Avoiding the Most Common ERP Challenges with Agile Methodologies

Tareq Qawaf
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Abstract

Enterprise Resources Planning (ERP) systems benefits to organizations are well known around the world. However, ERP implementation projects are complex, expensive and risky. A recent report that was conducted in 2016 shows that these projects have a quite high failure rate and an average cost of several million dollars per project. Many ERP implementation projects are still executed using waterfall or similar methodologies. While the usage of waterfall methodology in IT projects is decreasing, agile methodologies usage is growing. Agile methodologies have solved many challenges that traditional methodologies like waterfall did not solve in IT projects. This paper aims to find if the current most common ERP implementation challenges can be mitigated or solved by applying agile methodologies or techniques. The study suggests agile solutions for the most common ERP implementation projects challenges. These solutions aim to improve the ERP product selection process, the requirements collection process and the communications process during the ERP implementation project.

Keywords: ERP systems, ERP Implementation challenges, agile methodologies, ERP implementation agile solutions

1. Introduction

Enterprise resource planning (ERP) systems are complex, expensive and powerful software systems that provide modules to support administrative areas in business management such as marketing, manufacturing, sales, finances, distribution, planning, human resource management, inventory management, project management and e-business. Because these systems are off-the-shelf solutions, they require consultants to tailor and implement them based on the company’s requirements and business needs (Liaquat, Jon, & Rashid, 2002).

Implementing this type of systems is a strategic and expensive decision to make for any company and despite that a lot of research have been conducted to fill the gap in the area of providing solutions for these challenges, the failure rate in ERP projects is still quite high as a very recent report shows. During the last 4 years the average cost of ERP implementations has been roughly $4.5 million with an average duration of 17.3 months. Of these projects, approximately 55% exceeded their planned budgets, and 66% percent experienced schedule overruns. Post implementation, 53% of organizations achieved less than 50% of the measurable benefits they anticipated from new ERP software (Panorama-Consulting.com, ERP Report 2016).

The reason behind the high number of failed ERP implementation projects is that this type of projects has been facing many challenges. A recent case-study showed that the issues and challenges can be categorized into six major themes reengineering (organization and infrastructures), top management commitment, funds, skilled manpower, implementation time and data fill-in (Nordin & Adegoke, 2015). Many of these issues could be a result of lack of agility in ERP implementation projects. A small online survey conducted in 2010 on 45 firms that had
experience in ERP implementation showed that 38% of the implementation project used a pure big bang strategy (Neal, 2010).

The implementation process in big bang implementation strategy consists of separated phases which should be performed strictly in order. This approach is quite similar to the waterfall approach to systems development since it does not provide the option of going back to a previous phase or stage. In addition to that, it is quite expensive to perform changes of an ERP system. In contrast agile methodologies consist of iterative and incremental phases that deliver smaller parts of functionality from a series of comparatively short development cycles (Fetouh, el Abbasy & Moawad, 2011).

The lack of agility in big part of the ERP implementation projects might be one of the reasons behind the high failure rate in these projects. A study by West (2011) showed that many IT projects use agile methodologies. Agile software development methods have shown themselves to address several of the challenges that traditional systems development projects have struggled with. About 39% of 1,023 IT professionals said that they follow an agile method West (2011). Because of the benefits agile methods are bringing to IT projects, their popularity is growing among IT professionals West (2011). Thus, increasing the usage of agile methodologies in ERP implementation projects has a high potential to smooth many of the current ERP challenges.

My research question is:
Can the common ERP implementation challenges be solved by increasing the usage of agile methodologies? and if so, how these challenges can be solved?

2. Background and Related Research

2.1 ERP Implementation Strategies

It is important to mention the most common implementation strategies as a background for this study. An ERP implementation strategy defines how the customer organization will be transitioned from the old system to the new ERP system. Each one of these strategies has totally different processes which should be considered when selecting the best fit strategy to an organization. Generally, similar industries may use same strategy to implement for different software. Most strategies are variants of five basic types: Big Bang, Phased, Parallel, Process Line and Hybrid (Khanna & Arneja 2012).

Big bang: This implementation strategy provides customers with a clear map of the implementation strategy with promises of cost reduction in case of careful planning and execution. The implementation of all the ordered ERP system modules are executed across all the organization at the same time and the go live date is fixed for all departments in the organization. On this date the legacy system is abandoned and all users starts to use the new system only. This approach was the most used one in early ERP implementations and was one of the reasons behind the high failure rate (Khanna et al., 2012). However, its popularity has dropped significantly from early implementation days and companies nowadays are struggling to decide if big bang is the best implementation strategy for them.

Modular Phased: This strategy aims to implement only modules in one functional area at a time in chronological order. Each business unit has their own “instance” of the ERP system and database and go live as soon as their ERP area is ready without waiting for the other departments.
After finish implementing the autonomous modules separately, an integration process starts to integrate all the implemented modules. (Khanna et al., 2012). Implementing each module separately reduces the complexity of the ERP implementation process which increase the chances of success. Although this strategy takes longer time than big bang, it is the dominant of the current market (Neal, 2010).

Parallel strategy: This strategy is similar to big bang approach except that the legacy system stays active after the go live date of the ERP system. Users have to work on both systems for amount of time that could vary from a few months to several years. Parallel strategy is useful for companies that cannot bear a breakdown in the ERP system. It also provides a number-to-number accurate comparisons between the legacy system and the new ERP system when performing the important business process flows (Khanna et al., 2012).

Process Line implementation strategy: This transition strategy divides the transition process by product lines or similar business flows. The go-live date is the same for different functional business areas across the organization. The transition process to the new ERP system starts with the first part of the organization, such as a product line. After the transition process of the first part including all the related functional areas to the new ERP system, the transition process starts for the next part. This strategy could be helpful for the most industrial companies (Khanna et al., 2012).

Hybrid strategy: Just like its name indicates, it is a combination of any implementation strategies. This strategy opens the chance of having a more tailored implementation process to each organization since organizations have very different needs (Khanna et al., 2012).

### 2.2 ERP Implementation Phases

ERP implementation phases have been defined differently by books and companies. For example, Oracle has made its own definition for these phases in its Oracle Unified Method (OUM). This implementation method defines the ERP implementation phases as the following (Oracle, 2012).

- **Inception:** This phase mainly focuses on project management, business requirements, requirements analysis and organizational change management. It includes discussing and verifying the business strategy plan and prioritizing the abstract business requirements of the project. In addition, it includes defining the structure of the project team, the project scope and the initial project plan.

- **Elaboration:** The aim of this phase is to divide the development process into parts, to develop a basic structure of the system and related prototypes in addition to documenting detailed client requirements. The output of this phase is the base of the next phase, the construction phase. Poor efforts in this phase will lead to high risks in the next phase.

- **Construction:** This phase should be done in planned iterations. It aims to develop all the requirements collected before including any customization, test the whole system as soon as the output of any part of the system has been developed completely and is ready to go live. Users should get a full training on the new ERP system. The final product of this phase is the tested system.

- **Transition:** In this phase the full solution will be installed on the production system and then the final user acceptance test is will be conducted. After the approval of the user acceptance test, the live application is launched and users are prepared to use it.
Production: It includes monitoring the new ERP system, evaluating the success of it and supporting the users.

However, these phases may only be applicable to Oracle ERP projects. Leon (2013) has defined the ERP implementation phases in a different way that may fit any ERP product.

- Pre-evaluation screening: After the customer company decides to have a new ERP system, it receives ERP solution offers from many vendors. Each solution vendor offers an ERP package and claim that it is the best fit for the customer company’s business processes. The customer has to select a few packages to analyse in next phase.

- Package evaluation: One of the most important phases of the ERP implementation because deciding on the wrong ERP package may result in failing the whole ERP project. Deep analysing including employees from different business departments and ERP consultants is required to make the right decision.

- Project planning phase: The implementation plan is developed in this phase including details such as time schedules and deadlines. It also includes Identifying roles, assigning responsibilities, selecting organizational resources that will be used and selecting the project team members.

- Gap analysis: This is the phase where the customer organization create a complete model of the current business processes and the goals it wants to reach after implementing the ERP system. Putting effort in this phase can highly reduce the failure risks.

- Reengineering: Identifies the needed changes in the customer company’s business processes structure to match the new ERP system business processes.

- Customization: ERP systems are off-shelve systems that are designed as one-fit-all systems. Obviously, these systems do not match every company’s practices and for this reason companies have to choose between changing their practices to match the ERP practices or alter the ERP system to match their practices. Altering the ERP system is called customization.

- Implementation team training: This phase aims to train qualified employees in the client company on how to implement and run the system after the vendor finish the project. Selecting employees with the right qualifications to take the training will make the company self-sufficient in operating the system.

- Testing: It is the phase where the system is developed and real scenarios cases are tested. The testing team on the vendor side and users from the client side try to break the system and test all its functionalities. This phase includes user acceptance test, unit test, security test, integration test and performance test.

- Going live: The new ERP system is fully tested and ready to go operational, data conversion is done and databases are up. Once the system is live, all users will move from the old system to the new one for doing business.

- End-user training: This phase starts before going live. In this phase the employees who are going to use the new system are identified and given training on how to use it.

- Post implementation: This is the final phase in the implementation project and it could as well be called operation and maintenance phase. In this phase the customer employees start to become self-dependent to run, operate and maintain the ERP systems.

These phases are used in the discussion part of the thesis to help place the challenges mentioned by respondents in the context of ERP implementation life cycle.
2.3 Agile Methodologies

Agile methodologies started to appear in 2001 when a group of process experts who were keen to develop a modern, simple iterative and incremental development methods and principles met. In that year they created the Agile Alliance and the phrase “agile methods” which includes all iterative and incremental development methods (Cockburn, 2002).

Since that year companies from different industries have adopted agile methods in their projects. Recently, a report that was conducted in 2015 by (www.softwareadvice.com) showed the popularity of agile methodologies across different industries. It found that 48% of the project managers who took the survey said that they use agile solutions for non IT projects. It is important to differentiate between industrial agile and software development agile concepts. Supply chain agility is defined as the amount of effective flexibility to adapt to a rapidly changing global competitive environment to provide products and services and its flexibility is based on four factors: new product development, sourcing, manufacturing, and delivery (Eshlaghy, Rajabzade, Nikoomaram & Zandhessami, 2009). While in Information Software Development (ISD) agility is defined by Conboy (2009, P340) as “[…] the continual readiness of an ISD method to rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived customer value (economy, quality, and simplicity), through its collective components and relationships with its environment”. In software development agile concepts, the customer is a very important part of the project. Every agile software project must have one customer representative at least (Whitaker, 2009).

One of the most common agile methodologies in IT projects is Scrum (West & Grant, 2010). Applying scrum only in a small to medium projects results in retrieving the most agility effectiveness (Rising & Janoff, 2000). Scrum is a simple agile development approach for developing innovative products and services. It starts with creating a list of the needed features on the product under development. These features are prioritized by the product owner. The development team starts working on the highest prioritized, the most important, feature. Each one of the features is developed in separate short iterations which usually varies from one week to four weeks. An iteration includes a cross-functional team working on all the required tasks such as designing, developing and testing to develop complete working features that are ready to go to production. After an iteration ends, the team conduct a meeting with the stakeholders to take their comments on the developed feature. The received comments should be taken care of before moving to the next iteration. The backlog list could be modified depending on what the product owner needs (Rubin, 2012). There are three main roles in this approach: The product owner, the scrum master and the scrum team. The product owner is required to achieve the maximum business value from the project and to represent the customer needs. The scrum master is the person who is responsible to make sure that all the project members are following the scrum practices and to provide a proper environment for the scrum team. The scrum team is the team which is responsible to develop the product owner’s requirements. Scrum approach can work the best in small projects (Rao, Naidu & Chakka, 2011) and it might have high potential to solve many challenges in small ERP implementation projects.

The second most popular agile methodology is the extreme programming methodology (Nathan-Regis & Balaji, 2012). This approach is based on 12 concepts: test driven development, pair programming, refactoring, simplicity, planning game, small releases, continuous integration,
continuous testing, collective code ownership, sustainable pace coding standards, on-site customer, story cards, prototype UI and UI navigation, stand-up meeting and iteration completeness (Stober, 2009). Some of these principles might be quite helpful to mitigate the delivery related challenges in ERP implementation projects.

While applying agile methodologies in IT projects it is important to make sure that the lean software development principles are understood to increase the project success chances. Understanding the principles of lean software development is behind the success of many of the practices of agile software development (Poppendieck, 2007). Thus, lean software development methodology has interesting practices that help in reducing the planning challenges in agile projects. These principles are to eliminate waste, focus on learning, build quality in, defer Commitment, deliver fast, respect people and optimize the whole (Stober, 2009).

2.4 Agile Methodologies and ERP

Applying agile principles to the way a software project is managed is an evolutionary step from high ceremony process and Wells & Williams (2003) discuss how to apply some agile principles to ERP implementation projects. They suggested the following principles as the base for managing ERP projects in an agile way:

- Assume simplicity: The best ERP solutions are the simplest, project managers should not overbuild any part of the system. Any software parts that are not a current need should be avoided.
- Embrace change: Project stakeholders should be prepared to deal with requirements changes and stakeholders replacements as it is a natural part of an ERP project.
- Enabling the next effort: The success of delivering an ERP project is not by only delivering a well running system, the delivered system should be solid enough to be extended over the time.
- Incremental change: Instead of trying to implement the whole requirements at once and deliver it at once, the development process should be in an incremental way. A small portion of the system should be delivered and then incremental changes should be applied to it until reaching the needed system.
- Maximize stakeholder value: Project stakeholders are investing their resources to build a system that fulfil their business needs and they expect the system to be implemented in the best way.
- Manage with a purpose: Managing an ERP implementation project should be driven by the stakeholder’s value. A purpose should be identified for creating each part of the system.
- Multiple project views: In order to have effective communication between stakeholders, participants and service provides, multiple format presentations should be done to increase the customer understanding of the complex implementation process of an ERP system.
- Rapid feedback: The time taken to receive feedback on a finished task should be minimized. Working closely to the system users helps minimizing the time taken to receive feedback.
- Working software is the primary goal: Activities that do not contribute directly to this goal should be investigated to find out its value.
- Travel light: The system maintaining effort should be balanced with its business value to the client.
2.5 Previous Research on ERP Implementation Challenges
A recent case-study conducted by Nordin et al. (2015) showed that current ERP implementation projects face six major challenges.

2.5.1 Reengineering
This process is a major challenge in implementing ERP systems. Implementing a new ERP system requires the customer company to restructure their business processes to match the ERP business processes standards. Customers tend to go with this option to avoid the costs of customizing the ERP system and the following future expenses of maintaining and upgrading it.

2.5.2 Top Management
ERP projects are more than just new software installation projects. They include changes in the organization and restructuring of the business processes. Top management involvement in each phase of the ERP project is a focal ERP implementation success factor. Their level of commitment and dedication in the implementation project has a major impact on the completion of the project.

2.5.3 Lack of Skilled Manpower
Lack of skilled staff in the customer organization who often have insufficient knowledge in ERP implementation projects is a major challenge in ERP implementation projects. In some cases, consultants are unable to train the customer employees because they do not have the willing or interest to learn how to work with the new system. In other cases, customer employees do not have the computer literacy or have computer phobia. These challenges are hidden costs that might fail the project.

2.5.4 Funds
ERP implementation projects are complex and expensive especially in their early phases and funding these projects is a major challenge. Customer top management expect to get advantages over their competitors from investing their money in implementing an ERP system or upgrading a current one. They usually have a hard time deciding whether it is feasible to invest more money in order to get the most recent features of the chosen ERP system. Since the most recent features are much more expensive than the standard ones, some argue that the earned advantages from the recent features are not worth the cost. Deciding how much funds that should be invested in the new ERP system is one of the challenges that top management face.

2.5.5 Implementation Time
The consumed time to complete an ERP implementation project is very critical. They are more expensive and need more time and effort when the modular phase implementation is followed, which is the case most of the times. Customization of these systems makes the project longer, the more customization that is needed the more time is needed. Thus, the project consumed time is focal a factor in the implementation success.

2.5.6 Data Fill-In
This challenge happens in the Go-Live phase of the implementation process. ERP implementation cannot succeed with incorrect or missing data. In order to have a successful implementation the data from legacy systems or other sources should be transferred carefully.
Matching previous challenges with the challenges the respondents of this thesis are facing helps estimating how common these challenges are around the world.

### 2.6 Information Technology Management Framework (ITMF)

The ITMF was developed in 2014 by Pollard and Geisler (2014) to allow organizations to capture information from IT projects that use different methodologies and then to frame this information in a common lifecycle structure. The data collection in this research is done by conducting interviews with people from different companies which obviously use different implementation methodologies. This framework is important to categorize the problems in different phases in different projects that are stated by the respondents in order to suggest agile solutions. This framework has defined the IT project lifecycle in five stages:

1. The request stage: The goal of this stage is to define the business goals from implementing the new system and the expected benefits from it. It also includes the customer approval by signing the contract to start the project.

2. The define stage: This stage’s goal is to specify the customer requirements in detail and develop a clear project plan to implement these requirements. The output of this stage is a common agreed position between business stakeholders and delivery areas such as requirements documents and software prototypes.

3. The build stage: The aim of this stage is to execute the agreed common goals in earlier stages. It also includes developing the agreed deliverables and to procure the hardware requirements to run the system. This stage is similar to the construction phase in the Oracle Unified Method.

4. The deploy stage: In this stage users start to see a real version of the new system. Users test the new system functionality and send their comments to modify the system before going live. It is similar to the testing phase in the ERP lifecycle of Leon (2013).

5. The run stage: It is the final stage where the project team starts the transition process of the completed parts of the new system and make it go live. It also includes the new system support service for users after going live.

ERP implementation projects can never be identical to another. Each ERP implementation project lifecycle has a unique combination of phases structure, order and details (Leon, 2013). Since the aim of this research is to find agile solutions to the challenges collected from interviewing consultants from different companies, these challenges will be described based on different ERP implementation lifecycles. It is important to present these challenges in a unified framework in the analysis and discussion section in order to make it easier to find one solution for similar challenges and avoid repetition in the study results. I will use the ITMF framework as the unified framework of the presentation of the challenges stated by the respondents.
3. Method

3.1 Choice of Method

There are many ways that qualitative research differs from quantitative research data analysis (Chambliss, 2012). This research aims to find possible agile solutions to the most common ERP implementation problems by collecting in-depth information from ERP consultants and related literature about ERP implementation projects. Since qualitative research methods focal point is to reach in-depth knowledge (Patton, 2002), the qualitative research method has been chosen in this research. The method in this research is to collect the needed data from related case studies, recent statistical reports, academic articles and books, in addition to collecting information from experienced ERP consultants. Collecting the data from ERP consultants is done by conducting semi-structured interviews with them to find out how they do the implementation process in their company, what phases in the ERP project do they go through and what problems do they face the most in this type of projects. Then these interviews were analyzed with the qualitative content analysis method and then the ITMF (Information Technology Management Framework) was used to categorize the challenges mentioned by the respondents. Many of them matches the challenges mentioned in the previous research section. By using the in-depth information collected from respondents and related literature, this research will extract the most common ERP implementation challenges and then suggest agile solutions (based on agile principles) for some of the extracted challenges. Conducting the interviews in a semi-structured way opened the possibility to ask questions about new aspects mentioned by the respondents and reach valuable in-depth information that will enrich the contribution of this study.

3.2 Semi-Structured Interviews

Interviewing in quantitative research is different from interviewing in qualitative research in many ways (Bryman, 2012). Qualitative interviews are more flexible and dynamic than the structured interviews in quantitative research. Qualitative interviews are, in other words, non-standardized, non-directive and open ended interviews (Taylor, 2015). Qualitative semi-structured interviews have characteristics from both the structured and unstructured interview types. It consists of pre-defined set of questions that is used in the same order to drive the interview in loose lines. Additional questions can always be asked in order to collect data about new issues mentioned by the respondent (Cachia & Millward, 2011). Semi-structured interviews helped me exploring additional needed information about new ideas, approaches and methodologies related to ERP implementation mentioned by the respondents. It helped avoiding missing valuable information by sticking to pre-structured interviews.

3.3 Data Collection

The respondents were chosen based on several criteria. The first one was having respondents from different geographical locations. I chose to interview ERP implementation consultants from different countries to get a wider image of how ERP projects are implemented and how common the challenges mentioned by the respondents are. The second criterion was the respondent’s work position. IT consultants in different positions provide data from different viewpoints as each person tend to see the challenges and implementation process from a different perspective. This
criterion assured that more details about the implementation process was gathered. The third criterion was that respondents must have experience with ERP implementation and preferably with agile methodologies. Based on these criteria that helped to set more valuable data samples, I searched for respondents to interview. The search process for suitable respondents started with the connections I know including my thesis supervisor, ex-colleagues, friends and classmates. But my connections were not enough to find all the respondents I needed. Thus, I searched through business social networks to find more suitable respondents. In the end I succeeded to conduct interviews with six ERP consultants from three different positions and two different countries as demonstrated in the following table. ERP implementation projects are similar around the world but the data were gathered from two different countries to make sure that the challenges mentioned are not happen only in one country. The duration of each interview was approximately one hour.

<table>
<thead>
<tr>
<th>Work Position</th>
<th>Respondent 1</th>
<th>Respondent 2</th>
<th>Respondent 3</th>
<th>Respondent 4</th>
<th>Respondent 5</th>
<th>Respondent 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Country</td>
<td>Sweden</td>
<td>Sweden</td>
<td>Sweden</td>
<td>Saudi Arabia</td>
<td>Saudi Arabia</td>
<td>Saudi Arabia</td>
</tr>
<tr>
<td>ERP Project Manager PM1</td>
<td>ERP Functional Consultant F2</td>
<td>ERP Technical Consultant T2</td>
<td>ERP Project Manager PM2</td>
<td>ERP Functional Consultant F1</td>
<td>ERP Technical Consultant T1</td>
<td></td>
</tr>
</tbody>
</table>

### 3.4 Data Analysis

The data analysis process started with transcribing the recorded interviews. All of the interviews were conducted via Skype or mobile phone calls. The interviews were transcribed into summarized texts to analyse them with the qualitative content analysis method. The transcripts of phone interviews provide a rich source of data for different qualitative analysis methods (Cachia et al., 2011). Next I read through the transcripts then categorised the related content information based on paragraph unit analysis. Qualitative content analysis generally uses individual themes that might be expressed in a single word, a phrase, a sentence, a paragraph, or an entire document (Minichiello, Aroni, Timewell & Alexander, 1990). The nature of my interview questions and the summarized answers transcripts resulted in paragraphs each containing one main idea. Thus, expressing the themes of my data with qualitative content analysis gave a good result.

Qualitative content analysis helps to improve the understanding of collected data and provides the ability to examine theoretical issues. This analysis method categorises similar meaning words and phrases mentioned in the data in content related categories (Elo & Kyngäs, 2008). Minor and major theme codes of the interviews transcripts were generated through the process of applying this analysis method. These theme codes helped me to structure the interview results section and to place similar content information from the collected interview transcripts in the ITMF framework to present the research results.
3.5 Ethical Consideration and Limitations

Each one of the respondents was informed that their interview will be recorded prior and in the beginning of the interview. Every one also was informed that the recording will be used in the purposes of this research only and that personal information will not be mentioned. Anonymity was highly considered to protect all respondents. They all agreed to participate voluntarily in this research and I agreed to mention only their work position and the country they work in.

This research is based on interviews to collect the empirical data. There is a chance that interviewees may have avoiding answers some questions for privacy reasons or because the needed information is sensitive for the company. Such as sensitive information about the company’s strategy to deal with specific situations. Also, some respondent had to speak in a language that is not their native language. All of these issues might lead to inaccurate results due to lack of some details in the interviews data.

All the respondents have experience only in implementing Oracle ERP system (Oracle E-Business Suite). Thus, the suggested agile solutions may not have the same potential to solve the current common challenges in implementing other ERP products. Another limitation of this research is that the suggested solutions needs to be tried in real Oracle ERP implementation projects to judge their impact on the implementation experience for both the vendor and the client.

The challenges extracted in this study are collected from interviewing six experienced ERP consultants. Although a considerable effort was put into choosing the respondents carefully from various work positions and various countries to get the best results, different results might appear from interviewing more consultants.

4. Interview Results

In this section I am only presenting the empirical data while an analysis and discussion of this data is presented in the next section, Analysis and Discussion. During analysing the interviews with the qualitative content analysis method, theme codes were generated. Based on the main themes of these codes the interview results are categorized as following: challenges, possible solutions and agile practices.

4.1 Challenges

4.1.1 Project Related Challenges

Technical issues were mentioned as a common challenge by three respondents PM1, F2 and T1 who works in three different positions and in different countries. This means that the problem is quite common. Technical issues include bugs in new features, bugs in the system custom extensions, client’s network issues and client’s poor hardware specifications.

*Product challenges: Such as bugs in the new system, environmental issues that requires setting up new environment, issues in customer’s systems, network and firewalls. Some of the system bugs need two weeks to be solved and this makes the project lose two weeks of its time.* (PM1)
Technical issues (new technologies): Poor technical infrastructure at the client’s work place. Network failure. (F2)

Technical failure issues and access permission delay. These issues happen from of the implementer or the customer side. (T1)

Similarly, several client-vendor communications related issues have been mentioned by people from three different positions and two different countries. These challenges include the gap between the client’s and the vendor’s requirements understanding, the language or different dialects misunderstanding and the gap between each side’s expectations of the ERP implementation project.

Different expectations: Customer and the vendor team have different expectations of the project. (PM1)

Communications with the client: Different dialects can cause misunderstanding of the requirements. (T1)

Poor or always changing requirements because the customer misunderstands the agreed requirements. For the customer the requirements are quite obvious how it works but they don’t have enough details. (F2)

Most of ERP projects fail because of customers’ wrong ERP selection in the package evaluation phase that was defined by Leon (2013).

Pre implementation: 60 to 70% of the implementation failure happens because the ERP selection was not the best for the customer company. (PM2)

4.1.2 Client Related Challenges

People resist change of the routines they are used to. Unmotivated stakeholders can slow down the implementation process. Furthermore, they might aim to fail the implementation project by stay working in the way they used to on the legacy system. For example, users might take long time to give their requirements or their feedback on the deliverables during the project.

Resistance to change: Customer team resist adapting to the new system. (PM2)

The organizations that used to do their business processes partially on IT systems, or completely without IT systems face many difficulties to collect their data in one soft form file or database. Customers who are implementing an ERP system for the first time in their organizations usually store their data in different forms. For example, they might use Excel sheets or papers to store the inventory data and a small software to store the financial data. Furthermore, in many cases according to PM2 the data they have are unsynchronized or not completely correct.

Data availability: In many cases the data is not available, not completely correct or stored in different forms (excel sheets, papers and legacy system) and not synchronized. (PM2)
Sometimes customers do not understand that ERP systems are off-shelf software systems that are designed to be altered to fit each organization and not to be heavily customized to fit all the small business processes of each organization. Also, customers with little or no experience with ERP systems expect the new ERP system to run the business cycles exactly the same as the legacy system ran them. As these issues are mentioned by two technical consultants (T1 and T2) who work in different countries and companies we know that matching these expectations requires huge technical customization work. Heavy customized ERP systems needs longer time and cost too much to develop and maintain (Nordin et al., 2015). T2 make it clear that the more customization work is done the harder it is for the customer to do upgrades and patches to the new system.

*The end-user expects that the new ERP should work exactly as the old one. If you are implementing a standard system you should be careful on how you are customizing it, you need to be able to follow the life cycle of upgrades and patched in an easy way. (T2)*

*Users expect that all of their requirements are doable, which is not true, and should be delivered on-time. They might also refuse to sign on accepting the outputs in the closing phase because they changed their mind about their requirements despite that they signed on the requirements they asked for. (T1)*

Customers cannot guarantee that the same key users are going to be available during the project duration. Changing a key user might lead to communication problems, long discussions and conflicts between the client and the implementation teams if the new key user asks to change pre-agreed requirements. This problem is common in many ERP projects according to PM1 and F1.

*Dealing with different key users: For example, despite that the vendor makes the customer key stakeholders sign on the agreed expectations in the reengineering phase, the customer delegates different users to test and approve the deliverables in the testing phase. The new users have different expectations so they disapprove to receive it. (This problem happens only in long projects- longer than 6 months). Some examples of this problem is when key users change their job get pregnant or go on Parental leave, then the vendor has to deal with new people. (PM1)*

*Communication with the customer: Sometimes the key user who provided the requirements go on a leave or get changed and the new authorized person refuse to approve the developed solution because they have different requirements. Department is managed by more than one manager which means there are more than one key user. (F1)*

It is well known that the bigger the implementation scope and the customer’s company size is, the harder and more complex the ERP implementation projects are. F1 specified one of these complex issues which is having many key users to take requirements from. This issue is more complex when key users’ requirements are not compatible.
The size of the client company affects the speed of the implementation process and the way the requirements are collected (not the strategy), the bigger the size the more time needed. Big companies have many key users to deal with. Sometimes it leads to incompatible requirements. (F1)

The lack of customer’s top management support of the project can create implementation challenges such as delegating the wrong person to give the customer requirements as F2 said. Another problem with lack of customer’s top management support is the lack of users’ collaboration. These problems are dangerous and can lead to drop the whole implementation process as F1 has experienced.

Collecting the requirements from unauthorized users. Building the system on wrong requirements leads in some cases to drop the whole current implementation process and start a new one. (F1)

Users in the client company are usually busy doing their job and do not have enough time to collaborate. (F2)

4.1.3 Vendor Related Challenges
Three ERP implementation consultants T1, T2 and F1 stated that they experienced internal communication issues between their company’s different teams and that it is a common ERP implementation challenge. One of these issues is that developers are not aware of the project plans or scope which leads them to generate deliverables that do not fill the business needs behind them. Another issue is that different teams in the vendor company do not update each other about their progress. For example, team B start working on a task Z that is dependent on task Y from team A. Team B suppose that the task Y is completed by team A which is not true. This issue happens sometimes because of the lack of communication between vendor’s different teams, as explained by F1.

Developers are not involved in the initial and planning meetings. As a result, they work without having general knowledge about the project plan or scope. (T2)

There is an issue in communication between different teams inside the vendor company, the work is not synchronized sometimes. For example, a consultant may start with a task that requires another task from another consultant to be done. Then they find out that the needed task is not finished yet. (F1)

Communication within the teams: conflict on how many days a task should take. (T1)

Assigning resources with the right experience to a project is very important to increase the project’s success chances. Many projects experience problems because of a not enough experienced project manager as T1 explained. Moreover, it is not always an easy task to find qualified people within the project budget, especially in small vendor companies according to F2.

Finding skilled consultants. (F2)
In many projects the project manager performance is a big issue. (T1)

4.2 Possible Solutions to the Most Common ERP Implementation Challenges

Having the support of the client's top management can solve users’ resistance to change. It will encourage users to put more efforts to make the project succeed.

*Resistance to change:* Increase the main stakeholders’ engagement in the project by make them do frequent meeting with the users to encourage them to do more efforts towards the new project. They have to explain the goals of and the benefits from the new project. (PM2)

Early check on the data correctness level and availability in soft form can prevent losing time in the end of the projects.

*Data availability:* This issue should be discussed in the start phase of the project not in the end, data cleansing should be performed early as well. (PM2)

Many project challenges can be mitigated by having teams from both customer and vendor sides working as one team. More meetings with the client can help enhance the vendor team’s understanding of the customer’s requirements and therefore develop better deliverables.

*Project challenges:* Good collaboration with the customer and common trust in each other. If the project specifications and the project timeline were developed together, in other words if we run the project as one, then we will have as little project related issues as possible. The customer should be involved in all the project steps. (PM1)

More meetings should be conducted between the management and the client to understand the requirements better. (F2)

Selling less on the edge ERP services or features can help increasing the chances of finishing the project on time and on budget. Implementing new released ERP features is much riskier to the project than implementing older features. It makes the project longer since it is not widely spread and have more system bugs which take long time to solve according to PM1.

*Product issues:* If the sales team promised the customer features that are available these challenges will be decreased. Promising on the edge new features raise the possibility of having these challenges. (PM1)

Illustrating to the client why it is always better to stick to the standard solution as much as possible and that it is better to change some of their business practices.

*Make sure that it’s clear to the client that things will change and explain why it’s better to keep a standard system as standard as possible.* (T2)
All the vendor’s project members should be aware of the project’s plan and its updates as soon as possible, so they can produce better deliverables.

*Involve everybody as early as possible in the project planning.* (T2)

Assigning a qualified project manager with good skills can solve the vendor internal communication issues. Furthermore, a good project manager can solve most of the problems mentioned by F2 such as unavailable users and always changing requirements.

*Having a good project manager could solve the internal communication issues.* (F1)

*Good project manager can be a solution for most of the problems. They follow up with the project and have regular meetings that involve the consultants who can figure out that the requirements are not detailed enough. In addition to make sure that qualified consultants are in the project.* (F2)

Clients can dedicate some users to work only with the ERP project or give their users bonus for showing extra efforts towards making the ERP project succeed.

*Having dedicated key users to elaborate in the implementation process.* (F1)

*The client should give users bonus for helping in making the implementation succeed.* (F1)

The vendor company should provide a friendly work environment for its team and make sure that their employees are satisfied and are achieving their career goals. This environment will push the vendor employees to put all their effort to make the implementation project succeed.

*Build friendly environment between the team members and fulfil their career requirements such as getting a training course on a new technology, getting a promotion or getting a salary increase. This will guarantee that the team members will do their best to make the project succeed. In addition to try to satisfy the customer as much as possible.* (T1)

It is strongly recommended by PM2 that the customer should perform a proper pre-implementation phase. This phase can significantly increase the ERP implementation project success chances. It should be done with ERP implementation consultants or a third party that have deep similar experience. Scorecards and MoSCoW should be developed in order to select the best fit ERP product.

*Pre implementation: This phase started to emerge recently and it might be conducted in a separate project. The customer business requirements are defined to the smallest detail with the help of expert people in ERP implementation. A scorecard is calculated for each ERP product based on how it fits the organization’s business requirements including the current and future requirements. These requirements are listed in a MoSCoW (Must have, Should have, Could have, and Would like but
won’t get) list. Current recommendation is that the customer hire a third party company, which should have a solid experience in the customer’s industry business processes and ERP systems, to help them specify these requirements. This third party should not be a vendor to ensure that the recommendations will be neutral. It might be business process re-engineering or business process optimization service provider. More points are given to the most important modules for the customer business. Based on the scores of each ERP product the selection should be done. Next step is to choose the best implemen
ter for the selected ERP product. This phase is not common in this area (Arabian Gulf countries and Jordan). The traditional way of choosing vendor based on how much the client feels comfortable with a vendor. (PM2)

A weekly project progress report should be developed by project managers and discussed in weekly meetings between the key project stakeholders. The aim of these meetings is to keep key stakeholders updated with current project progress and evaluate risks and the plans to reduce their impact.

Weekly status progress report meetings are conducted horizontally between the customer teams and the vendor teams of each functional area including the project managers, the customer’s business champions and vendor’s team leaders. The aim of each meeting is to report the current issues and risks and their mitigation, in addition to review the project progress. A plan for the next week is developed in the end of each meeting. The discussion in these meetings should be objective, not subjective. (PM2)

Steering meetings are very important to keep the top management updated with the project status regarding the budget, schedule and scope.

Steering meetings is the second part of the communication plan. It is very important since it reports if the project is still intact on budget, schedule and scope. The project steering committee should always be updated with steering reports. It should be conducted weekly or monthly depending on the project progress. If the project progress is on track it is conducted monthly, otherwise is conducted more frequently. In case the project is a top priority for the customer, the report might be conducted biweekly. It is important that the customer’s top management shows high interests in making the ERP project a success so all the users follow them in these interests, otherwise the users will see the project as a not so important project. Considering the agile concepts, it is important to get the customer’s top management high interest and full support in the project. (PM2)

4.3 Agile practices

As PM2 stated, the big bang implementation approach is risky. He is currently performing a new agile like approach, which start with implementing only the core modules. The rest of the modules are implemented in iterations after verifying that the core modules are running stably.
Usually Big bang approach is used although it is risky since the dependency between core modules and advanced modules is very high. But the new recommended way is to go live with core modules first. After verifying that the new modules are running sustainably, additional modules will be released. Minimizing the parallel systems run is a goal, it might fail the implementation. Users have to work on two different systems in the same time to enter the same data. This causes the users to make data entry mistakes which lead to errors in the new system. To avoid the need to run in parallel a simulation test is run before going live. This test runs on a sample of data from a specific old period for example where the numbers should match the legacy system numbers in that period. (PM2)

The prototype concept is to develop the customer requirements in iterations. The first iteration includes developing only the core business requirements and receiving the customer feedback on the first deliverable. After applying the customer’s comments and the customer approval on the first output, next iteration starts. This practice is experienced by both Pm2 and F1.

Prototype (construction and validation): The first output of this phase is the first CRP. This CRP is a prototype that covers 80 to 85% of the customer’s business requirements. The next output is the gap list between this prototype and the rest of the customer’s business needs. An analysis process is conducted on the gap list, then set of resolutions are taken. One example of these resolutions is to change one of the business processes to fit the ERP system or deciding to customize the ERP system. After an analysis document is developed, the development team start the development process in iterative patches according to the analysis document considering the priority and dependency of different features. Next is internal technical and functional testing then demonstrating deliverables to the customer. (PM2)

The construction phase starts with implementing the standard requirements only to show the users a prototype of how their requirements would be on the system (like example of how they will buy a product on the system), which is called CRP1. In case the client had comments on the solution and they want to modify it, CRP2 phase starts. The vendor starts modifying the presented solution according to the client’s comments to CRP1. The vendor keeps modifying the solution and doing CRPs until the client approve the presented solution (if there was more than 2 CRPs then there is something wrong - either the requirements are not collected well or the client is not providing their full requirements) in this case a meeting (including the project manager) is conducted to find out what is wrong (the scope, the requirements) ... because it’s not possible to keep doing CRPs. Usually projects go through only 2 CRPs. When the client approves the presented solution in the last CRP, the consultants start receiving requests from users to develop reports and custom extensions. In UAT (User Acceptance Test) and training phases the required reports start to be delivered. (F1)
5. Analysis and Discussion

This section includes the analysis and the discussion of the results framed in the ITMF framework. It also includes suggested agile solutions for the extracted challenges found in this study.

5.1 The request stage

This phase includes selecting the most suitable ERP product for the customer industry to implement and the needed scope. It was explained in detail only by PM2 who suggested a new strategy to do this phase and stated clearly that 60 to 70% of the ERP projects fail because of wrong or inadequate ERP selection which means that ERP selection is a common challenge. Wrong package selection has a major impact on the ERP project as it could result in wasting time, increasing cost and escalating risk. In the end it might lead to total project failure (Haddara, 2014). The method PM2 suggested to select the best fit ERP product is by analysing the ERP implementation offers that the customer company receives from vendors. This method can significantly decrease the risk of selecting the wrong ERP product, since this analysis is based on the work of experienced consultants. Inadequate ERP selection is a focal risk factor (Haddara, 2014). PM2 mentioned the MoSCoW method to categorize the customer’s business requirements into four categories (Must have, Should have, Could have, and Would like but won’t get). A scorecard should be calculated for each ERP product. Based on the MoSCoW requirements list the scorecards will be calculated. This solution achieves all the goals of the request stage which are defining the business goals and the expected benefits from the new system and customer selection of an ERP product and signing its contract. The MoSCoW list and the scorecard method can define the business goals and the benefits from the chosen product since they help prioritise the company’s business requirements. The customer final selection decision is the output of this method.

The customer inadequate ERP product selection challenge mentioned by PM2 can significantly raise the risk of failing the ERP project (Haddara, 2014). The suggested solution by PM2 has high potential of mitigating this risk since it is based on consulting expert people to choose the best fit ERP which will remove the source issue of the inadequate selection. However, it is not possible to do full analysis for all the offers the customer receives. Customers who decide to implement an ERP system in their organization receive huge number of offers from vendors who claim that they have the best fit solution (Leon, 2013). With the help of one of the agile principles: “Simplicity -- the art of maximizing the amount of work not done-- is essential.” (agilealliance.org) it is possible to avoid many full analyses of offers by doing a very basic analysis to eliminate the offers that does not include all of the must-have requirements list and many of the should-have requirements list from the MoSCoW list in one iteration. The output of this stage will be a short list of the most suitable offers. The second iteration will include full analysis of each offer on the list and its result is the best fit ERP product. This solution needs additional time to be performed before the implementation project starts, but it will save the time taken in the next stage to collect requirements and will significantly decrease the project failure risk.

Another common challenge was mentioned by F2 and T1 which is the challenge of finding skilled people. The reason behind this challenge might be the project budget as F2 mentioned that his company size is not big which means that its budget is limited. T1 said that having a low
qualifications project manager is a problem. This might be related to the country his company is working in since Saudi Arabia is a very restricted country and not preferable to work in for many people. This issue occur in the request stage since a signed contract is the output of this stage and as F1 explained that the project resources are listed in the contract.

A solution of this issue could be using one of the lean software development practices, which is focus on learning during the implementation process (Stober, 2009). By focusing on learning the vendor organization will build its own experienced consultants and fill the skilled consultants shortage. Developing the knowledge and experience of the vendor’s staff can fill skilled consultants shortage. It could be done by enrolling the vendor’s staff in professional courses of the latest technologies to keep them aware of the new technologies, and allow them to apply what they learned from the courses in ERP implementation projects. In addition, conduct meetings after each project to conclude the earned experience.

5.2 The define stage
Ti1 mentioned that there is a common challenge of misunderstanding the customer requirements because of different language dialects. However, a study conducted by Zare Ravasan & Mansouri (2016) shows that the language barrier is not a significant failure factor. Two other challenges were mentioned by F1 about difficulties with collecting requirements. The first one is having many key users who have incompatible requirement which occurs more often in big companies. The second is collecting requirements from unauthorized users. These challenges happen in the define stage since it includes collecting requirements, which is part of this phase according to ITMF. Building the system on wrong requirements might lead to drop the whole development process and start it again F1. Thus, it is important to mitigate these problems to avoid developing unwanted deliveries, losing time and creating additional costs.

All of these challenges will have less impact on the project if the client develop their requirements list in the request stage supported by experienced consultants and the collaboration of authorized users. As a result, the vendor will probably receive much less requirements from customer during the project and face less requirements changes. It is important to spend time on developing customer requirements with experienced consultants and authorized users to avoid these challenges in order to make the project environment a better environment to apply agile methods. Having these client-communication challenges will still make the project less able to apply agile methods since agile methods require a high level of customer involvement in the project (Hoda, Noble & Marshall, 2011).

Another challenge is the resistance to change that was mentioned by PM2 which is similar to the implementation issue that F2 mentioned. F2 explained that users usually are busy doing their jobs and do not have the time to collaborate. This challenge happens partially in this stage when users are unwilling to collaborate in giving their requirements clearly or in reasonable time. These challenges can limit the benefits of applying agile methods since these methods require high level customer collaboration (Hoda et al., 2011). Furthermore, these challenges might lead to always changing the requirements by the customer which is a challenge experienced by F2.

Based on the “Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.” (agilealliance.org) agile principle, the top management of the customer should motivate their employees by showing them the benefits and
the importance of the new system, and giving them bonus on their efforts to make the project succeed as F1 suggested. The top management of the vendor also should provide its employees a friendly work environment and fulfill their career goals as T1 suggested. These two changes will push both teams to work as one team and increase the communication between them to make the project succeed. Having good communication between the project members is required to apply any agile solution. PM1 mentioned that if the customer key users worked with the implementation team as one team, the project will face as little issues as possible.

T2 stated that in many projects the top management do not inform the project developers about the project plan and scope which leads to developing deliverables that do not match the customer business needs. This communication challenge is related to the define phase since it includes planning the project.

The 9th principle of agile principles is “Continuous attention to technical excellence and good design enhances agility.” (agilealliance.org). Keeping the project members aware of the latest project plan enhance their understanding of the customer business needs. As a result, higher quality deliverables will be developed and this will enhance project agility according to the 9th principle.

5.3 The build stage

PM1, F2 and T1 mentioned that technical failure is a common ERP implementation challenge. The study conducted by Zare Ravasan et al. (2016) confirms that technical failure is a strong failure factor in ERP implementation projects. These challenges include issues like bugs in the new system, network failure and poor client hardware infrastructure. These are serious challenges that might fail the ERP project. They occur mostly during the development process which is part of the build stage in the ITMF.

T1 mentioned that it is not possible to know all the reasons behind technical failure, they just happen. Thus, it is difficult to solve this challenge with agile techniques or methodologies.

Another challenge that belong to this stage is the vendor internal communication issue. F1 and T1 stated clearly that there is a common issue in the communication between vendor consultants who work in different teams during the development process. The lack of vendor internal communication makes applying agile methods not so useful, as agile methods require teams to be self-organizing (Hoda et al., 2011). This challenge happens during this stage since the whole development process is part of this stage according to ITMF.

This issue can be solved in small to medium projects by applying scrum methodology. In their paper Rising et al. (2000) said that applying scrum only in a small to medium projects results in retrieving the most agility effectiveness. Scrum includes daily meetings between the development team. In the ERP case involving the functional consultants will synchronize the work between the implementation team members. In big projects these daily meetings could be conducted between the project manager and the team leaders. The team leaders will inform each of their team members of the updates related to their tasks.

To avoid the customer - vendor communication challenge that happen in the deploy stage some changes should be done in the development process. Based on the agile principle “Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.” (agilealliance.org), the system should be implemented in a prototype approach as suggested by
Only the customer requirements needed to implement the core modules should be implemented in the first iterations. This solution is similar to scrum concepts but more designed for off shelf systems. “The focus of scrum is not on perfecting the precision of planning, but rather maximizing the ability to adjust planning and respond to change. The focus of the involved parties is on negotiating only the high-level requirements and major usage scenarios upfront. While a number of key use cases will be committed to the stakeholders, there needs to be some flexibility to allow new or additional use cases to be added and others to be removed.” (Stober, 2009 P.47).

Since ERP systems are off shelf systems there are core information that are needed to implement specific modules in all ERP implementation projects. For instance, the bank account numbers of the customer organization are core information to implement financial modules. After implementing the core modules, the vendor team shows the deliverables to the customer, take their feedback and continue working on them if needed. Then show it again until the customer is satisfied. PM2 said that it is important to show the customer how the system will be, so they have better vision of how their requirements will look in the new system. By showing the first prototype, the client start reviewing their requirements once more and have the chance to modify their non-core requirements before implementing them. The next step is to implement the non-core requirements in scrum iterations since all the technical work and the system customization will be from the non-core requirements. This solution improves the customer involvement in the project and hopefully enhance their satisfaction with the implementation process. Thus, it has high potential to solve the customer - vendor unmatched expectations of the system. It will also provide the customer with more time to do changes to the non-core requirements in case one of the key users is replaced as in one of the challenges PM1 mentioned. As a result, the key user changing challenge will be mitigated.

5.4 The deploy stage

One of the challenges PM1 mentioned partially happens in the deploy stage. In this stage bugs in the new system could be found during the client test of the deliverables. He stated clearly that fixing one bug might delay the project delivery two weeks.

During the test and verification process of this stage many common issues mentioned by the respondents occur. Most of the respondents stated that they face a communication challenge with the client but in different ways. PM1 stated the issue that during the user acceptance test (UAT) customer and vendor may find that they have different expectations from the implementation of the new system. He said that the reason of this issue is that different teams from both vendor and customer sides are doing the project phases, and these teams do not have the same expectations. F1, T1 and T2 also mentioned similar challenges. T1 said that users might refuse to accept the deliverables of this stage because they changed their mind about their requirements. This challenge can be solved by agile methodologies since one of the 12 agile principles is “Welcome changing requirements, even late in development. Agile processes harness change for the customer’s competitive advantage.” (agilealliance.org). T2 said that user expects to have a system that exactly match the legacy system or exactly match all the requested requirements. Both T1 and T2 agreed that these systems are off-shelf systems which cannot be changed entirely to match every small requirement. F2 explained that many clients provide poor requirements or keep changing their requirements because they misunderstand the agreed requirements. All of these
challenges belong to the deploy stage since they happen during the user test process which is part of this stage.

PM1 and F1 mentioned another form of communication problems with the client. They have experienced dealing with different key users for the same functional area. This leads to customer disapproval of the deliverables of the project in the user acceptance test. Most of the times the new users have different expectations of the new system so they ask to change the requirements to what they want regardless of the previous agreements. This issue requires the vendor team to go back to the previous phase and modify the system to include the new requirements. However, PM1 said that this issue happens only in long term projects. Thus, it is not a challenge in many ERP implementation projects.

F2 has addressed that many clients do not have enough time to do their regular job and collaborate enough in the implementation process. This issue shows the lack of top management support of the project and negatively affects the project progress. For example, during the development process deliverables need to be tested by users to achieve progress in the implementation project. Delaying the user test results in delaying the whole project. The lack of customer collaboration makes it more difficult to apply agile solutions since agile methods require close customer collaboration (Hoda et al., 2011). This issue partially occurs in the deploy stage since it happens in the test process which is part of this stage.

The last challenge mentioned by the interviewees that belong to this stage is the challenge that PM2 mentioned about users’ resistance to change. This challenge partially belongs to this stage since it affects the define stage and the deploy stage together. This challenge affects the testing process since users who do not like to change the legacy system may delay the test process and try to make the new system work the same as the legacy system. Because this happens during the user test, this challenge is categorized to partially belong to the deploy stage.

The suggested solution for all of the challenges that happen in the deploy stage should be taken care of in the previous stage, the build stage, to prevent these challenges from emerging in this phase. Therefore, the solution of the challenges that occur in the deploy stage is mentioned in the build stage section.

5.5 The run stage

Only one interviewee mentioned a challenge related to the run stage. PM2 stated that it is very common to have issues in the customer’s data availability. In the transition process in this stage and before going live, the vendor may find out that the data of the customer either is not completely correct or it is not completely available in soft format. This issue delays the run stage and maybe the whole project.

The simplest solution for the data availability challenge is to check the data before the implementation process starts. Checking the data availability in an early stage of the project will give the client employees enough time to make it available until it is needed to go live.

All the implementation phases should be done on the customer site towards more agile implementation as the agile principle says “Business people and developers must work together daily throughout the project.” (agilealliance.org).
6. Conclusion

In this study I aimed to find potential agile solutions to the most common ERP implementation challenges based on data from literature and interviews. In order to collect data for this research, six semi-structured interviews with ERP consultants who are experienced with ERP implementation were conducted. The results from these interviews included several challenges that have been experienced by the respondents. Some of these challenges were mentioned by several respondents who works in different countries and job positions. This means that these challenges are widely common and not faced only by people who works in specific positions or in a specific country. The results also included examples of current agile practices in ERP implementation projects which helped in suggesting agile solutions to the common ERP implementation challenges. These results were analyzed by the qualitative content analysis method to categorize the results to fit in the ITMF framework. This framework was used in the analysis and discussion section to show the challenges and to suggest agile solutions in IT project phases in a structured way.

In conclusion, this study suggests agile solutions to the most common ERP implementation projects challenges that were mentioned by the respondents based on the data collected from the interviewees and agile literature. The suggested solutions include a solution to enhance the client selection process of the best fit ERP system and its features. It also includes a new agile method to collect customer requirements which can handle customer requirements changes in a much better way than traditional methods. New suggestions are also presented to improve the communication process during the implementation project.

7. Acknowledgement

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### 9. Appendix

#### 9.1 The interview questions

Q1: What are the most used ERP implementation strategies in your company? And can you describe them?

Q2: What factors affects your implementation strategy? And why?

Q3: What are the phases that you go through during an implementation progress from signing the contract to delivering the ERP system?

Q4: Can you describe each of these phases?

Q5: Some people believe that the water-fall development methodology is still the best option for implementing ERP projects. What development methodology do you follow to deliver output in each phase?

Q6: What is the structure and organization of the implementation team in a typical project? Are there any exceptions from this?

Q7: Which location do you work in? Customer’s site, the company’s office or you outsource the project to be developed in a different company.

Q8: Do you assign a resource to several projects at the same time?

Q9: What are the most common challenges you faced during implementing ERP systems?
Q10: Can you describe them.

Q11: What are the reasons that makes these challenges appear?

Q12: What possible solutions do you think can solve these challenges?

Q13: how familiar are you with agile methods in software development?

Q14: Do you use it in ERP implementation projects? And Why?

Q15: What methods did you use?

Q16: If you have experience with agile methodology, how it made the implementation process better?