Difficulties in ERP integration in Umm Al Qura University: A Case Study

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Abstract
The development and integration of Enterprise Resource Planning (ERP) systems have consistently attracted attention from software engineering researchers. Many studies have examined the factors that influence successful ERP integration, while others have focused on introducing integration models that address issues and challenges that affect the successful integration of ERP. However, it is crucial to recognize that the key player in successful integration is the individual involved. This paper aims to investigate how individuals based on departmental attachments and experiences have viewed the factors that affected the success of ERP integration. A case study was conducted at one large organization namely Umm Al Qura University, Saudi Arabia. Five departments were involved namely: Financial management, purchasing management, warehouse management, human resources management, and the Deanship of Information Technology. The results of 78 participants were collected and analyzed. Furthermore, it was different how individuals from different departments involved in the ERP integration viewed the factors that affected the success of integration. In addition, it was noticed that individuals with different experiences have various views on the factors. Moreover, it was evident that departmental attachments and individual experience might play a role in the successful integration of ERP.

Keywords:
Enterprise resource planning, Software, Software development management, Software engineering, Software maintenance, Software quality, Software systems.

1. Introduction

Enterprise Resource Planning (ERP) systems [1] are software that gathers and manages the business activities of an organization. They were introduced in the 1990s for business applications and offer benefits such as costs, time, and customer satisfaction [2]–[4]. It has been claimed that ERP joins business functions to facilitate providing information at a low cost [5], [6]. Furthermore, many researchers believe that ERPs can significantly advance the process of change and decision-making [7]–[11]. In addition, productivity can be enhanced among departments in the organization that use ERPs [12], [13]. However, challenges and issues with integrating and using ERPs have emerged [14]–[17]

ERP Integration is a complicated process and has many definitions depending on the opinions of individual experts in it. However, many prefer to identify ERP Integration as the process of connecting all business components with other applications of the organization [18]. It has been claimed that it is expensive and with no guaranteed success [19], [20]. Many have introduced their ERP integration models [21]–[29]. Each model has its strengths and weaknesses, however, there is clear evidence that one of them is the optimal one.

Since the introduction of ERPs many researchers [24], [26] have studied the issues and challenges of ERPs integration. Mahmood et al. [30] have studied and introduced a list of challenges and issues when integrating with ERP. Mahmood et al. [30] have categorized factors for the successful integration of ERP into four categories namely: Project Management, HR, Organizational, and Technical/technological factors. In this research, those factors are considered for conduct the investigation.

This research focuses on studying the impact of a number of factors that affect the success of ERP integration. As many departments and individuals are involved in the integration, this research concentrates on studying the impact of those factors based on the departmental attachments and the experience of the individuals involved. The study relies on the factors shown in Mahmood et al. [30].

This paper is structured as follows. The first section is the introduction which explains the ERP and the integration. The second section discusses the related work. The third section shows the Research questions and the Methodology. The fourth section demonstrates the Results and discussions. The final section draws conclusions and discusses the limitations.

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2. Related Work

Yathiraju [31] research has been carried out to study the integration of AI with the ERP cloud service in order to enhance the security of the use of ERP cloud service. The researcher focused on surveying the perspectives of 15 IT professionals. More ERP integration challenges were found due to the new aspects of integration with ERP. In comparison to this research, our research focuses on the well-known challenges of ERP integration and how they are viewed not only by IT professionals but also by individuals involved in the integration.

Rasanjali et al. [32] carried out a qualitative study to investigate minimizing lean waste in the industry through the integration of ERP. The study surveys the perspectives of 15 IT experts along with code analysis. New challenges were identified and highlighted. However, the researchers focused on IT professionals and not all individuals involved in the integration.

Sasidharan [33] has introduced an interesting work that studied the impact of social networks in the integration of ERP. Sasidharan surveyed a number of employees of a large organization and focused on friendship and gender-based factors. The researcher found that gender has an impact on ERP integration. However, in comparison to this research, our research focuses on the well-known challenges of ERP integrations and how they are viewed by the departmental attachments and the experiences.

Almutairi et al. [34] have investigated the importance of ERPs adaptability from the point of view of top management in an organization. New challenges were found and guidelines for top management were offered. The authors pointed out that many of the top management did not understand the meaning of adaptability.

Salih et al. [35] have investigated the impact of the support of the top management and vendors. The case study was conducted on 177 end-users of ERPs in two large organizations in Saudi Arabia. The focus was on the end-user acceptability of the use of ERPs. In addition, Mahmood et al. [36] have studied the factors that impact post-ERP implementation. The study was conducted using the interviews with the top and middle management in two large organizations in Saudi Arabia.

3. Research Questions

This research outlines two research questions that focus on the factors that affect the successful integration of ERP.

RQ1. Is there an impact of departmental attachments on the successful integration of ERP? In order to answer this question, participants should specify their departments which are one of the following: Financial management, purchasing management, warehouse management, human resources management, and the Deanship of Information Technology. Having this data at hand allows for analyzing the participants' views on challenges encountered during ERP integration.

RQ2. Is there an impact of experience on the successful integration of ERP? In order to answer this question, participants will be asked to categorize themselves into one of five categories of experience as follows: 1-5 years, 6-10 years, 11-15 years, 16-20 years, or over 20 years. This will indicate their experience and allow for analysis of their responses accordingly..

4. Methodology

In this research, 28 factors have been focused on and investigated. Those factors are derived from [30] and are shown in Table 1. The survey methodology was employed. This is due to the efficiency and effectiveness of data collection that this methodology provides. The survey utilized direct Likert scale questions (1- very negative impact, 5- very positive impact) on participants' opinions on all factors listed in Table 1. The online questionnaire was sent via electronic communication to 123 participants. Of those participants, 78 participants completed the questionnaire with a response rate of 64%. The participants were from different departments in Umm Al Qura University namely Financial management, purchasing management, warehouse management, human resources management, and the Deanship of Information Technology. As shown in Figure 1, out of the 78 respondents, around 73% were male

participants, whereas around 27% were female participants.

Following the ethical manner of scientific research, participants were informed that the collected data were confidential and would be used for research purposes. Thereafter, they were asked to provide their consent to participate and they were able to withdraw at any stage of the process. The participants were assured that their privacy was protected and respected.

The questionnaire consists of 4 parts. The first part is concerned with the general information about the participants. This information includes the name, gender, job title, qualifications, etc.. The second part considers the Project management factors which are abbreviated as Ch1 to Ch5. The third part addresses HR factors which are abbreviated as Ch6 to Ch10. The fourth part considers the Organizational factors which are abbreviated as Ch11 to Ch23. The fifth part addresses the Technical/technological factors which are abbreviated as Ch24 to Ch28. Table 1 shows the aforementioned factors and the sections they belong to.

Table 1: Factors impacting ERP integration.

Factor Category	Factor	abbreviation
Project management	Poor project management	Ch1
	Project team formation	Ch2
	High costs of implementation and hidden costs	Ch3
	Quality assurance	Ch4
	Ongoing project management	Ch5
HR	Training and development	Ch6
	Fear of loss of job	Ch7
	Team empowerment	Ch8
	Turnover of key project person and employee	Ch9
	Technical Manpower	Ch10
Organizational	Culture and language	Ch11
	Enterprise localization	Ch12
	Regulatory legal requirements	Ch13
	Organizational politics	Ch14
	Effective communication	Ch15
	Management approach	Ch16
	Infrastructure development	Ch17
	Subscription expense	Ch18
	Start_up support	Ch19
	Performance risk	Ch20
	Cloud Awareness	Ch21
	Change management	Ch22
	Risk and conflict management	Ch23
Technical/technological	BPR	Ch24
	Data conversion and migration	Ch25
	Security risks and data security	Ch26
	Functionality limitations	Ch27
	Usability issues	Ch28

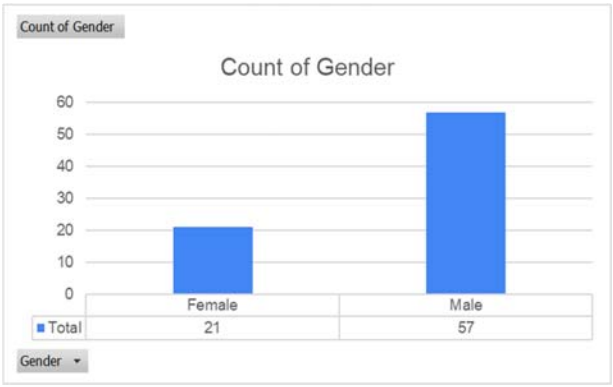

Figure 1: Participants Genders

5. Results and Discussion

In this section, the findings of the research will be shown and discussed. Some points will be highlighted in order to draw conclusions on the aforementioned research questions. First, general findings will be shown and discussed. The focus on showing the general findings is to show the views of the participants on the success of the integration of ERP in general and based on the departmental attachments. In addition, participants' opinions, on all 28 factors mentioned in Table 1, are shown and discussed. Second, in order to draw conclusions to the questions of this research, participants' opinions with consideration of departmental attachments are shown and discussed. Finally, participants' opinions with consideration of their experience are shown and discussed.

I. General Findings

As shown in Figure 2, around 86% of participants believe that they have experienced a successful integration of ERP in UQU. This indicates that this research will focus on studying the factors based on a successful case study. In future work, it is beneficial to replicate the same methodology and research questions on an unsuccessful case study.

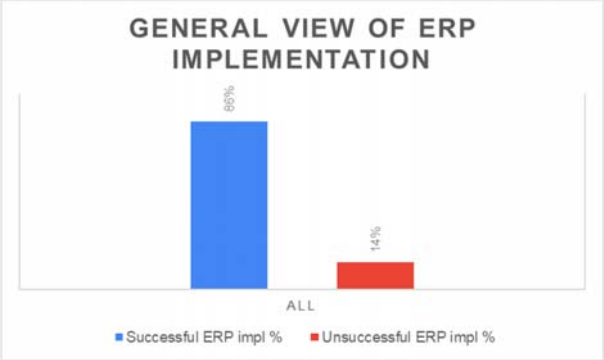

Figure 2: General success of ERP integration based on participants views

However, 14% have negative views on the success of the ERP integration. It can be clearly seen in Figure 3 from the HR and Supply Chain departments. Especially with the Supply chain department, 50% of the employees believed that the integration was not successful. This spotlights differences of views based on department attachments.

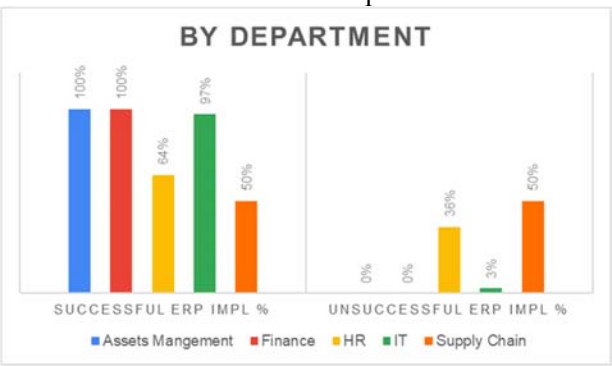

Figure 3: Success of ERP integration based on participants' views with consideration of their departmental attachments.

In general, in order to analyze the participants' views on the factors mentioned in Table 1, the mode answer has been taken into account for each question on each factor. Figure 4 illustrates the main results for all factors for all participants in general. Interesting results can be seen as 19 factors out of 28 obtained 4 or 5 as mode answer which is a positive/very positive impact on the ERP integration. Furthermore, Only 4 neutral answers are given to questions about the impact of factors namely CH3, CH5, CH7, and CH18.

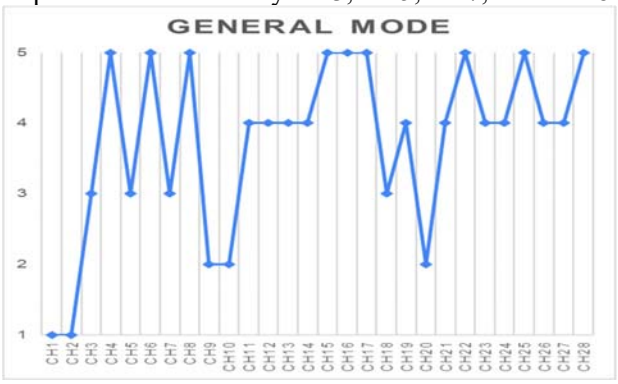

Figure 4: Mode answers of all participants' views on the factors.

On the other hand, factors CH1 and CH2 obtained a mode answer as very negative. This attracts attention to the project management factors as key factors that might cause project failure. Poor project management and formation of the project team in this case study seemed to have posed a threat to the success of the integration of ERP. In addition, CH9, CH10, and CH20 obtained a mode answer as negative. This indicates that in this case study the performance, empowerment, and key players have posed a threat to the success of the integration of ERP. However, they had less impact than poor project management and team formation.

II. Findings with Considerations to Departmental Attachments

In this section, the results will be analyzed in depth. This is to gain a deeper understanding of the results in line with the research questions. In particular, the results shown in Figure 5 illustrate the Mode answers of all participants' views on the categorized factors based on participants' departments. Four diagrams are compiled to highlight the differences in a convenient way.

As can be seen in Figure 5, the most notable difference which can be spotted in the figure is how the participants based on departments have an obviously different view of the project management factors (from CH1 to CH5). It can be seen from Figure 5 that participants from HR, Finance, and Supply Chain have either negative or neutral views on these

factors. However, HR participants have positive views for factors CH4 and CH5. On the other hand, participants from the IT and Assets Management departments have mostly positive views of project management factors (from CH1 to CH5).

With regards to HR factors (from CH6 to CH10), it can be seen from Figure 5 that participants from the Finance department have a considerable negative view of factor CH7 which is about the fear of losing the job. In addition, participants from the Supply Chain department have a negative view on factors CH9 and CH10 which are related to empowerment and personnel turnover. Despite the discussed indications, it seems that participants from other departments have positive or neutral views on the HR factors.

Regarding Organisational factors (from CH11 to CH23), it can be seen from Figure 5 that positive or neutral views are expressed by participants of HR, Finance, IT, and Assets Management departments. On the other hand, participants from the Supply Chain department have negative opinions on most of the Organisational factors. In addition, they expressed a very negative view on factors CH22 and CH23 which are regarding changing management and conflict management.

Considering Technical/technological factors (from CH24 to CH28), Figure 5 shows that positive or neutral views are expressed for almost all these factors. These views were from participants of all considered departments namely HR, Finance, Supply Chain, IT, and Assets Management departments. However, participants from the Supply Chain and Finance departments share the same negative views on factors CH27 and CH28 which are regarding the functionality and usability of ERP.

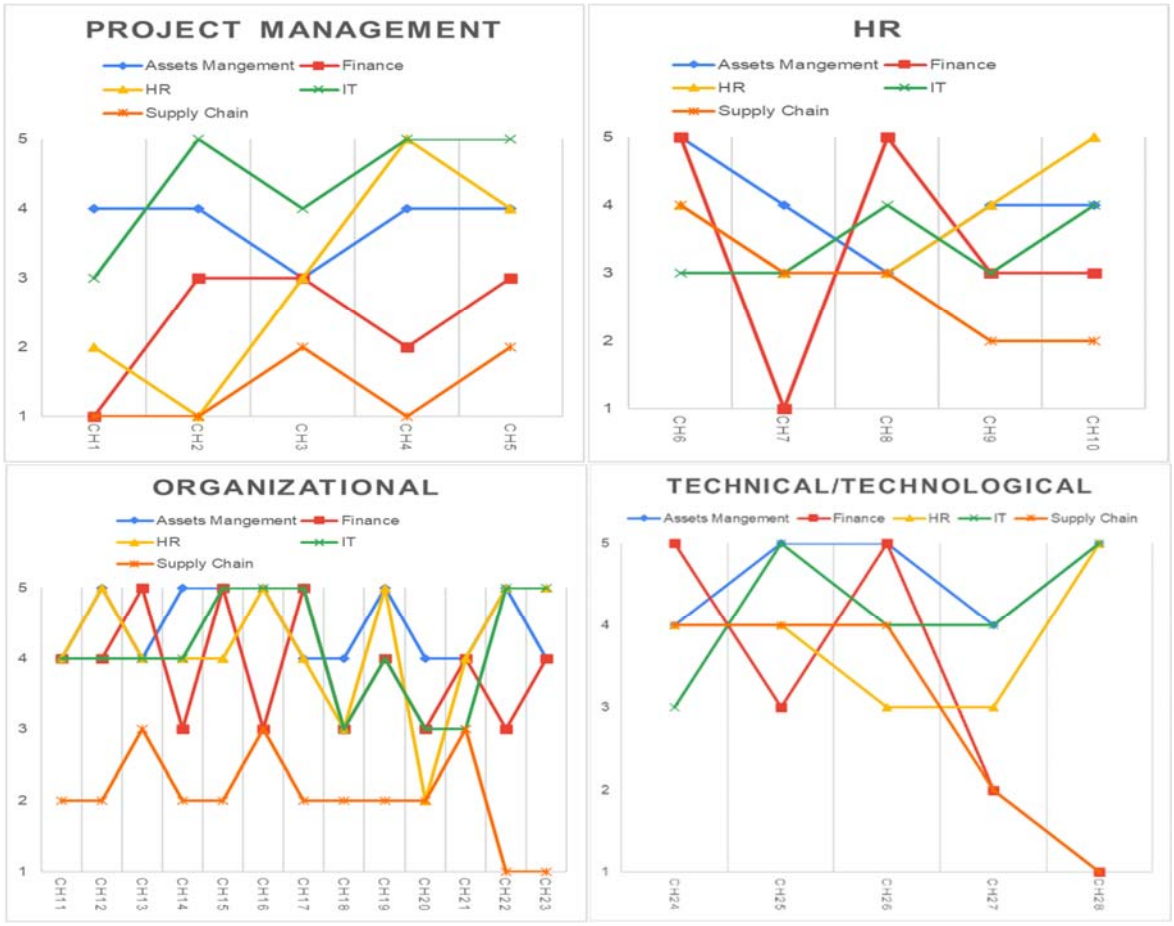

Figure 5: Mode answers of all participants' views on the categorized factors based on participants' departments.

III. Findings with Considerations to Participants' Experience

In this section, the results will be analyzed in depth. This is to gain a deeper understanding of the results in line with the research questions. In particular, the results are shown in Figure 6 to illustrate the Mode answers of all participants' views on the categorized factors based on participants' experience range. Four diagrams are compounded to allow the spotlighting of the differences in a convenient way.

Considering project management factors (from CH1 to CH5), Figure 6 shows that positive or neutral views are expressed for almost all factors from participants with 1-5 years of experience. However, participants with 6-10 years of experience seem to have an opposite view on the factors. In addition, with regards to factors namely CH4 and CH5, there is a clear diversity of opinion among participants depending on the category of experience to which they belong.

With regards to HR factors (CH6 to CH10), Figure 6 shows that participants with 1-5 years of experience continue to have the same positive or neutral views. On the other hand, participants with 11-15 years of experience seem to have negative views on the factors namely CH6, CH7, and CH8, however, they considered positive factors namely CH9 and CH10 which have been considered negatively by participants with 6-10 years of experience.

Moving to Organisational factors (from CH11 to CH23), Figure 6 shows that participants with 1-5 years of experience persist in having the same positive or neutral views. In addition, participants with more than 16 years of experience have almost positive views on all factors except factor CH20 which is regarding the performance risks. On the other hand, participants with 6-10 years of experience and participants with 11-15 years of experience seem to have an opposite view on the factors. However, participants with 11-15 years of experience seem to have some exceptions in their views as they indicated positivity to the factors CH12, CH15, and CH22.

Considering Technical/technological factors (from CH24 to CH28), Figure 6 shows participants with 1-5 years of experience continue to have the same positive views. On the other hand, participants with 6-20 years of experience have a mixture of views on the factors, however, they agree on a negative view on factor CH27 which is the functionality limitation. In addition, participants with over 20 years of experience have generally neutral views on Technical/technological factors, however, factor CH28, which is regarding the usability of ERP, was viewed negatively by them.

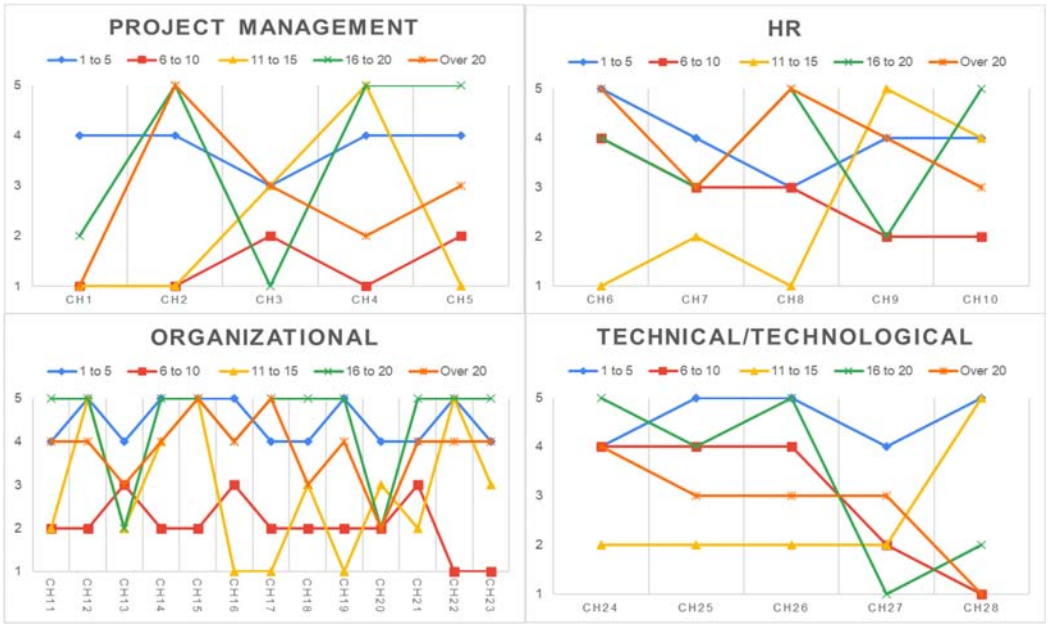

Figure 6: Mode answers of all participants' views on the categorized factors based on participants' experience range.

6. Conclusion

In this research, ERP integration has been focused on and studied. In particular, the research was on the factors that impact the success of ERP integration. This research aimed to investigate how individual based on departmental attachments and experiences have viewed the factors that affected the success of ERP integration.

From the previously discussed results, it can be clearly seen that how individual from different departments involved in the ERP integration viewed the factors affected the success of integration. In addition, it was noticed and discussed that individual involved with different experiences have various views on the factors.

The limitations of this study are that it was conducted on one case study. In order to gain a better understanding and reach a more general conclusion, the study should be applied to a number of case studies. In addition, although the number of participants was fairly acceptable, it might be more beneficial to have equality in the number of participants based on the involved departments. Finally, the sector of banks might be a suitable case study.

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