"Quantification of Information Technology's Generated Services and Associative Costs by Leveraging Empirical Artificial Neural Networks / Expert Systems Modeling"

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Abstract

In today's business world, Information Technology (IT) is an indispensible function within every organization providing solutions and services that are expected to enable the achievement of business goals and objectives. While IT's major components consist of technology, manpower and processes, each one of which composed of many sub components bearing cost to the organization under the umbrella of technology investment, its main product is delivery of services to the business users. Realizing the relationship between the investment cost of running IT, its provided services and degree of impact such services have toward fulfilling the business' objectives are profoundly of interest to the organization. As it is extremely difficult to precisely determine the correlation between IT's costs and services by using traditional approaches, methods such as Artificial Neural Network/Expert Systems/Fuzzy Logic can be utilized for building the relationship models by using previous fiscal periods' large volumes of data relevant to IT's cost factors, generated services and their associative costs for building patterns, fine tuning and training. Once the model is fully developed, stabilized, and passed through intensive Training with large volume of data, it would become possible to feed a specific fiscal period's data into the model in order to determine the quantities of IT generated services, their associative costs and level of business effectiveness caused by IT investment for that particular period. The Neural Network model introduced in this paper defines business effectiveness of IT investment to be the degree of cost fluctuations relevant to IT's provided services during a specific period in comparison with their associative optimized costs of those services determined by the model. This paper is a follow up to a previous paper (titled: "Measuring business effectiveness of information technology investment by using empirical artificial neural networks and expert system") by the same authors in which an overall approach and methodology have been introduced for developing Neural Network based models to enable calculation of IT investment effectiveness in business. In the previous paper a three-level-three-layer Neural Network model links IT Cost Factors to the IT generated Services and eventually to the organization's business objectives. However, in the present paper the introduced Neural Network models focus on the first-level-three-layers Consumed IT Resources (cost factors) and the IT generated services consumable by the business users. The introduced models illustrate how the Neural Network concept can be leveraged to identify the correlation between IT Cost Factors such as Storage, CPU, Memory, Network, etc. and the generated Business Consumable IT Services such as Systems Availability and Accessibility, Data Availability and Accessibility, Applications Response Time and Performance, etc. Once the relationship is identified, the quantification of services takes place followed by calculation of associative costs. The models referred to in this paper, leverage Back-Error Propagation paradigm with Supervised Training for developing patterns in each group of IT Generated Consumable Services consisting of 6 groups, each with sub components (services) varying from 6 to 9. Relevant to each group, a Neural Network model has been defined for pattern development based on available historical data as well as pattern matching for a set of Input data related to a specific fiscal period. Each model includes an Input Layer which consists of the sub-services associated with a specific group of Business Users expected Services, a Competitive Layer (Patterns) and an Output Layer which is the quantity of IT Generated Consumable Services for that particular group in a specific fiscal period. In order to develop an algorithm for defining the patterns associated with each group of IT Generated Consumable Services, historical data relevant to sub-services of that group spanning across a long period, e.g. 20 years, is fed in to the model. Once the patterns are in place, the model will be able to quantify the generated services associated with a service group during a specific fiscal period, by taking in the associated sub-services belonging to that group. Post quantification of generated services, the calculation of associative costs could be performed by taking into account the allocated IT Service Channels support, such as Help Desk, System Development & Maintenance, Operations & Maintenance, etc., to the sub-components of each service group that are normally readily available in an organization. In brief, by utilizing the available historical data associated with IT's previous periods' cost factors and its distribution of support services, Neural Network models can be developed that will allow the quantification of IT Generated Consumable Services used by a business. This in turn provides a mechanism to an organization for enabling it to determine the level of effectiveness that technology investment has had toward achieving certain business objectives. In the following sections of this paper, more detailed explanation of various factors that contribute to the development of neural network models, referred earlier, are being presented.