Study of Effectiveness of Using ERP Systems in Cost Optimization of Just-In-Time Manufacturing Cases

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Abstract – The software selection of Enterprise Resource Planning (ERP) is important phase in decision making and product cost optimization. The initial cost of any AIS Expert System is large and takes place in capital cost of software resources. The expert systems are studying both, quantity and quality. Application of ERP as expert systems in AIS to handle the manufacturing and cost optimization using information technology concepts faces the cost of ERP in many small business areas. The interesting area of study that involved in this paper is that, a plant that manufacture by order – in other words, the pants or manufacturers those has no standard product output and all or the most of its outputs are flexible deepening on the costumer order-. Such that process is so called "Just-In-Time" order. This paper aims to study the effectiveness of use the ERP software in Just-In-Time Manufacturing cases in Jordan.

Keywords – AIS; ERP; Expert Systems; Just-In-Time; Product Cost Optimization.

I.   INTRODUCTION

The growing of innovation demand, changes, with market response has to be more global for different organizational cases in the same time to be specific for application. The development affects the business practices of plants and business organizational in addition to the procedures to keep the manufacturer or market analysis specialists in competition. So, the rule of information technology and AIS in such cases is needed to increases the organization's competitiveness. The Enterprise Resources Planning (ERP) systems are being used in business organizations and companies to solve various organizational problems and to provide a frame as information technology integration.

As informatics expert system, the ERP is an integrated software system package that is composed by a functions set that consist of standard modules for financial applications, human resources management, production control, and such [2].

The projects that use a complete ERP systems takes a considerable time for selecting the fit software (this includes implicitly the vendor of the ERP software), passing through the system's implementation and business process managing, and practical change and examination of the selected system. [1]. That process involves macro-implementation at the strategic level and micro-implementation at the operational level [8].

The ERP benefits are many and can be seen from multi-angles. In general, for specific benefit classification of ERP process, the Shang and Seddon [9] divided them into groups like:

- Organizational, relating to empowering and building common visions, supporting organizational changes, and business learning facilitating.
- IT infrastructure, involving business flexibility building, increased IT infrastructure capability in addition to IT cost reduction.
- Managerial, relating to better resource management, decision making improvement and planning, and improving of the performance.
- Operational, relating to cost optimization, time cycle reduction, improvement of productivity, quality and customer services.
- Strategic, concerning supporting business growth, supporting business alliance, building business innovations, building cost leadership, generating

product differentiation, and building external linkages.

The process of selecting the most fitted ERP system and AIS process (including the configuration of the software and extending the compatibility of vendors with organizations) represents the main point of implementation success. The support of the vendor is a main issue that extends the scope of technical help, upgrade, maintenance, and also the training. While the bad selection of ERP software and vendor makes a non-fitted consideration between the package and the goals of the organization, and thus, this becomes a critical process that negatively or positively affects the process of product cost optimization.

The cost optimization process is highly succeeded in most of the big organizations others. Eventhough, the ERP is costly but it saves a large value of operational cost. The problem in small organizations is that, there is no one expert system that could be used in all of its processes, hence, those organizations is always have a dynamic changability of its processes. That change builds the difficulties of using single configured system, specially, when the work of organization depends on demands. The work order that runs a specific process while another order runs another specific makes the organization works on Just-in-Time work orders.

So, the question is that, what is the adaptive software system that could be used in such Just-in-Time cases. And what conditions to make it reliable, efficient, and easier.

II. PROBLEM

The vendor that integrates, adapts, and develops the functionality of the ERP modules can adapt them for customer's needs and also, in special specified applications [2]. In organizations that has stable and clear processes are efficiently uses the ERP as expert system in its process development. But in many cases, the ERP software should be adapted and configured depending on its applications.

Just-in-Time work orders states that, the business process is being developed in flexible operation to handle specified customer order, or even specified manufacturing, production, solution, etc. for a transient or short time. Then, that process will be changed once another demand or work order is being issued.

Such cases make the fixed configuration and adaptation of any expert systems such ERP, to be needs to adapt continuously. This case, represents the most of medium and small companies, and represents the biggest amount of business in many counties. Even mass production countries, like China, have large percentage of its business in the category of Just-in-Time work order.

Small and flexible production countries, like Jordan, implement the most of its business in the category of Just-in-Time work orders. So, the traditional ERP solutions face many problems to be applied in such environments and application adaptation.

The main issues faced the expert system software in such cases include that, the cost of ERP with respect to the total process modification stage. Hence, the process is dynamically changeable; the ERP change represents a big problem and big load in capitalized cost of the project order in case of thinking to apply it. Also, the adaptation or configuration of the ERP software in each order as Just-in-Time modification of the expert system costs much expensive with respect to traditional process as any person's first look.

This paper studies the use of ERP software systems in Just-in-Time work orders cases in Jordan, and trying to find reasonable rules of using expert systems in such cases. In addition, this research aims to find the real problems and uncertainties that facing such case of applications by question ring and analysis of Jordan manufacturers market, as an example of small production country.

III. RELATED WORK

Actually, the researched that interested in small scale operation organizations regarding the use of accounting information systems is not wide researches. Many of them related to small scale companies. And it could be found that, no actual study of Just-in-Time work ordering.

In [5] the author suggests some solutions to make the use of enterprise resources planning solutions in small cigarette company. Even though the author suggests good solutions, but those were very limited and not applicable in real applications. That comes from that, he build his study upon limited business section.

The author in [8] studies the use of ERP in Greek market of small business organizations. He built his paper on small study sample. But even though, the work in [8] is very helpful and can be cooperated with this paper to get future reliable solutions.

The enhancement of enterprise resources planning applications in small and medium organizations where introduced in [9] by the means of performance driver optimization. This paper solutions may consider being reliable in some cases, but having constraints in many.

Good work in adaptation of the ERP systems to be able to apply in small and medium scale organizations was demonstrated in [13]. Actually, this paper bellow will conclude that, the adoption of ERP should take his place to be reliable in Just-in-Time work order cases.

The fact that, the Just-in-Time work ordering is not related to small or medium organizations only, but many large scale companies also works in that mode of operation. This fact makes the previous studies in [5], [8], [9], and [13] to be not limited takes one side only of a big study case.

IV.   METHODOLOGY

This paper considers a hypothesis represents the main issues of the use of ERP in Just-in-Time applications. The questionnaire is explained in table-1. Where the hypothesis introduced in this paper are:

1. The ERP project effectiveness considering both; business process and information technology in the just-in-time manufacturing has better effectiveness that project that considers only the business process issues.

2. The business amount effects the ERP effectiveness rather that the number of repetitive manufacturing.

3. Information technology techniques can adapt the implementation of ERP system to deal in flexibility with the variation of project demands.

4. Artificially intelligent approach used to adapt the ERP systems automatically, improves the performance of that system under the frequent variations.

5. Stability in material requirements and resources is a case that the use of ERP in just-in-time manufacturing can be effective for first time enhancement.

6. The constraints of supply chain management make the use of ERP in just-in-time to be costly and ineffective. So, in order speed up the process and optimization the cost, the constraints of supply chain management should be minimized.

7. Introducing the concepts of forecasting can enhance the select of a suitable ERP that is comfortable for different instant manufacturing changes.

The estimated results of questionnaire states that the efficiency of use of any expert system will increase the reliability of that process if an application found to meet the demands of the changeability of the process requirements. Where goal of finding a technique in information technology that adapt the ERP system may be not complex. Also, the use of artificial intelligence – especially – fuzzy logic may make the configuration more adaptive.

Important issue is that, implementation of advanced forecasting techniques; neither in information technology or other process; definitely is a key point of using the intelligent and computation intelligence in Just-in-Time applications.

This paper flow the following procedure research, starting from reach problem definition and ending to results of this paper:

- Problem definition and formulation, including stating the objectives.
- Lateral survey to get up to date in the researches that concerns in that field. Including the small business application of ERP and expert systems.
- Stating the hypothesis
- Building the questionnaire and questionnaire application plan in Jordan field
- Analyzing the data and generating results.

TABLE-1: SAMPLE OF QUESTIONNAIRE THAT PERFORMED FOR THE HYPOTHESIS OF THIS PAPER

NO#	Question	ERP user		Interested in AIS		Answer			
		Yes	No	Yes	No	Sure	Yes	May be	No
1	Heypo1								
2	Hepo2								
3	Hepo3								
4	Hepo4								
5	Hepo5								
6	Hepo6								
7	Hepo7								
8	Additions								

V.   RESULTS

This paper study Just-in-Time business organizations in the term of information technology scope. The survey is Jordan organizations hence the countries like Jordan has its Organizational companies to work in very dynamic work order. And the most of work in Jordan can be considered to be Just-in-Time manufacturing, trading, servicing, and others.

The study sample was taken as 50% of the companies in Jordan, 40% of them were trying to use information technology solutions in accounting or tries to study the use of accounting information systems in there process. 40% percent of the study samples were actually uses ERP or other information system / expert systems in their accounting process. And only 20% of that sample didn't try to use or even didn't study the use of such information system to enhance their processes.

The last 10% percent of the study sample, was thought that, the ERP or any other information system will const their much of money without actual back income. The main problem of those business holder is that, almost of them didn't understand the actual concepts of accounting information systems. Thus, they think in a wrong way and didn't try to match the new requirements of the market increase and productivity reliability by the use of computerized information systems.

The survey of the questionnaire takes two weeks of telephone filling of the questionnaire form. The good point that limits the time of that survey is that, the exact and bounded design of the questionnaire itself and the good

stating of the hypothesis. Other else, it could take a month or more time.

Most of study sample was helpful but there have no experience with such researches, so, a problem was faced in dealing with them regarding to his first experience in survey and researches.

TABLE-2 SHOWS THE QUESTIONNAIRE RESULT OF THE HYPOTHESIS.

Hypothesis	Answer			
	Sure	Yes	May be	No
Hypo-1	20%	36%	28%	16%
Hypo-2	24%	34%	18%	24%
Hypo-3	44%	34%	6%	16%
Hypo-4	6%	26%	50%	18%
Hypo-5	0%	6%	26%	66%
Hypo-6	22%	30%	30%	18%
Hypo-7	4%	36%	38%	22%

The questionnaire contains a point of feedback from the company representative if they are interested in ERP. The questionnaire feedbacks that only 68% of the study sample are interested in applying of accounting information system in their business. Only 62% of the 80% that used or tried to use or studied the use of ERP are welling and interested in applying such systems in their business. While an 6% of the 20% those didn't use or try or study to use ERP in their business are interested and have encourage and scope to use such systems to develop their processes.

The results above have a variance in the view point of the study sample. It's clear that, there is a shared point stays that, there are uncertainties in companies in Jordan about the future look to the ERP systems. This almost comes from the fact that, there is no enough researches study this case.

We see that, there is no future scope toward the information system specialists in small or medium companies. That comes from the result of hypothesis-8. 38% of sample of study don't know enough information about forecasting or future work estimation. Even though, 22% of them decided to fail of forecasting without real trial to use forecasting or estimation techniques.

The trend of survey results a total percent of 69% of the survey sample decided that, the use of ERP information systems based on the developed solutions of artificial intelligent and computational algorithms with cooperation of keeping process variance small as possible.

As seen in table-1, the questionnaire contains a point "Additions" that is specified for any additions from the sample person. The largest percent of the sample added that, existence of cheap Accounting Information Systems will solve the most of the problem; hence, the main problem comes from that the high cost of such systems. so, we have to go cheaper.

VI.   CONCLUTION

As shown in results and study procedure, the enterprise resources planning solution could be used as accounting information system in all organizational scales; large, medium, and small. This paper problem concerns on Just-in-Time work ordering organizations and companies. And this paper considers the Jordan market to be the study area.

ERP is capable to be applied in Just-in-Time applications if a programming, intelligent, and information technology issued fixed, or specifically adapted. Where the adaptation that made on the ERP in every new features order represents high cost on the budget. So, the cost minimizing is main issue in using such systems in such areas.

The enterprise resources solutions and accounting information systems vendors needs to plan more dynamic, flexible solution to solve this problem, and they have to go cheaper.

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