly, the participants of the study are investigated by means of the applied questionnaires to indicate the level of the agreement scaled from strongly disagree to strongly agree based on a metric scale (Ankur Joshi, 2015; YK, 2006). The utilized evaluation intervals based on the arithmetical average according to the five point likert scale is presented in Table 2.

Table 2. Evaluation intervals based on the arithmetical average according to the five point likert scale

Interval	Options
1,00-1,80	Disagree
1,81-2,60	Partly disagree
2,61-3,40	Unstable
3,41-4,20	Partly agree
4,21-5,00	Agree

The arithmetical average at the abovementioned table has been utilized to evaluate the given answers in the questionnaires. All averages have been supposed on a same interval and all interval calculated as 0,80 points according the equation (1)

$$\text{Point interval} = (\text{highest point} - \text{lowest point}) / 5 = (5 - 4) / 5 = 4 / 5 = 0,80 \quad (1)$$

5.1 Research Design

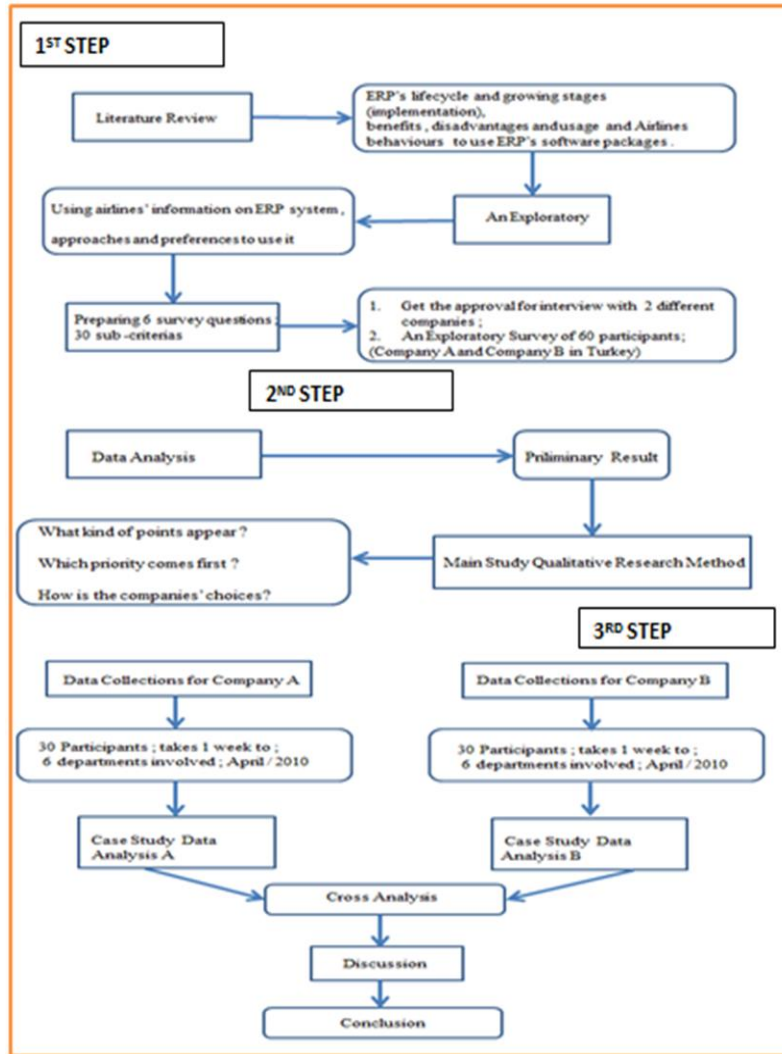


Figure 4 Research Design

This study uses two case study approach . Firstly , design of the study suitable with the research because searchers are willing to know about the deepest appropriate of ERP software system in the air industry's perspectives. Senior executives in aviation sector related to this research have predicted to define the basic questions for that they insist of 6 top level questions are composed to inquire to the participant, consisting of 30 workers, in each airlines. Also, they want to understand the main level up-and-down factors and to improve according to the facts.

AHP is used to determine the study's purpose and all selected criterias and sub questions are defined by managers and experts in companies.

Moreover the research method is a qualitative case method. This study is related to two stages like as; collecting primary data through questionnaires (the exploratory study) and making proportion assessment using the result (the main study).

These questionnaires are adapted from DeLone and Mclean model of the information system success. It wants to expose whether the business success is in the same line with their enterprise resource planning program's process or not. IS success are measured with the categorized plurality in this model and they have a causal relationship between the defined dimensions as presented in Figure (Wu & Wang, 2006).

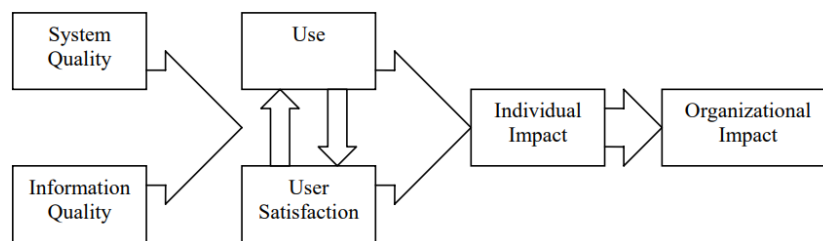


Figure 5. IS success model (DeLone & McLean, 1992)

To measure IS success, so many technics are in use. But DeLone and McLean's IS model is the most popular one to take into consideration regard to its validity (Younghwa Lee, 2006; DeLone & McLean, 1992). In this research, six backbones of airlines are determined and each one has 6 main questions also 30 sub-criterians at total to examine the basic problems or satisfactions in their software process in use.

Here, Company A and Company B are the most trustable and popular airlines in Turkey, Europe and Asia. These airlines answer the 5 scaled likert scope to their six different process dimensions using a software program. These airlines are mentioned as low cost carrier but they have chosen two different software programs named x and z. One of the software programs is a small process which expands and upgrades all of the achievements. The other one has a large extension in enterprise resource planning software solution and the examination is studied about the same airline's departments to evaluate all aspects. Apparently this software program comes and sets itself in the business' enterprise from past and day by day it influences all the company's choice or preferences.

5.2. Research Method AHP

We compare the elements over the others based on the scaled numbers to determine how is it significant. In that case, the most important issue is to be regardful for each criterion in comparison (Saaty, 2008).

It is necessary to use a hierarchy of control in a systematic approach like AHP to determine the corresponding quality. Both notional and measurable aspects are evaluated by means of the AHP methodology (Figure). In fact, the comparison of the pairs is more efficient than evaluation of a scoring table (Robin & Divahar, 2012).

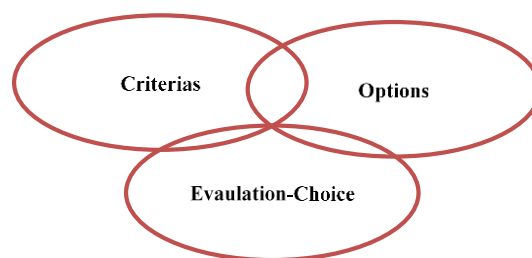


Figure 6. Analytic Hierarchy Process Framework

AHP approach evaluates the problem in a hierarchical manner, accordingly it is useful to make a research model of analytical hierarchy.



Figure 7. Research model of Software in analytic hierarchy adapted from (Younghwa Lee, 2006), this figure is designed in Superdecision

5.3. Priority Levels in Qualities

Comparison of the clusters in the matrix has been defined at a high hierarchical way, so that, each airline's percentage of each node has been calculated and the numeric results at the end are determined.

$$\%MQ1 = (MQ1) / (\sum MQ1) \times 100 = \dots\% \quad (2)$$

The above mentioned formula is used to determine the percentage of each main question in each company. Before this calculation, each sub – criteria should be known in average so they are determined according to the following formula.

$$|[(\%MQ1_B) - (\%MQ1_A)]| \quad (3)$$

We prepare a chart that defines which company has a superiority on each main question in the questionnaire. To evaluate the superiorities, the six matrix have been formed as the main questions.

Table 3. The percentage of the priority level for target companies A and B

Software System Qualifications Subjects in Questionnaire	Priority Level in Percentage (%)	
	Company A	Company B
Software System Quality: How good the Software System is in situations of operational qualities	17,52	18,48
Software Information Quality: How good the Software System is in situations of its outputs	18,26	18,05
Software Service Quality: How Good the Software Sytem is in situations of its process	17,24	16,31
User Satisfaction: The sum of personal feelings of pleasure or displeasure about the Software System	15,57	15,97
System Use: The extent of the Software System being used	15,42	15,40
Perceived Net Benefits: Valuation of the benefits of the Software System by users	15,99	15,78
Total	100	100

Table 4. The corresponding MQ for target companies A and B

		SQ	IQ	SV	US	SU	NB	
Company A	MQ Average	3,55	3,7	3,49	3,16	3,13	3,24	
	MQ % Total	17,52	18,26	17,24	15,57	15,42	15,99	100
Company B	MQ Average	4,28	4,18	3,78	3,70	3,57	3,66	
	MQ % Total	18,48	18,05	16,31	15,97	15,40	15,78	100

Table 5. Each quality has set in a rank to companies*

Software Satisfaction Ratio							
Company A	%	Standart Deviation	Evaluation	Company B	%	Standart Deviation	Evaluation
SQ	3,55	0,28	Partly Agree	SQ	4,28	0,10	Agree
IQ	3,70	0,17	Partly Agree	IQ	4,18	0,14	Partly Agree
SV	3,49	0,17	Partly Agree	SV	3,78	0,22	Partly Agree
US	3,16	0,24	Unstable	US	3,70	0,10	Partly Agree
SU	3,13	0,24	Unstable	SU	3,57	0,14	Partly Agree
NB	3,24	0,10	Unstable	NB	3,66	0,17	Partly Agree

6. Level of Satisfaction to Companies

According to the researches about the case of domestic performance of airlines, they have examined the priority levels of questions asked at minimum and maximum (Hatipoglu & Isik, 2015).

Based on our questionnaires scores, the satisfaction level of each company can be calculated. Both of them has got the same level of importance in some qualities. AHP weights refer to determine main and sub questions average point in evaluation.

Table 6. Evaluation of Companies to AHP Weight

Company	Average Point		AHP Importance Weight		Average of Percentage		Full Average of Percentage		Rank	
	A	B	A	B	A	B	A	B	A	B
SQ	21,29	25,69	0,20	0,46	4,26	11,82	6,0	13,8	1	2
IQ	25,90	29,29	0,49	0,24	12,69	7,03	17,15	8,40	2	1
SV	17,47	18,90	0,17	0,13	2,97	2,46	4,25	3,25	3	3
US	9,46	11,10	0,04	0,08	0,38	0,89	0,6	1,2	6	6
SU	12,50	14,28	0,04	0,04	0,50	0,57	0,8	0,8	5	5
NB	16,20	18,28	0,06	0,05	0,97	0,91	0,3	1,25	4	4
Satisfaction Percentage (%)					21,77	23,67	29,1	28,7	0.75	0.82

We use each criterion average to find the weight of each sub – criteria multiplying AHP weight of main criteria and the same calculation is used to determine the highest score of all criteria. Then all subtotal of six main criterias scores are collected to compare to the maximum subtotal. As a result, specifying of satisfaction percentage has been possible with compare the maximum total of all criterias to maximum total of all criterias at maximum level. We get the satisfaction percentage of software usage in Company A as % 75 and Company B as % 82.

Last 4 qualities (SV, US, SU, NB) are ranked in the same level for both companies despite of the fact that they are located on various percentage of points. Those having certain first ranker are apparently different. As the below table shows the specific information about mentioned scores and ranks. In addition, we have checked against each quality criteria between companies. For this, we have used again main AHP scale approach to define their superiority.

Table 7. Quality superiority of companies (red: strong, yellow: weak, blue: equal)

Software System Quality	A	B	Software Information Quality	A	B	Software Service Quality	A	B
A	1	1/3	A	1	3	A	1	1
B	3	1	B	1/3	1	B	1	1
User Satisfaction	A	B	Perceived Net Benefits	A	B	System Use	A	B
A	1	1/3	A	1	3	A	1	1
B	3	1	B	1/3	1	B	1	1

According to the identified values, each company has given the highest point as different main criteria. They have strongest, weakest and equal sides for both software system as they used. Both of them has the equality for software service and system use qualities but Company A is stronger in the case of the software information and perceived net benefits qualities than Company B on the other hand, Company B has got perority regards the software system and user satisfaction to Company A. Companies have to consider this prepotency and frailty so that they can move on their operational improving and developing status with regarding this vital information.

7. Conclusion

In aviation sector, using ERP modules influence the success mainly when it has been adapted or used in appropriate manner. Company A and B involves slight differences in their percentage having a strong achievement that they take the 2nd or 3rd place in this area. All related cases in their vision indicate that company B meet the needs of personal aspects and company A provides the knowledge all over the department.

Furthermore, they should know how is the weakest and strongest sides of their used software process and they should improve their undeveloped sides with respect to the other company and they should keep forward in the advanced side to get a replendence to the others.

This study's first survey question is explained as given ranks for each company. Second survey question is not mentioned the differences in clear because both two companies have a similar and near percentage for their first and second chosen software qualities. These two companies have an equal performance in business sector but we have to mention here; Company A is more preferred company according to the level of aircraft and operational areas.

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