Chapter III
Computational Intelligence in the Financial Functions of Industrial Firms

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ABSTRACT

Information technology has been proved to be a strategic weapon in the business armory for the creation and sustention of competitive advantage, especially, when it is aligned with the needs of the internal and external environment. Solutions are provided from the operational level up to strategic planning and are capable to support every choice in the strategy portfolio, from cost to quality and flexibility. IT systems in the manufacturing and operational level were analyzed extensively in literature: ERP systems, computer aided design/computer aided manufacturing (CAD/CAM), and so forth. According to Wong, Bo, Bodnovich, and Selvi (1997), 53.5% of the reviewed literature in artificial intelligence refers to applications in production and operations management. Nevertheless, the second most important area for advanced IT applications is that of finance (25.4%). This research will be focused on the common set of the two previously mentioned areas: production management and the necessary financial tools. Production and operation management requires specific financial tools in order to accomplish the functions of production planning, costing, investment appraisal, and so forth. Computational intelligence in those financial functions is mostly needed for the production operation department and for the production operation strategy. Specifically, the weight will be put on information technology automation of financial functions adopted by production departments: forecasting production needs, production planning and control, profit volume analysis, cost analysis, investment appraisal analysis, and so forth. An attempt will be made to classify the various quantitative and qualitative techniques in relation to various fi-

nancial aspects. Specifically, advances of neural networks, expert systems, advanced statistical analysis and operational research methods, and various hybrid techniques will be presented in relation to financial models applied in production. Financial applications will be analyzed according to their modules and their outputs in a strategic alignment concept. Finally, a strategic alignment model will be derived for the adoption of financial applications in businesses.

INTRODUCTION

A tremendous progress in production methods happened in the last decade. The new production models customer and financially oriented incorporate new quantitative and qualitative techniques integrated with the known production and operations management models. The "black processing box" of this new financially oriented model incorporates advanced computational intelligence techniques. Production is not restricted on the shop floor management; instead a market oriented approach along with financial functions for the increase of financial performance is a prerequisite for the strategic survival. Computational intelligence employed in those financial models includes techniques of advanced statistics (mainly time series with exceptions, like discriminant analysis for the credit risk evaluation), simulation of stochastic processes, and artificial and neural network models. Logit-Probit models, multivariate discriminant analysis, simulation techniques (Monte-Carlo), weighted moving average (WMA), autoregressive conditional heteroskedasticity-generalized autoregressive conditional heteroskedasticity (ARCH-GARCH), and so forth are some of the techniques included in the statistics toolbox. Moreover, techniques of artificial intelligence and neural networks include case base reasoning, genetic algorithms, genetic programming, heuristic methods of linear programming and neural optimization, and so forth. Machine learning techniques are applied in portfolio optimization and derivatives pricing. Furthermore, those systems try to estimate risks in order to predict bankruptcy and rate credibility. The financial oriented production model targets to optimum allocation of funds among production activities, and to further hedge operational risks with financial impact. The diversification in demand and the variability in the external environment increased the need for rapid response with diversification in product and production. Therefore, computational intelligence must be incorporated in order to facilitate flexibility (Theodorou, 1996).

Manufacturing companies organize their systems in order to manage their operations on the spot and hedge the risks in the secondary markets. The operation in those markets requires extensive computational intelligence. The integration of financial information systems (FIS) with the production management systems is increased in order to gain competitive advantage. The performance of the advanced FIS should be measured in relation to the strategic factors of quality, flexibility, dependability, and valuate the benefits of scope economies and lead-time shortenings under the strategic alignment perspective. In the following paragraphs the generic FIS will be presented along with the literature review concerning its components. Specific attention will be given on the basic quantitative processing techniques which are based on statistics, artificial intelligence and neural networks. Finally, an attempt will be made to integrate the generic FIS within the strategic alignment model for future research.

LITERATURE REVIEW

Financial information systems (FIS) are usually found as a subtopic of the accounting information systems, but they must be separated due to differences in principles and practices. Especially, the quantitative character of finance demands a