Journal of Service Science and Management, 2015, 8, 631-637
Published Online August 2015 in SciRes. http://www.scirp.org/journal/jssm
http://dx.doi.org/10.4236/jssm.2015.84063

Multi-Dimensional Architecture of ERPII Performance Evaluation Based on Symbolic Informatics Theory

Xianhao Wu

Management School, Jinan University, Guangzhou, China
Email: xianhaowu@126.com

Received 29 July 2015; accepted 21 August 2015; published 24 August 2015

Abstract

Based on single dimension of economics, IT Performance evaluation model can no longer perfectly explain IT productivity paradox. This paper proposes a multidimensional evaluation framework including social, psychological, cognitive, economic, managerial dimensions. Drawing on symbolic informatics theory, this paper analyzes several questions. What is the ERPII performance? What is personalized performance architecture? How does the performance dynamically form and what is the specific structure of performance? How to demonstrate performance? In this paper, we propose that ERPII performance evaluation should be multidimensional. During the implementation of ERP/ERPII, not only enterprises should focus on economic and management performance, but social and cognitive performance should also be considered. This model will make contribution to the study of the symbolic informatics theory and research methods. It will produce profound effect on studying information system by the methods of sociology and psychology.

Keywords

Symbolic Informatics Theory, ERP, Performance, Architecture Model

1. Introduction

Reviewed ERP/ERPII application over the past 20 years in China, we found the following ERP/ERPII implementation paradoxes which were completely regardless of the economic benefits.

1) Chasing fashion: in the late 1990s, some enterprises swarmed implementing ERP system, following other enterprise's adoption and only buying expensive products instead appropriate.

2) Court death: Lenovo's President Liu Chuanzhi said, "no ERP is waiting to die, but adopt ERP court death".

His opinion highlights the situation of helpless and urgent when enterprise takes adoption of ERP.

3) Theory of oil-water: Haier group Mr. Zhang once thought that the implementation of ERP/ERPII just like oil-water separation, the ERP like oil floating on the surface of the water, were indicative only.

4) Go public: in order to meet listing requirements, many enterprises replace the original ERPII system at huge costs which is running well.

For this kind of phenomenon, in the late 1980s, Morgan Stanley's chief economist Steven Roach's research suggested that the huge increase of computer utilization had no impact on economic performance. And Robert Solow, Nobel laureate in economics, gave the famous assertion: "We See the Computer Age Everywhere Except in the Productivity Statistics". The investment to IT is inconsistent with the actual and expected revenue. Researchers usually called "the IT productivity paradox".

The team I work with has been tracking the theory and practice of MRPII/ERP/ERPII for over 20 years in China. We deeply feel the above phenomenon of the IT productivity paradox which is a confused problem for many years [1] [2]. In the thesis, Massachusetts institute of technology's economist, Brynjolfsson [3] argued that the main reasons of the lack of IT productivity was the lack of measure methods and tools as well as improper use of information technology developers and users. Bakos [4] proposed the four hypotheses: measurement distortion, mismanagement, diffusion delay and capital stock theory. In general, most of these studies used economic models. Some causality of these models was questionable.

Current scholars begin to draw on symbolic semiotics in the field of sociology for information systems research, and they have tried to crack IT productivity paradox beyond the economics and management dimensions.

Through sorting out MRPII/ERP/ERPII research of the past 20 years and combining with symbolic information system research theory, this article will use the ERPII system performance as an example to resolve the IT productivity paradox, re-examine the theory, practice in the field of MRPII/ERP/ERPII for 20 years in China, extract multi-dimensional architecture of ERPII performance evaluation, use symbolic informatics theory to design and test ERPII Performance Architecture based on the Symbolic Action and Mechanism Isomorphism (PA-SAMI).

2. Symbolic Informatics and ERPII Performance

2.1. Symbolic Informatics

Symbol is the vehicle of "meaning" of things, behavior and events, as well as the relationship. Meaning refers to the general thinking of cognition, emotion and morality. It is an inclusive concept of perception, concepts, understanding and judgment. In the 1960s-1970s, anthropologists in UK and the US come up with symbolic anthropology. From the symbolic anthropology view, organization is socially constructed for the pursuit of legitimacy which is its political motivation. Organization is a meaning system with symbolic action, maintained by social, political and symbolic action. Organizational process is the process of the generation of meaningful relationship between some social role and other roles [5].

Information systems pioneers realized that information systems not only have the function of computing technology, and fundamentally is a social interaction system relying on symbols for information dissemination [6]. Latest sociological study further emphasized that information systems are not only a passive transfer channels of information. They much more often play a role of system bearing human activities and symbolic action. With the information system, People establish their own identity, relationship coordination and environmental awareness. Information system includes various types of human relations and decision-making activities. Information system should not be seen as a signal. It must be regarded as a kind of symbol, and reflects the identity and legitimacy of the behavior of the management organization [7]. Eriksson and Agerfalk [8] suggest, in addition to be used to represent the physical world, the information system can be used to create a digital world, the difference between the signifier and the signified has gradually blurred, the physical world are beginning to become a kind of representative of information.

Scholars have developed symbol anthropology to the field of symbolic informatics theory. Many symbolic informatics scholars are like Goffman, Habermas, Garfinkel, Leonardi, Barley, Orlikowski, Aakhus, Agerfalk, Lyytinen and Te'eni. Their main task is to study the fundamental problems of how to express social life in information system and in-depth analyze how information system is designed to express the symbolism of the people's life. Enterprises not only take advantage of information systems use value, but also consume its sym-

bolic value.

From the symbolic informatics view, management mechanism was encapsulated in the information system, and meanwhile, the information system has symbolic meaning. Information system becomes the means and tools to express symbolic meaning.

People's understanding and explanation to the surrounding environment and the actions and words of the other members in the same environment will be reflected in the adoption and performance expectations of information system, constituting a shared information meaning system. Symbolic informatics theory helps us understand why enterprises choose fashionable ERPII system, and explain the performance of information system from the social implications, social status and identity dimensions of information systems.

2.2. ERPII Performance

From the perspective of sociology, large and complex information system, like ERPII, is a system bearing the human activities and symbolic action. Enterprise can implement ERPII system to set up their own identity, synergic relationship, and to establish the environmental awareness. The implementation of the ERPII system symbolizes the input of western modern management pattern, and ERPII is a carrier of perception and absorption of western management thoughts and management philosophy. ERPII system, we think, as a symbol, the process of which should be seen as a symbolic action, can draw on the symbol of informatics theory to study the symbolic value and meaning of ERPII in this paper., therefore, the symbolism of ERPII system reflects the social norms and the competitive landscape, and indicate that the current enterprise business model depends on the support provided by information platform at the same time. From the late 1990s' information-based spring tide to the enterprises informatization, more entrepreneurs believe that, the implementation of the ERPII is a commitment to the informatization of enterprise business community. When social norms change, enterprises information system adoption is a symbol or a signal, reflects that the enterprise will be make some change, and also indicates the effect of the information system. The symbolic action of information systems adoption, like adopting ERPII, is that the enterprises try to position itself and create social identity. Symbolic act of the enterprise, Therefore, the purpose of this article is to analyze the demonstration process of the symbolic action, the legitimacy of information system adoption and implementation, and discover the formation mechanism of performance.

What is performance? What is ERPII performance? What is Personalized ERPII performance architecture? How does ERPII performance form dynamically, what specific structure does it have? There is no effective theory system to explain these problems. Based on the theory of symbolic informatics, we put forward the performance architecture of information system implementation, and make a theoretical discussion on the above problem.

3. The Performance Architecture Design of the Information System Implementation

Simon's research emphasized that the organization is a kind of design to make management decision, which need hierarchical analysis [9]. The theory paves the way for an idea that organization is activities based on semantics and communication [10] [11]. Information system is the architecture that defines social relations and organizational behavior. In our opinion, the performance is the architecture. Performance architecture is the dynamic process of design and construction of the performance. The structure and homomorphism formation process of the performance, like traditional buildings, can be designed, not just a result. Information system performance evaluation should not be measured only from a single dimension, such as economic dimension or management dimension, rather, we should build a multidimensional evaluation architecture of social and psychological cognition, economy, managerial, as shown in **Figure 1**.

3.1. The Environmental Elements of Information System Adoption

Symbolic informatics experts believe that each person's information access action is always in a certain situation. These situations include several elements (e.g., discipline, organization, work, daily life), at the same time, in the situation, the meaning of information created is affected by our shared language practice. In our opinion, for enterprise and society, information system is not simply the convergence of information and data integration, in the process of information system implementation, there are social conflicts and changes of corporate identity. As a result, the study of performance research can't be without environmental elements that promote enterprises

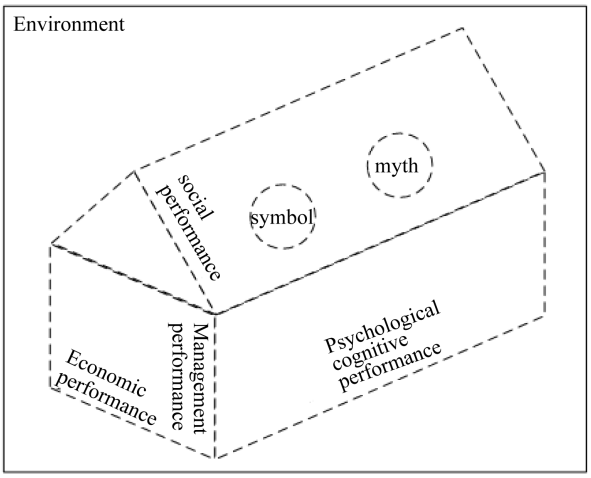

Figure 1. Multi-dimensional architecture model of information system performance.

to adopt information system, especially the complex large system like ERPII.

Structures in the environment will not directly affect the information behavior. Material, social condition and contingency form the organization's environment. The role of the environment can intervene information needs and trigger the generation mechanism of information behavior. In other words, the intervening variables of information situation trigger the information search behavior. These intervening variables can be psychological, human nature, can be role related, between people and the environment. Therefore, we need to study the environmental trigger intervening variables of ERPII system performance, to make a deep understanding of the ERPII performance generation process.

3.2. The Relationship between Symbolic Action and Organizational Implementation of IS: Social Performance Dimension of ERPII

Continuous change of Information system caused deep thinking of the basic concepts and assumptions about information system. These basic concepts and assumptions underpin our understanding on the relationship between the information system and organizational behavior.

In symbolic informatics view, social and cultural structure exist independently of our knowledge, which means that we should set out from this angle to reconsider and study some core issues in the field of information. When someone need or look for information, he or she is in a particular cultural situation and hold certain position within a given pre-existing information sources and search opportunities. Hjørland (2003) pointed out that the user might not know all the pop culture, structure, or situational constraints. However, these really affect the search process. Information researchers should not only revealed the mechanism of information search from the experience layer study, and observe user and their community, but also reveal the possible reasons and relationships behind.

To study information activities under some situation, it is necessary to clearly distinguish between human action and social and cultural structure. The properties of Social and cultural forms (scenario, system, work and daily life situation) constraint information activities, and they are completely different from individual (their reason, purpose and plan) activities properties. Information system contains complex social background, so we need to understand the symbolic meaning and the social performance of the information system, match the symbolic meaning of the information system to the performance evaluation of information system, develop research scope of performance evaluation of information systems, carry out theoretical analysis and practice analysis for symbolic meaning of the information system. In general, the following elements should be considered about the social performance of ERPII:

1) Information system is a comprehensive relationship between symbols and behavior; Information system itself is also a kind of action, symbols and metaphor;

2) The implementation of information system is a social behavior (symbolic act) building process, which is

mutual transition of time and space;

3) The implementation process of Information system is a social interaction process, a process of the pursuit of legitimacy.

3.3. Psychological Cognitive Performance

According to the symbolic informatics theory, the individual emerges from biological structure, the agent is a collective classification, social role emerges from the collective agent, which is activated and constrained by the social role and social and cultural situation. Archer suggests that personal identity must be distinguished with social identity [12] [13]. March suggests that the viewpoint of human agent layer can be used to study information reaction. This allows us to separate the personal psychological constraints from the effort of the group and the individual role. All information action, including field, work and daily life, are necessarily related to these layers. Therefore, the analysis of the information system operating performance can't be without personal considerations, it is necessary to draw lessons from psychology research to personalized ERPII performance analysis.

At present, there are two main popular theories in behaviorism psychology school, one is Cooley and Mead thought that the human self-understanding process is similar to observe themselves as an object by a mirror, namely cognition of the subject to the object of the subject. Another theory is that people constantly monitor their own behavior, pay attention to the reaction of others, and correct their social behavior in order to achieve social desirability effect. This article will analyze psychological cognitive performance of ERPII system implementation from the perspective of behaviorism psychology:

The first aspect is the impact of self-perception on ERPII performance design. The whole process of implementing ERPII system is the process of the enterprise constantly self-check, ego-examine and self-improvement. Sirgy believes that there is a feedback system in the consciousness of the individual. The system compares the self-understanding formed in the real life and the ideal self-image, and then consciously or unconsciously self-changes to make both convergences [14]. Our research task is to establish the performance design framework, to measure the enterprise's self-perception performance in the process of implementing ERPII.

The second aspect is enterprise social cognition involved with the implementation of ERPII system, namely, in the process of implementing ERPII enterprises pay attention to the external reaction of other enterprises, get feedback, monitor symbolism of the whole implementation process, and adjust the behavior in the implementation to get the affirmation of the society.

Cognitive performance of enterprises to implement ERPII system is a complex multidimensional concept. This paper argues that the cognitive performance consist the four dimensions of structure, which are communication cognition, relationship cognition, and members cognition and the cognition to ERPII project.

3.4. Management Performance

This paper argues that enterprise institution is not a natural system based on the enterprise internal management business, but a reconstructed system by introducing information system. When enterprises introduce different information systems, especially ERPII system, they introduce management mechanism and management system in different social environment. This means that the implementation of the ERPII is a complex reconstruction process of the social relations construction and physical reality. In the process of implementation, consultant help enterprises open the black box of ERPII system which is called "best practice", the enterprise need to lead the enterprise individuality demand with embedded management system in ERPII convergence. In other words, while ERPII socially applied, there are the convergence mechanisms of some social system, management philosophy, and management thought. ERPII performance is dynamic, structured, and formed in the convergence mechanism of social system, management philosophy and thought.

Through the sociology and the information system structural functionalism analysis method, we can focus on the information system symbolic explanation to grasp regeneration of the specific social competition order and the management mechanism, pay attention to the evolution of the structure and function of information system, study from the non-static change of information system structure and function in the research of the ERPII performance management system and the release of management mechanism convergence performance, explore the information system in the dynamic management mechanism in the process of convergence, in-depth excavate

microcosmic management performance functions of information system in a specific enterprise.

3.5. Economic Performance

There is no denying the fact that business investment in ERPII care for economic interest. The change mechanism of interest pattern is an indispensable dimension of performance research. We can analyze the change mechanism of enterprise internal interest conflicts and external interest pattern after ERP implementation, then we can further analyze the source of ERPII economic performance (such as return on investment and total cost of ownership, investment payback period, etc.).

4. Conclusions

This article attempts to resolve IT productivity paradox and some arguments about ERP/ERPII implementation in China, like chasing fashion, courting death, theory of oil and water. Through establishing the performance architecture of information system implementation, we improve the comprehension and the interpretation of social identity symbolism and psychological perception of the information system and extend the performance evaluation of ERPII from traditional management performance and economic performance to the sociology and psychology performance category. This paper adopts the perspective of critical realism in information system "emic" research, different from the traditional "etic" research methods. This paper argues that in view of the different information system application environment we should distinguish different symbolic meanings and implement mechanism, combining enterprise external environment, legitimacy and psychological perception to comprehensively evaluate the social value, psychological value, management value and economic value of ERPII system, thus making a breakthrough in terms of information system implementation methodology and theory and creating the precedent research of the symbolic informatics theory and the critical realism theory applied in the field of ERPII system. This will resolve the IT Productivity Paradox, evaluate information system performance according to specific enterprise unique value belief and implement background and show the difference of ERPII symbolic behavior and performance under the control of mechanism convergence.

The establishment of information system implementation performance structure based on symbolic informatics will make contribution to the symbolic informatics theory and research methods and produce profound effect on information system research using the theory and methods of sociology and psychology.

References

[1] Fu, S.C. and Wang, H.F. (2010) Collaborative Implementation of ERPII Systems in Modular Industry Cluster. The 2010 International Conference on Management Science and Engineering (MSE 2010). Engineering Technology Press, Wuhan, 215-220.

[2] Koh, S.C.L., Gunasekaran, A. and Goodman, T. (2011) Drivers Barriers and Critical Success Factors for ERPII Implementation in Supply Chains: A Critical Analysis. *Journal of strategic Information System*, **20**, 385-402

[3] Brynjolfsson, E. (1993) The Productivity Paradox of Information Technology: Review and Assessment. *Communications of ACM*, **36**, 66-77. http://dx.doi.org/10.1145/163298.163309

[4] Bakos, Y. (1998) The Productivity Payoff of Computers. *Science*, **281**, 52-52.

[5] Hosking, D.M. (1991) Chief Executives, Organizing Processes, and Skill. E*uropean Review of Applied Psychology*, **41**, 95-103.

[6] Goldkuhl, G. and Lyytinen, K. (1982) A Language Action View of Information Systems. *Proceedings of the* 3*rd International Conference on Information Systems*, Ann Arbor, 13-29

[7] Feldman, M. and March, J. (1981) Information as Signal and Symbol. *Administrative Science Quarterly*, **26**, 171-186. http://dx.doi.org/10.2307/2392467

[8] Eriksson, O. and Ågerfalk, P.J. (2010) Rethinking the Meaning of Identifiers in Information Infrastructures. *Journal of the Association for Information Systems*, **11**, 433-454.

[9] March, J.G. and Simon, H.A. (1958) Organizations. Wiley, New York.

[10] March, J.G. and Olsen, J.P. (1976) Ambiguity and Choice in Organizations. *American Journal of Sociology*, **84**, 765-767.

[11] Weick, K.E. (1979) The Social Psychology of Organizing. 2nd Edition, McGraw-Hill, Inc., New York.

[12] Archer, M. (2003) Structure, Agency and the Internal Conversation. Cambridge University Press, Cambridge.

http://dx.doi.org/10.1017/cbo9781139087315

[13] Archer, M. (2007) Making Our Way through the World. Cambridge University Press, Cambridge. http://dx.doi.org/10.1017/CBO9780511618932

[14] Sirgy, M.J. (1982) Self-Concept in Consumer Behavior: A Critical Review. *Journal of Consumer Research*, **9**, 287-300.