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Preventing Enterprise Resource Planning Failure Through an Enhanced Approach to Solve Ineffective Communication

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***Abstract*—Enterprise Resource Planning (ERP) is a widely known type of software that eases the managerial aspect in enterprises. It increases their efficiency and productivity which helps them to exponentially grow in a short span of time compared to organizations that are not using it. However, as much as productive it is, implementing it does not often succeed. Majority of ERP implementations ends up failing due to different types of factors. Spotting the light on technical aspects showed that several factors contribute to this failure. Starting from pre-implementation phase with Business Process Reengineering (BPR) execution failure, or during the implementation phase due to miscommunication or incapable project members. The research amount in this field, particularly in critical failure factors is not sufficient to learn from and avoid future implementations, hence this topic provides insights about this specific issue. Quantitative method is used to analyse the data collected from a survey questionnaire for those who got involved in ERP or BPR implementations. The research process goes through objectives from problem identification to an in-detail explanation about its causes and effects, to how it is going to be addressed, how the data is going to be collected and analysed, and finally the proposed approach with a technical evaluation for it. The final objective of the research results in developing an approach that minimises the negative contribution of two failure factors, poor BPR and ineffective communication on the mentioned implementations, or prevent them entirely. The reason these two were chosen were due to their high occurrence frequency and lack of research regarding why they are considered failure factors. Concluding the research, the mentioned enhanced approach is being evaluated showing its potential to solve these factors, as they are relying on each other, with additional suggestions to further improve the approach in future work.**

***Keywords*—Enterprise Resource Planning, Business Process Reengineering, Critical Failure Factors, Critical Success Factors, Ineffective Communication System**

I. INTRODUCTION

Enterprise Resource Planning (ERP) in a concept is a centralized business process management software that allows an organization to use a system of integrated applications to manage the business and automate many back-office functions related to technology, services, and human resources. It is a widely used software and an essential part of every major company to manage its business using different modules, such as Finance and Human Resources Management and others to facilitate managing it and boosting the company's overall productivity and efficiency. The most popular and used ERP software in most major companies are SAP, Oracle, and Microsoft Dynamics.

Throughout the last decade, its popularity has been increasing between small and medium size companies due to its efficiency in facilitating the work process. It is also the professional approach to flourish and improve your business, rather than using an outdated software or an inefficient one. An ERP offers several benefits including increased efficiency, quality, productivity, and profitability. ERP integrates all routine transactions within an organization, including internal suppliers and consumers (Turban *et al.*, 2008). ERPs are not easy to implement however and failing in implementation is a common occurrence. In 2001, it was found that 51% of its survey participants claimed unsuccessful ERP implementations (Barker and Frolick, 2003). The reasons for these failures are divided into technical problems and non-technical problems.

The importance of this research lies in understanding and knowing why ERP implementation fails as understanding what factors contribute to this will help avoid future implementation mistakes, thereby decrease the rate of failure. Adding on top of this is the scarcity of the research papers and thesis that are talking about failure factors, and even less which discusses how to decrease or prevent it. Thus, this paper should at least give a general coverage on all technical failures and be a reference to their explanations, as well as trying to approach two of them in order to minimize their failure contribution.

In addition to this introduction, the rest of this paper is organized in five chapters. Section 2 presents the theoretical background. Section 3 presents the approach in which the methodology is based on. Section 4 presents the setup that involved data collection and analysis. Section 5 presents the prototype and development of the enhanced approach. Finally, Section 6 concludes the paper.

II. BACKGROUND

In this section, an in-depth explanation will be given for ERP key features, its Critical Success Factors (CSFs) and Critical Failure Factors (CFFs) that are involved in ERP development.

A. ERP

ERP features are what makes it unique from any other centralized management software. The ERP system was defined as a comprehensive software package that seek to integrate the complete range of a business process and functions in order to present a holistic view of the business from a single information and IT architecture (Gable, 1999). However, in order for it to succeed, it has to possess certain qualities, or CSFs such as top management commitment, clear visioning and planning, balanced team, and post-implementation evaluation (Finney and Corbett, 2007). That being said, not all implementation succeeds as some of them either partially fail which means it had an increase in implementation cost, time, or other resources, or completely fail for being terminated before completion or not successfully being deployed (Gargeya and Brady, 2005). These failures are a result of CFFs that has not been managed properly or avoided in its entirety, such as IT technical issues, poor Business Process Reengineering (BPR), Ineffective Communication System (ICS), and data management issues (Ravasan and Mansouri, 2015). While previous related works by other researchers discussed multiple factors among both non-technical and technical ones, there were seldom researches that addressed poor BPR and ICS in this aspect, and how to decrease their occurrence rate. Thus, this puts important weight on why solving them can prove help to the industry. Hence why this paper will focus on these two CFFs.

B. Poor Business Process Reengineering

BPR can be defined as deliberate and fundamental change in business processes to achieve performance improvements in the enterprise (Bhaskar, 2018). It is a transition that allows enterprises to restructure their processes such as organizational structure, project planning and management, and IT infrastructure in a more effective way, and in many cases, it goes hand-in-hand with ERP implementations in a form of pre-implementation process. However, in many cases this process itself fails due to factors such as resistance to change, poor management, lack in understanding current function and how to reengineer it into better ones, or miscommunication between clients and consultancy firms due to inexistence of proper communication channels (Bhavsar *et al.,* 2019).

C. Ineffective Communication System

Communication is one of the most difficult and demanding activities in any ERP project. According to a study by made in 1999, it reported that 50% of the interviewees saw communication as a necessary condition for ERP implementation success (Parr *et al.,* 1999), with two case studies examples in 2003 and 2013 respectively (Sarker and Lee, 2003; Aubert *et al.,* 2013). Hence why miscommunication, lack of coordination, or inability to properly express your concerns during the implementation process may eventually lead to an implementation failure.

D. Socio-technical System

Socio-technical System (STS) (Savaget *et al.,* 2019), is a system that applies an understanding for social structure that involves people. It is an aspect that concerns communities working together in coordination through software or technical means. Quality of life satisfaction is a socio-technical approach, and it has an impact on employee's both physical and mental states. Some examples of an STS are e-mails, social platforms, or even blogs, which are basically means of interacting with your surroundings (Yeh, 2016). In many cases of ERP implementation, STS is thought to be an essential aspect to ensure that the entire team is on board, not just managers who decided the process. Therefore, it is an important concept to keep in mind as its importance will be explained ahead in prototype phase.

STS strength relies in its importance of integrating the interaction of technology with society (Lee *et al.,* 2020). However, its complexity (Nyman and Johansson, 2015) and difficulty in setting up and testing in operation trial before deploying it on an enterprise scale is an important weakness to mention.

III. METHODOLOGY

A. Data Collection

Due to the difficulty of reaching to experts and the natural privacy of large-scale implementations, the chosen methodology was quantitative. This allows to gather data based through multiple channels on a large scale, with close-ended questions that specifies and narrows the feedback to acquire as

much accurate data as possible. The quantitative research type was through a web-based questionnaire on Google Form that was distributed to experts in the industry through multiple channels on a global scale.

B. Research Procedure

The objective of this research is to propose an enhanced testing method to fix one of the failure problems that affects ERP implementation and to do so we need to come up with a solution for both poor BPR and ICS through proposing a product, such as web-application to work on the former problem, and to propose a tool that help in communication for the latter and integrate both into one final approach. This process spans seven phases. First and second phases by formulating the point and identifying its causes in order to pinpoint them accurately. Third and fourth phases are through discussing the best approach to collect data to validate the presence of the mentioned problems and analysing the data to see its relevance and if it persists. Fifth and sixth phase for developing the prototype using an online tool in a form of interactive interface and evaluate its usefulness. Finally, the conclusion of report in phase 7.

IV. EXPERIMENTAL SETUP

In this section, a detailed explanation regarding data collection and results, as it is important to show how it contributed to the design and development of the prototype.

A. Survey Design

In order to get accurate data on a large scale, a pilot study was conducted on a sample of 20 experts from the industry to share their opinion about the questions and suggest feedback to improve it. The number was determined based on 10% of the obtainable population, whom amongst them were project managers, ERP specialists, and other members in multiple different roles within the implementation process. The feedback was valuable, and it contributed to enhancing the quality of questions and its purpose. The full-scale survey consisted of 11 sections and 33 questions including introduction and conclusion, with most important questions being close-ended and additional open-ended optional questions for further feedback. The questions focused on experts' experience in implementing ERP and BPR. It focused on CFFs of both, and suggestions to tackle the problems they have chosen. The survey was distributed on a global scale with 40 respondents from 18 different countries, working in 35 different companies, under 16 different position titles. The purpose of having a global sample is to ensure that these factors are universal and not tied to a geographical location or a certain culture (Xue *et al*, 2004).

B. Survey Result

T The results showed that some of the issues still persisted, however the frequency of their occurrence has changed. For instance, as shown in Fig. 1 for ERP CFFs, in addition to IT technical issues, data management issues, poor testing quality, geographical differences, and top management issues, we have the three most issues are poor BPR, ineffective communication systems, and heavy customization respectively. The order of their occurrence is shown in Table 1. Meanwhile BPR CFFs as displayed in Fig. 2 has resistance to change on the top being followed by miscommunication between client and customer alongside lack in understanding current functions as well as poor management support, poor management transition, absence of proper documents, underestimation of human resources, and unsuitable IT infrastructure as shown in Table 2.

The figures showed that although some issues might have been solved or prevented on a higher rate, some others were still common and needs an attention to be paid to. The underlying problem here in both ERP and BRP remained to be the miscommunication as an effect of not having effective system to interact through.

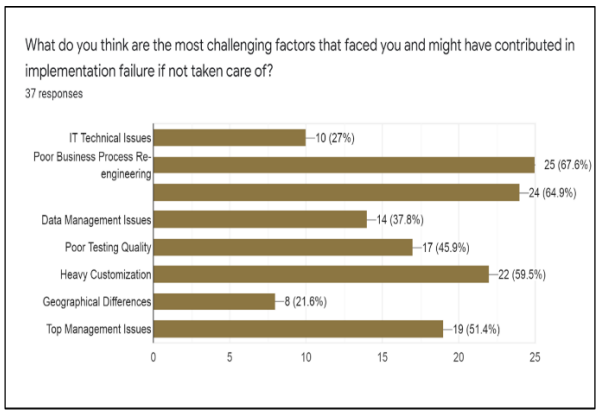

Fig. 1. ERP CFFs

TABLE 1. ERP CFFs

ERP CFFs	No. of Responds
Poor BPR	25
ICS	24
Heavy Customization	22
Top Management Issues	19
Poor Testing Quality	17
Data Management Issues	14
IT Technical Issues	10
Geographical Differences	8

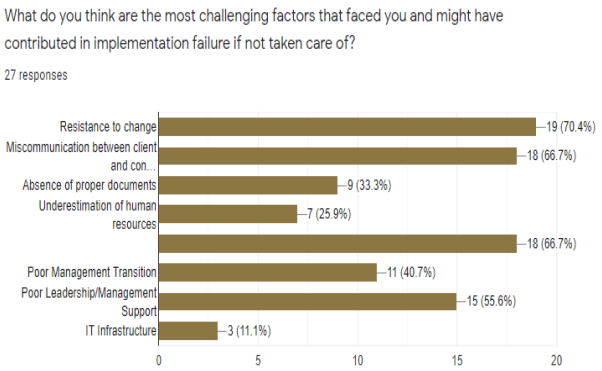

Fig. 2. BPR CFFs

TABLE 2. BPR CFFs

BPR CFFs	No. of Responds
Resistance to Change	19
Miscommunication between Client and Customer	18
Lack in Understanding Current Functions	18
Poor Management Support	15
Poor Management Transition	11
Absence of Proper Documents	9
Underestimation of Human Resources	7
IT Infrastructure	3

V. PROTOTYPE DESIGN AND DEVELOPMENT

Based on the suggestions and feedback received from the survey, a prototype under the name of ERPilitator had been developed to address this issue. The prototype as mentioned is an interactive user interface designed using proto.io online tool to give a visual illustration of how the actual web application would look like and behave in actual development. Proto.io was chosen after a comparison of ease of use, effectiveness, and cost between six different tools that specializes in developing an interactive user interface.

A. ERPilitator

The main theme is a tracking tool and the core addition which is added based on the survey's answers was an STS in a form of a messenger. The STS's approach has been enhanced to focus more on human factor, which is labelled as people, both cognitive and social, and the communication importance aspect of it as seen in Fig. 3.

The messenger allows users to interact with people assigned in their dashboard, as well as other dashboards related to their company. It also allows them to engage in discussion with external third-party companies such as consultants that they are dealing with during the ERP implementation process. Fig. 4 Explains what the full functions of the prototype are, including the ones that improves the communication between the team members.

In the prototype, some of these functions are fully working, while some are visually displayed for illustration purposes and do not go beyond that. The prototype also focused more into the communication aspect of this design.

As displayed in Fig. 4, the user can view activity of their team members, they can view active chat windows, they can view external team members, as well as internal team members within his own company. The user can also select one of the conversations to continue it, in which he can send an emoji, attach a file, search the conversation, or click on "more" icon in order to perform a voice call, a video call, or get directed to a certain online meeting web application.

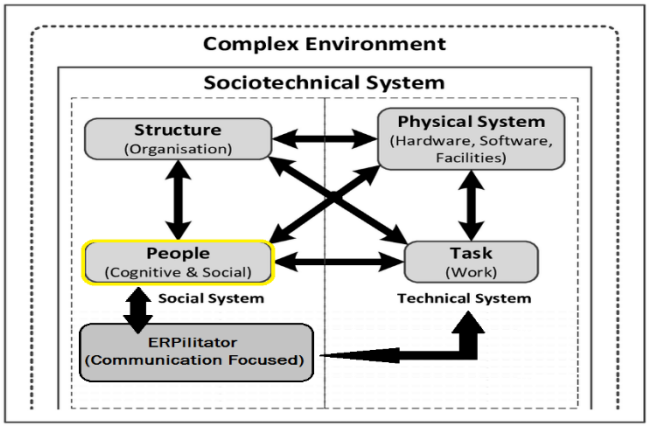

Fig. 1. Sociotechnical System with Communication Focus

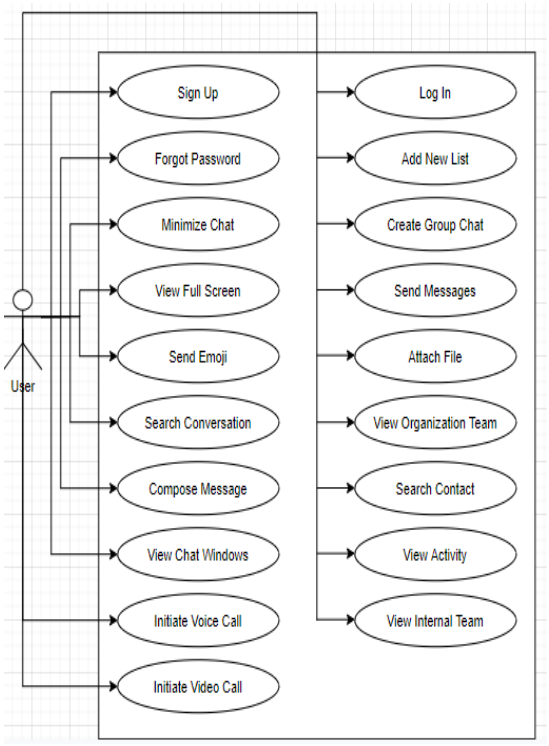

Fig. 2. ERPilitator Use Case Diagram

B. ERPilitator vs Existing Applications

The currently existing project tracking tools that are used for various purposes as shown in Table 3 are either not supporting communication functions such in Target Process and Eyelean cases where the main method for communication is through comments, or requires an integration of third-party software like Jira, however it does not come in as a built-in service. Hence why implementing it as a built-in may facilitate the working process of teams and help them to communicate more and get more familiar with the team working environment in general. This key feature is what makes ERPilitator unique and what is being modified in the STS model as seen back in Fig. 3 to support the social aspect of the model. The feature's presence in the prototype can be seen in the bottom right in Fig. 5 in a form of messenger that can be used while working on the task behind on the main screen, or in full screen as shown in Fig. 6 for a better user experience. In view full screen, the user will also be able to check the activity of his team and communicate with them more thoroughly. The transition happens from Fig. 5 to Fig. 6 by clicking on one of the options within the messenger. This allows flexibility and gives individuals the choice to communicate in their preferred manner.

Fig. 5. ERPilitator Dashboard

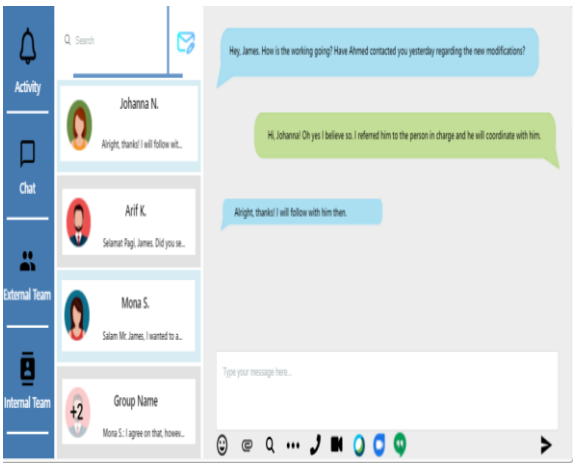

Fig. 6. ERPilitator View Full Screen

C. Evaluation

To ensure that the prototype addressed the existing problems, ERPilitator had been introduced and evaluated by an expert from the industry with the position of project manager. Holding an experience of 15 years, his main expertise is in project management of ERP projects, especially SAP ones. As someone who has experience in ERP systems which was crucial to the research, as well as project management which was important to determine the problems we had as they were related to communication issues, he was chosen to be an evaluator for the prototype.

Overall, the expert was optimistic about the concept and commended on its usefulness, especially that some employees find difficulties in engaging in discussions with their colleagues regarding work-related matters without leaving their devices. He expressed his opinion about developing more features to stay in touch with the best practices and latest features of web applications that provides similar services. Some examples of the features he suggested were Gantt chart designer, visual analysis for activities timestamps, pre-made project templates, and more. Finally, the expert believed that the proposed approach could provide a solution for the ICS and miscommunication between different parties' issues, in addition to the poor BPR which is affected by similar factors. He had high hopes that it will also provide a good solution for miscommunication between low level and high-level management, which will decrease the poor support and transition. However, the true significance of its magnitude and by how much it will decrease these CFFs occurrence is yet to be determined, but if implemented accordingly to what it has been designed for then it can prove to be a good solution.

The expert concluded that it would be a great addition to implement this proposed approach as it will greatly enhance and eases the workflow of both ERP and BPR implementation process, as well as the workflow in general.

TABLE 1. ERPILITATOR VS EXISTING APPLICATIONS

Features	Applications			
	ERPilitator	Jira	Eyelean	Target Process
Project Dashboard	√	√	√	√
Customizing Cards	√	√	√	√
Tracking Activities	√	√	√	√
Sharing Files	√	√	√	√
Communication	Built-in	Third-party integration	Comment	Comment

VI. CONCLUSION

The paper is discussing enterprise resource planning failure reasons and how to prevent them in order to decrease the failure rate.

In the beginning the paper addressed the first objective, the ERP projects' CFFs that were identified with an in-detail discussion about them. The findings showed multiple factors that contributed to failure, with some of them being technical and others being non-technical. It also raised the importance of BPR to the readiness of ERP implementation as a critical factor. It furthermore discussed BPR CFFs that contributed to failure. Although some of the citations are for case studies that happened over a decade or two ago, their findings still could be matched to the current date with some differences between each of them. As an example, while the survey's result showed some of the very similar CFFs as to back then, their occurrence rate had changed in order. This showed that some were addressed and had better ways to be approached and avoid, while some may have been neglected in favor of others and caused the increase of other CFFs.

Following that, based on the second objective, the paper proposed an enhanced approach to ensure the easiness of the implementation phase, which came in a form of a communication feature that were implemented in a project tracking web application. The approach was based on an STS model that had been modified based on the CFFs from the conducted survey to introduce a possibility of decreasing it.

Third objective was an evaluation of the proposed approach by an experienced expert from the industry to ensure it met the modern standards and fit the best practices that are used in companies and enterprises. The evaluation, feedback, and some of the suggestions were used to develop and improve ERPilitator, which showed that it has a lot of potential to grow and improve, as some were left for further research.

The further research will improve on the currently existing prototype based on the given suggestions such as implementing a voice and video communication, testing environment to facilitate testing, and to support in requirement gathering. Furthermore, to improve the overall possibility of decreasing the CFFs effect on ERP implementations in order to raise its success.

Experience and knowledge are valued but will not be utilized properly without proper communication and well team coordination, hence why these features are aimed towards these two aspects in order to make an actual impact on the real-life work to decrease or prevent the failure of ERP's implementations.

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