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The implementation of ERP systems in manufacturing firms-
Its merits, prerequisites and impact on business performance of local firms
مزايا ومتطلبات تبني أنظمة تخطيط موارد المؤسسة في المؤسسات الصناعية وأثره على الأداء
ـدراسة عينة من المؤسسات المحليةـ

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Abstract

The Enterprise Resource Planning ERP systems have gained a considerable place in modern industrial firms in the last decade. Implementing an ERP system in firms can be a challenging transition, but a rewarding change if the software is implemented properly. The purpose of this article is to provide further insights into the implementation of enterprise resource planning systems and their impacts on business performance. It aims at showing their benefits and providing evidence of the prerequisites that firms should provide to take advantage of ERP solutions. To collect the study data, a questionnaire was distributed to ERP users to empirically test the research model. there is a relationship between ERP usage and performance, though, firms have to adopt ERP systems as part of a strategic project of automation, they have to made some organisational changes and also have to provide the required technical and financial support.

Keywords :ERPsystems implementation, performance, automation, change, technical and financial support.

ملخص

أصبح نظام تخطيط موارد المؤسسة موردا هاما في المؤسسات الصناعية الحديثة. حيث أنه في حالة توظيفه الجيد فإن المؤسسة ستستفيد من مزاياه بشكل واضح، لكن عملية تبني هذا النظام يمكن أن تتخللها بعض التحديات والعقبات.

يهدف هذا البحث للتعريف الجيد بنظام تخطيط موارد المؤسسة وأثره على أدائها ، كما يهدف لمعرفة مزايا النظام ومتطلبات نجاح تثبيته في المؤسسة.

لجمع البيانات ،تمّ إعداد استبيان وتوزيعه الكترونيا على عينة من المؤسسات . وقد تبين وجود أثر إيجابي لتبني نظام تخطيط موارد المؤسسة على أدائها، لكن المؤسسات ملزمة على تبني استراتيجية واضحة لأتمتة عملياتها ، كما أنها مطالبة بإحداث تغييرات تنظيمية وتوفير الدعم والموارد الفنية والمالية لإنجاح عملية إدخال النظام الجديد.

الكلمات المفتاحية: نظام تخطيط موارد المؤسسة، الأداء، الأتمتة، التغيير، الدعم الفني والمالي.

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1. INTRODUCTION

To run effectively a business, the managers need skills, experiences, business acumen and the appropriate deployment of information technologies and systems especially Enterprise planning systems.

ERP systems have proven their dominance in the field of software solutions for business. They automate and support a range of administrative and operational business processes across industries which enable them to better compete and stay ahead of the rivals.

ERP systems are developed to satisfy the need of businesses to access to reliable, relevant, up-to-date information in order to reduce cycle times and costs and to improve product and service quality.

Long ago, only big businesses could bear the cost of adopting ERP systems because of the economic and technological restraints. Though, ERP implementation is now possible for SMEs as there are ERP software for small entities.

The implementation of ERP modules in businesses does not necessarily mean success, it is often plagued by uncertainties, more than a half of ERP implementations fail (AW Scheer, F Habermann, 2000).

This paper is structured as follows: after the introduction, a theoretical framework on ERP implementation is provided. We will then detail the research methodology. The next section describes the data analysis followed by a conclusion.

This research addresses the question of adopting ERP modules in industrial firms, their advantages, their obstacles, their Critical Success Factors and their impact on the business performance.

To collect the study data, a survey questionnaire was distributed to ERP users to empirically test the research model developed in this study. In addition to demographic and background information question, the survey contained instruments to measure the study variables.

We will especially focus on the following research questions:

- *What are the merits and objectives of ERP systems for firms?*
- *What are the prerequisites which enable firms to reach these objectives and therefore can be defined as critical success factors?*
- *What is the impact of ERP systems on business performance?*

2. Theoretical Framework

2.1 What is ERP

Enterprise Resource Planning (ERP) systems refer to organization-wide integrated information systems that are used to improve the efficiency and effectiveness of business processes by capturing real time business data and providing accurate, timely, and consolidated information throughout the organization (Saadé et al, 2017).

Enterprise Resource Planning is a software used by businesses to plan and oversee routine operations, such as supply chain management, manufacturing, services, project management, customer relationship management, risk management, compliance, accounting and procurement. ERP software helps to automate and organize these business activities, as well as connect departments for better communication and capture data about operations. Overall, ERP software enables businesses to function more effectively. (Kristin Poulton, 2021)

ERP refers to a business process management software that optimizes the processes of an organization by providing a system of integrated and centralized applications that manage and automate a wide range of business operations including accounting, human resources, sales and inventory management.

2.2 ERP systems core modules in firms:

ERP systems suppliers provide a variety of modules for businesses that contribute in their pursue for automation.

Fig.1 ERP core Modules

Source: The Web

For finance: ERP Finance module will take care of all accounts-related entries and their impact on the whole system.

How finance comes and how it is used. That will reflect the total flow of money (Cash/Bank) and total expenditures. It helps also to generate all sorts of critical financial reports.

Purchasing module rationalizes the purchase of required raw materials, packaging material, sub assembly and other non-inventory materials. It automates the processes of identifying potential suppliers, Supplier evaluation, supplier quote evaluation, awarding purchase order to the supplier, and billing processes.it prevents stock shortages and thus improve quality and reduce cost/time of procurement.

Manufacturing module in ERP ensures that machinery, workforce and material components are available in order to yield the desired finished products as scheduled.

Inventory management modules help measuring stock targets, standardizing renewals, and tracking items in the firm with serial numbers.

Supply chain management (SCM) module addresses firms' supply chain,

including areas such as purchase order management, process automation, and production flow from production to consumer, and back again in the case of recalls or returns.

Human resource management (HRM) module addresses firm' staff and includes things like time sheets, employee records, performance reviews, payroll systems, and job profiles.

Customer relationship management (CRM): This module aims to improve customer service and profit per capita. It manages leads, customer issues, and customer opportunities. In an ERP setup, it works closely with the sales module to speed up conversions.

Project Management module: offers advanced tracking tools and planning functionality specifically designed to meet unique needs. It helps to draw data directly into a project plan regarding real-time activities, synchronizes the dates, monitors the status and deadlines. It also handles comprehensive billing requirements of the project industry and avoid resources shortage through efficient inventory optimization, allowing the firm to have a detailed view of resource capacities to enhance delivery efficiencies.

2.3 ERP systems lifecycle:

The life cycle of ERP reflects how long a system remains usable. Because of changes in business and innovative paradigm, it becomes more and more difficult and expensive to maintain and extend the system, so the life cycle of ERP systems is getting shorter. The cycle of re-implementation and beginning a new cycle starts in this context. Many researchers tried to identify the phases that ERP systems pass through. in this section we present the model developed by (Esteves and Pastor,1999,p.19). This model is comprehensive and consists of six phases; adoption decision, acquisition, implementation, use and maintenance, evolution, and retirement.

Fig.2 ERP lifecycle phases

Source: personal

Adoption decision phase: In this phase, the need of a new ERP system is inspected, the business requirements, the nature of operations and the objectives of the company are carefully studied. What impact the ERP system will have on the company is also determined before deciding to go for ERP adoption. It is necessary to assess the organization's readiness, management's support and IT skills required before the ERP adoption decision is taken.

Acquisition phase: This phase involves selecting the vendor and the ERP software that best addresses the needs of the business. The pricing models offered by different vendors, the functionality of different ERP products. Businesses have to choose between two types of ERP systems, *On-premise* ERP system and *Cloud* ERP system, On-premise applications are located and operated within a user's datacenter, they are much more expensive. Apart from spending on licenses, users also need to purchase hardware and hire IT support personnel to maintain them. Though cloud ERP is a system that operates on vendors' cloud platform, allowing companies to access over the internet.

Implementation phase: This phase consists of the customization or parameterization and adaptation of the ERP package acquired according to the needs of the organization. Habitually this mission is made with the help of advisors who provide implementation methods, know-how and training. (Esteves and Pastor, 1999).

Use and maintenance phase: In this stage the firm uses ERP systems in the appropriate way to get the expected results, the supervisors track down the functioning of the system, and try to fix and maintain any errors or lapses.

Evolution phase: Activities that are fulfilled during this stage are typically updates and upgrades of the system, additional training and users' skills and capacities building, and the continuous business improvements. More over introducing and integrating more capabilities and functionalities into the new ERP system.

Retirement phase: with the appearance of new technologies and the inadequacy of the ERP system to the business needs, managers decide if they will substitute the ERP software with other information system approach more adequate to the organizational needs of the moment (Esteves and Pastor,1999,p.5)

2.4 ERP systems merits for firms

The implementation of ERP systems can bring significant advantages to firms' performance:

- ***The financial merits:***
  - Reduced operating and administration costs;
  - Reduced stock levels;
  - Increased turnover;
  - Reduced quality costs.
- ***The customer merits:***
  - Improved customer service;
  - Increased on-time shipments;
  - Improved quality;
  - Improved external information sharing;
- ***Internal business merits:***
  - Improved resource utilization;
  - Reduced data processing time;
  - Increased inventory turns;
  - Improved accuracy and timeliness of information;
  - Enhanced internal information sharing;
  - Improved decision-making;
- ***Learning and Growth merits:***
  - Increased user friendliness of IS;
  - Adherence to best practice work patterns;
  - Organisational learning;

- Effectiveness of employees;

2.5 The main prerequisites for a successful implementation of ERP:

The project of implementing ERP systems is vital in businesses' lifetime, its successful accomplishment requires a set of factors or prerequisites that managers should provide. The implementation of an ERP system is a highly challenging, complex and dynamic process which does not only involve technological but also organizational changes in the affected business (Otieno, 2010). These changes need to be carefully mastered in order to take advantage of an ERP solution. Critical success factors can be categorized into two groups; the strategic factors, and the tactical factors (Fang L et al.,2005,p.24), top management support and ERP strategy are strategic, the rest are tactical.

The main prominent factor is *top management commitment and support*; according to (Al-Mashari et al. 2003) and (Umble et al., 2003). Managers have to provide leadership and afford the necessary resources, communicate the strategy with all the stakeholders in order to ensure user acceptance and reduce the resistance for change and monitor the adoption of ERP and its progress.

Managers have another task which is drawing up *an ERP strategy*, that indicates what kind of ERP packages would be purchased and how long is the implementation process, and preparing *a business plan* and vision to guide the project throughout the ERP life cycle.

Another important factor is *ERP team composition and Teamwork*: the composition of the project team determines the result of implementing ERP, ERP project needs a mixture of employees with high technical, business and process competence and high commitment. (C. Barth, S. Koch, 2019,p.10), ERP project requires the common effort and cooperation of team members and the sharing of information between them.

Re-engineering Business Process is an important tactical factor which means the fundamental rethinking and radical redesign of business processes to achieve noticeable improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed" (A.S Balogun,2016, p.15), The enterprises must restructure their business processes to align with how the system should work.

one more factor is *Communication,* Managers have to communicate efficiently with their employees and system users by involving them in the

implementation process and sharing with them ideas about organizational changes that should occur when the ERP system is established, in order to avoid any resistance to change. Constant communication with all the interested parties in the company will let the system users know what is happening, what results are to be expected and if something goes wrong, they are directly informed and involved in solving the problem instead of being left behind in confusion (Dezdar et al,2011).

Vendor or Supplier Support: this is also an important factor, the right supplier also has a role in enhancing the quality of ERP products, thereby further ensuring user knowledge and involvement

2.5 ERP systems and Business performance:

This section will discuss the relation between ERP systems and business performance.

Previous studies have provided evidence about the positive effects of ERP implementation on the company's performance as shown in the table below:

Table 1: Previous studies tackling the effects of ERP on performance

Study details	ERP impact on Performance
Elragal and Al-Serafi (2011)	financial benefits, improvement of company operations.
(Huang et al., 2009)	Costs saving
Matolcsy et al. (2005)	more customer satisfaction by reducing time of delivery of product
Jeff K. Stratman et al. (2007)	Improvement in profitability
Erik Brynjolfsson et al. (2006)	Virtuous cycle" exists in the relationship between ERP investment and performance, that means initial investments in ERP drive performance gains, which encourage further investments, over years.
Andreas I. Nicolaou et al. (2005)	Long-term financial performance (Return on Assets, Return on investment, Return on sales) is reached providing that subsequent system changes are made.

B. Tsai (2008)	Rapid efficiency growth, with the consulting supports of leading vendors.

Source: personal, according to previous studies

3. RESEARCH METHODOLOGY:

3.1 Research Design

This study adopts a descriptive survey design. Descriptive surveys are used to describe the characteristics of variables selected in the study.

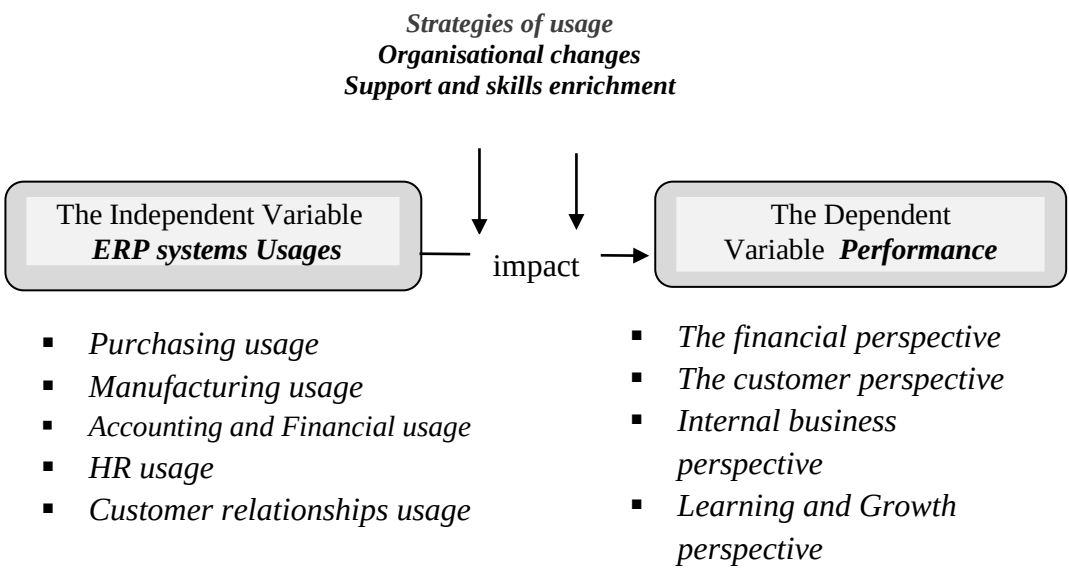
3.2 Population

The population targeted for the study covers the total of 70 firms in Algeria.

3.3 Data Collection

In this study, the research questionnaire was developed by the researcher and sent by e-mail to the respondents (Managers and IT Managers in the firms). The 70 questionnaires were distributed. 70 % percent of the original questionnaires were recovered, which means 49 firms have sent back their data.

3.4 Research Model



4. DATA ANALYSIS

The current study aims to assess the relationship between ERP

systems and firms' performance.

4.1. Designation of the Respondents

The table below shows that more than 80 % of the respondents hold a manager position, which indicates that most of the study's participants are familiar with daily operations. Therefore, they could provide the needed information on ERP implementation and performance.

Table 2: designation of respondents

Respondent function	*Number*	*Percentage*
Manager	8	17 %
Accounting manager	2	5 %
Human resources manager	7	14 %
Marketing manager	8	16 %
Financial manager	14	28 %
Other	10	20 %

4.2 Most useful ERP systems:

To differentiate between firms which use ERP systems and those which do not, we have been asking the respondents if their firms have already implemented any type of ERP systems, ten out of 49 did not establish any ERP system, so we have excluded them from further questions and analysis, the rest 39 firm have answered the question:

Which type or brand of ERP systems have your firm implemented?

The results are illustrated in the next table:

Table 2: Most useful ERP systems

ERP Brand or type	*N of users*	*Percentage (N/39)*
Oracle	11	28 %
SAP	10	26 %
Sage	5	13 %
Microsoft Dynamic AX	3	7.5 %
Delta	2	5 %
Other	8	20.5%

The study findings show that there are more than 5 brands of ERP systems used by firms. Oracle and SAP are the most popular ERP systems with 21 (54%) of the study's sample, followed by Sage, Microsoft-

Dynamics and Delta with 10 (26%) among the study's firms.

4.3 The impact of ERP usage on performance:

The use of ERP systems in SMEs improves performance under a number of conditions.

Our study examines the impact of implementing and using ERP systems on four perspectives of performance: *the financial perspective* is measured through productivity and cost reduction, *the customer perspective* is assessed via improvement in customer service and improvement in quality, *internal business perspective* is measured through improved resource utilization and improved decision-making, the fourth perspective *Learning and Growth* is evaluated by organizational learning and effectiveness of employees;

Two types of responses have been obtained, therefore two types of firms differ in terms of obtaining better performance indexes. The results are as follows:

- *33% of firms (13 firms) have not observed any improvement in their performance.*
- *67% of the firms (26 firms) reported improvement in at least one perspective of performance.*

The difference of impact caused by the usage of ERP systems needs to be explained by carrying out a deeper study of these firms. We split them up into two groups (the first group is *ERP unresponsive firms,* the second is *ERP responsive firms)* to carry out further analysis.

First, we investigate the strategies adopted by firms when implementing and using ERP systems, then we asked the respondents if their firms have made any changes in their organization. After that, we asked them if their firms provided support and specific training to enrich workers' skills and abilities.

- ***Strategies for the usage of ERP systems****:* The strategies for the usage of ERP systems are not always homogeneous and consistent. They vary according to the nature and objectives of firms' managers. Therefore, it is necessary to assess the motivations for those managers to adopt such technologies, as well as the impact of the strategic desire to develop applications linked to ERP systems.

Table 3: Motives of using ERP system

The motive / *firm category*	*ERP unresponsive firms (13)*		*ERP responsive firms (26)*	
Trial usage of ERP	7	53.8%	2	7.6%
Forced to use ERP	3	23%	3	11.5%
Project under implementation	2	15.4%	20	77%
Other motives	1	7.8%	1	3.9%

We notice that 77 % of ERP responsive firms have implemented ERP technologies as part of a strategic project of digitation, conversely, more than 53% of ERP unresponsive firms have implemented ERP systems just for trial, so there is an underestimation for the benefits and challenges of ERP.

***- Organisational changes*:**

Organizational change occurs when an enterprise converts its structure, strategies, methods, culture or other elements to reorganize and restructure the organization.

Many studies state that organizational change is a prerequisite for technology implementation success (Ahad Zareravasan et al.,2015) (Mohsen Attaran et al.2020), therefore, we have asked the respondents ***if their firms have made any changes to cope with ERP installation?***

The results are illustrated in the next table:

Table 4: Organisational changes

firm category	*ERP unresponsive firms (13)*		*ERP responsive firms (26)*	
Agree -Strongly agree	1	7.7%	23	88.4%
Strongly disagree- Agree	12	92.3%	3	11.5%

The table clearly shows that the majority of ERP responsive firms have made organizational adjustments and changes before, during or after the introduction of ERP technologies, which leads to better performing.

- Managerial Support and skills enrichment:

Another important factor that can affect the responsiveness of performance toward ERP is the support provided by managers to workers during the implementation of ERP systems, consequently we asked the respondents ***if their firms provided support and specific training to enrich workers' skills, know-how and abilities?*** The results follow in the next table:

Table 5: support and specific training

	ERP unresponsive firms (13)		*ERP responsive firms (26)*	
Implementing training plans	5	38 %	24	92.3 %
Funding ERP ad hoc training programs	2	15.4 %	12	50 %
Providing in-house assistance	2	15.4 %	23	88.4 %

It's clear that the majority of ERP responsive firms have implemented workers' training plans and provided internal assistance in order to enrich their skills and capabilities and consequently master the challenges of ERP systems.

5. Conclusion:

The implementation of ERP systems could be one of the most challenging and critical projects that manufacturing firms assume. The ERP systems can bring significant benefits to businesses despite the big costs they involve, but their deployment could face multiple challenges, which prevent them to provide the expected benefits. The fact that drives us to try to identify the prerequisites for successful ERP implementations. we found that the positive impact of ERP systems on business performance is associated with adopting the appropriate IT strategy, making some organizational changes and providing managerial support and specific training to enrich workers' skills and abilities.

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