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ORIGINAL

Framework for ERP implementation in the context of Moroccan SMEs

Marco para la implantación de un sistema ERP en el contexto de las PYME marroquíes

Yassine ZOUHAIR[1], Younous EL MRINI[1], Mustapha BELAISSAOUI[1]

[1]Hassan First University, SIAD Laboratory. Settat, Morocco.

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Corresponding author: Yassine ZOUHAIR

ABSTRACT

The current and future challenges and the rapid evolution of markets in a context of globalization require companies to acquire the technological tools to manage information flows in order to remain up-to-date and competitive. To do so, it is ready to deploy important means to guarantee its competitiveness and its scalability. This is done mainly through the implementation of software technologies, the most popular of which are known as Enterprise Resource Planning (ERP). ERP is a popular option for small and medium-sized enterprises (SMEs) today that are looking to optimize and integrate their information systems. However, the implementation of ERP is a complex process and remains a challenge for many SMEs, even more so than for large companies, where ERP integration failures have caused some to go bankrupt. In addition, SMEs differ in a number of characteristics that can affect the implementation of ERP, so it is not wise to use the frameworks developed for the large enterprises to implement Enterprise Resource Planning Systems (ERPS) in SMEs. The objective of this research is to develop a framework for implementing an ERP in the context of Moroccan SMEs. The developed framework was used for implementing an ERPS in two Moroccan SMEs, it includes 5 phases, for each one, the objectives, critical success factors, inputs, processes, outputs and risks to be considered. This research study contributed to both practice and research, and the results could help practitioners and Moroccan SMEs when implementing an ERP and to suggest directions for future research.

Keywords: ERP Implementation; ERP; Moroccan Smes; Integrated IS.

RESUMEN

Los retos actuales y futuros y la rápida evolución de los mercados en un contexto de globalización obligan a las empresas a dotarse de herramientas tecnológicas de gestión de los flujos de información para mantenerse actualizadas y competitivas. Para ello, está dispuesta a desplegar importantes medios que garanticen su competitividad y su escalabilidad. Esto se hace principalmente mediante la implantación de tecnologías de software, las más populares de las cuales se conocen como Planificación de Recursos Empresariales (ERP). Hoy en día, la ERP es una opción muy popular entre las pequeñas y medianas empresas (PYME) que buscan optimizar e integrar sus sistemas de información. Sin embargo, la implantación de ERP es un proceso complejo y sigue siendo un reto para muchas PYME, incluso más que para las grandes empresas, donde los fracasos en la integración de ERP han llevado a algunas a la quiebra. Además, las PYME difieren en una serie de características que pueden afectar a la implantación de ERP, por lo que no es prudente utilizar los marcos desarrollados para las grandes empresas para implantar Sistemas de Planificación de Recursos Empresariales (ERP) en las PYME. El objetivo de esta investigación es desarrollar un marco para implantar un ERP en el contexto de las PYME marroquíes. El marco desarrollado se utilizó para implantar un ERPS en dos PYME marroquíes e incluye 5 fases, para cada una de las cuales hay que tener en cuenta los objetivos, los factores críticos de éxito, los insumos, los procesos, los resultados y los riesgos. Este estudio de investigación ha

contribuido tanto a la práctica como a la investigación, y los resultados podrían ayudar a los profesionales y a las PYME marroquíes a la hora de implantar un ERP y sugerir direcciones para futuras investigaciones.

Palabras clave: Implantación De ERP; ERP; PYME Marroquíes; SI Integrada.

INTRODUCTION

As the socio-economic environment evolves, organizations are faced with increasingly complex requirements, and to meet them, they call upon technological and management tools that are constantly being developed and that attempt to integrate this growing complexity. The development of information systems (IS) and information technology (IT) applications follows this trend. Among the IS/IT developments, ERP has experienced a lightning evolution since its appearance on the market in the 1990s.[1] ERPS function as a centralized hub that coordinates and automates various business operations in areas such as manufacturing, logistics, accounting, finance, human resources and distribution.[2] The use of ERP has been considered a major determinant in achieving competitive advantage.[3]

Today, ERP is a very interesting choice for SMEs that aim to rationalize and better integrate their IS. This type of software has evolved considerably, especially for SMEs, which have now become targets for this type of solution. Many organizations opt to implement an ERPS to lower expenses, boost efficiency and enhance customer service.[4,5] ERP Implementation (ERPI) can be difficult for SMEs,[6,7] and it can be even more challenging than for large companies. In some cases, ERP integration failures have resulted in bankruptcy,[8] or other problems such as loss of functionality and unreliable data.[9] Successful ERPI project provide benefits such as cost savings, improved customer service, and higher quality production. However, despite these potential benefits, ERPI can still be challenging for many organizations to implement.[10,11,12] Particularly in Morocco, as a consultant specializing in ERPI within SMEs, we have observed that many companies have encountered difficulties in implementing ERPS, leading to problems within these companies.

There are many frameworks developed by different researchers for implementing an ERP in SMEs.[13,14,15,16] The majority of frameworks developed to implement ERP use a similar phases or a proposed framework based on Critical Success Factors (CSFs). However, they have not considered how the implementation phases can be linked to each other, the movement from one phase to another, objectives, risks, and deliverables of each phase. This lack motivates this study to develop a structural framework by relating all phases of ERPS implementation, use of output from one phase as input to another phase, define the objectives, the CSFs and the risks to be considered in each phase. It aims to help Moroccan SMEs successfully implement an ERPS.

Literature review

ERP in Moroccan SMEs

The Moroccan company, especially the SME, is continuously looking for benefits and interests, the flow of information system is considered as a main necessity to manage the internal and external informational network of the SME with the integration of the technological dimension that also allows the inclusion of the organizational and strategic dimensions. It is for this reason that companies are accelerating to adopt ERPs that today represent a great opportunity for modern and brave SMEs, even if their adoption could be a great risk.[17]

In the Moroccan context, the ERP market is still embryonic, they were launched in 1995, different international suppliers have been established on the Moroccan market to support and encourage Moroccan companies to adopt ERP. Indeed, research conducted by the consulting firm “capital consulting”, out of 61 Moroccan companies, more than half are based on ERP including SAP and Oracle, 41 % have chosen SAP and 18 % for Oracle, in addition 12 % of companies use ERP such as the dynamic Microsoft.

Methodology and framework for ERP implementation

In the literature, there is a multitude of methodologies and frameworks used for the implementation of an ERPS. For this reason, in this chapter we will review some of them. Our analysis centers on the approaches, frameworks, and methodologies utilized for implementing ERPS across diverse organizational settings. It is worth noting that literature on this particular topic is somewhat limited, with the majority of existing studies primarily emphasizing CSFs.

Miranda[16] defined a nine-stage ERPI process, with each stage playing an essential role in the successful implementation of an ERPS. The first step is a thorough analysis to understand the organization’s needs and objectives. Next, preparing the scope of work helps to clearly define what will be included in the project. The creation of a project plan follows, detailing the steps to be taken. System construction takes place to develop and configure the ERP software. Standard operating procedures are prepared to ensure consistent use of the system. Data migration planning is crucial for transferring existing information to the new system.

User acceptance testing verifies that the system meets user needs. User training is a key element in ensuring effective use of the system. Finally, the Go-Live marks the moment when the ERPS is operational for the whole organization.

Martin[15] proposed a conceptual framework for the implementation of ERPS, consisting of four distinct stages: first, the selection of partners and the negotiation or finalization of agreements. This is followed by the preparation and approval of the implementation plan. The third stage involves the actual implementation of the ERPS and an audit of the implementation process. Finally, the fourth phase involves evaluating the impact of the ERPS and developing guidelines for post-ERP activities.

Olson and Staley[18] proposed a framework from an organizational standpoint for the implementation of ERPS. This framework comprises two distinct phases: the project stage and the post-project stage. It is advised that an assessment of ERPI effectiveness should be conducted in both the short-term and long-term perspectives. The short-term assessment pertains to the results achieved during the project stage, while the long-term assessment is concerned with the outcomes of the post-project stage. It's worth noting that this framework is of a general nature and does not specifically emphasize the critical factors that should be considered at each stage.

Peslak[19] introduced a conceptual framework for ERPI that incorporates two aspects: the ERPI process and the specific components implicated in these processes. The ERPI process which encompasses five stages—project preparation, technology selection, project formulation, implementation, and post-implementation.

Pliskin[20] developed a four-stage ERPI process. These stages include planning, transition, performance and enhancement. The first stage, planning, encompasses the preparatory phase where strategic decisions are taken to implement the ERPS. The second stage, transition, involves implementing the system in one or more organizational units. The third stage focuses on performance, i.e., the day-to-day operation of the ERPS. Finally, the fourth stage, improvement, continues beyond the normal operation phase, enabling the organization to assess the potential benefits of its investment and take steps to further optimize the system.

Ross[21] delineated a six-stage ERPI process in six distinct stages, with each stage playing a specific role in the successful deployment of an ERPS. The first stage, initiation, consists of the decision to launch the ERPI project. Next, adoption occurs when the organization begins to implement the system in its operations. Adaptation involves adjustments and customizations to suit the organization's specific needs. Acceptance occurs when users begin to adopt the system across the board. Routinization represents the phase when use of the system becomes the new norm in the organization. Finally, infusion is the period when the ERPS is fully integrated into the company's overall operations.

Somers[22] Laid out a framework for implementing an ERPS that consists of four distinct phases. The first phase is the chartering phase, which encompasses decisions made prior to securing funding for the enterprise system. The second phase is the project phase, involving activities aimed at getting the system operational in one or more organizational units. The third phase is the shakedown phase, during which the organization becomes acclimated to the enterprise system. This phase typically concludes when the organization has achieved "normal operations" or, in some cases, when the system is uninstalled due to insurmountable issues. The fourth and final phase is the onward and upward phase, which extends from normal operation until the system is replaced with an upgrade or a different system. It is in this stage that the organization can finally assess the benefits, if any, of its investment.

Strong[23] identified a six-stage ERPI process, each of which plays an essential role in the life cycle of an ERPS. It all starts with adoption, where the organization decides to implement an ERPS. Next, the acquisition stage involves the selection and purchase of the appropriate ERP software. Implementation involves configuring and deploying the system within the company. Use and maintenance covers the period when the system is in operation, requiring ongoing management and updates. Evolution refers to improvements and adjustments made to the system over time to keep it relevant. Finally, the retirement stage occurs when the ERPS is replaced by a newer version or another solution.

In summary, the specialized literature reports a multitude of methodologies and frameworks used to implement an ERPS. The majority of frameworks developed for ERPI use similar phases or a proposed framework based on CSFs. However, we noted the absence of a framework that examines how the implementation phases can be interconnected, the smooth transition from one phase to another, the inputs, outputs, processes to be followed, objectives, CSFs, as well as the risks associated with each stage.

METHOD

This article attempts to develop a framework for ERPI in Moroccan SMEs, we used the design of several case studies to describe the phenomenon.[24] Case Study (CS) is a methodological approach that systematically aims at collecting sufficient information about a person, event or social system (group of individuals or organization) to enable the researcher to understand how it functions or behaves in real life.[25] According to [24,26] the CS method might be used to identify, explain, or study phenomena or events in their real context. In addition, "case studies are

particularly recommended when dealing with new and complex fields, where theoretical developments are weak and context retrieval is crucial for the development of the understanding process".[24,26] The use of CS method is pertinent when the study answers 'why', 'what' and 'how' research questions.[24,26] This fits exactly to our work. In this work, we used the method "action research" or "participatory research" which is one type of CS that describes research where the author, generally the researcher, is implicated in the system implementation.[27]

In this article, the CS method was used in two Moroccan SMEs that operate in private sector. The first of these two companies operate in the services sector and the second one B is in the consulting and audit sector. Our case studies are an ERPI project for the first time at both companies. I had the occasion to work in both projects as a project manager. In this role, I assumed responsibility for steering and overseeing the implementation of the respective projects. As a project manager, my role encompassed strategic planning, team coordination, and overseeing the various phases of project implementation. This experience as a leader directly involved in these initiatives gave me an in-depth perspective on the challenges and successes encountered during these complex ERPI processes. Table 1 shows the cases studied.

Table 1. Description of case studies

	Company A	**Company B**
Year	**2014**	**2013**
Specialty	Coaching, leadership and management	Consulting, audit and support
Number of employees	120	80
ERP	Odoo Version 11	Odoo Version 12
Modules	Purchasing, Sales, CRM, Inventory, Billing, Accounting, Document, Project, Human Resources	Purchasing, Sales, CRM, Inventory, Billing, Accounting, Document, Project, Human Resources, Signature

A qualitative research approach is also adopted in this work via the interview technique with a total of 46 interviews, each lasting between 40 minutes and 1 hour. The majority of interviews took place in person, directly at the companies. The population of this work includes users of the ERPS in Moroccan SMEs, IT managers, consultants, team leaders and people with knowledge of the SME sector in Morocco, with different levels of education and experience. Prior to the interviews, interviewees were given a sample of questions to discuss during the interview sessions. The key questionnaire below was used as a guide during the working group's exploratory discussions.

What steps need to be taken to ensure the success of ERPI in all areas of the organization?

How should the ERPI process be managed to ensure its success?

What are the key phases in the implementation process?

How are the implementation phases interconnected as part of the ERP project?

Can you describe how the transition from one phase to the next is ensured to guarantee a smooth project flow?

What are the main inputs required for each phase in the ERPI process?

What are the main outputs generated at the end of each phase, and how do they influence the next phase?

What are the essential tasks in each phase of the process?

What are the key objectives to be achieved at each phase of ERPI?

Can you identify the critical success factors that were essential to guarantee the success of each phase?

What risks are considered essential at each phase of the process?

How did the teams manage the risks associated with each phase of the ERPI?

The complete interview transcripts were coded using Atlas.ti software. Data analysis focused on identifying the different phases of ERPI, the interconnections between these phases, the inputs and outputs of each phase, the processes to be followed, the objectives to be achieved, the critical success factors to be taken into account, as well as the risks associated with each phase of the ERPI process.

Initially, an analysis was carried out to capture the individual cases, providing an initial list of the essential elements of each phase of ERPI (inputs, outputs, processes, objectives, critical success factors, risks). Subsequently, a cross-case analysis was carried out to identify similarities and disparities between the different cases.

We also used literature review as a source of data, some phrases are identified for research, including "ERPI", "ERPI framework" and "ERP in SMEs". We collected articles from digital libraries of reputable publishers such as Springer, IEEE, Elsevier, Scopus, and Google Scholar. Inclusion and exclusion criteria include whether the article is published in a reputable journal and whether it is highly relevant to our research.

Research questions

The process of introducing an ERPS represents a considerable challenge for many SMEs, often leading

to complications and, in some cases, bankruptcy due to integration failures. The majority of frameworks developed to ERPI use a similar methodology phase or a proposed framework based on CSFs. However, we have not found a framework that examines how implementation phases can be interconnected, how one moves from one phase to another, or the specific objectives, risks and deliverables of each phase. The principal objective of this research is to develop an ERP framework distinct from those already in place, with the intention of introducing significant improvements by filling identified gaps and strengthening aspects requiring improvement over existing frameworks.

To develop our framework successfully, we need to answer the following questions:

What are the main aspects that distinguish the proposed ERPI framework from other existing frameworks?

How can implementation phases be interconnected, and what considerations need to be taken into account when moving from one phase to another?

How does the framework take into account inputs, processes and outputs at each phase of ERP implementation?

What are the main risks in each phase?

What are the main objectives in each phase?

What are the main critical success factors in each phase?

Resolving these questions is crucial to the successful development of our framework. These questions are key points that require careful thought and analysis, guiding us towards a complete and robust framework. By answering each question in depth, we aim to ensure the clarity, relevance and effectiveness of our framework for successful ERPI in the Moroccan SME context.

Developed framework

The specialized literature reports a multitude of methodologies and frameworks used to implement an ERPS. The majority of frameworks developed for ERPI use similar phases or a proposed framework based on CSFs. However, we noted the absence of a framework that examines how the implementation phases can be interconnected, the smooth transition from one phase to another, the inputs, outputs, processes to be followed, objectives, critical success factors, as well as the risks associated with each stage. This lack motivates this study to develop a structural framework linking all phases of ERPS implementation, using the outputs of one phase as inputs for another, defining the objectives, processes to be followed, CSFs and risks to be considered in each phase.

Our framework is different from existing models, making substantial improvements, filling identified gaps and strengthening aspects requiring optimization. It is presented as a systematic five-phase model, ensuring a smooth connection and transition from one phase to the next. Each phase is subdivided into:

Inputs refer to the data, information and elements required to initiate and execute this specific phase of the project.

Outputs represent the deliverables, data or results generated as a result of the activities carried out during this specific phase. These outputs serve as the basis for subsequent phases of the project.

Processes are the organized and interconnected sequences of activities designed to achieve the phase's specific objectives and deliverables.

Objectives represent the specific, measurable results that the project team is striving to achieve during this particular phase. These objectives are defined to direct activities and efforts towards the successful completion of the phase.

Risks in an ERP project phase represent potential events or circumstances that could compromise the success of that particular phase. Risk identification is an essential practice in project management, aimed at anticipating and mitigating potential obstacles that could arise.

The CSFs in an ERP project phase are the key elements that need to be taken into account and managed effectively to ensure the success of this particular stage. These factors play an essential role in achieving the objectives set for the phase and, by extension, in the overall success of the ERP project.

Based on the results of the interviews and the researcher's practical experience of ERPI in two Moroccan SMEs, this section describes the framework theory developed and discusses actual ERP installation, personalization, the business process reengineering, and all of the other activities which align the ERPS with the business requirements in five phases. This framework is developed to assist and help Moroccan SMEs to implement an ERPS by using the following phases and steps. The process steps have been developed as a base to provide a step-by-step and easy to follow procedure. The procedure of our framework developed can be looked like a feedback loop, where the actions of one phase are based on the output of another phase; in addition, the entire framework should function as a simple flow. Certain criteria were considered in developing the framework: simple structure, systematic, and easy-to-understand, clarity between phases and steps described, general enough to adapt to various contexts, road map and implementation planning tools. The foundational concept design of the framework, as depicted in figure 1.

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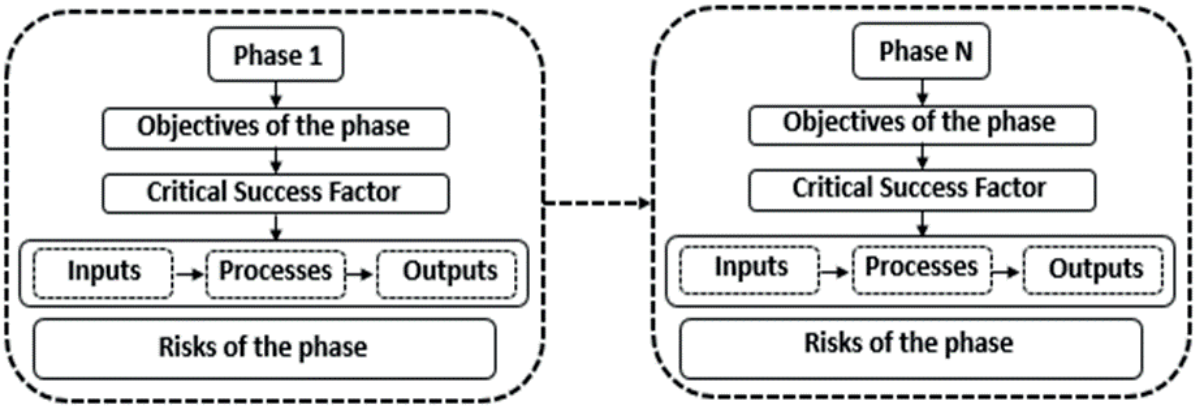

Figure 1. Framework design

Analysis phase

The purpose of this phase is to clearly establish the project's scope, goals and objectives. It also involves analyzing and mapping current business processes, and defining the project team that will be responsible for implementation. The aim of this initial phase is to lay a solid foundation for project planning and implementation, by defining the precise boundaries of the project, identifying the objectives to be achieved, and structuring the team that will implement it.

The analysis phase begins with a thorough review of reports and documents currently in use, followed by inaugural project meetings. These meetings are designed to provide stakeholders with a comprehensive understanding of the project's vision, scope, objectives, key performance indicators and expected benefits. This approach establishes a solid foundation by ensuring that all stakeholders share a common understanding of the essential elements of the project, thus promoting consistent implementation aligned with the defined objectives.

During this phase, in-depth interviews and assessments were carried out in collaboration with employees and future users. The aim was to capture the company's current processes in detail, identify obsolete methods, and highlight problems and challenges encountered in the workplace. The result was an in-depth understanding of current practices, potential inefficiencies, and specific user needs, providing a solid foundation for the design and implementation of tailored solutions.

The findings of this stage facilitated the development of the project plan and the detailed mapping of the company's current business processes. This information was crucial to the drafting of the functional requirements document, defining the specifications and functionalities required to meet the identified needs. This phase served as an essential foundation for strategic project planning, providing a clear vision of existing processes and functional requirements, effectively guiding the subsequent design and implementation stages.

The results of our research indicate that several critical factors influence the success of this phase:

Top Management support and involvement is critical to the success of an ERPI, it focuses on the willingness of senior management to provide sufficient and necessary support for the implementation process of the ERPS. Management must be present because an ERP project involves significant changes to existing business processes. Management's support of the employees is the necessary condition for the employees to accept the new system. If the management is firm on the project, the employees will also be firm. On the contrary, if management does not agree with the new system, employees will be even less so. It is not in management's interest to show these doubts in front of the employees and must be firm about the usefulness of the new system. It must create a favorable environment for the ERP project to be accepted, otherwise the project could be rejected by the users. This factor is necessary in all phases of the project implementation.

Involvement of end users and stakeholders is crucial for the success of a project. Including users in the implementation process ensures that the business vision is incorporated into the ERPS. Poor user involvement often leads to failed projects, as a lack of representation can result in inaccurate business processes.

Project scope is an important element to define first before beginning the ERPS implementation, it is crucial for the project's success. The definition of the project scope, as defined by the PMBOK, consists first of all in determining and controlling that which is and is not in the project. A bad control of the scope will have an impact on the performance triangle and consequently on costs and deadlines but also undoubtedly on the project quality.

Project management is essential to the successful implementation of the ERPS. It consists of continuously managing the implementation plan. This includes planning the various stages, determining milestones, allocating responsibilities and defining success criteria. In addition, a successful project management allows you to focus on the core activities of the ERPI and ensures that deadlines and timelines are respected. This

factor is necessary in all phases of the project implementation.

Business process reengineering is the process of observing and analyzing how the business operates to determine what changes can be made to streamline its operations. It is a way of examining the current operations of the business to determine the best way to proceed when designing the new system.

Project team competencies is essential, for a successful implementation, the team must have the talent, knowledge, influence and experience needed to complete the project. It is crucial to identify experts who have a comprehensive understanding of the business, its operations and its objectives, to ensure the success of the project. This factor is necessary in all phases of the project implementation.

Change management is essential to the successful implementation of the ERPS. In order to deal with any resistance you may encounter, it is important to make employees understand the benefits of digital transformation that come with the deployment of the new system. Implementing such software in an organization requires a well thought out change management process to ensure that the entire company is moving in the same direction.

Key risks to consider in this phase include non-involvement of both management and end-users, poor re-engineering, misunderstanding between project team members, lack of expertise and competence within the team, planning and resources deemed inadequate, and resistance to change. Failure to involve management and end-users can hamper the project's alignment with real business needs. Poorly executed re-engineering could lead to operational complications. Misunderstandings within the project team could affect the quality of results. Lack of expertise and competence, inadequate planning or resources could compromise the project's success. Finally, resistance to change can hamper acceptance of the new system. Proactively managing these risks is essential to ensure a successful transition to the next phase of the project.

Table 2. Guidelines for the analysis phase

Analysis phase	Objectives		
	- Define the scope of the project - Define project goals and objectives - Analyze and map existing business processes - Define the project team		
	Critical success factors - Top Management support and involvement - Involvement of end users and stakeholders - Project scope - Project management - Process reengineering - Project team competencies - Change management		
	Inputs	Processes	Outputs
	- Review and examination of documents and reports	- Project kick-off meetings to provide an overview of the project vision, scope, objectives, key performance indicators and benefits to stakeholders - Discussions and evaluation of key users to understand the current processes - Build an efficient, capable and qualified project team	- Project plan - Process mapping - Functional requirements document
	Risks - No involvement of management and end users - Poor reengineering - Poor understanding between the project team - Lack of expertise and competence of the project team - Inadequate planning and resources - Resistance to change		

Design phase

The purpose of this phase is to present prototypes for each module to be implemented. It also involves formalizing detailed specifications, validating business rules, and defining the method and mechanism for data migration. By implementing these elements, this stage aims to ensure a thorough understanding of expected functionality, guarantee compliance with pre-established business rules, and rigorously plan the data transition. All in all, this phase is a crucial step in bringing the project to fruition, providing a solid framework for the

development and effective implementation of the envisaged modules.

The design phase builds on the results obtained in the previous analysis phase, using the understanding of current work processes as a basis for developing the prototype of each module to be implemented. Based on the findings of the analysis phase, this phase aims to translate the project vision and specifications into concrete prototypes, thus laying the tangible foundations for further development. It is an essential step in ensuring a smooth transition from the data gathered during analysis to tangible representations of the modules, enabling concrete visualization prior to actual implementation.

During this phase, planning meetings were held involving employees, future users and the supplier. The aim was to understand each module to be implemented in its current state, to identify the adaptations required to meet current and future business needs, to explore the new functionalities to be developed that are not available in the standard ERP, and finally, to define the method and mechanism for migrating data to the new ERP. These strategic meetings helped to align expectations, clearly define customization steps, and ensure consistent planning for the successful deployment of the new system.

The results of this phase were used to draw up the detailed functional specifications document, as well as the list of data collection and migration models. Based on the conclusions drawn during this phase, we were able to formalize in depth the functional specifications required for the project. In addition, the list of templates developed facilitated the structuring and planning of the data collection and migration process to the new system.

The results of our research indicate that several critical factors influence the success of this phase:

- Top Management support and involvement.
- Involvement of end users and stakeholders.
- Project management.
- Project team competencies.
- Change management.

Table 3. Guidelines for the design phase

Design phase	**Objectives**		
	- Presentation of the prototype of each module - Formalize the detailed specifications - Validate the business rules - Define the method and mechanism of data migration		
	Critical success factors - Top Management support and involvement - Involvement of end users and stakeholders - Project management - Project team competencies - Change management		
	Inputs	Processes	Outputs
	- Preparation of the prototype based on the results of phase 1: Installation and configuration	- Key user and vendor meetings to understand the modules to be implemented “as is” - Understand the customization of each module to meet current and future business needs - Identify features that are not available immediately in standard ERP - Discussion of the method and mechanism of data migration to the new system	- Detailed functional specifications document - List of data collection and migration templates
	Risks - No involvement of management and end users - Poor understanding between the project team - Lack of expertise and competence of the project team - Inadequate planning and resources - Resistance to change		

Key risks to consider during this phase include non-involvement of both management and end-users, the potential for misunderstanding between project team members, lack of expertise and competence within the team, planning and resources deemed inadequate, and resistance to change. Lack of management and

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end-user involvement could hamper the alignment of project objectives with real business needs. Ineffective communication between project team members can lead to misunderstandings that are detrimental to the quality of results. Lack of expertise within the team, inadequate planning and insufficient resources can compromise the quality and success of the project. Finally, resistance to change can hamper the acceptance and effectiveness of the new system. Proactive management of these risks is crucial to ensure a successful transition to the next phase of the project.

Realization phase

The realization phase aims to build the system, encompassing the configuration of the standard solution, customization, specific development, testing, data migration, and the resolution of anomalies detected during testing. By implementing these elements, this phase aims to turn the prototype developed earlier into reality, by working on the specific configuration, the necessary adaptations, the development of specific functionalities, as well as the in-depth verification of the system. Data migration to the new solution is also planned and executed during this phase. Throughout this phase, any anomalies identified during testing are addressed to ensure that the system is operational and compliant with specifications.

The realization phase builds on the previous design phase, which integrates detailed functional specifications and data from all departments that will be migrated to the new ERPS. Using the information gathered during the design phase, this stage aims to concretely implement the specified functionalities, while orchestrating the efficient migration of essential data from all departments to the new ERP. This ensures seamless continuity between design and actual system implementation, ensuring a consistent and successful transition to the new operating environment.

The start of this phase revolves around the initial configuration of the standard solution, continuing with the customization of forms, screens, menus and reports, as well as the specific development of new functionalities. This phase also includes the careful preparation and migration of essential data, followed by thorough testing to ensure that the system functions correctly. Once testing is complete, the focus shifts to resolving any anomalies identified, with the aim of correcting them and optimizing overall system performance before the final deployment phase.

The results obtained during this phase were used to create the configuration document, the test catalog, the training materials, and to gather the data to be migrated as well as the source code for custom and specific developments. Based on these elements, we established detailed system configuration documentation, defined test criteria and processes, prepared training tools, and organized the data required for migration to the new system. These elements are essential to ensure a smooth and successful transition to the next phase of the project.

The results of our research indicate that several critical factors influence the success of this phase:

- Top Management support and involvement.
- Project management.
- Project team competencies.
- Minimal customization, a successful implementation usually involves minimal customization. Customizing an ERP can be really interesting and beneficial, but it can also result in additional costs and an even longer implementation timeline, so it becomes difficult to make upgrades to the latest versions.
- ERPS configuration deals with the management of numerous usage controls, which can be enabled or disabled, to balance its functionality to the extent necessary. The configuration of these elements is based on the detailed functional specifications to align the ERPS processes with the business processes of the company. The configuration must be performed by people who understand the business and the company's business, and also have a thorough understanding of the solution to be implemented.

Major risks to consider during this phase include a lack of management commitment, a project team lacking adequate expertise, insufficient planning and resources, an inappropriate technological infrastructure, and a risk of excessive or incorrect customization. Management's lack of involvement could hamper crucial decision-making, while the project team's lack of expertise could compromise the quality of implementations. Inadequate resources and planning can lead to delays and inefficiencies, while an inappropriate technological infrastructure could result in operational complications. Finally, excessive or incorrect customization can generate compatibility and system operation problems. These risks require proactive management to ensure the success of the phase.

Table 4 shows guidelines for the realization phase (objectives, CSFs, inputs, processes, outputs and risks).

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Table 4. Guidelines for the realization phase

Realization phase	Objectives		
	- Configuration of the standard solution - Customization and specific development - System testing - Data migration - Resolve the anomalies found in the tests		
	Critical success factors - Top Management support and involvement - Project management - Project team competencies - Minimal customization - ERP system configuration		
	Inputs	Processes	Outputs
	- Detailed functional specifications document - Data from all departments according to the templates	- Configuration of the standard solution - Customization of current form templates, screens, menus and reports - Specific development of new functionalities - Preparation and migration of data - Integration tests (process, integration and data acceptance) - Resolution of anomalies found in the tests	- Configuration document - Source code for specific and customized developments - Data migration - Catalog of tests - Supports for formation
	Risks - No involvement of management - Lack of expertise and competence of the project team - Inadequate planning and resources - Inadequate technological infrastructure - Incorrect or excessive customization		

Final preparation phase

The final preparation phase focuses on training users, carrying out the acceptance test in collaboration with them, and resolving any anomalies detected during this validation phase. During this crucial stage, the aim is to ensure that users acquire the skills they need to use the new system effectively. Carrying out the acceptance test with the participation of users enables us to validate the system's correct operation under real-life conditions. In addition, any anomalies identified during this stage are dealt with proactively to ensure a smooth transition to the next phase of full system deployment.

The final preparation phase builds on the work accomplished during the previous implementation phase, which included the creation of training materials and the preparation of acceptance data sets. Drawing on the concrete elements developed during implementation, this phase aims to orchestrate a smooth transition to user training and acceptance testing. The training materials developed earlier are used to ensure a thorough understanding of the new system, while the recipe datasets are used to validate the system's correct operation under practical conditions before full deployment.

This phase begins with user training to ensure that all employees have the necessary skills to properly use the system and perform the job effectively. Proper training ensures that employees use the system effectively and efficiently. The training is done in two phases, first the leaders of the implementation teams will coach a few users, who will be considered as "trainers". Then, these trainers will train the other users. Once the training of the users is completed, we move on to the recipe with the users, which consists of testing the correct functioning of all the management processes of the new ERPS by the users. Each function corresponds to a test case and each test case to data sets. After the recipe users, we move on to the resolution of the anomalies reported in this phase to correct them.

The findings obtained during this phase were used to create the user guides, the final configuration document, the production launch plan, as well as to gather the final migration data and the final source code for specific and customized developments. These results are essential for consolidating the information required for effective use of the new system. The user guides provide clear instructions for end-users, the final configuration document details the system parameters, and the production release plan sets out the strategy for the actual deployment of the system. In addition, the final migration data and source code form the basis

for ensuring the stability and performance of the system as it is deployed in the full operating environment.

The results of our research indicate that several critical factors influence the success of this phase:

- Top Management support and involvement.
- Involvement of end users and stakeholders.
- Project management.
- Project team competencies.
- Change management.
- User training is of crucial importance to ensure the successful integration of the new system within the organization, and to guarantee its correct use. It also plays an essential role in optimizing business performance.

Major risks to consider during this phase include the non-involvement of both management and end-users, a lack of expertise and competence within the project team, inadequate planning and resources, resistance to change, and the possibility of insufficient user training. Failure to involve management and end-users could compromise the alignment of project objectives with real business needs. Lack of expertise and competence within the project team could have a negative impact on the quality of implementations. Insufficient planning and resources can lead to delays and inefficiencies, while resistance to change can affect acceptance of the new system. Inadequate user training could impact on their ability to take full advantage of the new system. Proactively managing these risks is imperative to ensure the success of the phase.

Table 5 shows guidelines for the final preparation phase (objectives, CSFs, inputs, processes, outputs and risks).

Table 5. Guidelines for the final preparation phase

Final preparation phase	**Objectives**		
	- User training - User recipe - Resolve the anomalies found in the user recipe		
	Critical success factors - Top Management support and involvement - Involvement of end users and stakeholders - Project management - Project team competencies - Change management - User training		
	Input	Process	Output
	- Supports for formation - Recipe datasets	- Training of key users - User recipe - Resolve the anomalies found in the user recipe	- User guides - Final configuration document - Final source code for specific and customized developments - Final migration data - Production go-live plan
	Risks - No involvement of management and end users - Lack of expertise and competence of the project team - Inadequate planning and resources - Resistance to change - Poorly trained users		

Commissioning and support phase

The purpose of this phase is to launch the new ERPS operationally. It marks the effective start of day-to-day use of the new ERPS within the organization. During this phase, efforts are focused on transitioning the system from its final stage of readiness to production deployment.

The current phase draws its foundations from the results obtained in the final preparation phase that preceded it. The work accomplished during the final preparation phase, such as user training, acceptance testing and bug resolution, provides the necessary basis for the transition to operational deployment of the system.

This phase began with the configuration of the system on the production environment, followed by the installation of the source code for customized and specific developments, and the migration of data to this operational environment. Once the system has been put into production, ongoing support and guidance is imperative to ensure that system users can take full advantage of all its functionalities in the performance of their tasks. This support includes answering their questions, guiding them through the various possible uses of

the system, and resolving any problems encountered, thus ensuring a smooth transition to the new ERPS.

The findings of this phase were used to prepare the project's closing report. This document summarizes the results achieved throughout the ERPI, and provides a comprehensive assessment of the project's success. The closing report offers a retrospective perspective, highlighting successes, lessons learned and recommendations for possible future improvements. By consolidating essential information, it provides a documented reference for the project team and stakeholders, marking the official conclusion of the ERPI project.

The results of our research indicate that several critical factors influence the success of this phase:

- Top Management support and involvement.
- Project management.
- Project team competencies.
- Change management.

The current phase exposes several major risks that merit particular attention. It is crucial to consider the possibility of non-involvement of both management and end-users, which could compromise the alignment of project objectives with real business needs. In addition, a lack of expertise and competence within the project team poses a potential threat to the quality of implementations. Inadequate planning and resources could lead to delays and inefficiencies, while resistance to change could affect acceptance of the new system. In addition, it is essential to remain vigilant to the discovery of new usability issues that may arise as the system is rolled out. Managing these risks proactively is essential to ensure the ongoing success of the phase.

Table 6 shows guidelines for the commissioning and support phase (objectives, CSFs, inputs, processes, outputs and risks).

Table 6. Guidelines for the commissioning and support phase

Commissioning and support phase	**Objectives**		
	- Commissioning of new ERP system		
	Critical success factors		
	- Top Management support and involvement - Project management - Project team competencies - Change management		
	Input	Process	Output
	- Final configuration document - Final source code for specific and customized developments - Final migration data	- Configuring the production environment - Install the source code for custom and specific developments - Migrate data to the production environment - Perform a production release audit - Provide post-production support	- Project closing report
	Risks		
	- No involvement of management and end users - Lack of expertise and competence of the project team - Inadequate planning and resources - Resistance to change - Discovery of new usage problems		

DISCUSSION

As the socio-economic environment evolves, organizations are faced with increasingly complex requirements, and to meet them, they call upon technological and management tools that are constantly being developed and that attempt to integrate this growing complexity. One of the major tools for businesses to exceed and meet their information requirements and needs is the ERPS. ERPI in SMEs has proven to be significant for SMEs to be following the best practices in the industry. ERPs are nowadays among the major tools to reinforce competitiveness. They represent an advantage that transforms working methods by promoting the rapid dissemination of information, the coordination of actions, the emergence of new approaches, rapid access to a wide range of knowledge and the creation of new services. While there has been an increase during the last few years in the usage of ERPS in SMEs, it is apparent in the literature that the majority of ERPI are not successful and the percentage of success is relatively low, because of the complex and difficult process of implementing ERPS. The ERPI complexity is very different between enterprises, depending on the size of the enterprise and

the system complexity itself. Therefore, numerous SMEs consider ERPI as an essential part of their improvement strategy. As SMEs still have resource constraints, they should think about how and when to use those resources, so they don't run out of resources during the ERPI, rather than being overly ambiguous about what to do and when to do it. It seems important to have clear steps for ERPS implementation in SMEs, which will facilitate the complexity of the system implementation. This means that instead of bringing about radical changes in SMEs by implementing an ERPS, a systematic incremental approach seems more appropriate. Therefore, there is a need for a structural framework to help SMEs implement the ERPS in order to overcome the difficulties encountered during the implementation of the ERPS and to enable SMEs to obtain the benefits related to the ERPS. This framework, which is composed of several phases in the Moroccan SMEs context, was developed to help industry practitioners to implement an ERPS. Most frameworks designed for ERPI follow similar phases, or rely on a proposed framework based on CSFs. However, we have not identified any frameworks that examine how the implementation phases can be interconnected, the transitions from one phase to another, or the specific objectives, risks and deliverables of each stage. Our framework distinguishes itself from existing ones by proposing significant improvements, filling identified gaps and strengthening aspects requiring improvement. It is presented as a systematic five-phase model, with each stage subdivided into inputs, processes, outputs, as well as objectives, critical success factors and risks, ensuring clear understanding and more effective implementation. The implementation starts with the analysis phase whose objective is to define the scope, goals and objectives of the project, analyze and map the existing business processes and define the project team. The second phase, which is the design phase, consists of presenting the prototype of each module to be implemented, formalizing the detailed specifications, validating the business rules and defining the method and mechanism of data migration. Then the realization phase which aims at building the system, i.e., configuration of the standard solution, preparation and migration of data, customization, specific development of new functionalities and testing. Then, the final preparation phase which aims the training and recipe of the users then solve the anomalies raised in the recipe users. Finally, the last phase, which is the commissioning of the new system and support. Our study provides a clear guideline to Moroccan SMEs that are considering implementing ERPS in the future by using the developed framework to determine the appropriate phases of ERPI, as well as prioritizing efforts and resources to manage critical factors affecting the success of ERPI.

CONCLUSION

The relevance of ERPS to support SMEs has been universally recognized. Thus, the central objective of this study was to design an ERP framework to assist Moroccan SMEs in implementing an ERPS. The framework developed, described in this paper, is structured in five phases, each encompassing specific objectives, critical success factors, inputs, processes, outputs, and risks to be considered. The applicability of our framework was demonstrated through a case study conducted in two companies, illustrating its relevance in concrete contexts. This research represents a significant contribution to the current literature on the implementation of ERPS within SMEs. Moroccan SMEs considering a future ERPS implementation can benefit from our framework, by following the phases demonstrated, offering practical guidance for their approach and increasing their chances of a successful ERPI.

Limitations

The framework proposed has been successfully applied in two companies, which suggests that the methodology can be extended by implementing the framework developed in other Moroccan SMEs. Further researches are necessary to generalize the framework developed including the IT infrastructure, the adoption of the concept of digital economy in business processes, which can improve framework capability in government and service organizations.

REFERENCES

1. Alaskari O, Pinedo-Cuenca R, Ahmad MM. Framework for implementation of Enterprise Resource Planning (ERP) systems in small and medium enterprises (SMEs): A case study. Procedia Manuf. 2021;55:424-30. doi:10.1016/j.promfg.2021.10.058.

2. Benbasat I, Goldstein DK, Mead M. The case research strategy in studies of information systems. MIS Q. 1987;369-86.

3. Dantes GR, Hasibuan ZA. Enterprise resource planning implementation framework based on key success factors (KSFs). 2011.

4. Davenport TH. Putting the Enterprise into the Enterprise System. Harv Bus Rev. 1998;76(4):121-31.

5. Dezdar S, Ainin S. The influence of organizational factors on successful ERP implementation. Manag Decis.

2011;49(6):911-26. doi:10.1108/00251741111143603.

6. Esteves J, Bohórquez VW. An Updated ERP Systems Annotated Bibliography: 2001-2005. Commun Assoc Inf Syst. 2007;19(18):386-446. doi:10.17705/1CAIS.01918.

7. Esteves JM, Pastor JA. An ERP life-Cycle-Based Research Agenda. First Int Work Enterp Manag Resour Plan Methods Tools Archit (EMRPS). 1999; Venice, Italy.

8. Govindaraju R. Enterprise systems implementation framework: An organisational perspective. Procedia Soc Behav Sci. 2012;65:473-8. doi:10.1016/j.sbspro.2012.11.151.

9. Haddara M, Zach O. ERP Systems in SMEs: An Extended Literature Review. Int J Inf Sci. 2012;2(6):106-16. doi:10.5923/j.ijis.20120206.06.

10. Jagoda K, Samaranayake P. An integrated framework for ERP system implementation. Int J Account Inf Manag. 2017. doi:10.1108/IJAIM-04-2016-0038.

11. Lune H, Berg BL. Qualitative research methods for the social sciences. Pearson; 2017.

12. Malhotra R, Temponi C. Critical decisions for ERP integration: Small business issues. Int J Inf Manag. 2010;30(1):28-37. doi:10.1016/j.ijinfomgt.2009.03.001.

13. Marciniak R. Piloter les technologies de l'informatique et des télécoms-Modèles et outils. Weka éditions; 2001.

14. Markus ML, Tanis C, Van Fenema PC. Enterprise resource planning: multisite ERP implementations. Commun ACM. 2000;43(4):42-6. doi:10.1145/332051.332068.

15. Martin MH. An ERP strategy. Fortune. 1998;137(2):149-51.

16. Miranda R. The rise of ERP technology in the public sector. Gov Finance Rev. 1999;15:9-18.

17. O'Brien JA, Marakas GM. Management information systems. McGraw-Hill; 2010.

18. Olson DL, Staley J. Case study of open-source enterprise resource planning implementation in a small business. Enterp Inf Syst. 2012;6(1):79-94. doi:10.1080/17517575.2011.566697.

19. Peslak AR, Subramanian GH, Clayton GE. The phases of ERP software implementation and maintenance: A model for predicting preferred ERP use. J Comput Inf Syst. 2008;48(2):25-33.

20. Pliskin N, Zarotski M. Big-Bang ERP Implementation at a Global Company. In: Cases Inf Technol Plan Des Implement. IGI Global; 2006:27-40. doi:10.4018/978-1-59904-408-8.ch002.

21. Ross JW, Vitale MR. The ERP revolution: surviving vs. thriving. Inf Syst Front. 2000;2(2):233-41. doi:10.1016/j.procs.2016.09.179.

22. Somers TM, Nelson KG. A taxonomy of players and activities across the ERP project life cycle. Inf Manag. 2004;41(3):257-78. doi:10.1016/S0378-7206(03)00023-5.

23. Strong D, Volkoff O. Understanding Organization—Enterprise System Fit: A Path to Theorizing the Information Technology Artifact. MIS Q. 2010;34(4):731-56. doi:10.2307/25750703.

24. Teittinen H, Pellinen J, Järvenpää M. ERP in action—Challenges and benefits for management control in SME context. Int J Account Inf Syst. 2013;14(4):278-96. doi:10.1016/j.accinf.2012.03.004.

25. Upadhyay P, Jahanyan S, Dan PK. Factors influencing ERP implementation in Indian manufacturing organisations: A study of micro, small and medium-scale enterprises. J Enterp Inf Manag. 2011;24(2):130-45. doi:10.1108/17410391111106275.

26. Yin RK. Case study research: design and methods. 3rd ed. Sage; 2003.

27. Yin RK. Case study research: design and methods. 5th ed. Sage; 2009.

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There is no conflict of interest.

AUTHOR CONTRIBUTION

Conceptualization: Yassine ZOUHAIR, Younous ELMRINI.
Data curation: Yassine ZOUHAIR, Younous ELMRINI, Mustapha BELAISSAOUI.
Formal analysis: Yassine ZOUHAIR, Younous ELMRINI, Mustapha BELAISSAOUI.
Research: Yassine ZOUHAIR, Younous ELMRINI.
Methodology: Yassine ZOUHAIR, Younous ELMRINI, Mustapha BELAISSAOUI.
Drafting - original draft: Yassine ZOUHAIR, Younous ELMRINI.
Writing - proofreading and editing: Yassine ZOUHAIR.