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Implementation Phases in Both Closed-Source and Open-Source ERP Systems

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Abstract*—There are several classifications of the ERP systems, including the classification according to ownership of the software source coding into open-source ERP systems (OS), and closed-source ERP systems (CS). The life cycle of implementing ERP systems includes several stages (pre-implementation stages, implementation stages, and post-implementation stages). These stages differ in CS from the OS ones. In CS the Implementation process is usually more formal and is a systematic and clear process, while in OS it is more flexible and customizable, so it is more complex in OS and requires high skills in all stages of the Implementation. Several factors are necessary for success in the Implementation process. Attention must be paid to determining the availability of these factors and their performance standards, as failure to pay attention to them is the main reason for the higher failure rate of Implementation processes in OS than in CS. This research attempts to determine the basic Phases of each implementation stage for both closed-source and open-source ERP system by answering the following four questions:

- *What are the stages of implementation in both of closed-source and open-source ERP systems?*
- *What are the differences between the implementation phases in both (CS) and (OS)?*
- *What are the main reasons for differences in the implementation phases of open-source ERP systems (OS) and closed ERP systems (CS)?*
- *What are the factors that should be taken into consideration when choosing the type of ERP system?*

***Keywords*—** *Implementation phases, ERP systems, closed-source and open-source systems, Implementation key factors*.

I. INTRODUCTION

ERP systems are software programs used to manage core business processes, such as (warehousing, human resource planning, manufacturing, sales, marketing, purchasing, finance, and more) [1].

ERP systems are divided into several classifications, including: According to Deployment Models, or Scope and Size, or according to Code ownership.

Examples for OS: (Odoo, ADempiere, Apache OFBiz, Dolibarr, ERP Next) are ERP systems that are developed and distributed under an Open-source license, which means that the source code of the program is available to anyone to view, modify, and distribute it. It is not limited to the company that create it (the vendor). OS are usually free or much cheaper than CS. Developers can modify the source code to meet the business needs, and they can contribute to improving the software and to review the source code for security vulnerabilities. However, one of the disadvantages of OS is the lack of technical support from the vendor or its absence, and it may be difficult to be integrated with other systems, so, expert employees are required to develop and implement OS.

As for standard/closed ERP systems, examples: (SAP, Oracle E-Business Suite, Microsoft Dynamics AX) are ERP systems that are developed and distributed by one owner company (the vendor). Among their advantages is technical support from the vendor, as it is committed to providing comprehensive technical support. As for experience, it is easy to find employees with experience in using CS [2]. However, the high cost of CS is much more expensive than OS, which is one of its most important disadvantages. It may not be possible to customize CS to meet the business specific needs, because ownership of the program's source code is exclusive to the vendor, which limits your control over the system.

II. PREVIOS STUDIES

Jayantha Jayasinghe and Upul Wijewardena compare the implementation phases of closed and Open-source ERP systems, highlighting the key challenges and success factors specific to Open-source implementations. They emphasize the importance of community support, customization flexibility, and lower upfront costs in Open-source ERP [3].

Michael W. Umble and James A. Harris offer a global perspective on ERP implementation best practices. They highlight the need for careful planning, customization, and support considerations during their implementation [4].

Stefan Smolnik and Carsten Feld, Thire article proposes a theoretical framework for understanding how Open-source ERP systems influence implementation practices. It argues that Open-source ERP systems lead to more collaborative and user-driven implementation [5].

Brian Lawley provides a practical guide to implementing Open-source ERP systems. He discusses the specific phases of Open-source ERP implementation, including requirements gathering, system selection, configuration, customization, and testing. He also compares Open-source and closed source ERP implementation approaches [6].

Ravi Shankar Kalyan offers comprehensive textbook covers various aspects of ERP systems, including implementation. While not focusing solely on Open-source vs. closed source, it dedicates a chapter to Open-source ERP systems, discussing their advantages and challenges in the implementation process [7].

N. Anitha and C. Rajendran, provide a case study focuses on the different methodologies used for implementing closed and Open-source ERP systems. It identifies the iterative and

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agile development approach prevalent in Open-source implementations compared to the waterfall approach often used in closed source systems [8].

III. What Are The Stages Of Implementation In Both Of Closed-Source And Open-Source ERP Systems ?

The implementation phases of both closed source and open-source ERP systems share a similar infrastructure, although there may be some differences due to inherent differences between the software models. Below are details of typical stages [9]:

A. Evaluation and design (Gap analysis)

In the evaluation and design phase, the company collaborates with the vendor to define its needs and goals for the ERP system, which are considered as critical factors (CAFs). Vendors typically provide pre-evaluation and design to customers, saving the company time and effort. However, if a company has specific or complex requirements, it may want to take responsibility for the evaluation and design itself.

B. Preparation

In the setup phase, the system is installed and configured to meet the company's needs. Vendors typically provide a range of services for system setup, including installation, configuration, and user training. However, if the company has sufficient internal resources, it may want to set up the system on its own.

C. Integration

In the integration phase, the system is integrated with other business systems. Vendors typically provide integration services with other business systems, ensuring that the system works seamlessly with the rest of the business environment. However, if a company has complex or specialized business systems, it may want to integrate the system with other business systems on its own or using an outside vendor.

D. Training

In the training phase, end users are trained to use the system. Vendors typically provide training for end users, which helps them get started using the system quickly and efficiently. However, if a company has a large number of end users or if it has specific training requirements, it may wish to provide training to end users on its own or using an external supplier.

E. Support

In the support phase, technical and financial support is provided to the system. Vendors typically provide financial and technical support, which helps companies keep the system up and running smoothly. However, if a company has specific or complex support requirements, it may wish to provide technical and financial support itself or using an outside vendor.

IV. What are the Difference Between the Implementation Phases in Both (CS) and (OS) ?

The life cycle of implementing ERP systems includes several stages (pre-implementation stages, implementation stages, and post-implementation stages). Below is a more detailed comparison between the implementation stages of the two types of ERP systems [10].

A. Closed ERP Systems

The client's project team often relies in selecting the candidate CS ERP on the reputation of the ERP system and its spread in the same field of work and among the client's competitors.

Pre-implementation stages:

- (Phase 1): Gap analysis: In this phase, the vendor agent presents a small demo to the assigned internal client team. Often, he explains how he implemented the recommended CS ERP at the client's competitors. the agent evaluates the important requirements of the business, and ensure that the candidate ERP system meets it.
- (Phase 2): Purchase: In this phase, the project team contracts with the vendor agent to use the candidate ERP system.

Stages of implementation:

- (Phase 3): Setup: In this phase, the vendor agent in cooperation with the project team prepares the ERP system, including its installation and configuration.
- (Phase 4): Deployment (staging environment): In this phase, the ERP system is deployed to users. on-premise, cloud or hybrid.
- (Phase 5): Testing: In this phase, performing functions testing and stress tolerance for the entire system and devices, testing the package and retrieving data.
- (Phase 6): Complete training, ensuring the user's acceptance of the system's functions, and developing a comprehensive plan to move to the live operation stage (Production environment).

Post-implementation stages:

- (Phase 7): Support: In this stage, the vendor's agent provides support to the internal project team and users of the CS, and the system's performance is evaluated by measuring and monitoring performance at frequent intervals during operation to avoid any error.
- (Phase 8): Improvements: In this stage, improvements are made, system problems are solved, and the system is upgraded to the latest versions.

B. Open-source ERP systems

The client's requirements differ in each project in which prefers to choose the OS ERP system. The project team expects the ERP to achieve all their requirements, because of knowing that the customizations in OS systems are widely available.

Pre-implementation stages:

- Phase 1: Evaluation: In this phase, vendor agent presents a small demo, and assesses the needs of the business which are considered as critical factors (CAFs). He ensures that the candidate ERP system meets these needs, determines the required

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customizations and estimates the cost of the entire system and the deadline for actual deployment (Go Live).

- Phase 2: Subscription and contracting: In this phase, A contract is concluded with the vendor's agent or the nominated developer to pay the vendor's annual subscription fees, and the percentages for paying the customizations and implementation costs to the vendor's agent or developer are agreed upon after each stage of implementation.

Stages of implementation:

- Phase 3: Customization: In this phase, the vendor agent or developer customizes the open-source ERP system to meet the business needs.
- Phase 4: Setup: In this phase, the vendor agent in cooperation with the project team prepares the ERP system, including its installation and configuration.

Stages of final preparation:

- Phase 5: Training: The vendor's agent or developer trains employees on the final system before Go-live deployment
- Phase 6: Deployment: In this phase, the open-source ERP system is deployed to users on servers, whether internal, cloud, or hybrid.

Post-implementation stages:

- Phase 7: Support: In this stage, the vendor does not provide any support, but the developer community or the vendor's agent provides support to users of the open-source ERP system, and the support is often for a cost determined by the developer or vendor's agent.
- Phase 8: Improvements: In this stage, the improvement processes to solve system problems and upgrade the system to newer versions are very expensive and arduous and require great experience due to the need to reprogram all customizations made to the current version to newer versions.

V. What are the Main Reasons for Differences in the Implementation Phases of Open-Source ERP Systems (OS) and Closed ERP Systems (CS) ?

Here are some of the main differences between the implementation phases of the two types of ERP systems [11]:

A. Formal and systematic:

CS usually has a more formal and structured implementation process, with specific phases and specific responsibilities for each phase. OS is more flexible and customizable, allowing companies to adapt the process to their specific needs.

B. Time:

Implementation of CS usually takes longer than Implementation of OS. This is because the implementation process of a CS ERP system is more formal and requires more steps, and CS is often requiring more work to set up and configure.

C. Cost:

CS is usually more expensive than OS. This is because the source code of CS is owned by the company that developed it, while it is freely available in the OS. CS Often requires purchase of license and support from the vendor. As for licenses in OS from the vendor in exchange for use of the original program with Open-source code.

D. Control plane:

In CS vendors often provide implementation packages that define the framework of the implementation process, while OS is often tailored to the needs of the individual company.

E. Level of Support:

CS vendors typically provide a higher level of support than OS developers, because CS vendors often have a large, dedicated support team.

F. Customization:

OS gives businesses more flexibility in customization, because OS is often more adjustable to meet individual business needs.

TABLE I. The implementation responsibilities for each phase in both (CS) and (OS).

Phase	Closed source ERP	Open-source ERP
Evaluation and design	Vendors typically provide pre-design and assessment of the company's needs and selection of the appropriate system, including analysis of business requirements, assessment of compatibility with existing business systems, and design and preparation of the necessary system infrastructure	Customer is responsible for the evaluation and design, including analyzing business requirements and evaluating compatibility with existing business systems. Customer can pay to the vendor's agent for that
Preparation	Vendors typically provide a range of services for system setup, which may include system installation, configuration, and data transfer. Including system configuration and creating tables and metadata	Customer or vendor's agent is responsible for setting up the system on customer's own or using a third-party vendor, including configuring the system, creating tables and metadata, and transferring data
Integration	Vendors typically provide integration services with other business systems, including development of application programming interfaces (APIs) and data integration.	Customer or vendor's agent is responsible for integration with other business systems on customer's own or using a third-party vendor, including development of application programming interfaces (APIs) and data integration.
Training	Vendors typically provide training for end users, including training on basic operations and daily use of the system.	Customer or vendor's agent is responsible for training end users on customer's own or using a third-party vendor, including training on basic operations and daily use of the system.
support	Vendors typically provide technical support, including problem solving, updates, and maintenance.	Customer or vendor's agent is responsible for technical support on its own or using a third-party vendor, including updates, troubleshooting, maintenance, and technical support.

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VI. What are the Factors That Should be Taken Into Consideration When Choosing the Type of ERP System ?

Choosing the right ERP system is very important for any company, as it can greatly affect the performance and success of the implementation process in general. Here are some key factors to consider when choosing an ERP system [12],[13]:

A. Company size::

If the company is small (less than five people), an Open-source ERP system may be the best option, as small businesses can usually customize an Open-source ERP system to meet their own needs.

B. Company budget:

If a company has a limited budget, an Open-source ERP system may be the best option, as OS is usually free or has a small annual license fee compared to CS.

C. Company's business needs:

The company must take into account its business needs when choosing the type of ERP system. If a company has complex or specific needs, a closed ERP system may be the better option

D. Functions and features:

Accurately identifying the basic features that the business needs play an essential role in choosing the appropriate system. This may include financial functions, inventory management, customer relationship management (CRM), supply chain management, etc. Must find out whether there are functions that are unique to the company and whether the candidate system meets these functions or not.

E. Scalability and flexibility:

Based on future studies and predictions of how the business will grow in the future, an enterprise resource planning (ERP) system is chosen that can adapt and expand to meet the evolving needs of the organization. You should look for a system that provides customization options to suit your workflow and processes.

VII. Conclusion

Choosing the appropriate type of ERP system depends on the business needs of each company. If a company is looking for a more formal and structured implementation process, a closed ERP system may be the better option. If a company is looking for flexibility and customizability, an Open-source ERP system may be the best choice.

In general, CS requires a higher level of investment and commitment from companies. However, these systems can provide a wide range of features and functions that may be useful for large or complex companies.

OS is less expensive in terms of cost and time, and may be a good option for small or medium-sized companies looking for an ERP system with basic functionality.

Overall, CS is a good choice for businesses looking for a ready-to-use system that meets their basic needs. It is also a good choice for companies that want financial and technical support from the vendor.

While OS is a good choice for companies looking for a customizable system that meets their unique needs. It is also a good choice for companies that want to save money on the cost of licensing and support.

However, companies considering implementing an ERP system should take into account their unique needs and requirements when deciding which type of system is right for them.

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