

# ERP Service for Small and Medium Enterprises in Saudi Arabia

Arif Bramantoro

Faculty of Computing and Information Technology in Rabigh  
King Abdulaziz University, Jeddah, Saudi Arabia

---

## Article Info

### Article history:

Received Jan 24, 2018

Revised Apr 30, 2018

Accepted Jun 16, 2018

---

### Keywords:

Service System

Enterprise Resource Planning

Small and Medium Enterprises

---

## ABSTRACT

This paper aims to present the benefits of enterprise resource planning (ERP) service over traditional ERP through the development in the form of software as a service. This service is published in response to the fact that traditional ERP is rarely implemented in small and medium enterprises (SMEs) in Saudi Arabia due to the high cost and risk of implementation failure. This paper can be used to encourage SMEs in Saudi Arabia to exploit ERP service. ERP service can be accessed by client via any programming interface over an Internet connection without special configuration, thus highlighting the core competencies of the SMEs. As a prove of concept, the stock service is published as a concrete ERP service. Two types of application were developed to access the service: desktop and smartphone based application. Based on a simple qualitative assessment, it is acknowledged that ERP service is advantageous over traditional ERP systems in terms of its scalability, agile implementation, global accessibility, mobility, low operational costs, lack of upfront costs, best practices, rapid upgrading, and interoperability among other services

Copyright © 2018 Institute of Advanced Engineering and Science.  
All rights reserved.

---

## Corresponding Author:

Arif Bramantoro,  
Faculty of Computing and Information Technology in Rabigh,  
King Abdulaziz University,  
Jeddah, Saudi Arabia  
Email: asoegihad@kau.edu.sa

---

## 1. INTRODUCTION

The increasingly rapid advancement of technology changes daily life. Accordingly, the business environment is also shifting. The generation of globally competitive technology is crucial in the continued growth of any businesses. In the market, organizations must build close ties with customers and deliver high-quality services or products in the earliest possible time worldwide. Hence, enterprises should seek to increase profit and to adapt their services for the latest technology. It is important to understand the mechanisms that enterprises use to adapt to the changes in technology and remain competitive in their industries.

To adapt the products and services to the latest technology, enterprises must significantly alter their legacy systems, infrastructure, tools and the other requirements of business process [1]. As main business activities of an enterprise, the integration demand is the cornerstone of enterprise resource planning (ERP) systems. ERP is a software application that integrates the business process with the business units of large, medium, and small organizations [2].

This paper focus on small and medium-sized enterprises (SMEs) in Saudi Arabia, where either on-premise or on-site ERP software is installed on the computers to set up inside the building of the organization rather than on the computers of a remote facility through service system on the Internet. Service system is a necessary and reliable delivery model for business application. It is based on software as a service (SaaS)

technology which eliminates several barriers that prevent companies from implementing or upgrading software. Service system primarily allows enterprises to concentrate on their core business operations instead of managing IT requirements.

Several theoretical works have been proposed to examine the implementation of state of the art technology, such as cloud technology as proposed by [3] and a specific implementation in academic environment in [4]. However, the current studies lack of practical approach. In this paper, ERP is delivered in the form of a service. To tackle the ERP development issues, this service suggests a set of best practices, so that the enterprise in Saudi Arabia is able to evaluate their decision to implement ERP. Moreover, this work enables SMEs in Saudi Arabia to overcome the disadvantages of traditional ERP systems in practical way.

Enterprise can securely extend their services globally with less restrictions through service system. Service system refers to the modeling of service and infrastructure delivery to customers. It is beneficial for enterprises due to its low upfront costs, operational expenses, agile, flexible and adaptable to the use of advanced technology. With service oriented approach, enterprises can purchase cloud and infrastructure services based on the need to reduce investments on infrastructure. Enterprises can request these services from service providers. These providers have computer resources and related infrastructures on site. ERP service system is appropriate for SMEs mainly because it reduces upfront costs as also argued by [5].

ERP system is a set of business applications or modules that integrates various business process units of an enterprise, such as the financial, human resources, inventory, purchasing, and manufacturing units. ERP systems are important applications in information systems and accounting. Many Saudi Arabian companies have adopted ERP systems or similar integrated systems to reduce operational cost, to enhance competitiveness, and to adapt to the challenges of a disruptive business environment such as in [6]. Research on hosted, on-premise, and service oriented ERPs has grown exponentially over the past decade. In the present study, the ERP systems are divided into two main categories: traditional and service oriented ERP systems. The traditional ERP system is distinguished as hosted and on-premise solutions. In this paper, there is a need to investigate the advantages of service oriented ERP systems over traditional ERP systems, such as sizable cost savings and the enhancement of competitive advantage. The disadvantages are presented in this paper as well. The respective advantages and disadvantages of service oriented ERP over on-premises are classified into benefits, costs, limitations, and risks. This investigation aims to clarify the structure of drivers for cost saving that are enabled by service oriented ERP.

## 2. ERP Service Methodology

ERP is a software that integrates and standardizes the business processes of an enterprise to increase its productivity and flexibility, thus reducing cost. Most Saudi Arabian companies implement ERP systems as a business requirement. However, ERP implementation by SMEs faces many problems, such as hardware, the space for data center, software maintenance, and a long and complex implementation period [7]. Depending on the size of companies and target area of the company, implementing ERP system takes on average three to six months, while real transformation of the legacy system to the ERP system may take from one to three years [5]. In addition, the design and development of an ERP system are subject to a number of risks [8]. For example, long and complex implementation process may cause unexpected results in the ERP system including security risks such as flaws, errors and segregation of duty conflicts.

The term of services computing is coined by [9] which progresses rapidly fast given its many advantages over traditional computing, such as reduced upfront and operational costs, quick deployment, ready scalability, on-demand service, and global accessibility. A new methodology has been proposed to combine service oriented architecture and service engineering framework in [10]. The authors use ERP as a case study in their assessment. Service system [11] is, on the other hand, incorporating service oriented architecture adopted from services computing to information systems, to make the system more intelligent (not only driven by business simulation and system optimization). These benefits may offset some of the risks and challenges faced by Saudi Arabian SMEs with respect to the ERP system. Despite the benefits of service system, the use of ERP services by Saudi Arabian enterprises is limited by the issues of trust, privacy, security, complicated implementation processes, and lack of ERP service providers.

The best way to adopt service system methodology is by exploring its features and framework as illustrated in Figure 1. Since service system exists on top of previous framework, its layer can be divided into three: service management, service orchestration and choreography, and service oriented basic functions. The feature of service system can enhance through all these layers. Some of the features are non trivial for developing ERP service in Saudi Arabia, such as: platform independence, autonomous, self contained,

reusability, heterogeneous, and loosely coupled. Hence, this study presents new technology that aims to address the concerns of SMEs. It displays the simplicity, benefits, scalability, and low entry cost of the ERP system. It is also rapidly deployed, easily scaled, operated on-demand, and is not restricted by location as it integrates service system with ERP systems. By empowering ERP in the service oriented environment [12], this combination system caters for Saudi Arabian SMEs.

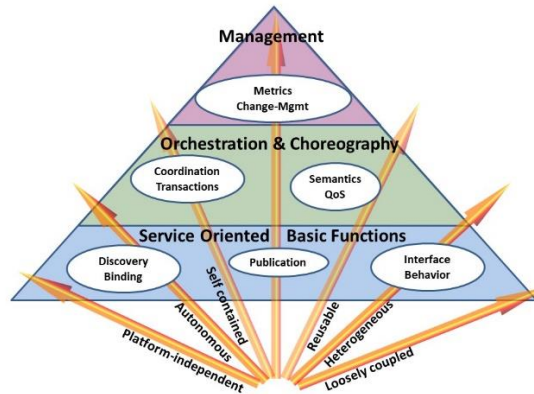


Figure 1. Service system methodology for developing ERP service in Saudi Arabia

In detail, there are three methodological contributions of this paper. First, this paper mainly aims to merge ERP capability with the benefits of service system to reduce investment cost and implementation delays for Saudi Arabian SMEs with limited budgets. This developed system can be accessed via a common interface over an Internet connection. Thus, access is hardly dependent on client configuration. Second, this paper evaluates ERP systems in general before and after shifting to service system through basic qualitative research. Therefore, this paper is able to define the advantages and disadvantages of shifting ERP to service system. Third, this paper encourages SMEs in Saudi Arabia to apply for ERP service by developing a rapidly deployable and implementable solution. The minimal requirement involves registering through the site. Clients are hesitant to migrate to service system because of the risk of data loss. Thus, ERP service prevents data loss to clients by allowing the download of data in multiple formats. It is also noteworthy that, to our knowledge, ERP service should be provided within Saudi Arabia in order to enhance the trust of SMEs in Saudi Arabia in ERP. Hence, this paper enables the service users to deal directly with service providers in the same country.

**3. ERP Service Modelling**

Although the service system is the chosen methodology for this research, the design of the system still requires conventional approach in system documentation. This is because there is not enough advance in the service system modelling [13]. There are several diagrams that are proposed in this work to represent ERP service, such as use case, class, state, sequence, collaboration and abstraction diagrams. Due to the limitation of the page, only one example of use case diagram is illustrated in Figure 2 which explains the best practice in stock module as a concrete service of ERP service. In this service, there are three service users who are granted a service access to the stock service. They are employee, storekeeper and supplier.

An example of class diagram to model service instances as a collection of static elements and the relationships between service instances connected as a graph is illustrated in Figure 3. The service instances are designed based on the objects commonly used by commercial ERPs. An example of state diagram to model the sequence of states that a service instance goes through during service life cycle in response to external interaction and message is shown in Figure 4. This state diagram for ERP service is non trivial task since it illustrates the business workflow of ERP service. This design is still in an early stage, therefore, it can be used as an "as-is" service workflow. Once it reaches its maturity, this diagram can be extended to a "to-be" service workflow. An example of sequence diagram of stock module in ERP service is shown in Figure 5. This diagram is an easy and intuitive way of describing the behavior of ERP service by viewing the service interaction between the service and its environment. One of the prime feature in service system is its support to collaboration. Based on the philosophy of the service science, the collaboration

diagram is utilized to streamline a set of services related to a particular context and interaction. It is a set of exchanges among the services within the collaboration to achieve the desired outcome. A partial example of collaboration diagram of ERP service is shown in Figure 6.

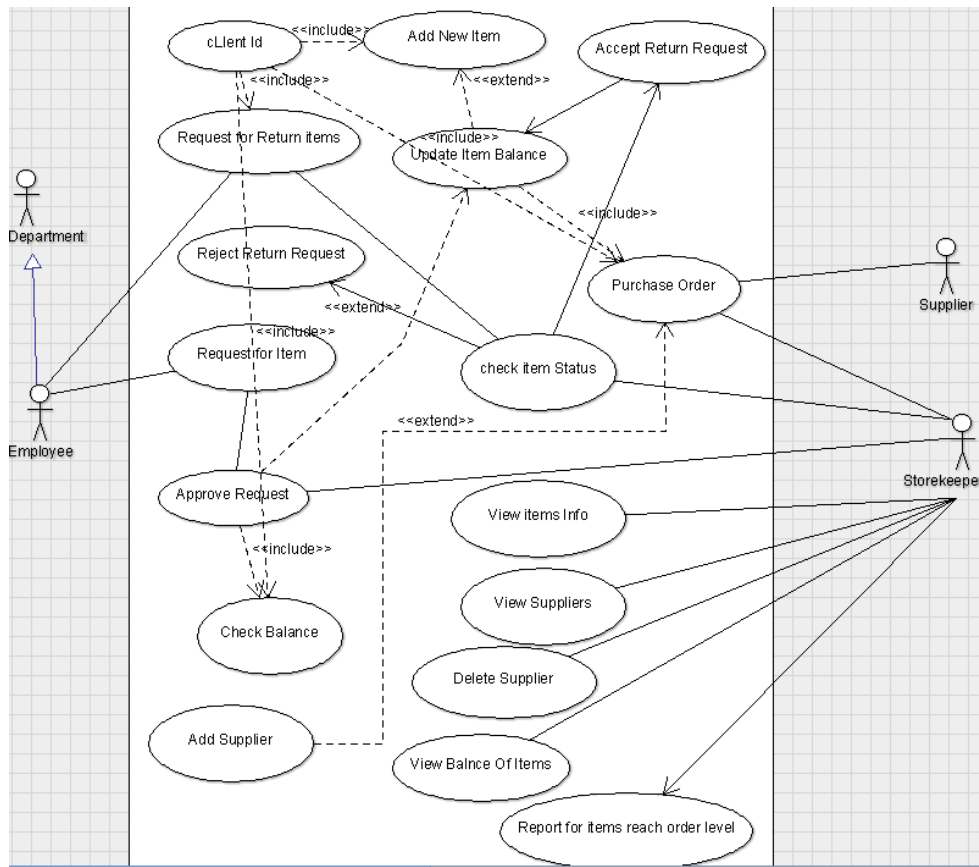


Figure 2. Use case diagram for stock service

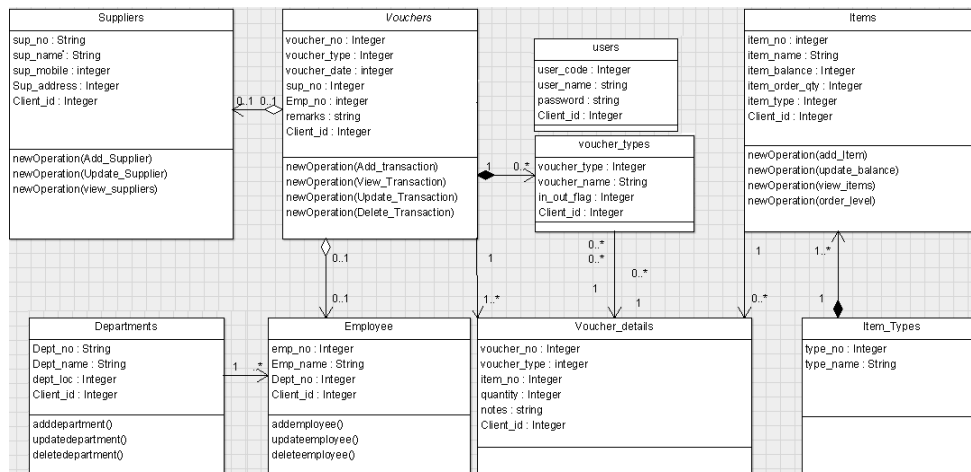


Figure 3. Class diagram for stock service

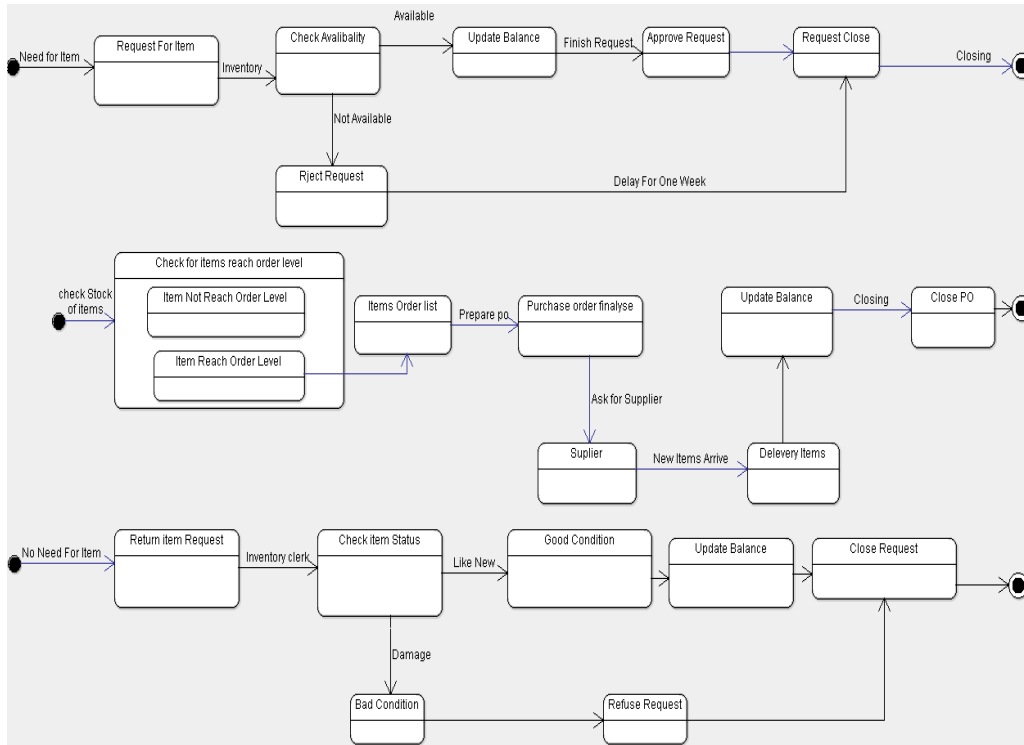


Figure 4. State diagram for stock service

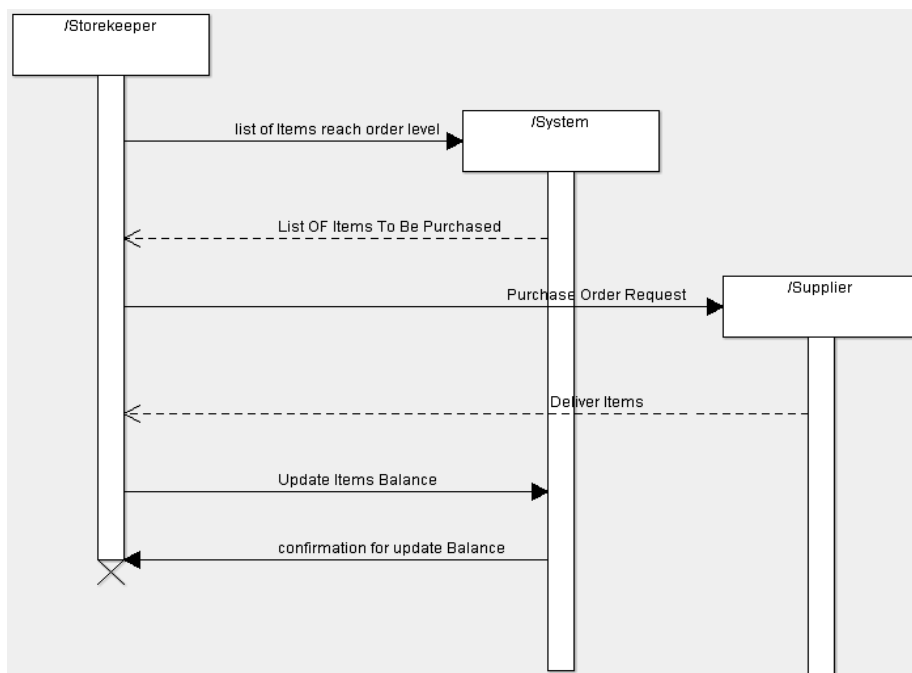


Figure 5. Sequence diagram for stock service

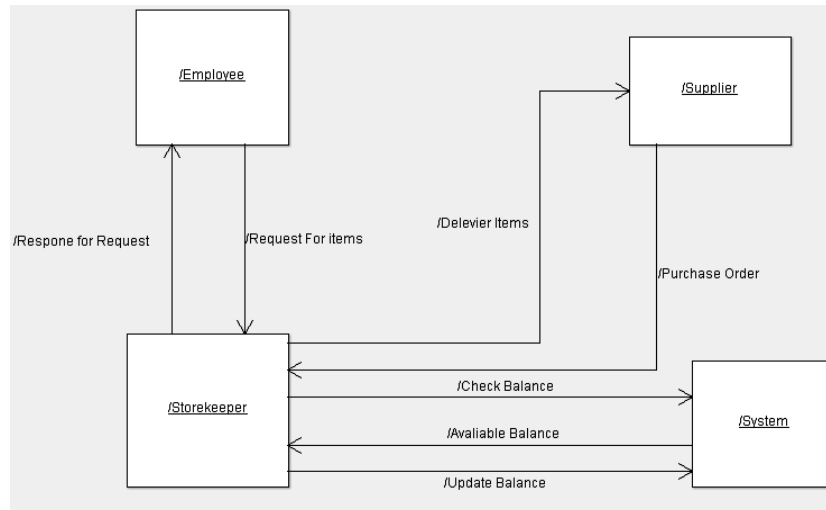


Figure 6. Collaboration diagram for stock service

#### 4. The advantage of ERP Service

The demand for ERP systems based on service system solutions is closely associated with an effort to improve the business value of IT investments. Accordingly, SaaS is a delivery model that enables end-user organizations to use application software on demand or as required through Internet-based services. SMEs in Saudi Arabia are willing to implement ERP applications to automate their business processes, but they are constrained by high costs and risks of the implementation. The proposed combination of ERP with the SaaS model is a viable option for these organizations because they need to invest less. Moreover, they minimize risks with the option to stop using it at any time. Unlike other on-premise ERP systems that require installation, ERP service presented in this study does not require several months for deployment. The application is utilized by clients in several minutes by registering their company and service user profiles.

ERP service is not limited to a single computer or network. In fact, service users can access the application from anywhere at any time and obtain the same information. Thus, remote employees can still share work and ideas and download the same business reports. This service is advantageous for enterprises by accessing the system in only two steps, profile and service user creation. Service users can launch the system without any intervention from service administrator. A previous study on available ERP systems reported that users initially request to launch the system. A response is then generated based on user situation. However, this response takes months. Therefore, the customer may opt to patronize another provider or lose interest in implementing the system. With ERP service, service users can activate the mobile version using mobile devices outside the workplace without requiring software installation. The data remain secure even if the user device is lost or stolen. Hence, it significantly reduces the possibility of business interruption as a result of hardware or software issues. ERP service is a very large, complex, and multilingual ERP service application that is built by using service system development tool. To increase client trust, a feature to allow the clients to download the data is incorporated. The data are in heterogeneous formats, such as CSV, HTML, XLS, PDF, and RTF; in order to mitigate the risk of data loss.

ERP service system operates from within the database which allows the applications to scale to meet the largest user communities. Worldwide companies are building robust intranet and internet to deliver applications. Thus, applications of ERP service can be scaled to satisfy the high demands of clients. The applications of ERP service system are strengthened through the combining security features, such as authentication and authorization schemes; and session-state protection service. Hence, ERP service users can concentrate on meeting business objectives. ERP service supports multiple security models, such as lightweight directory access service protocol and single sign-on service, through the current database, user credentials, or customized security. ERP service is deployed as a secure service deployment tool for any other web-based applications via embedding service stack. ERP service system is continuously productive, robust, and secure despite remaining an open system. Furthermore, ERP service supports any state-of-the-art web service technology tools such as APEX, XML, AJAX, Javascript, JQuery, HTML, WSDL, SOAP, and CSS. The infrastructure of ERP service system fits and integrates with the technology standards of the service developers. ERP service development tool consolidates business workflows through web service business process execution language (WS-BPEL) horizontally and vertically [14]. It either

implements a full solution or enables the customer to incorporate personal proprietary systems logic to increase the competitive edge of businesses in the market by composing the services as a single business workflow. ERP service system generates quality of service information to help identify and resolve bugs through immediate feedback during service failure. Hence, any problems can be addressed quickly and accurately. Service users log bugs into the system and provide suggestions via immediate feedback. The system considers this feedback as additional data entry by the user and notes the session state, timestamp, and user environment.

## 5. Evaluation

ERP service system is designed for an easy use without the involvement of the service administrator. The client begins using the service once she creates a company profile and a service user profile as shown in Figure 7. There are additional security features are required for smart phone version, such as service authentication, session state protection, and service authorization schemes.



Figure 7. ERP service service interfaces

Once the user clicks on stock system, there is a stock system menu. The page for Stock system displays all functions that can be executed to access the available concrete services within the stock module. The system shows the data related to the client based on client ID which is hidden. The client ID is a stamp for each transaction that occurs in the system, such as data retrieval. All service registrations and inquiries are based on client ID. Figure 8 shows the statistical data for the service client at AIRimal International School. The user can control all services by clicking the customization to create a personal home page. The page contain many aspects that may be not important for her but may be important to others.

Through immediate feedback, ERP service system can obtain user-defined quality of service information that helps identify and resolves issues and bugs during failures to solve problems quickly and accurately. Service users uses immediate feedback to log comments, bug reports, and suggestions into the system. The implementation of ERP service to prove its concept is evaluated with a basic qualitative research assessment. Several interviews with IT consultants and ERP users were conducted. Some results are listed as follows:

- End user working as accountant: "It is really cost-effective, it will encourage the owner to implement it, since there is no upfront cost or operational cost".
- ERP end user working as a data entry processor: "New idea, I can work from anywhere".
- IT consultant: "I have never heard about Saudi ERP service before. It is a good idea, ERP service will success here in Saudi Arabia".
- IT consultant: "It is good, no operational cost, no risk for data loss".
- IT consultant: "Surprised, easy deployment for new company without any cost, no upfront cost, no operational cost".
- ERP end user working as accountant: "Fast deployment and implementation"
- IT consultant: "With this system, I can download my data in Excel format at the end of the day, so no problem for data losing"

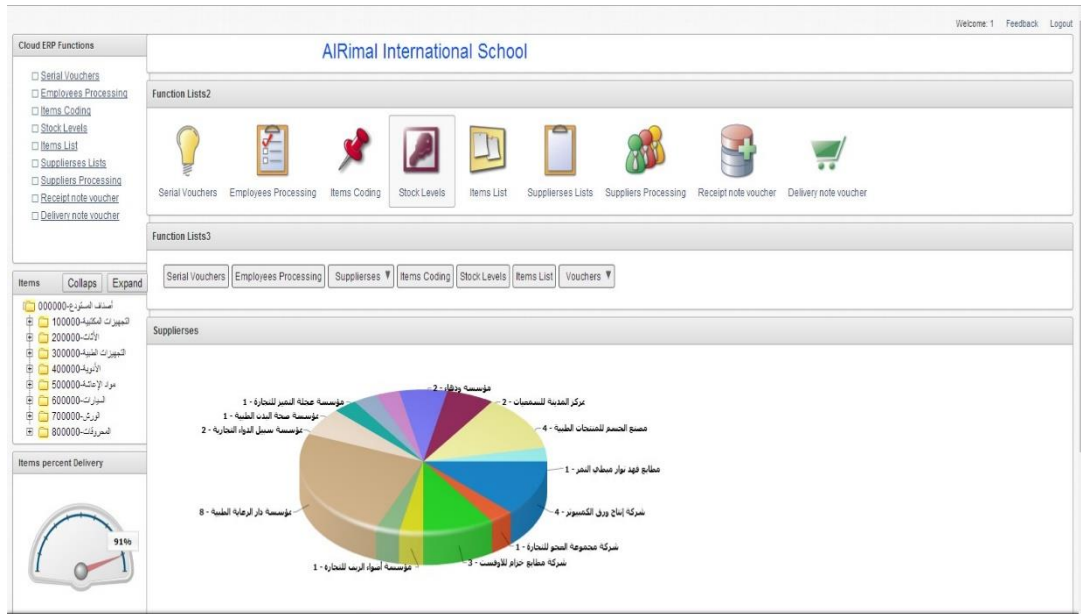


Figure 8. Stock service for AIRimal International School

The main reason why clients hesitate to move to service system is data loss. Thus, the difference between the proposed ERP service and other ERP services is the capability to download the data from each function and module. To decrease the risk of service system in term of data loss from the service providers, a feature for each service function is created in order to allow service clients to download data daily in heterogenous formats, such as CSV, HTML, XLS, PDF, and RTF. In addition, ERP service system periodically exports complete data.

The benefits of ERP service outweigh its challenges. After comparing and analyzing the benefits and drawbacks, it is strongly suggested that Saudi Arabian SMEs, especially those with budget limitations, can benefit significantly from migrating traditional ERP to a service oriented environment. Some challenges still remain, such as lack of trust, loss of control, security attacks, and auditing and monitoring control; as also identified by [15]. However, these drawbacks are manageable by SMEs and supposed to be mitigated by ERP service improvement and its life cycle. The proposed ERP service for SMEs in Saudi Arabia mitigates the risk in two ways. The first is to contact a service provider located in Saudi Arabia. The second is by adding features that allow the service client to import the data both as a whole and individual for each service function.

## 6. Conclusion

A review of recent research on service oriented and traditional ERP applications to investigate the proven advantages and disadvantages is presented. The cause of these controversies could be the differences in the capabilities of various ERP service systems examined at different times, given the general tendency of dynamic improvement in ERP service. It is also argued that the advantages of ERP service system are considered as more pertinent for SMEs in Saudi Arabia than for large enterprises. In addition, ERP disadvantages, such as security risks, are mitigated in the proposed ERP service system for SMEs. Therefore, ERP service system is generally considered a suitable option for SMEs in Saudi Arabia. To the best of our knowledge, no one has yet developed an ERP service system in Saudi Arabia.

## Acknowledgement

This work was supported by the Deanship of Scientific Research (DSR), King Abdulaziz University, Jeddah, Saudi Arabia. The author, therefore, gratefully acknowledges the DSR technical and financial support. The author also thanks Amer Al-Shorbaji for the implementation.



## References

- [1] V. Bansal, "Identifying critical success factors for erp in smes through a case study," *International Journal of Future Computer and Communication*, vol. 2, no. 5, p. 471, 2013.
- [2] A. Y. Pratama, S. Harmanto *et al.*, "Business process reengineering on customer service and procurement units in clinical laboratory," *TELKOMNIKA (Telecommunication Computing Electronics and Control)*, vol. 13, no. 2, pp. 644–653, 2015.
- [3] A. M. AlBar and M. R. Hoque, "Factors affecting cloud erp adoption in saudi arabia: An empirical study," *Information Development*, pp. 1–15, 2017.
- [4] K. Alaqeel, A. Alfageeh, R. Budiarto *et al.*, "An investigation study on optimizing enterprise resource planning (erp) implementation in emerging public university: Al baha university case study," *International Journal of Electrical and Computer Engineering*, vol. 6, no. 4, p. 1920, 2016.
- [5] J. Duan, P. Faker, A. Fesak, and T. Stuart, "Benefits and drawbacks of cloud-based versus traditional erp systems," *Proceedings of the 2012-13 course on Advanced Resource Planning*, 2013.
- [6] M. W. Sari and A. Wibowo, "Measuring enterprise resource planning (erp) systems effectiveness in indonesia," *TELKOMNIKA (Telecommunication Computing Electronics and Control)*, vol. 16, no. 2, 2018.
- [7] N. Y. Sahin, "Cloud erp security: Guidelines for evaluation," *Department of Computer and Systems Sciences, Stockholm University, Sweden*, 2013.
- [8] S. V. Grabski, S. A. Leech, and B. Lu, "Risks and controls in the implementation of erp systems," *The International Journal of Digital Accounting Research*, vol. 1, no. 1, pp. 47–68, 2001.
- [9] L.-J. Zhang, H. Cai, and J. Zhang, *Services computing*. Springer, 2007.
- [10] S. Suhardi, R. Doss, and P. Yustianto, "Service engineering based on service oriented architecture methodology," *TELKOMNIKA (Telecommunication Computing Electronics and Control)*, vol. 13, no. 4, pp. 1466–1477, 2015.
- [11] J. Spohrer and S. K. Kwan, "Service science, management, engineering, and design (ssmed): an emerging discipline—outline and references," *International Journal of Information Systems in the Service Sector*, vol. 1, no. 3, p. 1, 2009.
- [12] Y. Verginadis, A. Michalakis, P. Gouvas, G. Schiefer, G. Hübsch, and I. Paraskakis, "Paasword: A holistic data privacy and security by design framework for cloud services," *Journal of Grid Computing*, pp. 1–16, 2017.
- [13] J. Wang, H. Wang, J. Ding, K. Furuta, T. Kanno, W. Ip, and W. Zhang, "On domain modeling of the service system with its application to enterprise information systems," *Enterprise Information Systems*, vol. 10, no. 1, pp. 1–16, 2016.
- [14] A. Bramantoro, A. B. Hassine, S. Matsubara, and T. Ishida, "Multilevel analysis for agent-based service composition," *Journal of Web Engineering*, vol. 14, no. 1&2, pp. 63–79, 2015.
- [15] S. Tai, "Continuous, trustless, and fair: Changing priorities in services computing," *Advances in Service-Oriented and Cloud Computing (ASOCC)*. Springer, 2017.