Integrating Enterprise Resource Planning with the Organizations' Management Structure for Decision-Making

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Abstract—The unstable situation of some countries in Middle East have caused several crises. Many humanitarians Non-Governmental Organizations (NGOs) intervene to provide services to the affected groups. Good information management may have an effect on the project's activities and the accuracy of decisions making, especially for organizations that have limited resource. This paper presents the integration of a Management Information System (MIS) and its' impact in a local organization operating in Duhok City, Kurdistan Region-Iraq (KRI), namely voice of older people and family (VOP Fam). The goal is to increase the quality of humanitarian work through good decision making and data management. Based on the System Usability Scale (SUS) result, the system includes many components as an Enterprise Resource Planning (ERP) and is used by the organization staff for managing and organizing their activities. This system is essential to provide knowledge and can bring together the management and the organization's senior staff members to make decisions, collect the important information, and allow the donors and the staff of the NGO to follow work timely. The importance of the research lies in its contributes to highlighting the positive impact of integrating a computer-based information system (IS) in conducting humanitarian activities of NGOs in KRI. In addition, it will add a level of reliability to the NGO's activities data and make it trustworthy. This study has concluded that Integrating IS in organizations can help in decision-making based on analyzing the aggregated data, and prepare more accurate reports in a short period.

*Index Terms—*Decisions support system, Enterprise resource planning, Management information system, None-governmental organizations, System usability scale.

I. Introduction

Today, information and communication technologies (ICT) and its wide applications are used by many people around the world, either by personal/group within private or public firms. Since 1991, the investment in information technology (IT) is the highest amongst all other investment sectors in many companies, such as US companies (Dewett, 2002). Furthermore, IT has helped to gathering and analyzing data of Non-Governmental Organizations (NGO), especially in the humanitarian operations. It has allowed to involve information systems (IS) and technologies in their works and activities for recording and analyzing data that have been conducted for the work. Therefore, it can be considered that it is the ICT era, where the economy depends on the valuable information to stay competitive. Hence, the organizations need well-structured information for handling work partners such as partners, stakeholders, staff, and suppliers, who are coming from other areas and covering a different geographical area.

Data gathering and analyzing using IS have become meaningful in an organization's work greatly (Stair, et al., 2018). Overall, the organization's staff can handle the data received through paper-based systems or computer-based systems (for example, tools or software) and then analyze it. Nevertheless, computer-based systems can be incompatible, because the tools or software may not be able to communicate with each other (Abeysekera, 2011). The computer knowledge and skills of staff and lack of resources can be considered as the main problems and lack of system effectivity.

At present, the integrating management information systems (MIS) and decisions support system (DSS) have a great role in improving the efficiency and productivity of the organization's manager. It can support them gaining insight into the business operations by taking into consideration providing alternatives and advice in business strategies and plans (Kohli and Devaraj, 2004).

Current paper aims to highlight the impact of integrating one or more types of IS in the operation of NGOs and their activities, especially those the organizations that have numerous of data transactions and then for making a decision for supporting the management (that is., Decision Support System). Furthermore, it is an effort to overcome the organization's weaknesses and gaps founded in the paper-based system and increasing awareness among the organizations on investing in development and integrating ICT in NGO operations.

Therefore, to reach the aims of the study, the following research questions are raised to be answered in this study:

1. For managing organizations work, is it possible to integrate IS in organizations that are located in Kurdistan Reign-Iraq to support formulating final decision and reporting it?
2. How to save time and have a better decision-making?
3. How to use and test the enterprise resource planning (ERP)?

The rest of this paper is structured as follows. In Section II, a related work is provided on how MIS can be integrated into the organizations and has supported them to make a decision. In Section III, the methodology for implementing the system is presented. The results of the SUS are discussed in Section IV. Finally, the conclusion and future work are presented in Section VI.

II. Related Work

The previous studies have highlighted the impact of integrated MIS into organizational processes for supporting the decision-making procedures. Recently, Sigala, et al., 2020, have presented a research that highlights the importance of HRP systems within Humanitarian Organizations (HO). The authors stated that each organizational IS should be formed to solve the challenges and workloads in lined with their mission and values. The research concluded that ERPs should be specifically designed to meet the specific needs of each HO. Although the study by Sigala, et al., (2020), has highlighted the importance of integrating a computerized system within the HOs, it mainly focuses on supply chain and logistics management. The current study presents a dedicated ERP package that includes project based activities and traces all the transactions involved in these projects.

A key and powerful study for this research that is aimed at using IS in within enterprise infrastructure is done by Almazán, Tovar and Quintero (2017). In their research (Almazán, Tovar and Quintero, 2017), they have used a statistical method and collected samples from 133 companies. The result obtained, indicates the information from small and medium enterprises those depend on computerized IS, can provide useful, up to date and acceptable information by users. Therefore, these enterprises have showed indications of better work performance. In the same direction, Tripathi (2011) have shed light on using computer-based systems in organizations. He clarified how the DSS contributes to the harmony and efficiency of work. Overall, Tripathi found that the reports generated by using DSS can facilitate the understanding of workflow by the management sector, help

to analyses, observing the performance, and then make a well-decision to follow up the organization's work.

Nowadays, ERP systems are considered as the integrated management of the core business process by including multiple software and technology in one package that can be used to collect, store, analyze, manage, and interpret data from many organization activities (Umble, Haft and Umble, 2003). Van Nieuwenhuyse, et al. (2009) have stated "An ERP system should be able to support decisions regarding the planning and execution of the business." Meanwhile, Ali Xie and Cullinane (2013) have mentioned that ERP systems have significantly revolutionized and improved in organizations, especially in conducted activities, and have made them more productive, competitive, and integrative.

Tripathi (2011) and Ada and Ghaffarzadeh (2015) have agreed that DSS and MIS are consider the types of IS. They have recommended implementing integrating DSS and MIS in organizations operations to help the top management for decision making. Theoretically, the study that followed by Ada and Ghaffarzadeh discussed the different types of IS, which are focused on DSS and MIS. It has focused on how DSS and MIS can be similar to each other, but each one has targeted the user's group individually. Meaning, DSS can be focused on leadership and provide an innovative vision to senior management, whereas MIS can be focused on gathering and accumulating information from various transactions of activities.

In addition, Asemi et al. (2011) have presented MIS and DSS and their relation in decision-making in organizations. The MIS supports the managers in the decision-making process through the extraction of certain information from an enormous database to increase the performance of the organization, whereas DSS is the usage of computer systems by managers or user's group in an organization. These systems are intended to solve organizational problems through the generation of special or periodic reports.

III. Methodology

This research paper is focused on the benefits of integrating IS within an organization's work and its role in supporting decision-making. Several studies have been presenting integration of IS within organizations. These works were mostly focused on theories that are proposed in developed countries. In sum, each study has tackled a type of IS which are targeting a specific group of users, as shown in Fig. 1.

This study sheds light on implementing ERP that includes several systems in the organizations, which are located in KRI. The ERP has been designed and implemented to support the organizations by aggregation data from multiple activities carried out in different locations. Therefore, the research questions must be the following:

Based on the brainstorming techniques, this paper is inspired by the best known formal technique called Nominal Group Technique as presented by Hill (2019). The technique barring together all the important personnel of NGO to highlight problems in the current system and discuss the ideas and lessons learned to be reflected in the ERP.

For following the research objective, the ERP System has been designed and implemented by including several forming. The methodology consists of stage methods: Design and implementation, which is can describe the design of the study and how the ERP System was implemented, as illustrated in Fig. 2.

A. Analysis the Current System in Voice Of Older People And Family (VOP Fam) Organization

The design phase of the system has been inspired by observing and analyzing the structure and environment of the organization. Several interviews have been made with key staff to figure out the mechanism work inside the VOP Fam organization, and then recognize the bottlenecks that happen in their traditional working processes. All in all, the observations and interviews conducted have highlighted that the process of data gathering and analyzing requires too much effort and time (Maxwell and Kaplan, 2005). Hence, the result cannot be occasionally accurate. What is more, retrieving, updating and aggregating data in the traditional process can be considered other problems and challenges for decision making. The advantages of this step lie in shaping the components and the using methods that suits the user's wishes.
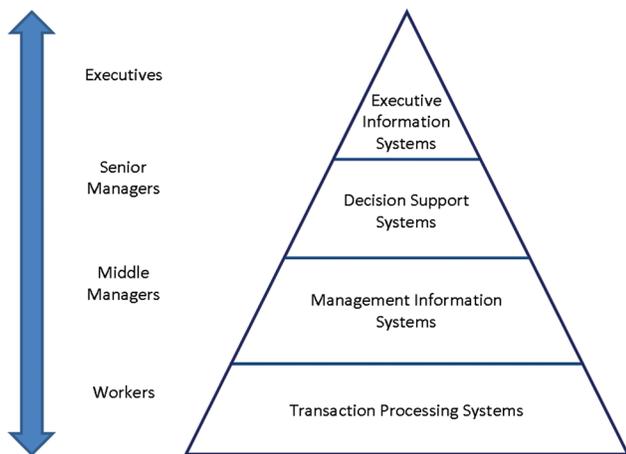
B. ERP System Implantation

After analyzing the structure and environment system of VOP Fam Organization, the ERP system has been designed and implemented (hence forth VOP-ERP) by including and integrating six components that are working together, as it is illustrated in Fig. 3.

The main components of VOP-ERP system:

C. Human Resources

This component of the system contains the full details of each employee/ staff, in addition to employee/staff working history record. It includes some important tools for the management, such as generating and printing employee Identification Card (ID) as it is indicated in Fig. 4, with other options for classification of the employees according to their projects and other functions.

D. Inventory

The inventory component includes the existing items of the organization in the main office and all other field locations. In addition, item status, donation, and classification have been included in this component.

Fig. 1. Four level pyramid model based on the different levels of hierarchy in the organization ("Different Types of Information System and the Pyramid Model," no date).
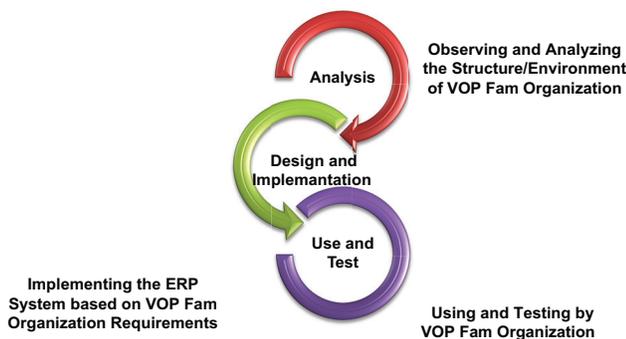

Fig. 2. Methodology used for integrating the ERP systems in voice of older people and family organization.
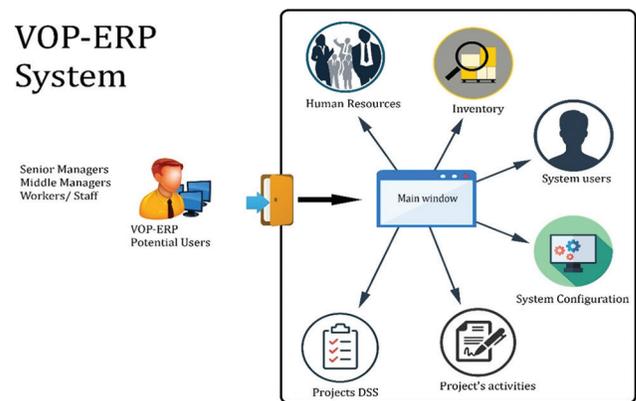

Fig. 3. Components forming of the ERP system for organization. Each component contributes to its organization activities.

Fig. 4. Staff identification (ID) generated from VOP-ERP system.

E. System Users

This component is considered a significant and vital part in VOP-ERP system because confidentiality is most demanding within the work of the humanitarian field due to the fact that the information recorded is related to other people. This component has credential access by the system's admin only and it provides the ability to give user access permissions to other users of the system separately.

F. System Configuration

This component of the system provides the ability to some users to configure some selections for avoiding errors, as much as possible, to increase the efficiency of the DSS reports that will be generated.

G. Project's Activities

This component includes the daily transactions of the workers. It means the activity that is conducted by staff must be inserted in this component. Furthermore, this component has the support for five kinds of sub-activities (for example, Narrative and Numbered Project Activities, Case Management, and Referrals) according to the work requirement and its type.

H. DSS Projects

All the data are analyzed and presented for the managers, to support the decision-making, can be found in this component. It can generate up to 20 different reports based on a variety of variables that the manager must identify. This is why this component is only available for senior staff like the project managers.

Accordingly, the system users will be grant access to VOP-ERP components, once he passes the login window to the main window as it is illustrated in Fig. 5.

This step was very important for the system users which can see all the components that have been reflected in the system for more work motivation.

I. Using and Testing ERP System

The usability method is meant to trace the user's interaction whereas they are using the system. It is not only testing the user interface of the system, but it should test the functionality of the system as well. It consists of five basic attributes: Learnability, Efficiency, user Retention over Time, Error Rate, and Satisfaction (Atrushi, Ahmed and Ahmed, 2017). According to the ISO definition, the basic elements to measure the ability to use are three elements (Ferré, Windl and Constantine, 2001): Effectiveness, Efficiency, and Satisfaction. Effectiveness means the extent of goal achievement, whereas efficiency means the effort required to complete a certain goal or a specific task. The last element, satisfaction, shows the level of satisfaction felt by the users during using the system and the extent of acceptance of the system as a tool to achieve its objectives.

IV. RESULTS AND DISCUSSION

A. Time, Accuracy, Confidentiality, and Decision-Making

Compared with the traditional (manually) system, which has been used by VOP Fam organization previously, integrating the organization functionalities into a computerized IS resulted in many competitive advantages (Peppard and Ward, 2004). The main result is reducing and saving time of work specifically in terms of generating reports. This achievement has a direct effect on each aspect of the work sector, as illustrated in Table I.

Accordingly, several characteristics are achieved using VOP-ERP system in the organization, for instance: Saving time, Increasing Accuracy, Increasing Confidentiality, and Supporting the managers in decision-making.
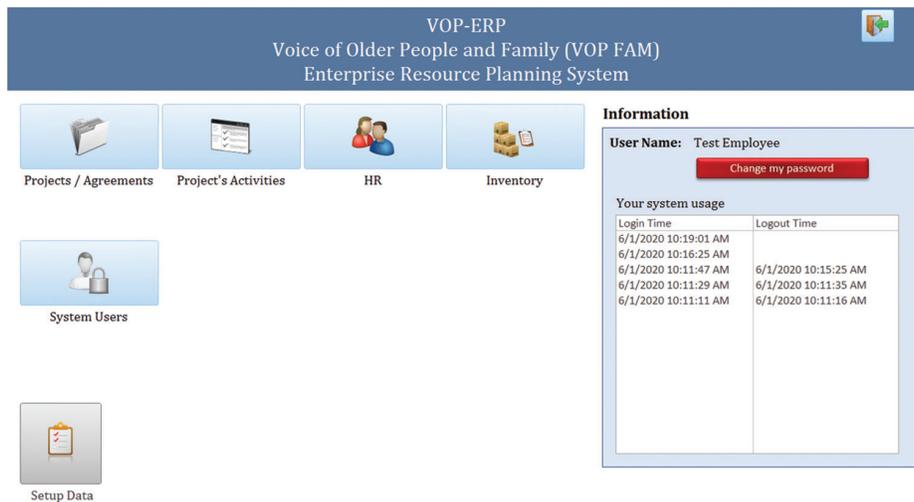

Fig. 5: VOP-ERP main window.

B. SUS Result

SUS as a quantitative method was developed to measure the effectiveness, efficiency, and satisfaction of the system. The SUS consists of ten adapted items (that is., Questions) with the statement on a 5 point scale: (1) Strongly disagree, (2) Disagree, (3) Normal, (4) Agree, and (5) Strongly Agree

TABLE I
PAPER-BASED SYSTEM VERSUS ERP SYSTEM (BLOCK CHAIN) BASED ON TASKS ACHIEVEMENT TIME

No.	Task	Traditional system	ERP System
1	Data Collection	2 Days	2 Days
2	Data Analysis and Entry	2–3 Days	1 h
3	Project Activities Report	3 Days/Report	1 Click/Report
4	Reports for Managers	1–2 Days/ Report	1 Click/Report
5	DS Report	1–2 Days/ Report	1 Click/Report
6	HR Reports	Up to 1 Day/Report	1 Click/Report
7	Staff ID Printing	Up to 1 h/ID	1 Click/ID

TABLE II
THE SUS ITEMS (I.E. QUESTIONS)

Question No.	Items (Questions)
1	I believe that I would to use ERP system frequently.
2	I have found this system unnecessarily complex.
3	I feel that this system is easy to use.
4	I think I need assistance to use this system.
5	I found that several functions have been integrated into this system.
6	I think there are some inconsistencies in this system.
7	I believe that most people can learn to use this system quickly.
8	I found this system is cumbersome and needs a high effort to use.
9	I feel confident during using this system.
10	I need to learn a lot of things before going forward into this system.

(Brooke, 1996). The odd-numbered items are formulated positively whereas even-numbered items are formulated negatively, as shown in Table II.

The odd-numbered items are formulated positively whereas the even-numbered items are formulated negatively.

As SUS can be conducted for at least two users (Sauro, 2013), the testing process of the current system ends through the contribution of (17) employees who have been using the system for more than 6 months in VOP Fam organization. The results have been analyzed, as shown in Table III. In sum, the results indicate that the minimum of the answers to SUS questions is 70%, whereas the maximum score is 95%. Therefore, the total score of SUS is 85.3% indicating that the system is generally acceptable in accordance with the rules of the SUS tool as it is a 70% acceptable ratio (Bangor, Kortum and Miller, 2009).

According to the SUS results analysis for the 17 participants in Table III, the results indicate the following:

- The result of question (1) shows that 100% of participants have agreed and would like to use the ERP system frequently and keep working on it. Furthermore, 94% of participants agree that the ERP system is easy to use basing on question (3), whereas they have disagreed that the ERP system is complex basing on question (2). In the same way, 100% of participants feel confident using the computerized system basing on question (9).
- The result of question (5) shows that 94% of participants have agreed to the various operations and activities in the ERP system are well-integrated. Similarly, the respondent answers in question (6) agree that the operations and modules in the ERP system have not been inconsistencies.

TABLE III
SUS RESULTS BY THE PARTICIPANTS: SUS RESULTS, SCORING, CALCULATION, AND PERCENTAGES

Total agrees	17	1	16	1	16	1	16	2	17	2	
Total disagrees	0	16	1	16	1	16	1	15	0	15	
Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	SUS Score
P1	5	2	5	1	4	1	2	1	5	1	87.5
P2	5	2	5	1	4	2	5	2	5	1	90.0
P3	5	1	5	2	5	1	5	1	4	1	95.0
P4	5	1	4	1	2	1	5	1	5	1	90.0
P5	5	2	5	1	5	2	5	1	5	1	95.0
P6	4	2	5	1	5	2	5	3	5	1	87.5
P7	5	2	4	2	4	1	5	2	4	2	82.5
P8	5	2	5	1	5	1	5	1	5	2	95.0
P9	4	2	4	2	5	2	5	1	4	1	85.0
P10	3	1	5	2	4	1	5	1	5	1	90.0
P11	4	1	3	2	5	1	3	4	3	1	72.5
P12	4	1	4	2	5	1	4	2	4	2	82.5
P13	5	3	4	1	5	1	4	2	5	3	82.5
P14	4	2	2	3	3	2	4	1	5	2	70.0
P15	4	1	3	2	5	2	5	2	4	2	80.0
P16	4	1	5	2	5	3	5	1	4	2	85.0
P17	5	2	4	1	3	1	4	2	5	3	80.0
Participant's answers percentage	100	94	94	94	94	94	94	88	100	88	
To each question	% Agree	% Disagree	% Agree	% Disagree	% Agree	% Disagree	% Agree	% Disagree	% Agree	% Disagree	
Overall results		Min score	70.0		Max score	95.0			Average score	85.3	

- The result of question (Q4) and (10) indicates that the majority of the users do not need an assistant to use the system and they do not need to learn a lot of things to use it.
- The result of both questions (Q7) and (Q8) shows that 94% of participants will be able to use the system quickly, whereas only 22% of participants believe that they need a little bit of effort to use the ERP system.

V. Conclusion and Future Work

With the vast expansion of the technology and the need to keep pace with the development in the field of data analysis, it has become necessary to integrate IS in organizations due to the extensive benefits such as flexibility, productivity, and quality improvement (Melville and Kraemer, 2016). The ERP system used in VOP Fam organization is in operation currently and becomes one of the supportive to the organization seniors in decision-making and the flow up of the work. At present, it is helping the staff in tracking their activities and the managers for making decisions and generating reports. In general, it has provided more accurate and detailed results related to the operations compared with the manual system used before. On the other hand, during the system implementation phase, a challenge has appeared, namely, the wireless network structure was not helping for the communicating in this organization. This challenge has been fixed by replacing the wireless network to the wired network.

Some limitations in this work can be the relative to funding limitation, and it is still used by one local organization only, and technically it has been implemented by using commercial tools and software.

However, the following could be taken into consideration in future development of ERP system:

- Integrating extra functions so that a wider range of users can use it such as (Finance, Logistics, Monitoring, and Evaluation).
- Link the system through internet-based portal or cloud, and making it available at anytime from anywhere (24/7) to access and use the system.
- Translating the ERP system to other languages (that is, Kurdish and Arabic) for making the system clearer and understandable by local users.

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