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The Impact of Expert Systems on AIS - Characteristics and Productivity Work Life Cycle: A Study Targeting Jordan Large Market Organizations

Muhannad Akram Ahmad
Department of Accounting Information System, Irbid National University
Dr.muhannadAhmad@gmail.com
Irbid - Jordan

Farah Hanna Zawaideh
Department of Computer Information System, Irbid National University
Dr.farahzawaideh@inu.edu.jo
Irbid - Jordan

Abstract
The computer science new emerged technology on AIS researches should explore the application of AIS on the commercial development in terms of availability and characteristics, in addition to productivity and life cycle. The AIS researches are concerning not only into computer science and accounting, but also in organizations and organizational effects. A general citation of expert systems on AIS will be stated and studied in this paper, which aims to investigate the impact of theuse of artificial intelligence and expert systems techniques strategies on accounting information systems. Itconcentrates on concerns that are of most interest for accounting information systems, this investigation looks at the use of Artificial Intelligence and expert systems to be a solution to those concerns, and to be efficient factors in improving general characteristics of accounting information systems in an organization simply by improving productivity and work quality and make a reasonable change in the process life cycle. This thesis targets the large scale market organization in Jordan, where those organizations also has many constrains and limitations.
Keywords – AIS; Expert Systems; Work Life Cycle; Productivity

1. Introduction

With the wide expansion of the use of computers in mostly every field of business, Accounting Information Systems are transferred from paper formats into computer-based formats. In many situations nothing was done to computerize the accounting information systems more than using a computer as an advanced calculator or paper processor, besides for many decades. The accounting databases are mostly used to store limited information about certain accounting transactions; which to the result that the needs of the decision makers could not be met by these systems.

The integration of Artificial Intelligence (AI) into accounting database could be adapted to be a solution for many problems, since it helps developing systems that are able to diminish the complications of the traditional systems. Even with the significant attention the accounting database theory is getting nowadays, the application of expert systems to the accounting information systems was not given its fair share of work. Since previous literature of accounting information systems and their relation to expert systems have suggested that the work done on expert systems in accounting was mostly focused on auditing with little work on accounting management and some tax applications. It has become of great importance to inspect issues in accounting information systems and look closely at the solutions offered by the use of expert systems.

For many years, the researches that try to find a solution of accounting problems based on expert systems were limited in large percentage to the industry processes. Where, the expert system and the AISwere not appeared as a hot area of researches till now. This comes from two facts; the first is to limit the AIS researches on accounting side with few contributions in computer science, while the second is the cost of researches that didn't target the most of AIS researches where those work in questionnaire principles only.

In performance measurement should concentrate on saving time in addition to the administration effects, also the reliability of internal audit for the financial issues. Productivity increases when these innovations are properly used. Insofar as a firm’s culture is open to the introduction of new accounting information systems this will lead

to a more holistic view of it and make for greater flexibility and dynamism in organizational search for improved results.

The firm measurement of performance should be distinguishable to determine the performance increasing or decreasing. The performance evaluation is being done in most accounting information system via the information technology and software system. In fact, the performance evaluation should be measured in terms of financial and accounting criteria. So, this paper was developed a questionnaire to survey the experienced people view and measurements of specialists in accounting and finance.

Software and information technology investment for the accounting was being done by many firms. But that investment failed, and especially in attaining the goals of established performance.

The large scale organizations and firms are more suitable for the information technology and software researches, because of its ability to attend such cost and new models of work flow. The impact of the researches in AIS is more measurable in such large scale organizations. . Given that AIS are a basic component derived from technologies in general, the main issue is whether applying accounting information systems contributes to firms' improving their results.

2. Problem Formulation and Objectives

Many issues should be noticed in the AIS, like the needs of the decision makers were not met by the accounting information systems. It has never been off the table and always have been a subject of arguments between accounting researchers, whether that these conventional accounting information systems meet their users' needs or not.

It has been noted by McCarthy (1982) that accounting information systems and databases in general, overlook related and equally important non-accounting information, looking at productivity and reliability data for example, most of the time they are poorly summed up, using unsuitable coding scheme, and its integration with the data needs of the rest if the firm is not very effective.

Another issue in AIS is the inability of humans that is not computer specialist to understand or process the captured data in computerized accounting databases. Nowadays, computer-based systems are able to store and accumulate huge amounts of accounting information, and it had been found by accounting researchers that huge amounts of data would be a reason, especially if combined with the decision time constraints, for poor decisions to be made by decision makers.

Besides, not much accounting models that are able of changing the method of modeling and use of the accounting data have been presented. Income and cash flow statements and balance sheets, are till this day the primary models to use in accounting data summaries, which means that not only the needs of the decision makers are not met, but that the users in most of the cases do not know how to use available information in other situations.

On the other hand, the focus on numeric data, since it has been noted that the strength of expert systems would usually be the great ability to process numeric information, therefore, all the focus was put on numeric data when designing computerized systems. This means that as a result, symbolic data (such as text) along with the models that are able to handle both numeric and text data (which can be very helpful when estimating important essential context and other variables related to accounting events, such as including information like who processed a transaction and their motivation) was excluded.

The advantages of the involvement of humans in systems have been lost after the increasing in computerization of systems. Humans are able to understand and bring memory to accounting information processing. Then, the problem now is how to involve the human in the accounting information systems (AIS).

Nevertheless, computerized accounting databases are most likely to have little information about the relations of different transactions to the same event. For example, adding extra non-accounting information about the

detailed causes of those transactions (and other context-oriented information) could be helpful in establishing such relationships.

On the other hand, such AIS systems are mostly difficult to use, and the users will either be not able to use systems because it is not user friendly. This will costs much more in trainingto enable to use it. The ease of use is supposed to be looked at in the interface of the system, and with the proper understanding of the underlying models; for example, databases with natural query language are noted to be easier to use, than systems where natural language is not available.

The methodology, technology, and computer science that could provide a reasonable feature to overcome the previously described problems is the part of artificial intelligence; Expert Systems. The expert systems areartificially intelligent computational techniques that are based on huge historical human knowledge and artificial knowledge representation.

The expert system design could be led by one of powerful artificial intelligent techniques which are common in computer science and problem solving like neural networks, KNN, fuzzy logic, and others. The core of expert systems is the knowledge representation which enables to make the computer programming and computation more human like represented. Itmakes the computer software more near the human language and thinking level.

For long time, the expert systems were still inside the researches under development only. In recent years the rise of expert system strategies in problem solving makes it out to the real problem formulation, verification, and applications.

So, what his paper will be helped by the use of expert system? The problems was described above could be formulated by one major issues, which is that the computer style in programming which consists of mathematical representation of the problem minimizes the impact of the accounting information systems (AIS). Thus, the problem is known, and the solution should be to overcome the causes.

The computer style in programming via mathematical representation should be masked, and the user shouldn't deal with that complex data structure. Instead, the user needs to deal with human level linguistics in problem description, captions, estimation, and the complete processes of AIS.

The expert systems are the way that enables the user to overcome the described problem. Thus it could increase the power of AIS impact.

3. Hypothesis

This paper states that, the impact of AIS is normally minimized by the cause of complex structure of the AIS software. That is mainly, the mathematical representation and formulation of the expressions and output results in AIS software. This is the first hypothesis that the paper was based on. Also, another hypothesis is dependent on this main hypothesis.

The complete hypotheses of this paper are the following:

- The complexity of mathematical programming structure slows down the rise of AIS and limits the user visibility of such software tools.
- The complexity of AIS could be dropped down by the move to make the application, input, and output of AIS in terms of human linguistic level.
- The use of human linguistic via expert system will affect in increasing the performance and enhancing the life cycle and characteristics of the AIS
- The cost of expert system is not much as the cost of training and human resources to ensure the special knowledge that is needed to deal with numerical and mathematical formulation, expressions, and results of the intrinsic accounting information systems.

4. Study Sample

This thesis targets Jordan in Middle Eastern area of the world. The Jordan inMiddle East has special treatment in the AIS and in business in general. This specialty comes from the trading and manufacturing scale and nature, the most common industry in Middle East is the oil and gas industry. Oil and gas are very big company that didn't care to put large amount of money in modern technologies problem solving like AIS training.

Unlike most Middle Eastcountries, Jordan represents a small limited market with no oil or gas industries, and no large scale industries.

The Jordan business is mostly trading with medium and small scale. The largest industries in Jordan are the mining industries, like phosphate and cement mining.

This paper build the study on the large scale trading and mining industries in Jordan by dividing the study sample into three parts; mining industries, large scale export / import traders, and large scale food suppliers.

This variety of study sample ensures to get confidence of the paper results with respect to each different type of business. The result could be guaranteed not for all the three types of that business, but may be guaranteedfor some of them.

5. Related Works

Optimal AIS usage enables better adaptation with respect environmental changes, and better managerial with high competitiveness degree. A boost of firm dynamic nature is exist with greater information flow betweendifferent levels of staff, and business possibility on network and improved external relationships of the firm. It is mainly with foreign customer those are being accessed via the web firm.

The researches that areconcentrating on impact increasing on AIS were mainly focused on that firm and the boost itself. Unlike the paper, the concentration was on the AIS by the means of accounting, where this paper focuses in impact ofAIS by the means of information systems and computer implementation.

In [3],the accounting information system and commercial units performance was reviewed by analyzing strategies, that led to explain the commercial units high performance based on large scale accounting information systems. This study examined the variation of the accounting information systems upon organization semantics.

The reviewed strategies get the potential for strategic management potential changes. The complexity of organization semantics was dependent on the AIS design via computer system nature .

The author in [4] presents a scant evidence of the financial performance and accounting information systemsrelationship. That research considered the study made by Elena Urquia Grande, Raquel Perez Estebanez andClara Munoz Colomina (2010).
That paper finds an association between the organizational strategy performance and the accounting information system itself. The accounting information system implementation could beimproved in order to save the money of shareholders in addition to the working time, which affects the performance and the life cycle, and thus, helping in decision making about the investment .

The research of [5] make an interest study about the needs of the AIS based accounting data and financial managers in order to estimate the performance of the firms and futures planning maps. The performance oforganizations is measured in that research in terms of return on equity and return on assets. The measurements are numerical ratios are limited measurements of financial performance.

Also, the nature of the accountinginformation system makes negative effects on the performance and work life cycle of the organizations and financial processes .

6. Methodology

This paper aims to study the expert systems implementation in AIS on the impact of AIS, which is represented by user orientation and feasibility. Thus the first process in this research was to formulate the problems and the goals of the research. Then, select the study sample which is described in details in the section-4.

The expert system was selected to be fuzzy logic based expert system. This is because the fuzzy logic with its high reliability, it is adaptive by its nature, so, it can proceed easily in changing its behavior while normal working of the user. The environment change in the expert system should continuously affect the knowledge representation but keep the representation scheme of that knowledge.

The expert system is an artificially intelligent computer system which is capable to simulate the decision making process via its ability to represent the human knowledge in computer structure.

The expert system is artificially intelligent computations (i.e. computer programs) that are capable to simulate the process of human decision making depending on high level knowledge representation and high level rule based structure.

The complex process of decision making requires high level of and very large size data and knowledge structure in addition to comprehensive rule based system. Originally, the idea of expert system was suggested as a solution of complex problems description and solving algorithms. The representation of the knowledge should be reasonable based on advanced artificial intelligence techniques, while the rules are being derived as IF-THEN rules, not as common programming languages conventions and rules.

The expert generally consists of two sub-systems or parts; the knowledge representation of knowledge base sub-system and the interface engine or interface sub-system. The knowledge base part consists of facts and the rules that represents the most of the system structure, where the interface sub-system implements the rules with respect to represented facts in the knowledge base parts, thus, by applying those rules, a new facts will be deduced.

The knowledge base represents world and problem environment facts, which is could be represented primarily as variables flat assertion, or commercial shells which the knowledge get it in more utilized concepts and structure from object oriented programming techniques. In object oriented techniques, the world and problem environment is being represented as classes, sub-classes, instances, and assertions. The rules of knowledge bases are being implemented in different techniques, like objects value assertion and querying. With the rise of artificial intelligence estimation and decision making algorithm and techniques like genetic algorithms and fuzzy logic, those modern techniques becomes highly used in the expert systems, due to those ability to adapt with different systems, knowledge size, and natures of the data structure.

The interface engine sub-system represents automatic reasoning system to evaluate the knowledge base current state, then, applying the reasonable rules, and gets new knowledge and then asserts that knowledge to the knowledge base. The interface engineer could be forward chaining (i.e. the interface engine is derived by the antecedent rule) or backward chaining (i.e. the interface engine is derived by the consequent of the rule). The first expert system keying was presented by Hayes-Roth [1] as a system to derive its power from knowledge that it represents rather than traditional way of deriving power of the system from specific formalisms and theuserinterface schemes.

The first expert system was implemented by Stanford heuristic Programming Project [2], where the idea of standalone artificial interface and the rigid terms of expert systems were dropped from IT lexicon. After that, the researches were continued in such field, but the limitations were the complexity of such systems, and the no-maturity level of concepts and many artificial techniques.

Nowadays, the expert systems is widely used and adopted in different life applications and problem solving tools, and the expert systems was the first commercial system that used knowledge based system and software architecture. In the field of accounting information system (AIS), the expert system is capable to solve and handle the critical knowledge information and data that is required for the accounting information system to work not implicit, but explicit. The explicitly is measured with respect to the user.

As described earlier in this paper, the mathematical expressions and notation of the programming languages make the information system and specially the AIS not user friendly, where the input and output is not easily understood able. The computer or IT specialists are the only one who can review the conventional code of any accounting information system. Whereas, the expert system embed the original code and specify rules that has format easily to be reviewed and understood by non-computer programmer or computer specialist. Even though, the expert system enables to edit the rules not by IT experts, but by domain experts (i.e. in this case, the accountant, or financial specialists). In addition to that, this explicit implementation is easy to be maintained and the domain experts need very few training rather than long term training that is supposed to be in the traditional accounting information systems.

The fuzzy logic is basically based on knowledge based structures with knowledge based derived rules. Fuzzy logic rules also are IF-THEN rules, not conventional coding control flow. This makes the fuzzy logic more suitable and easier to be adapted for expert systems. By the rule of thumb, fuzzy logic is cheaper than any technique that could be deployed to create an expert system, and much faster any historical data based artificial intelligent computation and knowledge based structure.

The prospective of fuzzy logic and its characteristics led this research to select fuzzy logic based expert system. Whereas, this research is not intended and not specialized for comparison between different expert systems and artificial intelligence tools vendors, so, the selection was not made deeply looking for details.

The AIS tools itself cost much of money, so, the expert system that could be used with AIS tool should be at lower cost as reasonable application and support software.

The selected expert system was being used to mask the accounting information system, and specialized for accounting to study the performance and performance measurement in addition to the work life cycle in the targeted companies and/or organizations in the large scale Jordan market. The Jordanian large scale companies are highly motivated to apply the modern AIS technology and the impact of computer systems. The selected expert system that is adopted for AIS was distributed on the study sample and few training was made for the domain experts in those organizations to make them familiar with that system. The system was used by those organizations for one quarter.

The methodology was designed in the form of questionnaire to measure the impact of expert system on AIS performance measurements and work life cycle. The questionnaire designed to present the hypothesis those described in the hypothesis section. The statistical analysis was used to make factor overloading. The factor overloading was done by the mean of principal component analysis to minimize the questionnaire dataset and to remove the non-coherent variable. Then the results were analyses with respect to each individual hypothesis.

7. Results

The performance measurements of this research were done by the selected organizations itself. The selected fuzzy logic based expert system was adapted to be used by the firms, and the field specialists were trained to attain the work on it safely without any problems. Initially, the study samples were divided into three parts; mining industries, large scale export / import traders, and large scale food suppliers.

The results were measured by survey analysis, where the survey was subjected to factor overloading by the means of PCA. The gotten results were analyzed directly to get the hypothesis trust percentage from the view points of the firm specialists.

The organizations in Jordan that are assumed to be the study sample and field, was very welcome to use the modern technology and to solve the proposed problems of the conventional method of the accounting information systems which they are using currently.

The expert system setup and use was simpler than any software system the organization specialists was used yet. This paper made that, the research specialized all of them are not information technology specialists. Those are only accountants and financial officers. An 88% of the study sample considered that, the expert system easier than the conventional AIS, where 12% didn't consider the AIS easier, but they either weren't able to judge or already have a lot of experience in AIS that makes them feel freer toward it than any new tools.

The complexity of AIS was a problem with respect to workers in AIS in general. But 23% of the specialists in the export / import didn't consider that a big problem. But a 11% of the food industries organizations didn't

consider the AIS complexity to be big deal. The percentage becomes more less in the import and export organizations, with percentage of 5%. This means that, 88.5% of the study sample highly recommends growing up the researches in the field of this paper to minimize the complexity of AIS which slows down the performance of operation.

As proposed in the hypothesis, the complexity of the AIS efficiently dropped by the move toward more human-machine interactive solution. 99% of the study sample stated that, the complexity of the conventional accounting information system was dropped by the use of adaptive accounting information system that is based on expert system. 100% of the mining industries sample, 95% of the food industries sample, and 99% of the export / import trade study sample were stated that, the work life cycle in the quarter year (i.e. study period) is more measurable, observable, and controllable with the expert system adaptation.

The use of human linguistic effect has variety between the different categories of the study sample. While 90% of the export / import trade organizations see that, the use of linguistics will increased the performance of internal audit and the productivity, 48% of the mining industries found that not really considerable and not really active for productivity measurements. In addition, 77% of the food industries sample ensures the good and effective rule of the linguistic input / output format in improving the productivity and the performance of the accounting information systems in different conditions.

The large scale companies specializes a large budget in order to train the field specialists to make them familiar with the conventional accounting information systems. The cost represents an overhead to all study samples. 100% of the study sample feels that, the training of AIS is a must, to get the expertise of the field highly capable to handle all input and outputs of the AIS tools.

But, the training cost plus the accounting information system itself cost was minimized by introducing the expert systems in cooperation with the AIS. The study survey results that, 100% of the study sample organizations considered that, the cost of AIS and training could be saved by adapting expert system to support the AIS tool.

8. Conclusion

Thispaper presents a contributed improvement study of the accounting information system by the deployment of artificially intelligent technique. Artificial intelligence has a wide interest in different prospects of computer systems and human interaction. The best aspect artificial intelligence is to make the human machine interaction more reliable and higher to the human level.

The conventional accounting information systems are computer programs that are based on arithmetic expressions and formulation.This study finds that, the most users of AIS from the field expert (i.e. non computer or information technology specialists) consider the conventional programming style of the input output format of the accounting information system not reliable, wasting time, and need more training, thus, it wastes time.

The introducing of expert system in the field of accounting information system as artificially intelligent technique improves the AIS itself by the mean of user interface. The problem of mathematical formulation and expression of the AIS could be minimized by adapting the appropriate expert system. The cost of training and the need for IT specialists is minimized too. Many other pros and prospective could be improved in the AIS by the implementation and adaptation of the expert systems.

The continuous improvements of the computer science and information technology have the main rule in the modern information systems and specially the accounting information systems. These improvements led the researches in AIS to be grown in order to increase the performance. Nowadays, the human interaction with the information system itself should be placed in the top interest of such researches. This paper shows that, the human interaction directly affecting the performance of the AIS. Also, the human interaction reliability of the information system affects the work life cycle upon this research study and analysis.

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