



RESEARCH ARTICLE - MANAGEMENT

Modern Methods Used in Enterprise Resource Planning About the Business of International and Iraqi Commercial Companies

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Article Info.	Abstract
<p><i>Article history:</i></p> <p>Received 10 July 2023</p> <p>Accepted 17 September 2023</p> <p>Publishing 31 December 2023</p>	<p>The concept of enterprise resource planning depends on knowledge and the production of knowledge and its optimal use to determine the nature of the economy and its activities and means. Plan and expand the resources, methods, and techniques used in these activities.</p> <p>Research, planning, and development are important factors in the economy, and countries seek to invest in this important activity to achieve a renewable and diversified source of research and development. The economic institutions of these countries have become a window to get rid of surplus production that exceeds the need of the local market to be able to create a future vision for the possibilities of advancing this activity and its vital role for the economy and society. For it to be a model that can be applied, followed, and benefited from in drawing a picture of a bright role in an effective economic activity, despite the difficulty of obtaining some data and indicators related to this important activity in Iraq and some of them. This led to an increase in the volume of international competition based on product quality and lower costs and prices.</p>
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1. Introduction

Enterprise Resource Planning (ERP) is one of the technologies that has revolutionised the business world. Customer Relationship Management, Inventory, Supply, or even Financial Management for Economic Enterprises, this software package provides several modules that allow companies to manage all their sectors in a computerised manner to save time, increase productivity and maximise their profits. They are struggling in an ever-changing market, but digital technologies have enabled companies to remain competitive. PGI (Integrated Management Software Package), often known as ERP (Enterprise Resource Planning), is one of the technology solutions that has made a huge breakthrough in the business industry.

The emergence of today's network economy has increased market transparency. It allows greater customisation of customer needs, a major driver of systemic changes in volume and supply chain management (SCM) methodology. However, it has been observed that global prices for business are constantly rising, so advancements in supply chain management (SCM) can significantly impact a company. Due to the increasing competition in the industry, supply chain management has also been added as an element of efficiency. Surprisingly, ERP is in high demand as companies scramble to improve their supply chains. Manufacturing Resource Planning II (MRP II) was created in the 1980s after the 1970s saw the introduction of Market Requirement Planning (MRP), which also impacted how the sector developed.

Emphasis has been placed on the development of resource planning for economic institutions, as modern technology offers technologies capable of continuing for the better, such as the online ERP system, which is considered one of the most important and greatest revolutions for companies in the field of cloud computing and the connected era. Although some Iraqi companies are working hard to adopt this type of planning, they are preliminary and primitive steps so far and may become leaders in this field. It is important to move towards expansion in the future [1].

1.1. Research problem

Developed countries compete in developing their economies that depend on research, development, planning, and improving resources in terms of spending on this activity, supporting its indicators, allocating large amounts of the general budget for that, establishing institutions, and enacting laws related to this activity. However, there is a disparity between industrialised and developing countries, including Iraq, regarding the value of research and development. This has a detrimental effect on human skills, which are among the most important intangible sources for the growth of economic activity.

Nomenclature & Symbols			
ERP	Enterprise Resource Planning	SAAS	Software as a Service
MRP	Material Requirements planning	e ERP	Enterprise Resource Planning engineering
SCM	Supply Chain Management	MRPII	Manufacturing Resource Planning
PGI	Integrated Management Software Package	SPA	Single Page Application

1.2. Research importance

Its focus emphasises the importance of scientific research and technical innovation as tools for economic growth and powerful forces for advancing social, political, and economic realities. For developed and developing countries alike, to generate a stable source of growth, and to benefit from the application of successful global experiences in the fields of research, development, innovation, and creativity in industrialised countries, and to benefit from them in Iraq [2].

1.3. Research hypothesis

The subject of the study leads us to speculate that there are many engines of economic growth, the most important of which is the research and development sector, which is the sector in which economic growth and research and development activity are currently closely and mutually linked. Increased spending on research and development promotes economic growth, which is reflected in increased productivity or gaining a competitive advantage when producing goods and services for international markets.

1.4. The purpose of the research

Advancing the reality of the Iraqi economy by promoting economic growth and achieving global economic competition. The research aims to shed light on the sources of its economic growth (planning, research, and development) and ways to activate it. And to reveal the prospects for the development of the economy based on (research and development) and identify the basic factors that support sustainable economic growth [2].

1.5. Research methodology

To clarify the role of research and development in the growth of the economies of these countries and to consider the possibility of its application in developing countries, including Iraq, the study relied on the descriptive analytical approach as well as the deductive approach by examining the experiences of some countries that have made great strides in the fields of research, development, and planning.

1.5.1. Previous studies

Saravanan (2014) study under the title. Critical Success Factors of ERP Implementations – An Analysis This study aimed to analyse what was stated in light of previous work, as it indicated that ERP systems are information systems that integrate organisational activities across geographical and functional divisions, and it aims to study the factors. The critical success of implementing enterprise resource planning, as this type of system helps organisations improve productivity, respond to customers, and increase the effectiveness of information, contributing to the ability to make the right decisions. The researcher built a model of four variables represented in planning and implementation. , stability, and improvement, based on identifying a set of critical factors for implementing ERP, which is supporting senior management, forming a team to implement the system, project management, defining a plan of action that includes vision and goals, re-engineering administrative processes, training, communication, and identifying the negatives of the current system. , organisational culture and the study concluded with a basic recommendation, which is the necessity of keeping pace with the implementation of enterprise resource planning in light of the availability of the organisation's strategic critical success factors.

Dizdar's study (2012) entitled: Enterprise Resource Planning (ERP) Strategic and Tactical Factors for successful ERP projects: Insights from an Asian Country. This study sought to identify the strategic and tactical factors considered in successfully implementing resource planning systems, where the strategic factors are represented by senior management, project management, and the process re-engineering method. The tactical factor is represented by the foundations of communication at the organisational level, according to the findings of users, and qualitative support for enterprise resource planning. The findings of this study are that there is a relationship between senior management support, project management, establishing communications at the enterprise level, and training users, especially enterprise resource planning (ERP) support, Which has a role in the system that leads to improving the performance of the national institution. The study concluded no consensus between process re-engineering and the ERP implementation group. It concluded with recommendations that senior management must effectively plan the ERP implementation project, participate in every system implementation stage, and work to prepare the project team [3].

2. Supply Chain Management in The Network Economy and The Closest Meanings To ERP

The supply chain comprises a network of suppliers, manufacturers, distributors, customers, and other parties. Three different forms of flow require close coordination and cooperation.

- Material flow - This is a physical flow that depicts how products are moved from suppliers to customers and from consumers to suppliers for servicing, repairing, and other purposes.
- Information flow - This data stream shows how orders are transmitted, tracked, and other things. The physical flow of commodities is always linked with this information flow.
- The financial flow represents the credit terms, payments, consignments, and other ownership agreements. This flow requires all supply chain participants' highest level of cooperation [4].

All these networks are, in turn, supported by the three main pillars. They are:

- Procedures assessing a company's capacity to manage logistics include knowledge management and developing new products.

- The organisational framework governs the relationships between the various supply chain participants. Both vertical integration and horizontal integration apply to this structure. Technologies employed by businesses to simplify organisational management and process management tasks.

Enterprise resource planning, which we can define as a computerised solution that enables the management of all a company's resources by integrating different functions such as purchasing management, customer relationship management, accounting, financial management, human resources management, sales management, or management, E-commerce, supply and inventory for full control and better control of all business processes, also places the greatest emphasis on the supply chain. They, in turn, are based on a set of computer applications and are configured in the form of completely independent functional units, which contain the basics for communication through a single central database that is updated in real-time [5]. Computer programs known as MRP systems (Material requirements planning), which stands for planning materials requirements or materials needs planning, were initially approved. These programs are only intended for large companies due to their high-cost requirements for the necessary software and computers. In light of this, MRP entails automating routine tasks, such as (Fig. 1), overseeing and assisting in organising the production, delivery, and raw material purchasing schedules. This strategy allows us to suggest that all of these coordinated planning processes be planned as follows and as illustrated in Fig. 1.

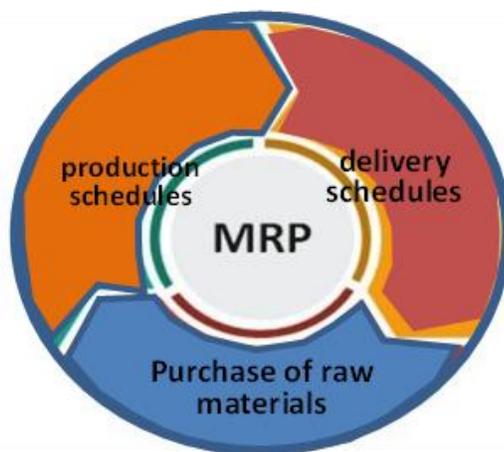


Fig. 1. MRP functions

Companies are looking to use existing ERP systems since they are more adaptable, precisely suited to business needs and requirements, and safer. They rely on dematerialisation in many areas, including digitising outgoing papers like client invoices and incoming documents like receipts. This saves businesses a ton of time and explains the process (Fig. 2). Business intelligence has also grown crucial since it enables organisations to gather and store information about their clients and suppliers for later decision-making. Therefore, ERP systems have gotten quicker, more affordable, and simpler to use, especially for businesses with strong prospects for doing business with other institutions inside and outside Iraq [6], as seen in Fig. 2.

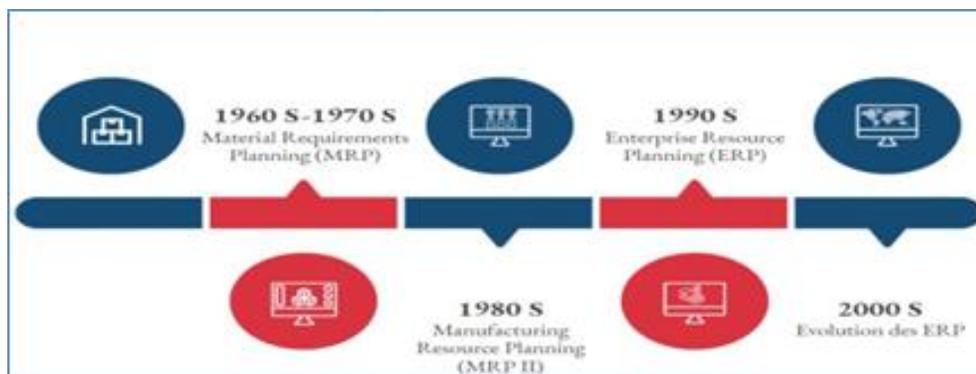


Fig. 2. ERP /Systems

2.1. Dimensions of coordination in the supply chain

Coordination dimensions in supply chain management are founded on the fact that an organisation may not effectively and efficiently accomplish the processes involved in manufacturing a final product out of raw materials. That is why the interrelationships among the supply chain members require coordination so that materials, information, and money would circulate appropriately. Malone has provided a general definition for coordination, which assumes that coordination is equivalent to managing interrelationships among supply chain members. Usually, coordination is defined by the concepts of complementarity and cooperation. In (Fig. 3) the supply chain is coordinated at three levels. At the first level, coordination occurs by integrating overall or external organisational information. At the second level, supply chain coordination crystallises in the cooperation of supply chain members to create joint coordination in information and materials. The higher levels contain some elements from the lower levels. The most advanced level of coordination occurs in effectively managing information, materials, and money to maximise value creation in the supply chain [7]—This type of optimal coordination results from using the layer coordination model illustrated in Fig. 3.

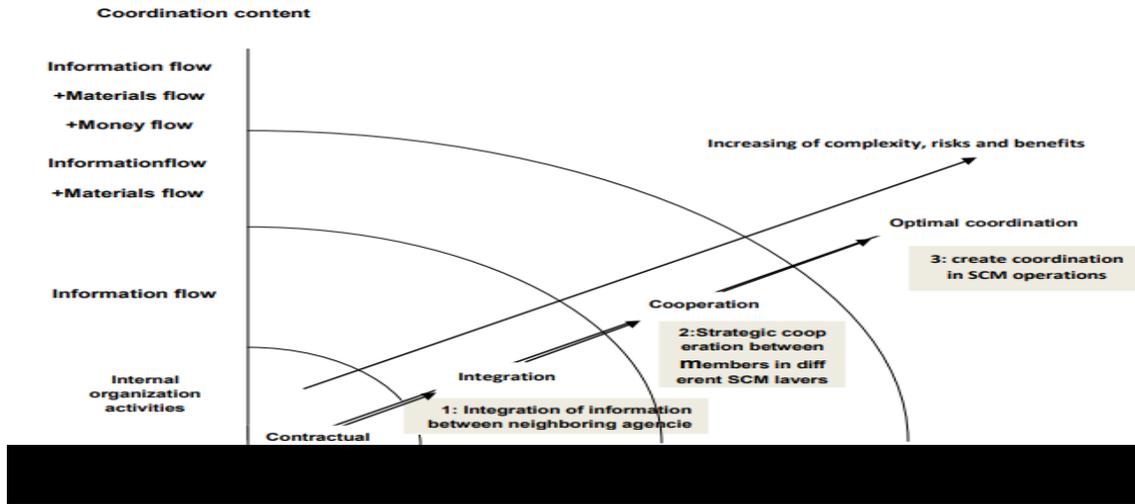


Fig. 3. Coordination levels in the supply chain

2.2. The most important characteristics of ERP systems

It Features the Following Different Elements:

- Modular structure.
- Flexibility.
- Fusion.
- Drawbacks related to distributed databases.

Currently, there is a shared and central database.

The Purpose of Planning Systems [8], ERP Has Several Objectives During Its Integration Within the Company, Among Which We Mention:

- Boost the business' overall performance.
- Clearly state the goals that the company is aiming for.
- Simplify control and improve data management.
- Oversee management via a solitary database.
- Ensure that the company's various departments are integrated.
- Make data easily accessible without sacrificing safety and legal standards [9].

2.3. Types Of ERP

2.3.1. Generalist ERP specialist

This kind of ERP is a comprehensive solution with key features that satisfy all traditional business needs and adapt to any industry activity. These ERP systems contain several settings that each firm may customise to meet their needs and several modules that can be chosen based on those needs. The cloud is the most frequently utilised implementation in this sort of ERP, and some of the producing organisations in Iraq have just started using it.

2.3.2. Specialised ERP systems

This kind of ERP was created specifically for a single project and is a program that fully addresses the intricate and unique issues of the industry for which it was created. Perfectly tailored to this in every way. Healthcare, biology, logistics, trade, and other economic sectors are some of the ones that are covered the most. Predicting future changes and developments of the businesses in the selected industry is where these ERP systems struggle [10].

2.3.3. Open source ERP

Due to the reuse of the source code made accessible to users in particular, this program is free to use and does not require acquiring a license. Its goal is to make technical change possible and legally allowed. Users must modify them per their requirements, filling in gaps and removing excess weight.

2.3.4. Proprietary ERP systems

They are distributed by businesses that require the purchase of a license, a type of agreement in which the publisher permits its clients to use its products within certain parameters and outlines their respective duties. These are paid services that cannot be altered [11].

2.3.5. ERP in SAAS mode (Software as a Service)

The difference between these systems is that they use remote servers; therefore, having servers is not required. ERP systems in SAAS mode (Software as a Service) are promoted as services rather than software. Strong installation and repair capabilities for internal ERP systems. Any internet-connected computer, mobile device, or tablet can access ERPs in SAAS mode. ERPs are implemented in the cloud because, Table 1 displays the breakdown. 5.

Table 1. Types of Enterprise Resource Planning (Silver, Pyke, and Peterson 1998)

	Advantages	Disadvantages
ERP generalists	<ol style="list-style-type: none"> 1. Cheaper. 2. Is a solution tested by several companies. 3. Robust solution. 	<ol style="list-style-type: none"> 1. Not suitable for measure to the company. 2. Heavy solution.
Specialized ERP	<ol style="list-style-type: none"> 1. Recognise yourself in the integrated solution. 2. The software is immediately functional without having to adapt its access needs. 3. The deployment of the solution is simple and tested. 	<ol style="list-style-type: none"> 1. Less suitable for evolution. 2. Software and maintenance are expensive.
ERP Open Source	<ol style="list-style-type: none"> 1. Process highly customisable. 2. Costs are minimal. 3. Independence. 	<ol style="list-style-type: none"> 1. Limited in terms of features. 2. Modification requires good computer knowledge.
Proprietary ERP	<ol style="list-style-type: none"> 1. Service adapted to the activity of the company. 2. Benefit from assuring service maintenance and service after-sales. 3. Benefit from the know-how of the editor. 	<ol style="list-style-type: none"> 1. Reliance on Publisher. 2. High cost. 3. Flexibility.
ERP in fashion SAAS	<ol style="list-style-type: none"> 1. Outsourcing. 2. Optimise costs. 3. The application is updated and maintained by the provider. 4. Permanent access to data. 	<ol style="list-style-type: none"> 1. Reliance on Service Provider. 2. Risks related to the bankruptcy filing of the service provider.

3. Organising the Methods of the Analytical Method Used and the Case Study

The main goal of our research is to develop the heart of a web-based ERP system, which is a database where the user will create certain tables according to the needs of his company through the web interface.

Our solution will allow the user to:

- Identify attributes that describe the company's product categories
- Identify the attributes that describe their products.
- Identify the attributes that will differentiate their customers [12].

The system layout will consist of three parts:

- The first part includes our ERP demo site, which will serve as an entry point for:
 - ERP is already configured for registered users.
 - Registration forms and configuration interface for users wishing to become customers.
- The second part will include the ERP system, so it is intended for registered users who have access to the ERP system already configured.
- The third part will consist of an administrative control panel and interfaces designed to manage users of our ERP system (our clients):
 - Add a new client (new company)
 - Block/unblock users[13]

By studying and carefully examining the topic, it is possible to use one of the special systems for planning and using the Unified Modeling Language (UML). Linguistic mediation is standardised. It is a general-purpose visual modelling language consisting of an integrated set of diagrams developed to help developers define, visualise, construct, and document systems and the objects they contain. This is a very important part of object-oriented software development. The primary purpose of UML is to define a standard way to visualise how to design an efficient system and help those working on it communicate, explore potential designs, and validate the system's architectural design.

We see UML diagrams as a unified modelling language. It contains pictorial representations of categories, objects, and the relationships between them. UML standards provide several diagrams that can be divided into two categories:

- Structural diagrams that show the static structure of the system. This category includes the following charts:
 - Class diagram.
 - Component diagram. Deployment scheme. Outline of the object. Package diagram. Composite structure diagram. Profile chart.
- Behavioral diagrams that show the dynamic behaviour of objects in the system
- UML provides the following behavioural diagrams:
 - Use a case diagram.
 - Activity chart.
 - State machine diagram.
 - Reaction diagrams that come together.
 - Sequence diagram.
 - Communication diagram.
 - Timing chart.
 - Interaction display diagram [14].

We believe that the purpose of this organisation is to describe the ERP system in an accurate and detailed manner through interfaces that provide all the necessary commands that meet the user's needs. So, we must define the functional needs that the system must meet and then identify

future users and use cases related to each of them. This analysis and diagrams show the use case and some interfaces related to specific use cases and their users, as shown in Fig. 4.



Fig. 4. Home Page

3.1. Enterprise resource planning engineering

3.1.1. Artistic architecture

We suggest the following model describe this structure, as illustrated in Fig. 5 because ERP is characterised by the client/server structure on three levels, as shown in Fig. 5.

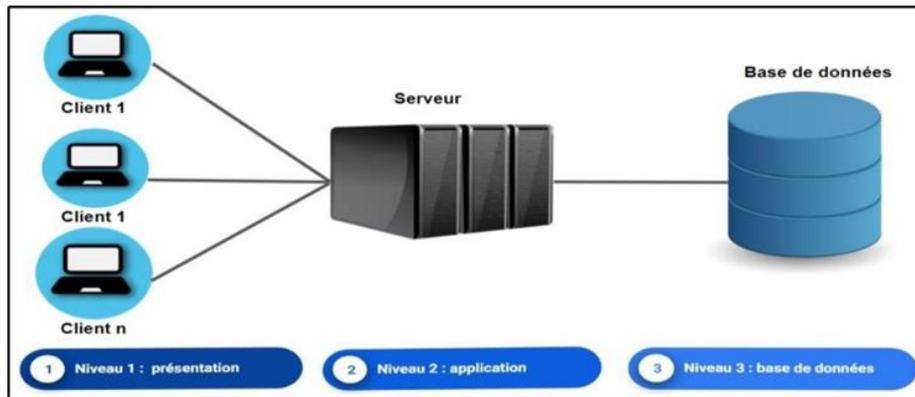


Fig. 5. ERP technical architecture

- Level 1: The presentation layer, which is the section of the user interface responsible for enabling system interaction, is represented by this level.
- Level 2: The application layer is represented by this layer. It contains system processing features, which the presentation layer makes available to the user. This level accesses the database at level 3, handles request processing, and returning results to the user.
- Level 3: This is the database’s access level, and this section contains all corporate data. [15].

3.2. Modular architecture

The ERP system comprises an integrated collection of autonomous units that may communicate with one another, and these units utilise the same central database as in Fig. 6.



Fig. 6. The main ERP modules

3.3. ERP cost

ERP adoption is a difficult project that costs the organisation a lot of money and has been taken on by particular Iraqi businesses that have made significant investments and engaged in numerous commercial transactions. To guarantee a return on investment in the medium term, I established an ERP cost study and made it a crucial criterion. The following expenses should be included in this analysis, among others [16]:

- Investing in an ERP system
- Costs associated with publication
- Infrastructure
- Maintenance and support
- The purchase of further units

4. Web Environment

4.1. Definition

The word “web” is a contraction of the World Wide Web. It comprises a collection of multimedia documents (including text, photos, video, etc.) connected by so-called hypertext connections. The web, the most popular internet service, was developed in 1989 by Tim Berners-Lee (Ballou, R.H., Gilbert, S and Mukherjee, A.,2000) and is based on the HTTP protocol, the idea of a URL, hyperlinks, and the HTML language. It enables users to access websites via a browser from their desktops, tablets, smartphones, smartwatches, and other devices [17].

4.2. Types of websites

- View the Website.
- Notation.
- Commerce Website.

4.3. The overall structure of the web application

The client and server sides are the two components that make up a website when it operates in client/server mode. The most typical client on the web is the browser (Chrome, Safari, etc.), but it can also be an indexing bot or even a website vacuum cleaner. The client-side also contains an entity called HTTP client, whose function is to exploit site resources. On the other hand, the server side typically has at least two components, the database server, and the HTTP server; nonetheless, certain websites may be developed in addition to these two entities, server applications; however, the latter's function may be fulfilled by the former. Fig. 7 the latter is in charge of the site's logic and is primarily responsible for responding to user requests. The HTTP server has a file system that stores website assets, including pictures, videos, and HTML pages. Additionally, the database server has a database management system (DBMS) that houses all website data and allows the global SQL (Structured Query Language) language to be used for queries by the HTTP server. The Fig. 7 summarises the website architecture.

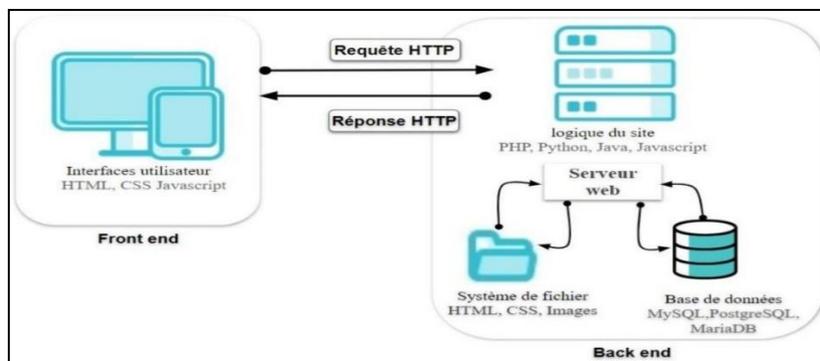


Fig. 7. The overall structure of the web application

5. Web Development Process

Every web development project must go through steps that guide it from beginning to end in Iraq and worldwide. Even though each project has a different number of stages, the fundamental procedures always apply. The seven steps of the web development process are as follows:

5.1. The first stage: collecting information

The most important task at this level is to thoroughly understand the future goals of the website or web application (the reason for the site's existence) by selecting the audience we want to attract to give them suitable jobs. This stage refers to discovery and research, and this stage determines what the next steps will look like. A thorough strategy that is based on pre-development data prevents the use of additional resources to address unforeseen issues [18]. This stage is expected to take between one and two weeks. During this phase, things to keep in mind include:

- Requirements Assessment: This step refers to finding the specific requirements for a website, including features, target audience, and goals for the website or web application.
- Project Brief: Summarises the final requirements for the website that will serve as a reference point throughout the web development process.
- Determining the required resources and technology: The technologies needed for the project are determined during this stage. We also determine the necessary needs for the project, whether human or material resources, to be added to the development budget.

- Studies of what is out there: This step allows you to learn about what is currently being done in the market and assess the competition.

5.2. The second stage: planning

A plan for the site or web application will be created based on the data gathered in the prior stage, allowing the customer to assess how the entire project will look. All significant addresses are listed in the sitemap. Explains the connections between the major sections of a website or web application pages. It can also demonstrate the connections between various pages of a website. The plan describes not the user interface but the underlying organisation of the website or program. As a result, the user or client can assess how simple it is for him to find the necessary information or services. The plan aims to build a user-friendly and intuitive website or web application and avoid results that fall short of the client's expectations and require modifications once construction is complete. Typically, during this stage, the methods to be used are picked. An example of a site-related strategy in an abstract is shown in Fig. 8 [19].

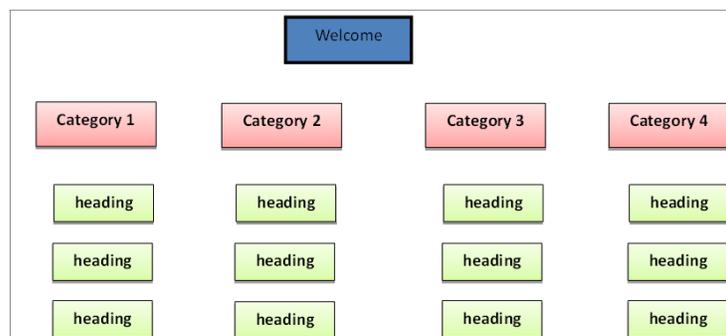


Fig. 8. An abstract example of a website plan

5.3. The third stage: designing the website or web application

The website or application starts to take shape at this point, and images are developed for the visual content and aesthetics of the site. The theme, colours, layout, functionality, and other visual elements of the website or web application are also decided upon at this stage. The customer is then shown a drawing, the primary purpose of which is to help the consumer picture the content and fundamental operations of the future product. This stage guarantees that the finished product complies with the client's request. If the design doesn't match, it is changed and returned to the client; this process is repeated until the client is happy.

5.4. Fourth stage: development

The creation of websites can now start. This stage is essential because the web developers will employ each graphic component from the prototype created in the preceding steps to create the actual working website, which is how the website or application is brought to life. Typically, the homepage is produced initially, and all subsequent pages are added one at a time by the previously established website hierarchy, which takes the shape of a sitemap. The development tools mentioned above, such as programming languages, are used in this step [20].

The project consists of two parts:

- Front face

The front-end developer's job is to write the code required to generate the interfaces created by the designers. This code is performed on the client side or in the web browser. This section of the website discusses the visual aspect of the site. It is built on HTML, CSS, and JavaScript, and the developer can also use the Framework and several libraries, including Bootstrap, React JS, AJAX, jQuery, and many others.

- Back end

The portion of a website running on a web server that is not visible to the user is called the back end or server side. Its function is to make the website dynamic, practical, and user-customisable. The back-end developer creates the logic of the website. Various programming languages are available, including PHP, Python, and Java. We can also use frameworks like Laravel, Django, or Node.js. The decision is made on the requirements of the website and the back-end developer's skills. The latter is also in charge of improving the website's effectiveness and speed.

5.5. Fifth stage: writing content

Excellent and appealing content is written for the website or web application after the creation phase. This content must be modifiable to continuously publish to accomplish your business objectives and raise brand awareness.

5.6. Sixth stage: testing

The website or web application will be evaluated before deployment to ensure it operates as intended. Testing will concentrate on both comprehensive site functionality (such as forms and scripts) and last-minute compatibility issues, like display variations between web browsers. The most crucial testing aspect is ensuring that all written code is correct and complies with W3C standards; code validators may do this automatically. Each link is carefully verified to ensure there are no broken links between them. The website can finally be uploaded to a server to run after this stage is finished [21].

5.7. Seventh stage: maintenance

Unlike traditional businesses, a web project does not end with the delivery of the finished product but rather continues with its maintenance over the following months or years. This is especially true of apps and websites, which are more like services than products. The maintenance goal is to make adjustments to the software or website and add new features to maintain it current.

6. The Most Important Key Web Usage Techniques

6.1. Working methods for the front-end

All static or dynamic user interfaces that users see on their displays fall under the category of front-end development. Any Iraqi company going towards this vast electronic investment must embrace the following primary strategies as part of the fundamentals in interacting between developers and users:

- Programming language
- CSS
- JavaScript and its frameworks and libraries (React js, Vue js, Angular js, JQuery, and AJAX).

6.2. Technologies used in the back-end

You provide many of the same programming language options at the back-end level to design the logic of the website. The prevalent frameworks and those that go with them are:

- PHP (Laravel), Symfony)
- Python (Django)
- Ruby (Ruby on Rails)
- Javascript (Nodejs)

Database management systems are employed for this purpose, and the website's server side also includes the database portion. Relational database management systems and non-relational database management systems are the two categories that these belong to.

The most used on the web are:

- MySQL (relational).
- PostgreSQL (relational)
- MongoDB (non-relational)

The DBMS and back-end programming language are chosen according to the needs of the project as well as the country-wide capabilities of the respective project team.

7. Progressive Web Essentials Application (PWA) [22]

PWA is a web application that incorporates contemporary mobile app features (push notifications, GPS, camera, etc.), and its goal is to give users a more immersive experience and deeper understanding across many platforms. PWAs are accessed through a user's browser, and the app's content loads as the user browses—hence the name “progressive web app.” PWAs, which combine the finest of websites and mobile applications, are among the online trends for 2020, especially because of the numerous advantages they provide during the transaction, including the following:

- Fast loading.
- Responsive application works on all platforms (iOS, Android, etc.) as long as it has a browser.
- No download or installation is required.
- Secure thanks to the HTTP protocol.

Research reflections in the theoretical field and its effects on practice: This research can serve as a basis for future studies focusing on the cross-organisational decision-making model and integrating analytical systems with enterprise resource planning (ERP). As for systems integration and developing relationships between ERP systems, analytical systems, such as decision-making systems, may provide contexts for application through research.

On the other hand, any computer, mobile device, or tablet with an Internet connection can access ERPs in SAAS mode. ERP systems are certainly implemented in the cloud since they use remote servers as services rather than software and have strong installation and repair capabilities for internal ERP systems, so developing detailed decision-making models based on the reference of planning and supply chain processes is another means for future studies [22].

8. Conclusions

Through our study in this research, we discussed the methods and techniques of enterprise resource planning (ERP) and decision-making systems. It plays a fundamental role in other regulatory systems that can be adopted for development in this field. We sought to investigate how enterprise resource planning (ERP) systems can create essential information and structured services across the web to achieve optimal user interaction. This basic structure can be considered the core of the transaction layer of other systems.

The transactional layer is created by interconnecting enterprise resource planning (ERP) systems so that the analytical layer that supports decision-making for organisational and supra-organisational processes and issues can only be created through the information architecture or transactional layer. In short, ERP is a system that helps business areas such as finance, logistics, sales, production, distribution, etc., which are interconnected with each other so that if the activity is recorded in one place, it is immediately reflected in all the other places, through supply chain modelling, which includes the information structure model and the decision-making model. In other words, the analytical layer should be created, considering strategic and tactical issues and their role in the organisation's supply chain. The results can be summarised as follows [23]:

- The system solved some supply chain problems.

- Developing the link between enterprise resource planning (ERP) systems to create and link a transaction layer with other systems.
- The information architecture or transaction layer is the only way to create the analytical layer that supports decision-making procedures and supra-organisational issues.
- Enterprise resource planning (ERP) is one of the most important requirements for supply chain analysis and organisational decision-making due to a number of factors, such as comprehensive information exchange in supply chain operations and the ability to absorb and apply this knowledge [23].
- The necessity of having highly skilled individuals using the program at the level of planning and analysis, especially for companies in countries that are currently experimenting, such as companies in Iraq.
- Enterprise resource planning (ERP) systems are expensive and sophisticated, making integrating them into other systems difficult. As a result, the ERP system must be compatible with all other information systems and be flexible enough to adapt to new tools and procedures at any system level.
- According to our findings, the biggest downside of enterprise resource planning (ERP) systems is the need to re-engineer all processes and tools and continue development to keep pace with continuous changes in the business.

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References

- [1] Achabal, D. D., McIntyre, S. H., Smith, S. A., & Kalyanam, K., A decision support system for vendor managed inventory. *Journal of retailing*, 76(4), 430-454., 2000, [https://doi.org/10.1016/S0022-4359\(00\)00037-3](https://doi.org/10.1016/S0022-4359(00)00037-3).
- [2] Ballou, R. H., Gilbert, S. M., & Mukherjee, A., New managerial challenges from supply chain opportunities. *Industrial marketing management*, 29(1), 7-18., 2000, [https://doi.org/10.1016/S0019-8501\(99\)00107-8](https://doi.org/10.1016/S0019-8501(99)00107-8).
- [3] Boersma, K., & Kingma, S., Developing a cultural perspective on ERP. *Business Process Management Journal*, 11(2), 123-136, 2005, <https://doi.org/10.1108/14637150510591138>.
- [4] Botta-Genoulaz, V., Millet, P. A., & Grabot, B., A survey on the recent research literature on ERP systems. *Computers in industry*, 56(6), 510-522, 2005, <https://doi.org/10.1016/j.compind.2005.02.004>.
- [5] Esteves, J., & Pastor, J., Enterprise resource planning systems research: an annotated bibliography. *Communications of the association for information systems*, 7(1), 8, 2001, <https://doi.org/10.17705/1CAIS.00708>.
- [6] Chang, Y., & Makatsoris, H., Supply chain modeling using simulation. *International Journal of simulation*, 2(1), 24-30, 2001.
- [7] Christopher, M., & Juttner, U., Supply chain relationships: making the transition to closer integration. *International Journal of Logistics*, 3(1), 5-23, 2000, <https://doi.org/10.1080/13675560050006646>.
- [8] Ciborra, C. U., From thinking to tinkering: The grassroots of strategic information systems. *The information society*, 8(4), 297-309, 1992, <https://doi.org/10.1080/01972243.1992.9960124>.
- [9] Dhulfiqar Talib Abbas, Dalal Abdulmohsin Hammood, Seham ahmed hashem, and Saidatul Norlyana Azemi, "Minimizing Energy Consumption Based on Clustering & Data Aggregation Technique in WSN (MECCLADA)", *JT*, vol. 5, no. 2, pp. 10–19, Jun. 2023, <https://doi.org/10.51173/jt.v5i2.693>.
- [10] Esteves, J., & Bohórquez, V. W., An updated ERP systems annotated bibliography: 2001-2005. *Instituto de Empresa Business School Working Paper No. WP*, 07-04, 2007, <https://dx.doi.org/10.2139/ssrn.1006969>.
- [11] Yao, Y., Cui, H., Liu, Y., Li, L., Zhang, L., & Chen, X., PMSVM: an optimized support vector machine classification algorithm based on PCA and multilevel grid search methods. *Mathematical Problems in Engineering*, 2015, <https://doi.org/10.1155/2015/320186>.
- [12] Zerbino, P., Aloini, D., Dulmin, R., & Mininno, V., Why enterprise resource planning initiatives do succeed in the long run: A case-based causal network. *Plos one*, 16(12), e0260798, 2021, <https://doi.org/10.1371/journal.pone.0260798>.
- [13] Gripsrud, G., Jahre, M., & Persson, G., Supply chain management—back to the future?. *International Journal of Physical Distribution & Logistics Management*, 36(8), 643-659, 2006, <https://doi.org/10.1108/09600030610702907>.
- [14] Gupta, M., & Kohli, A., Enterprise resource planning systems and its implications for operations function. *Technovation*, 26(5-6), 687-696, 2006, <https://doi.org/10.1016/j.technovation.2004.10.005>.
- [15] Iles, A. (2007). Seeing sustainability in business operations: US and British food retailer experiments with accountability. *Business Strategy and the Environment*, 16(4), 290-301, 2007, <https://doi.org/10.1002/bse.483>.
- [16] Imad Jaber Ramadan, a proposed accounting approach to rationalise government performance expenditures for electronic services in light of cloud computing (case study), PhD thesis, Faculty of Commerce, Cairo University, 2017.
- [17] Lambert, D. M., & Cooper, M. C., Issues in supply chain management. *Industrial marketing management*, 29(1), 65-83, 2000, [https://doi.org/10.1016/S0019-8501\(99\)00113-3](https://doi.org/10.1016/S0019-8501(99)00113-3).
- [18] Nicolaou, A. I., & Bhattacharya, S., Organizational performance effects of ERP systems usage: The impact of post-implementation changes. *International journal of accounting information systems*, 7(1), 18-35, 2006, <https://doi.org/10.1016/j.accinf.2005.12.002>.
- [19] I. S. Oglah, "The Effectiveness of the Green Design and Manufacturing Decision in Achieving the Outstanding Performance of the Industrial Companies: An Analytical Study in Al-Zawraa General Company", *JT*, vol. 5, no. 2, pp. 251–264, Jun. 2023, <https://doi.org/10.51173/jt.v5i2.1232>.
- [20] Panorama Consulting Solutions, L. "Report on ERP Systems & Enterprise Software", (2017).
- [21] Sama Hayder Abdulhussein AlHakeem, Nashaat Jasim Al-Anber, Hayfaa Abdulzahra Atee, and Dr. Mahmod Muhamad Amrir, "Iraqi Stock Market Prediction Using Artificial Neural Network and Long Short-Term Memory", *JT*, vol. 5, no. 1, pp. 156–163, Apr. 2023, <https://doi.org/10.51173/jt.v5i1.846>.
- [22] Shehab, E. M., Sharp, M. W., Supramaniam, L., & Spedding, T. A., Enterprise resource planning: An integrative review. *Business process management journal*, 10(4), 359-386, 2004, <https://doi.org/10.1108/14637150410548056>.
- [23] Stevenson, W.J., "Operations Management", Ninth Edition, New York: Industrial Engineer: IE, Vol. 40 No. 10, pp. 44-8, 2008.