

Proposed Intelligent Computing Research Disciplines for critical success factors (CSFs) of ERP implementation: measurement and forecasting

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Abstract: The paper studies the knowledge gap of assisting organizations planning to implement the Enterprise resource planning (ERP) technology. The previous articles shown that there are many critical success factors (CSFs) for ERP implementation; papers pointed the importance of each factor in implementation process, also articles shown that the ERP implementation is expensive and high risk, in spite of high performance and benefits of ERP. The paper focusing on CSFs and new organization looking to adopt the ERP in the future, and the objectives of the study is assist these kinds of organizations to predict the future value of implementing the ERP depend on the previous research results.

After extensive literature review of ERP implementation and its CSFs, on one hand, and intelligent models experience and knowledge on the other hand, we identified the necessary directions of the future research required in order to develop learning system to predict the future expectation of ERP implementation in the organizations that start from its current situation, the intelligent computation models assist in some of these research directions.

Keywords: Enterprise resource planning, Critical Success Factors, Intelligent computing.

1. Introduction

ERP is the techniques and concepts for integrated management of businesses as a whole from the viewpoint of the effective use of management resource, to improve the efficiency of enterprise management [1]. Many benefits can be achieved from implementing ERP like inventory, man power, and produced material cost reduction, man, improving sales and efficient financial management [1]. In other Hand, in spite of all these great benefits, ERP implementation is highly complex process, time-consuming, unpredictable terms of costs, and high risk [2][7], which it may lead the organization implementation failure and lost [1]. Implementation of information systems in general is quite difficult. It is there for not surprising that implementation of ERP would be equally if not more difficult due to their size, scope and complexity, and the benefits of ERP can't be achieved easily [8], in fact that about 60 -70 % of ERP implementation in organizations end with failure [8][9][10]. Number of publications has highlighted the failure and the frustrations that enterprise goes through in implementing ERP systems. As cases of ERP failure have increased, many studies have been initiated factors that could lead to ERP implementation success.

For implementation success, a lot of research articles had written during last twenty years on the ERP implementation critical success factors (CSFs) [1][3][4][5][6][7]. Most of these articles analysis focus on the issues that contributed to failure than those contributed to success [8]. If these factors are controlled and managed so that they are phrased as positive factors that contribute to success are appeared in the following list include: top management support, user training and education, project management, clearly define goals and objectives, project team competence, and change management [8].

In developing countries like Sudan, ERP systems is in its early stage, maybe there are many reasons on that like limit of capital, depth IT experience and limited knowledge about ERP [8]. In spite of that a little number of organizations are implementing ERP technology, and some others think to buy and implement, so this paper a part of a research focusing to assist companies that looking to



buy and implement the ERP in the future. This motivation leads us to propose and recommend different research disciplines assist such kinds of organization in measuring its current CSFs, and forecast their future ERP implementation result and success expectation.

2. Literature Survey ERP Implementation CSFs

2.1. ERP Implementation CSFs

The ERP implementation process concerns all aspects of implementation including developing the initial business case and planning the project, configuring and implementing the packaged software, and subsequent improvements to business processes. ERP implementation should therefore be considered a “business project rather than a technological initiative” [15].

A lot of articles were interest to determine the critical success factors of ERP implementation, recently D. Aloin et. al in 2007 [2] determined 19 factors, Catersels R. et 2010 [11] defined 22 factors, and Basu R. et in [8] also defined additional factors, the table 1. Shows the factors discussed by these articles, some of them intersected in more than one paper and some of them explored by one paper:

Table 1 shows the CSFs from 3 articles:

id	Factor\reference	[11]	[2]	[8]	id	Factor\reference	[11]	[2]	[8]
1	Top management	*	*	*	21	Vendor tools	*		
2	Project team	*	*	*	22	Consultants	*	*	*
3	Interdepartmental cooperation	*			23	Key user involvement		*	*
4	Clear goals and objectives	*	*	*	24	Implementation model		*	
5	Project management	*	*	*	25	Legacy system management		*	
6	Interdepartmental communication	*	*	*	26	Leadership		*	
7	Management expectation	*		*	27	IT system issue		*	*
8	Project champion	*			28	IT system Mentality		*	
9	Vendor support	*	*	*	29	Strategic thinking and planning		*	
10	Package selection	*	*	*	30	Financial management		*	*
11	Data analysis and conversion	*			31	Data accuracy			*
12	Dedicated resources	*			32	User knowledge			*
13	Steering committee	*			33	Scalability and scope			*
14	User training	*	*	*	34	Software development			*
15	Education Business process	*		*	35	Testing and troubleshooting			*
16	BPR	*	*	*	36	Effective decision making			*
17	Minimal customization	*			37	Performance measure			*
18	Architecture choice	*			38	Suitability of hardware and software			*
19	Change management	*	*	*	39	ERP Importance			*
20	Partnership with vendor				40	Multi size issue			*

A system is called computationally intelligent if it deals only with numerical (low-level) data, has a pattern recognition component, and does not use knowledge in the Artificial Intelligence (AI) sense [12], one of these kind models is artificial neural network (ANN) and genetic algorithm (GA). An ANN is an analysis paradigm that is roughly modeled after the massively parallel structure of the brain. It simulates a highly interconnected, parallel computational structure with many relatively simple individual processing elements. It is known for its ability to deal with noisy and variable information. There are five areas where neural networks are best applicable [12]:



- Classification and Clustering or Compression

- Content Addressable Memory or Associative Memory;

- Forecasting and prediction;

- Generation of Sequences or Patterns;

In order to forecast problems more accurately in management, an artificial neural network (ANN) models has been applied in many varieties of business decision making [13]. For example, ANN is widely used by companies for forecasting bankruptcy, customer churning, and or stock price forecasting. The researchers in [13] applied the ANN model in ERP systems development and operation forecasting, and they compare the model with case based reasoning model (CBR) and multivariable discrimination analysis (MDA). ANN is suitable for solving complex problems, it consist of input layer, hidden layer and output layer [13], it has a processing elements which are modeled on neuron function as a bases. Linkage weighting between the processing elements can be calculated through the circulation of input layer, hidden layer and output layer [13]. The most frequently used activation function is the sigmoid function in ANN, the advantage of using ANN is that it provides the best result for defining the relationship between independent variables and dependant variables [13].

Another intelligent computing model is genetic algorithm (GAs) are presently used to recognize patterns, anticipate changes, and learn the buying habit and preferences of electronic commerce customers in Internet-based transactions [14]. In GA, a generation of individuals consists of the surviving individuals from the previous generation together with new solutions or offspring. The population size usually remains constant from one generation to the next. The offspring are generated through reproduction and mutation of individuals (parents) from the previous generation.

A mutation in a parent chromosome might be equivalent to a pair-wise interchange in the corresponding sequence. In each generation, the fittest individuals reproduce and the least-fit ones die [14].

3. Discussion and Contributions

Some articles talk about CSFs and their impact on ERP implementation process, what are these factors? And explore the new factors, in addition to percentage of importance of each factor on implementation process, so from literature review on ERP implementation and CSFs we explored the following observations:

1. These factors are somehow different in total number and factor itself, Some articles include the previous factors and add more factors, or just explore new factors impacton.
2. Most of these articles are tried to determine the impact of each factor on the implementation process, and what is the weight of each factor on overall impacton.
3. No articles found on my search tried to suggest any factor value measurement, and much the value of each factor in the specific organization which implementing the ERP.

We want to suggest and recommend new research disciplines that will assist to improve the ERP implementation process, and differentiate between success and failure activities and organization behavior, the disciplines can be shown in the following points:

- a. We suggest future research in collect the overall articles that talk about critical success factors, and try to find out all factors determined by the previous researcher, this is require extensive review of all papers and integrate all researchers efforts.
- b. We propose future research discipline that is the CSFs Measuring model to determine the degree and value of each factor of critical success factor in each organization implementing the ERP or even not implement yet, the values determined will assist to indicate the behavior of the successes organization and predict final conclusion of future implementation process.
- c. From the measuring model found, another research discipline can found. The CSFS value measured can represent implementation patterns, which can be a collection in a learning database of organization success and failure patterns, which will assist in constructing the learning system that can predict the future of organizations looking to implement the ERP system.



- d. If the values of CSFs are determined and successive pattern collected with failure patterns, we can propose here a research projects on pattern production and population to increase the number of the cases collected. Genetic algorithm is one on such models can assist in produce population for the learning system. The generated pattern are generate perfectly from crossover process between each two genes of original data, the features of the produced patterns can be evaluate and compare with original pattern, so all healthy pattern can be the content of learning system database.
- e. If CSFs specific values found for many cases and database collected, and success or failure status of each row is determined, so learning system can be implementing to predict the status of unknown organization, based on its CSFs pattern value. Intelligent computation models can assist to construct that system, a tool like artificial neural network will do perfectly on that, the figure bellow shows the proposed model.
- f. If the initial situation of CSFs are found in the pre-implementation phase, then the intelligent learning model also can support prediction process for organization before its ERP implementation, so when we enter the organization CSFs pattern to the learning system it suppose to predict the future status of this organization.

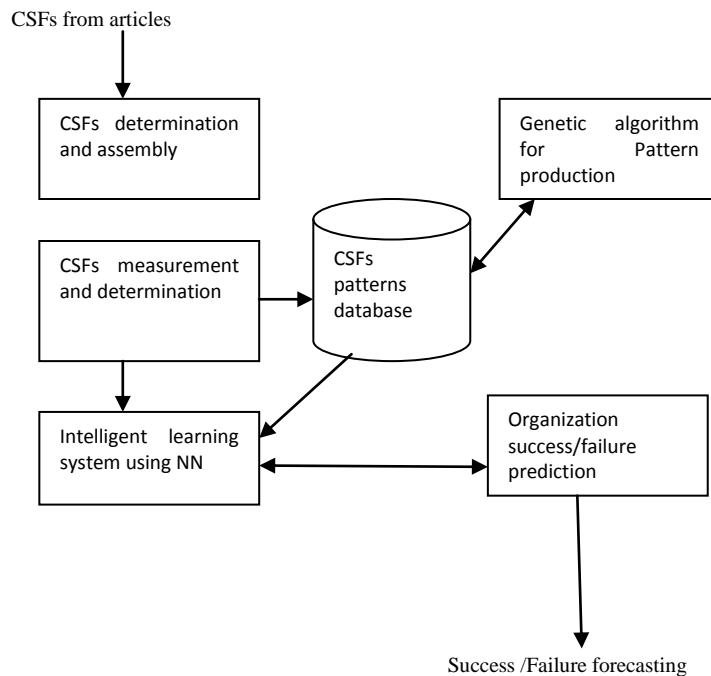


Fig. 1: Proposed research disciplines model for ERP implementation forecasting

Conclusion

In this paper, we focused on the forecasting problem of ERP Implementation process either its success or fail, the previous articles found Critical success factors influenced the implementation process, from the gap of articles and real problem, we proposed multidiscipline future researches include the intelligent computing models as part of these directions.

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