Path Analysis Development Based on Balanced Scorecard in Order to Identify Causal Relationships of Science and Technology Indices (Case Study in Iran University of Science & Technology)

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ABSTRACT

The main aim of this paper is to investigate the causal relationships among science and technology indices used by universities. This is investigated using workflow automation and interactive planning in order to take control of competitive environment, and consequently to enhance the adaption rate of universities to uncontrolled changes. The science and technology indices were categorized into five domains of communication and international relationships, research and technology, education and culture, postgraduate education, budgets and utilities and infrastructures. The indices of Iran University of science and technology were first evaluated according to concepts of interactive planning and intelligent agents. These indices are research-based, and the most important ones were identified in each field according to experts' opinion. The conceptual model was then designed.

Keywords: Balanced scorecard; science and technology; path analysis; interactive planning.

1. Introduction

In an arena, which entails fundamental change as an invariable maxim, issues such as university, science and technology, research and development and education require special attention. The survival of academic centers depends on continuous efforts to adapt to continuous developments and on relentless endeavors to achieve an appropriate status consistent with their general and particular objectives. This depends on the goals and status of these institutions in a competitive arena. Future orientations may include globalization plan, tendency towards concentrated activities, development of IT technology, more demands for research projects, increases in the number of researchers, promotion of social welfare, implementation of information communities by governments and increases in the number of academic centers. It is worth mentioning that the development of academic centers are no longer peculiar to some certain nations; rather any society, which is developing consistent with simultaneous growth of scales and restriction of social processes as well as concentration of knowledge within the society and the consequent prevalence of scholarship, needs to develop a plan of its future scientific and research centers. Drawing a unified academic sketch requires a unified planning system and adequate policy-making, which directs the management towards a clear road based on the overall objectives.

Achieving a high performance in offering intelligent services does not solely depend on the efficiency of service attributes; rather it relies on the added value in offering adequate services consistent with changes in the academic world and on how to deal with these changes. The aspirations for efficient performance have led to a shift from traditional to interactive planning as a dominant approach to developing intelligent academic centers. Interactive planning systems are employed to direct organizational attention to strategic uncertainty and to provide leverage to adapt the strategy to variations in the competitive market [1].

Business process management, which is also called workflow management, seeks to facilitate the implementation of performance management so as to fulfill system requirements [2].

The present study aims to design a cause-effect process to support different macro levels of planning in universities using multivariate analysis methods such as path analysis. To this end, the approach proposed by Burney and colleagues was drawn upon to analyze the organizational factors [3]. Since Burney and colleagues' approach is devised according to traditional planning in non-competitive conditions, this system was incorporated into the two approaches of interactive planning and intelligent agents to serve the purposes of the present study.

The concepts of interactive planning and intelligent agents were first elaborated upon, followed by the identification of agents in making cause-effect relations that lend themselves to statistical analysis. The results and conclusion of the study were then presented below.

2. Interactive planning and intelligent agents

Several companies have successfully employed business process management, which broadly seeks to facilitate the implementation of performance management to fulfill system requirements. However, due to its low flexibility in establishing effective interaction with business activities, scholars are investigating technological alternatives. Software agent technology can increase flexibility and manipulation of computational components and create a flexible mechanism. Automated agent is a goal-oriented, automatic software entity which may work in coordination with other factors when required [4,5].

All business managers may experience uncertainty in informed strategic choices. Uncertainty usually results from the difference between the information required for successful fulfillment of a task and the information already available. Strategic uncertainty relates to variations in competitive dynamics and internal competencies the perception of which is necessary for a successful conduct of business. Still, strategic uncertainty differs from key performance factors. Key performance factors are identified through analysis and incorporation into objectives and programs. On the contrary, instead of doing a perfunctory review to assure the launching of plans into their original path, strategic uncertainty seeks new information and concepts [6]. Considering strategic uncertainty, mangers may draw upon interactive control processes to search for new opportunities, to enhance impetus for gaining experience and quick reaction and to maintain control on what may turn out to be a turbulent process [7].

The recognition of strategies may be the main reason why managers tend to use interactive control systems. They may use these systems to learn strategic uncertainties and to launch new activities. Indeed, these systems help build signs and interact with a complicated environment [7].

3. Designing path analysis process based on intelligent agents and interactive planning

Cause-effect relations take on considerable importance since they enable the management to measure the performance based on nonfinancial criteria despite traditional approaches used to predict the organization's financial efficiency. Besides, a cause-effect relation requires some time interval between the cause and its effect. Therefore, it may be a difficult task to establish a true relation between all perspectives. Several procedures have been employed to establish these relations including using key performance indicators and mathematical modeling, though the use of multivariate analysis methods such as path analysis may be more appropriate here. However, little attention has so far been paid to this process, which can be considered as the most important component in making a sketch of promising paths to determine the agents. Most organizations solely concentrate on the components which are needed to make a sketch of organizational scorecard. However, considering the day-to-day variations and dynamicity of environment, appealing to interactive approaches consistent with intelligent planning is a requisite for the identification of these agents. In this section, we seek to design an intelligent process based on the structure of path analysis. This design comprises two components including:

- Activity provider

- Activity recipient

Each component has its own service management system. Thus, management systems for these components need to do all respective activities (from the time of application to service delivery) coordinately.

The proposed design comprises two layers including: