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Identify enablers of agility and agile modeling strategy with neural network approach

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Abstract
The electronic industry suffers a rapid changing and highly rival environment. Thus, firmshave an essential need to strive for acquiring the competitive advantage. Strategy Organizational Agility(SOA) is a tool which enables to assist firms to attain the competitive advantage. Therefore, this study benchmarks the core competencies from a case study within the supply chain network and establishes a set of attributes for augmenting SOA. A novel multi-criteria decision-making structure is proposed to deal with the complex interrelationships among the aspects and attributes. Radial basis function (RBF) neural network can use linear learning algorithm to complete the work formerly handled by nonlinear learning algorithm, and maintain the high precision of the nonlinear algorithm. However, the results of RBF would be slightly unsatisfactory when dealing with small sample which has higher feature dimension and fewer numbers. Higher feature dimension will influence the design of neural network, and fewer numbers of samples will cause network training incomplete or over-fitted, both of which restrict the recognition precision of the neural network.The competence and accountability indicators can the continuously increasing level of agility to be effective. According to the analysis chart production and product design performance indicators alone cannot level a considerable amount of agility to change. But reducing the level of the index level of agility is reduced. Flexibility indices speed and agility level changes can also affect the organization. But with increased levels of these two indicators increased agility rate change indicators will be more flexibility. The results showed that customer knowledge management impact on organizational agility and organizational effectiveness and customer knowledge management through organizational agility has significant positive impact on organizational effectiveness. Finally, some practical suggestions, future research suggestions and research limitations are presented.

Key Words: *Organization Agility, enablers, Neural Network, strategy, approach.*

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1. Introduction

Failure in service delivery occurs when the required services provided in some poor and incomplete ways; this would lead to more costs and energy and would be a great hurdle on the way of competition with other organizations. Service recovery is an action during which one can employ facilities logically in a way that it makes more lucidity among customers (Othman et al 2013, 117). It is for decades that organizations and companies are trying to improve the speed and efficiency of providing information and the materials related to organizational performance in service delivery chain to show the importance of time-oriented competitive advantage in dynamic business environments; while no companies have been able to convert their operational success to constant performance. Despite the improvement in speed and operational performance, institutes create an area of competitive conflict when they cannot react to the environmental dynamism and unexpected challenges. Institutes must try both to facilitate the process of goal fulfillment and to create agility and compatibility (Shin et al 2o15, 181). When the clients are not satisfied due to lack of suitable service delivery, organization would try to concentrate on the recovery of those deficiencies to have an impact on costumers' appraisals and behaviors (Baker et al, 2015, 181). This requires leader's speed, flexibility and ability in changing conditions. In non-profit organizations, the client-personnel an client-organization relationships are among the kinds in which services received without any financial turn. This may lead to a condition in which clients would not inclined to declare their dissatisfaction and even the organization would not aware of the service delivery failure, the continuity of which may lead to costumers' complaint and developing negative attitudes toward the organization; while positive service recovery may lead to customers' satisfaction (Homburg & Furst, 2005, 95). Tsourveloudis and Valavanis (2002) defined agility as business potential to perform profitable tasks in an international market that is always changing and dividing; moreover they defined it with some descriptions like high quality production, high performance, and customized goods and services (Tsourveloudis & Valavanis 2002, 330), which indicate the emphasis on agility in profitable organizations; while flexibility in non-profit organizations may discussed as agility and affects service recovery. Due to extensive changes in today's world and the intensification of competition, many researchers paid attentionto design appropriate strategies for effectiveness organizations and rapid and effective implementation them. Theconcept of efficiency is one of the most important issues in the understanding of organizational behavior which is known as the main cause of development of the organizational theory and the main subject in practical field. Amphora (2005) in his studies said that effectiveness is doing the right things, not doing things right. Effectiveness is one of the Criteria for the achievement of organizational goals which is considered in all field (classical, neoclassical, contingency, etc.) and can be achieved by different approaches and hence it is an overall concept (Malhotra, 2005). Research shows that optimization of organizational knowledge through different ways increases the efficiency and effectiveness of the organization, therefore knowledge should manage to ensure the provision of desirable goods and services to customers and attain their satisfaction (Bhatti et al., 2011). Today's competitive economy and stressful environment made knowledge management to organize as an important factor for the business benefits and competitive advantages. Organizations should know how to use knowledge management to develop of their revenues and profits and their goals. But the available methods and procedures to measure the effectiveness are disappointing and continuous needs for assessments and evaluations of this issue are felt

(Zheng et al., 2010).Relying on knowledge as a key factor of competitiveness in the global economy, companies may be looking for a key component which called customer knowledge (Gilbert et al., 2002). This knowledge is superior which enables organization to exploit the resources and increase its ability for competition. Customer knowledge processing involved with customer relationships management which his aim in business process is retaining customers. Customer Relationship Management is an advanced step to gather information about customers in order to understand and influence customer behaviour (Soliman& Spooner, 2000). The recent studies have reflectedthat the possible competition between the knowledge management and customer relationship management to attaina sustainable competitive advantage. The mixture of these two theories is known the customer knowledge management (CKM) which is a good method to obtain knowledge of the customer and supply the most appropriate knowledge for him. Customer knowledge management is in connection with the acquisition, sharing and the development of customer knowledge and it aims to give benefit between customers and organizations (Sarhadi, 2013). On the other hand, Organizations are forced to look for agility to compete in the twenty-first century because modern organizations face with increasingly pressure to find new ways to compete efficiently in the global dynamic market. Agility promotes the organization ability to offer high quality products and services; therefore it becomes an important factor for productivity of organization. Banks are such organization in which the issues of knowledge management, agility and efficiency are vital in them. Banks are considered as an essential component of financial systems in the economy have a great impact on the economy and world trade as financial. With increasing competitors, banks are realized the importance of attracting the customers and their benefits. Customer is one of the main factor and the condition of success of the banking industry. Advantages of customer knowledge management should be taken in the banks so that information and experience are systematically applied, in a way that invention, competence, efficiency and accountability of the organization are improved (Sarhadi, 2013). Inspired by biological Neural network, artificial neural network (ANN) is a family of non-parametric learning methodsfor estimating or approximating functions that may depend on a large number of inputs and outputs. Typically, training protocol of an ANN is based on minimizing a loss function defined on the desired output of the data and actual output ofthe ANN through updating the parameters. Classical approaches usually tune the parameters based on the derivatives of the loss function. However, much of the power of ANN comes from the nonlinear function in the hidden units used to modelthe nonlinear mapping between the input and output. Unfortunately, this kind of architecture loses the elegance of finding the global minimum solution with respect to all the parameters of the network since the loss function depends on the output of nonlinear neurons. Thus, the optimization turns out to be nonlinear least square problem which is usually solved iteratively. In this case, the error function has to be back propagated backwards to serve as a guidance for tuning the parameters [30]. Due to this, it is widely acknowledged that these training methods are very slow [38] and may not converge to a single global minimum because there exist many local minima [29,53] and also the resulting neural network is very weak in the real world noisy situations. These weaknesses of this family of methods naturally limit the applicability of gradient-based algorithms for training neural networks. Randomization based methods remedy this problem by either randomly fixing the network configurations (such as the connections) or some parts of the network parameters (while optimizing the rest by a closed form solution or an iterative procedure), or randomly corrupt the input data or the parameters during the training. Remarkable results have been achieved in various network structures, such as single hidden layer feed forward network [69], RBF neural networks [9], deep neural network with multiple hidden layers [31], convolutional neural network [43] and so on.A main goal of the paper is to show a role and a place of randomized methods in optimization based neural networks'learning. In Section 2, we present some early work on this line of research on perceptron and standard feed-forward neural network with random parameters in the hidden neuron. Another piece of important work is Random Vector Functional Link Network, which is described in Section 3. Randomization based learning in RBF, recurrent neural network and deep neural network are presented in Sections 4, 5, and 6, respectively. We also offer some details on other scenarios such as evolutionary learning in Section 7. In Section 8, we point out some research gap in the literature of randomization algorithm for neural network training. Conclusions are presented in the last section.

2- Strategy Organizational Agility

Electronics industry encounters rapid changes in market, intense competition,fast-paced technological innovations and customer's environmental awareness increasing. Hence, firms have an essential need to develop the agility for surviving in this rival environment. Agility exists in Strategy Organizational network can help firms to achieve the competitive advantage (Hayes and Wheelwright, 1984). Previous studies emphasized that Strategy Organizational Agility (SOA) focuses on promoting innovation, flexibility and speed, and then reducing the costs of production (Lin and Tseng, 2014; Tseng et al., 2008). In addition, SOA not only consider as a tool to quick respond the changes in the markets (Fayezi et al., 2015; Lin et al., 2006; Wong et al., 2014; Yusuf et al., 1999), but also encourage individual firms to work together for enhancing the environmental credentials in terms of green raw materials, eco-product design, process integration and customer-based measures (Tseng, 2010; Tseng, 2011; Tseng et al., 2015). Although Strategy Organizational Agility network is a collaborative group that formed together to attain the mutual benefit in the economic and environmental performance, it still lacks a logical and crystal structure to guide the group in achieving the competitive advantage through SOA.To address this gap, this study proposes a closed-loop hierarchical decision-making structure to explore the key drivers of SOA for developing the competitive advantage. In addition, SOA has to be structured from multidimensional considerations to reflect the real situation, which might enhance the challenge and complex in the evaluation. Thus, Van der Vorst and Beulens (2002) proposed an evaluation model to reduce the uncertainty and enhancing effectiveness in searching the key drivers. This model contained the information integration, estimating the impact of alternative actions, lean production, organizational agility, quick response and individual actions. DeGroote and Marx (2013) demonstrated that information technology can increases SOA through quick respond market changes and enhance Strategy Organizational Agility collaboration, so firms enable to reach the cost reduction, quality improvement and the innovative processes and product design support. Several studies emphasized that developing a set of measurements for exploring the key drivers of SOA is an urgent task (Venkatraman, 1989; Agarwal et al., 2007). For filling up this gap, a comprehensive measure is required to consider in integrating with interdisciplinary knowledge and real practices. Once the key SOA drivers have been found, firms enable to improve the competitive advantage under limited resources.The measurement of SOA belongs to qualitative analysis, which uses for capture the interrelationship and interdependence within firms (Tseng, 2011;

Tseng & Chiu, 2013; Tseng et al., 2015). These data are generally described into subjective ways and linguistic terms rather than numbers, so the conventional assessment approaches suffer the difficulty to deal with non-numeric analysis. Then, fuzzy set theory offers an effective means to overcome these imprecise and vague phenomena (Lin et al., 2014; Tseng et al., 2014). The transformation process of fuzzy set theory enables to convert these qualitative measures into comparable SOAles. This study adopts closed-loop decision making structure in order to reduce the complexity and emotionally burdened decision with resembling the existing real situation. Subsequently, decision-making trial and evaluation laboratory (DEMATEL) applies to determine the interrelationships among the selected attributes (Tseng, 2009; Tseng and Lin, 2009; Tseng, 2010). Closed-loop analytical network process (ANP) method is used for gathering the ranking and dealing with the hierarchical structure through interdependence measures (Lin & Tseng, 2014; Tseng, 2011; Tseng et al., 2015; Uygun et al., 2014). Therefore, the objective of this study is to develop a SOA decision-making hierarchical structure and explore the key drivers for leading firms to achieve the competitive advantage under uncertainty. Previous studies have been proposed several necessary attributes for assessing SOA; nevertheless, these attributes haven't been integrated as a comprehensive consideration in the measurement. In view of this, a hybrid method and systematic analysis procedure are required to overcome the interrelationships, interdependence and the hierarchical structure. This is the first study to consider SOA as a closed-loop hierarchical decision-making structure and adopts hybrid method to conquer the uncertainty. The detail discussion is organized as following. Section 2 presents the theoretical basis and extensive literature review. Hybrid method is composing of fuzzy Delphi method, fuzzy set theory, DEMATEL and closed-loop ANP, which illustrate in the section 3. Empirical results and significant findings are stated in section 4. Section 5 expresses the implications. Conclusion, research limitations and future researches are provided in the final section. Literature review This section contains the background of competitive advantage, SOA, proposed measures and the proposed analytical method. These discussions provide a comprehensive theoretical basis to support the concept of this study and forming structure. 2.1 Theoretical background Competitive advantage refers to a capability, which acquires from the attributes and resources to perform in a higher level within the industry (Hayes & Wheelwright, 1984; Tseng et al., 2008). Blome et al. (2013) presented that SOA is a complex set of dynamic aspects, these are the necessary for developing the competitive advantage. These dynamic aspects enable to underpin the performance in changing market conditions through integrating, building and reconfiguring internal and external competences (Teece et al., 1997; Wu et al., 2015). However, several obstructions contain insufficient collaboration, lacking information technology integration, inadequate alliance with eco-design, and failing to satisfy customer's needs, which might generate the gaps in achieving competitive advantage (Cao & Zhang, 2010; MacDonald & She, 2015; Ngai et al., 2011; Sharifi et al., 2006; van Hoof & Thiell, 2014; Xu, 2006). Undoubtedly, SOA is a tool for enhancing the competitive advantage in terms of reducing cost through operational process integration, maintaining customer-based measures,speeding up the reflection of customer's needs, improving information access andtransparent, supporting eco-design alignment with Strategy Organizational Agility partners, increasing-flexibility in production and suppliers (Eisenhardt et al., 2010; Yusuf et al., 2004; Wong et al.,2014; Yang, 2014). However, the linkage between SOA and competitive advantage still-remains the uncertainty and undiscovered relationship in previous studies (Zhang et al.,2003). To fill up the gap, it requires a comprehensive structure to measure and relies on ahybrid method to overcome the uncertainty. Agility uses for transferring and applying the winning strategy to the newly acceptedunits of business under environment changing (Harrison et al., 1999). To increase the agilityamong entire Strategy Organizational Agility, it not only requires upstream and downstream collaborationfrom suppliers to customer, but also seeks the lateral collaboration with competitor forintegrating the total value creation process (Gligor, 2014). Once these collaborations arealigned, it can generate the agility to use for responding short-term changes in demand orsupply, mitigating the external disruption occurrence, and generating the value adding to customers for ensuring the uninterrupted service (Lee, 2004; Van der Vorst and Beulens,2002). In addition, outsourcing function, downstream customer-based functions withe-co-product design and process integration are required firms to concern in developing theagility through collaboration (Tseng et al., 2014; Wong et al., 2014; Yusuf et al., 2004). SOA can consider as flexibility, which possess a capability to assist firms in reflecting the rapid market changing and preventing the disruption among Strategy Organizational Agility(Christopher,2000). Swafford et al. (2006) presented that internal integration, cross-functional alignmentand external integration between customers and suppliers play important roles indeveloping the flexibility. Agarwal et al. (2007) emphasized that information integration,networking and collaboration are stimulated the performance of agility in qualityimprovement, cost minimization and lead-time reduction respectively. Therefore, Vinodhand Prasanna (2011) considered SOA as the operational dynamics, which reflects an ability todeal with the uncertainties around business environment and reflect the rapid changes.However, SOA not only promotes the competitive advantage in terms of flexibility, speed,innovation and cost to some specific customers and markets, but also assists firms inimproving their capability of collaborations, process integration, information integration andso on (McCullen et al., 2006; Zhang et al., 2003). It retains the individual firms' competitiveadvantage in satisfying the extensive range of needs for responding the rapid changes in themarket (Braunscheidel & Suresh, 2009; Yusuf et al., 2004). Hence, SOA has to consider as a multi-level hierarchical structure in minimizing uncertainty and resistance among the entiresupply chain (Li et al, 2008; Sangari et al., 2015). This study proposes a close-loop hierarchical structure and concerns the interrelationships and interdependence amongproposed measures to develop the competitive advantage through SOA.Proposed SOA measuresNgai et al. (2011) proposed a set of competencies that included information technology,operations and management, which shows the effective operational functions to improvethe performance through SOA. It is composed of a sequence or network of interrelationshipsfostered through strategic alliances, collaborations, process integration, informationintegration and customer-based measures. For achieving the competitive advantage throughSOA efficiently, it requires to explore the key attributes under uncertainty. SOA is composedof four interrelationship aspects, which includes strategic alliances, collaborations, processintegration, information integration and customer-based measures. To demonstrate therelationships with these aspects in developing the competitive advantage, this study selectstwenty-nine attributes through comprehensive literature review and real practices to reflectthe real situation with validity and reliability. Collaborations play an important role in SOA,due to it is not just a transaction, but leverages the information sharing and marketknowledge creation for reaching the competitive advantage (Ding and Huang, 2010; Lin &Tseng, 2014). In addition, collaborations enable to provide the befits to partners among theentire

Strategy Organizational Agility. However, these benefits have to depend on the following seven attributes: trust-based relationships and long tern collaboration with customers/ suppliers; focused on developing core competencies through process excellence; increasing suggestedimprovement in quality, social and environment health and safety with partners; management and technical team-based goals and measures; first/second order choice partner in performance and capability basis; actively share intellectual property with partners; concurrent execution of activities throughout the supply chain (Chen & Paulraj, 2004; Lin et al., 2006; Tseng, 2010; Tseng et al., 2014; Tseng et al., 2015; Yang, 2014; Yusuf etal., 2004; Gligor et al., 2015).Information integration (e.g. demand information on demand, data and files for supplychain partners) is part of critical drivers also. Because of the data and information can beeasily accessed by entire Strategy Organizational Agility partners simultaneously. Such virtual connectionspossess the ability to detect the market changing, enhance responsiveness in reducing costand ensure the quality and operation flow. To enhance the information integration, severalstudies proposed to capture demand information immediately; prefer to keep informationon file for Strategy Organizational Agility partners; virtual connection and information sharing to all partners;information accessible Strategy Organizational Agility; customer/ marketing sensitivity; quickly detect changes in our environment (Chen & Paulraj, 2004; Lin et al., 2006; Nagi et al., 2011; DeGroote & Marx, 2013; Yang, 2014). The process integration can be divided into two measurements; one is the verticalintegration – information reach extends from firm to firm through to the networks; another one is the horizontal integration – the range of eco-product design activities widens fromprocess integration to alliance with entire supply chain. Subsequently, five attributes areproposed to measure the process integration upon SOA, which includes reduce dispersion of toxic and hazardous materials; infrastructure in place to encourage eco-innovation within shortening timeframes; pro-actively update the mix of available manufacturing processes in the Strategy Organizational Agility network; effectiveness of master production schedule; vertical integrationin supply chain (Chen & Paulraj, 2004; Lin et al., 2006; Tseng, 2010; Tseng et al., 2014;Wonget al., 2014; Yang, 2014).Strategic alliances for eco-design can consider as longterm collaboration with preferredsuppliers and customers. The goal is to secure cost and quality advantage as well as toensure the smooth flow of operations, within the framework of deliveries of small volumesof output (Yusuf et al., 2004). In support of this goal, collaborative initiatives haveincorporated virtual connections and information sharing with suppliers and other partners(Gligor, 2014; Sharifi and Ismail, 2006; Wu and Barnes, 2011). Several studies have beeninvestigated the strategic alliances for eco-design among the Strategy Organizational Agility in terms of design,process and structure (MacDonald and She, 2015; Tseng et al., 2015). Only few studies have demonstrated how these attributes can be aligned to achieve eco-product design. Thus, design eco-products for ease of use with suppliers; design eco-product with social norms in mind; reducing eco-product costs in process and supplier together; reducing ecoproduct development cycle time with Strategy Organizational Agility partners and horizontal eco-product developmentare the important attributes that need to concern in SOA measurement (Chen & Paulraj,2004; Lin et al., 2006; Tseng, 2010; Wu & Barnes, 2011; Yang, 2014; MacDonald & She, 2015;Tseng et al, 2015). Customer-based measures are to jointly find solutions to material problems and address the issues. Customers and suppliers must exchange and share the information in the sensitive design (Carr and Pearson, 1999; Sharifi et al., 2006). Sharp et al. (1999)conceptualized SOA as the ability of a Strategy Organizational Agility to rapidly respond to changes in marketand customer demand. Previous literatures suggested driving customer needs, whichrequire to increase the competition in the market and the speed of innovation (Mentzer etal., 2008; Tseng et al., 2009). Accordingly, customer–based measures shall consider followingsix attributes to build up the SOA, product ready for use by individual customers, seeopportunities to increase customer value, customer-driven eco-products design, retain andgrow customer relationships, products with substantial added value for customers and fastintroduction of new products (Lin et al, 2006; Tseng et al., 2014; Yang, 2014; Gligor et al.,2015). Summary of above points, collaborations, process integration, information integration,customer-based measures and strategic alliances for eco-design in supply chain are the mainSOA aspects for developing the competitive advantage. Although prior studies have beenidentified and provided various attributes to increase the understanding of SOA, it is stillinsufficient in concerning the measures within a hierarchical structure. Thus, this studyproposes twenty-nine attributes to construct a closed-loop hierarchical structure to ponderthe interrelationship under uncertainty. Table 1 presents the measures of SOA within ahierarchical structure. As a matter of fact, selecting an appropriate collection of suppliers serves a vital function for a company to succeed, on which there has been great emphasis since a long time ago(Zhang, Lei et al. 2003). With the concept of supply chain management having been introduced recently, a majority of researchers, scientists, and managers have found selecting the appropriate supplier and managing it a useful way which can be used to improve supply chain competitiveness(Lee, Ha et al. 2001). Considering a supplier as a supply chain network with the ultimate goal of offering customer's expected product has been introduced and discussed since 2000(Ali Ahmadi, Tajeddin et al. 2003). Foreign suppliers contribute to cost minimization, better delivery, and customer satisfaction; These features are explained in details in the agility section. One important aspect of agility is the supply chain section of an organization. If the management section can select the agile and prominent supplier using the appropriate factors and methods, it will be of great help for the organization to achieve its goals. Interpretive structuralmodel is capable of identifying the relationship betweencriteria which have individual or group dependence on each other. Multi-criterion decision making is one of the research areas in operational and management science which considering various functional needs has been developed rapidly during the current decade.

3- Evolution or Revolution

Two different views about the form of the agile manufacturing are portrayed in the literature, that it can be seen as either revolutionary or evolutionary. As evolutionary, it is progressive and incremental change or alternatively, as discontinuous and revolutionary. Some conceptual constructions emphasize instrumentalism, whilst others focus on the discontinuity necessarily involved in implementing agile manufacturing. Our view, presented here, is that agile manufacturing has arrived as an evolutionary form of manufacturing system, most obviously because it synthesis and incorporates many prior approaches. Sharp et al (1999) argue convincingly that lean manufacturing and world class manufacturing are traditionally positions in an organization's migration towards the ultimate goal of agile manufacturing. Consequently it represents an evolutionary "fitness", a refinement of what has gone before, but in a new, and integrated, recombination to fit the new competitive environment. We also note the revolutionary aspect, not least in that agile manufacturing is very different from the preceding systems upon which it is based. For example, as Maskwell (1997) notes, lean or world class manufacturing is being very good at the things you can control, but agile manufacturing deals with

Author	Key words	Definition
Iacocca 1991	Capability, Real-time response, Customer needs	Agility means a manufacturing system with extraordinary capabilities (internal capabilities: hard and soft technologies, human resources, educated management, information) to meet the rapidly changing needs of the marketplace (speed, flexibility, customers, competitors, suppliers, infrastructure, responsiveness). A system that shifts quickly (speed, and responsiveness) among product models or between product lines (flexibility), ideally in real-time response to customer demand (customer needs and wants)
Goldm an 1994	Strategic response, Irreversible changes, Dominant system,	Agility is a comprehensive strategic response to fundamental and irreversible changes that are taking place in the dominant system of commercial competition in "First World" economics.
Kidd 1994	Synthesis, Compatible CIM, TQC, MRP, BPR, OP	Agility is a synthesised use of the developed and well-known technologies and methods of manufacturing. That is, it is mutually compatible with Lean Manufacturing, CIM, TQM, MRP, BPR, Employee Empowerment, and OPT
Booth 1996	Vision, More flexible, Customers,	Agile manufacturing is a vision of manufacturing that is a natural development from the original concept of "lean manufacturing". In lean manufacturing, the emphasis is on cost-cutting. The requirement for organisations and facilities to become more flexible and responsive to customers led to the concept of the "agile" manufacturing as a differentiation from the "lean" organisation.
Cho 1996	Capability, Competitive Environment, Customer-designed,	Agile manufacturing can be defined as the capability of surviving and prospering in a competitive environment of continuous and unpredictable change by reacting quickly and effectively to changing markets, driven by customer-designed products and services
Gould 1997	Competitive environment, More flexible	Agility is about casting off of those old ways of doing things that are no longer appropriate- changing patterns of traditional operation. In a changing competitive environment, there is a need to develop organisations and facilities significantly more flexible and responsive than current existing ones
Devor 1997	New expression, Ability, Continuous change, Alliances, Core competence,	Agile manufacturing is a new expression that is used to represent the ability of a producer of goods and services to thrive in the face of continuous change. These changes can occur in markets, in technologies, in business enterprise. It requires to meet the changing market requirements by suitable alliances based on core-competencies, organising to mange change and

Table 1.The evolution of interpretative definitions of agility

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the things you cannot control. Table 1 provides a summary of the elements discussed in the literature which are seen as elements in this evolution of agile manufacturing.

4- Research Method

Choosing a research method depends on the objective and the nature of the research subject and its implementation facilities. Therefore, the research method can be selected when the nature of the subject as well as the objectives and its broadness is identified. Mixed research method is frequently used in a study. Miller believes that the research orientation layout can be distinctively divided into three areas including fundamental, practical and evaluation. The nature of a research subject means the researcher goes in search of the consequences of the solution to the social problems or the outcome of the prevailing measures and the research objective is to conduct an accurate social study on the consequence of a program which is applied for a social problem(Miller, Boehlje et al. 2001). In the current study library survey method are applied to collect the required information. Data collection was through the questionnaire about the study of the conceptual relationship between attributes and the questionnaire about pairwise comparison as well as the questionnaire about the evaluation of agility level of suppliers; the respondent community includes the managers and the production heads of several industrial organizations manufacturing polyethylene products and couplings. The questionnaires on the evaluation of the agility level of suppliers are also completed by experts in logistic and procurement sections of the organization. The data for theoretical research covering topics from the internet, specialized and general books, articles and specialized publications, documents found in organizations, Due to the special features of the questionnaire required by the organization as well as interviews with experts in the design industry To determine the relationship will be analyzed by neural networks. In this study, calculation and design of neural network model of SPSS, JMP is used.

5- Contextual Model of the Research

The primary conceptual model of this research is created, as shown in figure 5.1 based on the studies carried out and introduced here, based on which the variables of the evaluation of the agile suppliers are derived using the research literature. Next, these variables are rated by establishing a contextualcorrelation matrix and an interaction matrix.

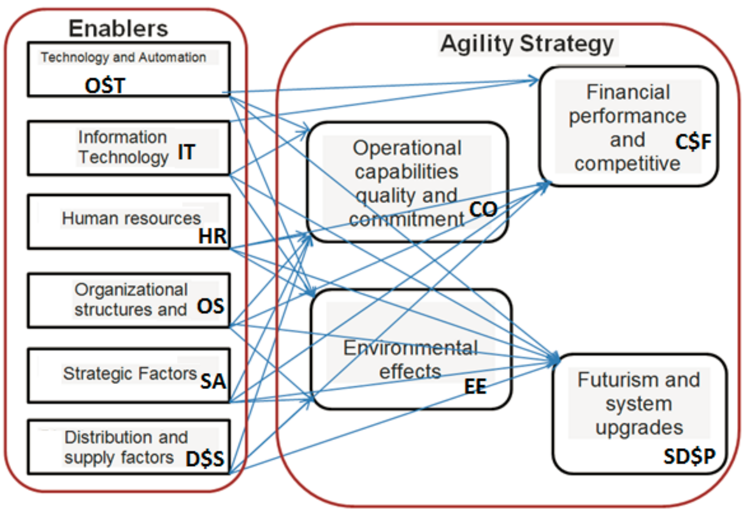

Fig1. Conceptual Model Research

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6- Solving Method FOR NEURAL NETWORK

To solve FSPP, we introduce the following fuzzy optimization problem:

$$\min_x \quad \tilde{P}(x) = \tilde{c}x + \frac{k}{2}||Ax - b||_2^2 , \qquad x \geq 0.$$

(1)

Where A is the matrix of technological coefficients for FSPP. (Note that here for simplicity and to save space, we skipped most fuzzy introductory requirements and just state some results) .

Theorem 2.1 (see [4]). Suppose $\tilde{f}$ is a fuzzy function with $\tilde{f}(x)[\alpha] = [\underline{f}(t,\alpha), \overline{f}(t,\alpha], \ 0 \leq \alpha \leq 1$ then if $\tilde{f}$ is differentiable (fuzzy differentiable), then $\underline{f}(t,\alpha), \overline{f}(t,\alpha)$ are differentiable functions and we have :

$$\tilde{f}'(x)[\alpha] = [\underline{f}'(t,\alpha), \overline{f}'(t,\alpha], \ 0 \leq \alpha \leq 1$$

Definition 2. 1 (see [4]). Let $\tilde{f} : \Omega \subseteq R^n \to E$ be a fuzzy mapping (E is the set of all fuzzy numbers), where Ω is an open subset of. Let $(x_1, x_2, ..., x_n) \in \Omega$ and $\frac{\partial}{\partial x_i}, i = 1,2,...,n$ stands for the partial differentiation with respect to the i th variable x_1 . Assume that for all $\alpha \in [0,1], \underline{f}(t,\alpha), \overline{f}(t,\alpha)$ (the $\alpha -$ cuts of f) (the cuts of) have continuous partial derivatives.

Define:

$$\frac{\partial \tilde{f}(x)}{\partial x_i}[\alpha] = [\frac{\partial \underline{f}(x,\alpha)}{\partial x_i}, \frac{\partial \overline{f}(x,\alpha)}{\partial x_i}], i = 1,2,...,n; \alpha \in [0,1] . \quad (2)$$

If for each i=1,...,n,, defines $\alpha -$ the $\tilde{f}$ cuts of a fuzzy number, then we will say that is differentiable at x , and we writ: $\tilde{\nabla}\tilde{f}(x) = (\frac{\partial \tilde{f}(x)}{\partial x_1}, \frac{\partial \tilde{f}(x)}{\partial x_2}, ..., \frac{\partial \tilde{f}(x)}{\partial x_n})$ .We call $\tilde{\nabla}\tilde{f}(x)$ the gradient of fuzzy function $\tilde{f}$ at x .

Theorem2. 2 (see [4]). Let $\tilde{f}$ be a differentiable fuzzy function at $x \in \Omega \subseteq R$ (is an open set) if x is a point of local minimum then $\tilde{\nabla}\tilde{f}(x) = \tilde{0}$.

If we apply theorem 2.2 for problem (2), we should have: $\tilde{\nabla}\tilde{P}(x) = \tilde{0}$. Or we should have $\tilde{c} + k\sum_{i=1}^{m} a^{i^T}(a^i x - b_i) = \tilde{0}$. Now according this, we introduce the neural network model as:

$$\frac{\tilde{d}x}{dt} = -\tilde{c} - k\sum_{i=1}^{m} a^{i^T}(a^i x - b_i) \qquad (3)$$

We proved that this model is convergent to the optimal solution of FSPP. Note that here is not fuzzy and $\frac{\tilde{d}}{dt}$ stands for fuzzy derivative of x. Now we can solve (4) with any numerical methods (for solving fuzzy differential equations). We solved this neural network model with Euler method.

7- Learning algorithm

Learning of the parameters is based on sample temporal trajectories. In this section, a learning algorithm which learns a single trajectory per iteration by points (STP, Single Trajectory learning by Points) will be proposed.In the STP learning algorithm, one iteration is comprised of all the time points of the learning trajectory, and the network parameters are updated online. At one time point, FENN uses the current value of parameters to get the output, and runs the learning algorithm to adjust the parameters. Then in the next time point, the updated parameters are used, and learning will be processed again. After the whole trajectory was passed, one iteration completes and in the next iteration, the same trajectory or an other one would be learned.

Given the initial state X(0) and the desired output $\boldsymbol{Y_d(t), t = 1,2,\ldots,t_e}$, the error at time t is defined as

$$e(t) = \frac{1}{2}\left\|\boldsymbol{Y}_d(t) - \boldsymbol{Y}(t)\right\|^2 = \frac{1}{2}\sum_{i=1}^{P}\left[y_{di}(t) - y_i(t)\right]^2 ,$$

(4)

and the target of learning is to minimize each ett= t=1,2,...,t_e. The gradient descent technique is used here as a general learning rule: (assuming w is an adjustable parameter, e.g.a^2_{ij}

$$\Delta w(t) \propto \frac{\partial e(t)}{\partial w(t)},$$

$$w(t+1) = w(t) + \Delta w(t) = w(t) - \eta\frac{\partial e(t)}{\partial w(t)},$$

(5)

where $\eta > 0$ is the learning rate. We shall show how to compute in $\partial e(t)/\partial w(t)$ a recurrent situation, giving both the equations in a general case and for specified parameters. If possible, we shall also give the matrix form of the equations, for its concision and efficiency. From (1) and (5) we can get

$$\frac{\partial e(t)}{\partial x_i(t)} = \sum_{j=1}^{P} \frac{\partial e(t)}{\partial y_j(t)} \frac{\partial y_j(t)}{\partial x_i(t)} = -\sum_{j=1}^{P} \left[y_{dj}(t) - y_j(t) \right] c_{ji}(t),$$

or in matrix form

$$\frac{\partial e(t)}{\partial \boldsymbol{X}^T(t)} = -\left[\boldsymbol{Y}_d(t) - \boldsymbol{Y}(t) \right]^T \boldsymbol{C}(t).$$

Since we want to compute $\partial e(t)/\partial w(t)$, we should also know the derivative of X()t to the adjustable parameter w. Taking into account the recurrent property [see (4)], we have

$$\frac{\partial^+ x_i(t)}{\partial w} = \frac{\partial x_i(t)}{\partial w} + \sum_{j=1}^{N} \frac{\partial x_i(t)}{\partial x_j(t-1)} \frac{\partial^+ x_j(t-1)}{\partial w}$$

or in matrix form,

(6)

which is a recursive definition of the ordered derivative $\partial^+ \boldsymbol{X}(t)/\partial w$. With the initial value $\partial^+ \boldsymbol{X}(0)/\partial w$ given, we can calculate $\partial^+ \boldsymbol{X}(t)/\partial w$ step by step, and use

$$\frac{\partial^+ \boldsymbol{X}(t)}{\partial w} = \frac{\partial \boldsymbol{X}(t)}{\partial w} + \frac{\partial \boldsymbol{X}(t)}{\partial \boldsymbol{X}^T(t-1)} \frac{\partial^+ \boldsymbol{X}(t-1)}{\partial w},$$

and (12) to update w.

From (4) and (5) we can get

$$\frac{\partial e(t)}{\partial w} = \frac{\partial e(t)}{\partial \boldsymbol{X}^T(t)} \frac{\partial^+ \boldsymbol{X}(t)}{\partial w} = -\left[\boldsymbol{Y}_d(t) - \boldsymbol{Y}(t) \right]^T \boldsymbol{C}(t) \frac{\partial^+ \boldsymbol{X}(t)}{\partial w}$$

where δ_{ki} is the Kronecker symbol which is 1 when *k* and *i* are equal, otherwise 0. Together with (3), we have Since [see (2) and (6)]

$$\frac{\partial x_k(t)}{\partial f_r} = \frac{x_k^r(t) - x_k(t)}{S},$$

(7)

$$\frac{\partial f_r}{\partial x_j(t-1)} = \frac{\partial f_r}{\partial \mu_{T_{x_j}^r}} \frac{\partial \mu_{T_{x_j}^r}}{\partial x_j(t-1)} = -f_r \frac{x_j(t-1) - c_{T_{x_j}^r}}{s_{T_{x_j}^r}^2},$$

(8)

$$\frac{\partial x_i(t)}{\partial x_j(t-1)} = a_{ij} + \sum_{r=1}^{R} \frac{\partial x_i(t)}{\partial f_r} \frac{\partial f_r}{\partial x_j(t-1)}$$
$$= a_{ij} - \sum_{r=1}^{R} h_r \left[x_i^r(t) - x_i(t) \right] \frac{x_j(t-1) - c_{T_{x_j}^r}}{s_{T_{x_j}^r}^2}.$$

$$\frac{\partial f_r}{\partial c_{T_{x_i}^r}} = f_r \frac{x_i(t-1) - c_{T_{x_i}^r}}{s_{T_{x_i}^r}^2}, \quad \frac{\partial f_r}{\partial s_{T_{x_i}^r}} = f_r \frac{[x_i(t-1) - c_{T_{x_i}^r}]^2}{s_{T_{x_i}^r}^3},$$

$$\frac{\partial f_r}{\partial c_{T_{u_j}^r}} = f_r \frac{u_j(t-1) - c_{T_{u_j}^r}}{s_{T_{u_j}^r}^2}, \quad \frac{\partial f_r}{\partial s_{T_{u_j}^r}} = f_r \frac{[u_j(t-1) - c_{T_{u_j}^r}]^2}{s_{T_{u_j}^r}^3},$$

we can getUsing (6), (7) and (8), we can calculate the ordered derivative for a^2_{ij} and b^2_{ij} Though we can easily get equations below from (2) and (6),

the derivatives to the parameters of membership functions, i.e., c and s, are not so easy to get in that there exists the probability of two or more rules using the same linguistic term. If we assign each linguistic term a different serial number, said v, from 1 to *V*, then the linguistic term Tvmay be used in Rule r1, r2, … That is, it may be called T^{y1}_{x1} (or T^{y1}_{u1} Tur1), T^{y1}_{x1} (or T^{y1}_{u1}) In the previous part of this paper. To clearly note this point, we shall use the notations c_v and s_v to represent the center and the width of the membership function u_v of term T_v , and $\hat{\boldsymbol{x}}_v^r$ the corresponding input variable with T_v in Ruler, no matter it is x_i or u_j. Thus (17) becomes

$$\frac{\partial f_r}{\partial c_v} = f_r \frac{\hat{x}_v^r(t-1) - c_v}{s_v^2}, \quad \frac{\partial f_r}{\partial s_v} = f_r \frac{\left[\hat{x}_v^r(t-1) - c_v \right]^2}{s_v^3},$$

(9)

and we can calculate $\partial x_i(t)/\partial c_v$ and as $\partial x_i(t)/\partial s_v$

(10)

$$\frac{\partial x_i(t)}{\partial c_v} = \sum_r \frac{\partial x_i(t)}{\partial f_r} \frac{\partial f_r}{\partial c_v} = \sum_r h_r \left[x_i^r(t) - x_i(t) \right] \frac{\hat{x}_v^r(t-1) - c_v}{s_v^2},$$
$$\frac{\partial x_i(t)}{\partial s_v} = \sum_r \frac{\partial x_i(t)}{\partial f_r} \frac{\partial f_r}{\partial s_v} = \sum_r h_r \left[x_i^r(t) - x_i(t) \right] \frac{\left[\hat{x}_v^r(t-1) - c_v \right]^2}{s_v^3},$$

When learning a nonlinear system, different trajectories are needed to overall describe the system. Usually, multiple trajectories are learned one by one, and one pass of such learning (called a cycle) is repeated until some training convergence criterion is met. A variety of such cycle strategy, which does not distribute the learning iterations among every trajectories evenly in one cycle, may produce more efficient learning. In such unevenly strategy, we can give more learning chances (iterations) to the less learned trajectory (often with larger error), and thus speed up the total learning. Next section we will show how to do this by an example. In this study, (10) carried by the interface is optimized.

8- Findings

As shown in the graph is assuming normal distribution of residuals and stability variance be independently verified. Indeed sensitive analytical methods are procedures in which the change in inputs is looking analysis of the change in output. That will show us which input will have the greatest impact on output

Training		Validation	
Pr F&C	**Measures**	**Pr F&C**	**Measures**
RSquare	1	RSquare	0.924098
RMSE	2.644e-14	RMSE	0.1156856
Mean Abs Dev	1.748e-14	Mean Abs Dev	0.0880123
-LogLikelihood	-328.2955	-LogLikelihood	-80.43556
SSE	7.688e-27	SSE	1.4587632
Sum Freq	11	Sum Freq	109
Pr CO	**Measures**	**Pr CO**	**Measures**
RSquare	1	RSquare	0.8558108
RMSE	1.849e-14	RMSE	0.512783
Mean Abs Dev	1.649e-14	Mean Abs Dev	0.390804
-LogLikelihood	-332.2295	-LogLikelihood	81.862917
SSE	3.76e-27	SSE	28.661154
Sum Freq	11	Sum Freq	109
Pr EE	**Measures**	**Pr EE**	**Measures**
RSquare	1	RSquare	0.832866
RMSE	1.531e-14	RMSE	0.5937228
Mean Abs Dev	1.247e-14	Mean Abs Dev	0.4525459
-LogLikelihood	-334.3033	-LogLikelihood	97.837937
SSE	2.579e-27	SSE	38.423234
Sum Freq	11	Sum Freq	109
Pr P&SD	**Measures**	**Pr P&SD**	**Measures**
RSquare	1	RSquare	0.6606705
RMSE	3.152e-14	RMSE	0.5252438
Mean Abs Dev	2.233e-14	Mean Abs Dev	0.4129916
-LogLikelihood	-326.3599	-LogLikelihood	84.479997
SSE	1.093e-26	SSE	30.071038
Sum Freq	11	Sum Freq	109

	Generalized R-Square	-LogLikelihood
Training	1.0000	-1321.188
Validation	0.9994	183.74529

Table 2 Calculate optimal neural network

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[29] this chart can be very valuable results because after this Hairy drawing Grdyd.my can keep stable other variables change a variable average. If this change makes the average of the variable charts only move a certain relationship cannot be predicted, but if a variable with a mean change r the variables change. This suggests that garlic can achieve variable changing its level of agility and can vary according to the level of increase or decrease. In Figure 4 graphs the average of each of the independent variables and their changes in agility provided.Since the concept of AM was introduced in 1991 [4], the benefits of implementing it in companies were soon widely recognized by researchers and industry. In the early 1990s, research was mainly carried out on developing enabling tools to achieve agility by approaching one or several attributes, such as Virtual Enterprise, Adaptable Production, Supply Chain Integration, ERP, Business Reengineering, Mass Customization, Concurrent Engineering, and Holonic Manufacturing [14-18]. However, because these manufacturing concepts focus on one or several aspects of business operations, they cannot provide companies with the whole picture as to how companies could achieve agility by considering all aspects of business operations.

In the late 1990s, research interest was focused on finding systematic ways in which manufacturing enterprises could approach agility. Kidd [9] suggested that agile manufacturing could be achieved through the integration of three resources: organization, people and technology into a coordinated, interdependent system. Dove [8] presents a set of change proficiency models for a number of business practices thought to be related to agility. The models contemplate a series of statements representing proactive and reactive proficiency characteristics. Priests et al [19] defined four steps to achieve agility, understanding business environment, recognizing enterprise level attributes, obtaining enabling infrastructure, and implementing business processes. No detailed instructions as to how these steps could be carried out have yet

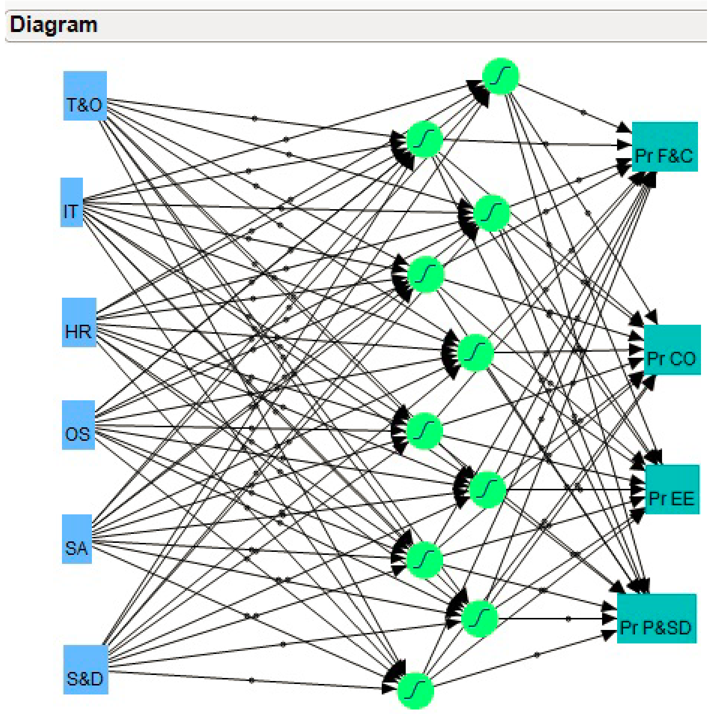

Fig.2. Building layer neural network

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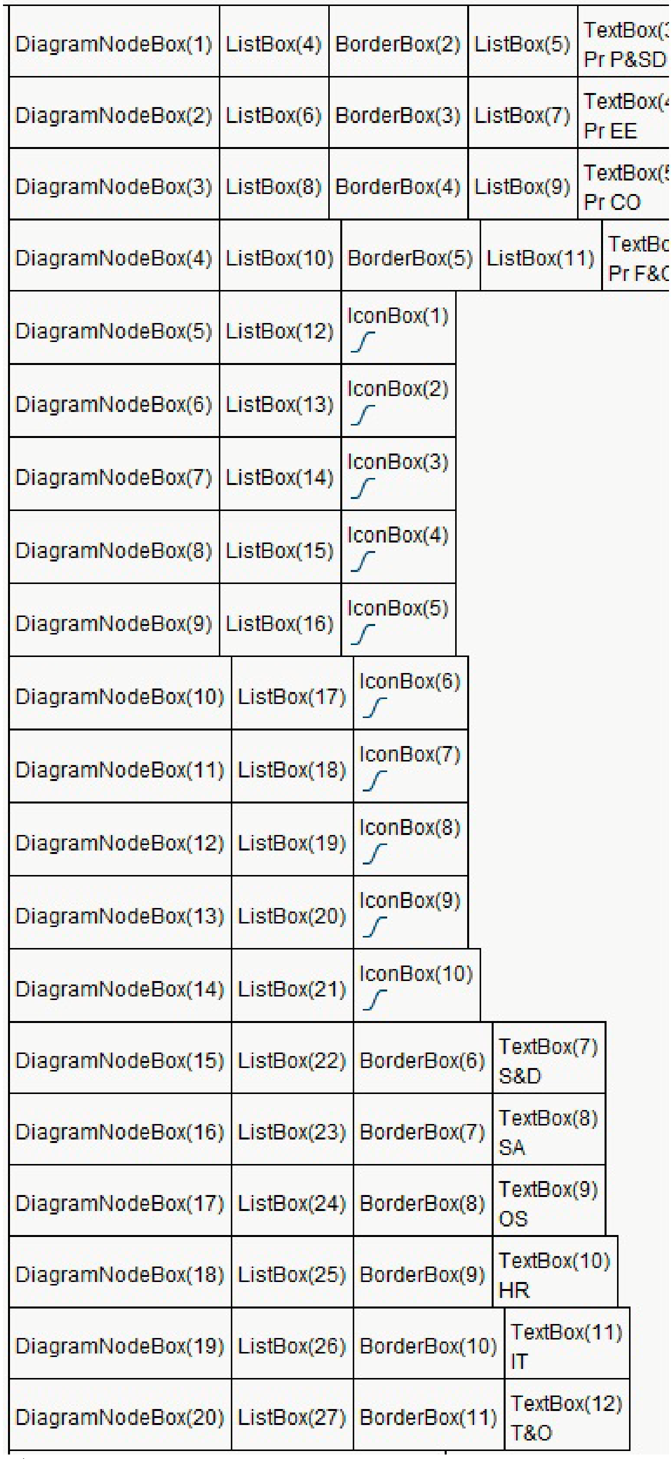


Fig.4. Conceptual diagram of the structure of the model

been proposed. Gunasekaran [20] developed a conceptual model to illustrate the concept of agility and defined seven enablers of agile manufacturing. Attempts have been made to formulate a framework within which agile manufacturing systems could be developed. Besant et al [21] proposed a reference model for agile manufacturing practices, which has four dimensions: Strategy, Process, Linkages and People. These are pinned down to six-

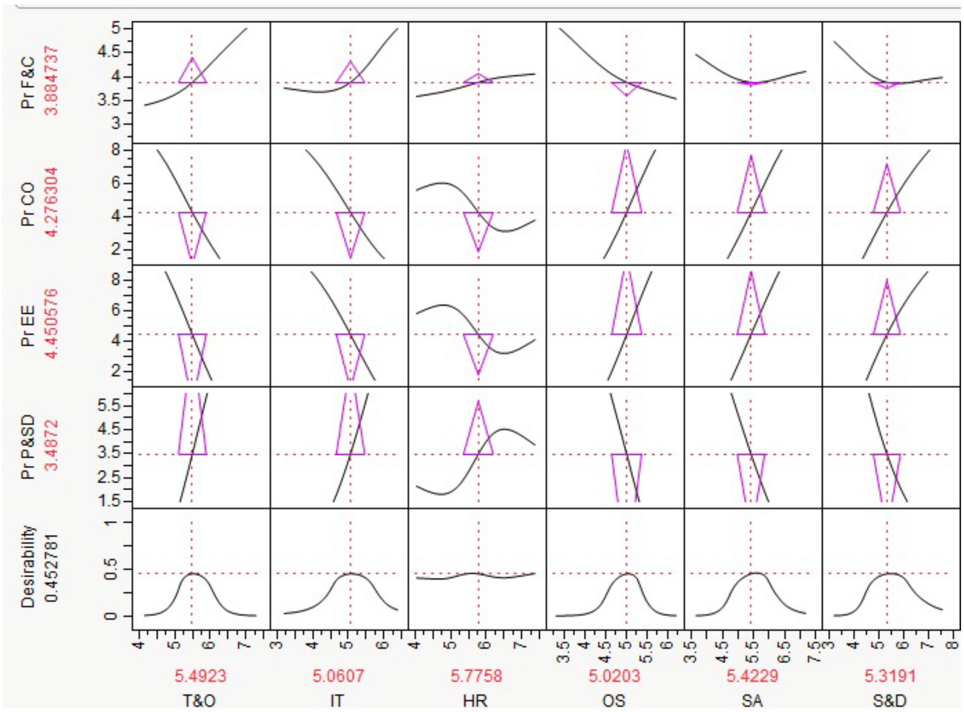
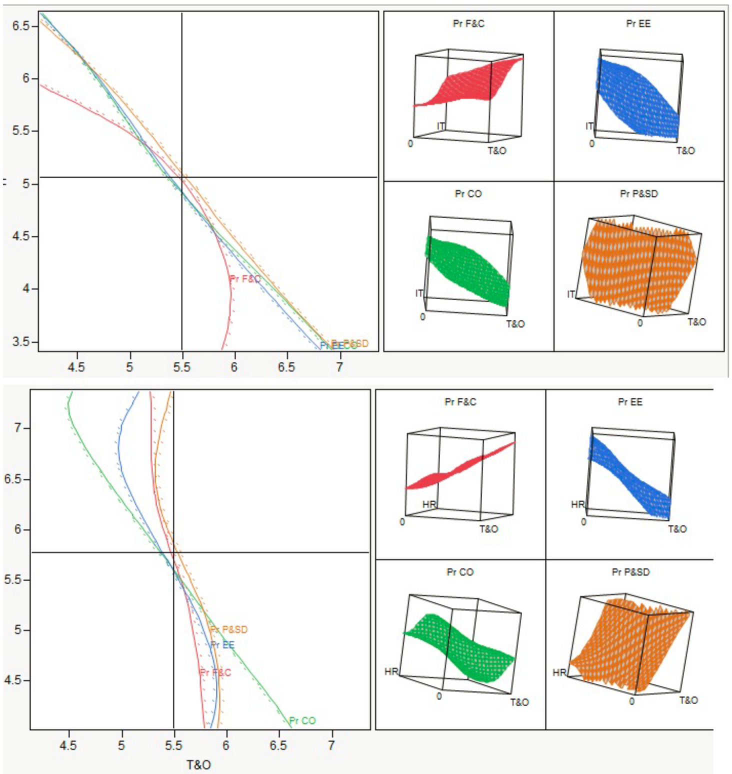


Fig.5.Enablers sensitive to the magnitude of the change agile strategy Chart

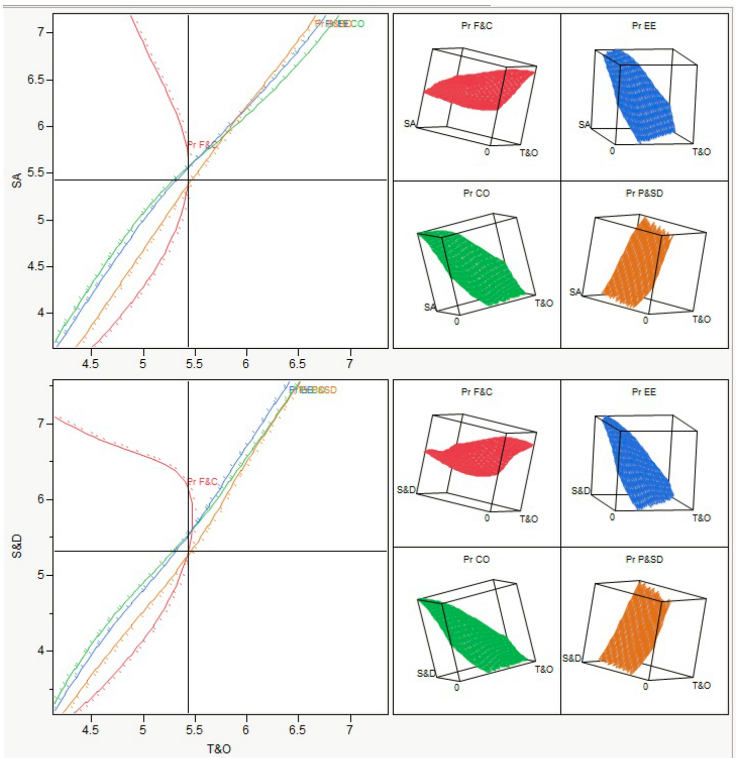
teen sub-dimensions for detailed analysis. Ramasesh et al [22] put forward a simple exploratory framework for modeling and simulation of the agility of manufacturing systems, in which attempts have been made to formulate ways to assess agility. The analysis is based on data collected from questionnaires. Sharifi & Zhang [12] proposed a conceptual model for achieving agility based on two hypotheses for agility implementation:

- Agility may be achieved through the strategic integration and utilization of a selection of managerial and manufacturing methods and tools appropriate to changes experienced by an organization;
- Organizations are different in terms of changes and levels of pressures resulting from changes and different organizations at different circumstances would require different sets of tools.

According to this model, manufacturing enterprises experience varieties of changes in their business environments ("agility drivers"), which drive the enterprises to identify "agile capabilities" that need to be enhanced in order to respond to and take advantage of changes. The enterprises are then forced to search for ways or tools ("agility providers") to obtain such capabilities. A list of drivers, capabilities and providers were identified to characterize the model. It is also confirmed that statistical correlation exists between drivers and capabilities. However, this method relies on qualitative scoring assessment, and suffers from being subjective. Attempts to apply this model in industry have identified that such models are not sufficiently convincing and are generally perceived as a management exercise. Companies usually have limited resources to achieve manufacturing agility from all aspects of business. Over or lack of manufacturing agility in one or more particular important business aspects could also result in business failures. Therefore, it is important for manufacturing companies to develop or improve agility by using an analytical methodology, which identifies important or forthcoming problems, weak, or missing business



▲ Fig.6.Chart sensitivity analysis to changes inStrategy of agile than HR and IT and T$O



▲ Fig.7. Chart sensitivity analysis to changes inStrategy of agile than HR and S$D and T$O

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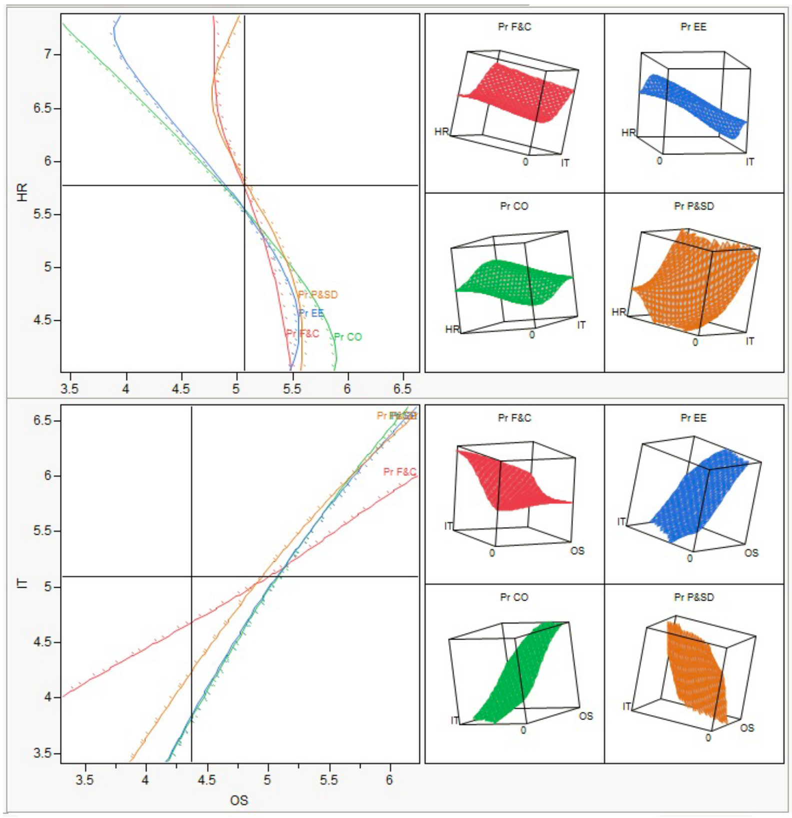
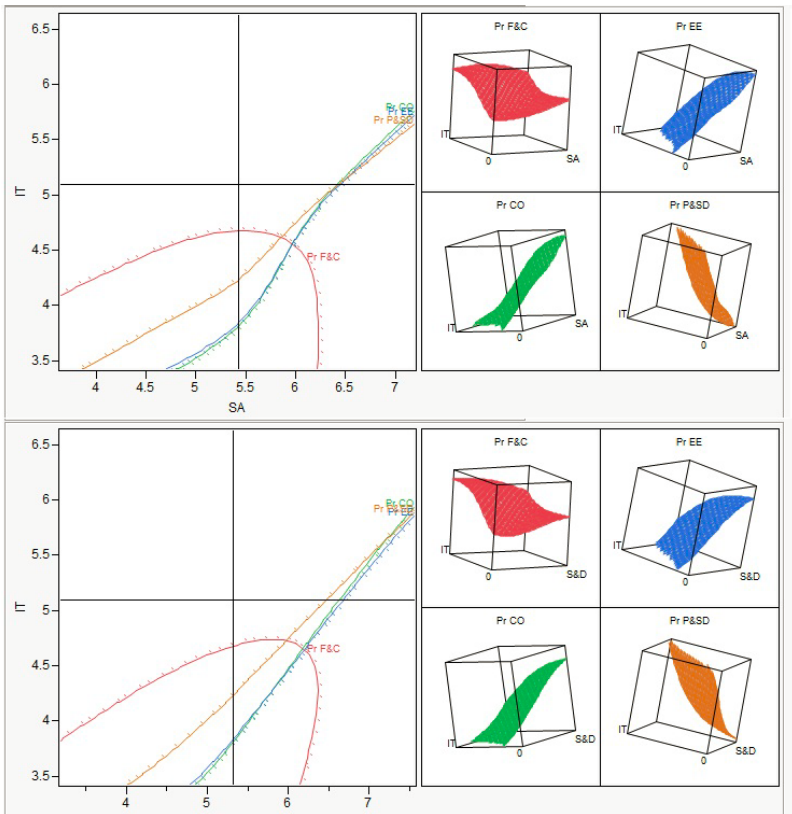


▲ Fig.8.Chart sensitivity analysis to changes inStrategy of agile than OS and IT and HR



▲ Fig.9. Chart sensitivity analysis to changes inStrategy of agile than SA and IT and S$D capabilities, and business practices to improve them.

Motivated by Sharif and Zhang's [12] research findings, Sun & Zhang [13] made an attempt to propose an agile manufacturing implementation methodology with benchmarking, modeling, and prediction capability taking into consideration of company characteristics. The following elements are necessitated to be included into the proposed method:

- Quantitative metrics to enable companies to objectively analyses, and continuously monitor, changes in the business environment (and agility drivers), agile capabilities, as well as performances;
- Decision methods to enable companies to identify, model and priorities agile capabilities that need to be improved, determine the required level of improvements, and predict performances;
- Mechanisms to help identify best practices continuously for improving agile capabilities, and to model relationships between practices and capabilities.

A framework is proposed based on the requirements mentioned above as shown in figure 1. It mainly consists of three elements, a multilayer Agility Assessment Model (AAM), a Decision Support Simulation Model (DSSM), and a Best Practices Provider (BPP).

The Agility Assessment Model provides a structured way of modeling information related to agility analysis, including a company's internal and external characteristics, its business factors and turbulence, available resources and capabilities and its current performance. Driving forces for agility, available agile capabilities, and existing performances can be analysed and enterprises benchmarked against each other.

Conclusion

In the knowledge age, the successful organizations are the ones which rapidly run novel strategies based on competitive advantages, and learning from market and customers theymodify and improve their processes and customers if necessary. In the current study, first, the factors influencing agile supplier are given in different levels using interpretive structural model and then are given in a driving powerand dependence graph.The result of this process helps suppliers choose a more efficient way to increase the degree of their agility and competitive ability. In 2009 Kannan, Pokharel et al has conducted a research which is relatively similar to this study but with different results; this could be possibly because of using AHP. ISM method results show that delivery time and lead time minimization variables are of the most important factors influencing suppliers'agility. There is cost minimization factor in the next level. With taking a look at the graph of agility variable clusters, it can be seen that delivery time and lead time minimization variables are of high driving power whereas customer satisfaction and data accuracy variable have the minimum driving power and dependence. Also, the variables in linkagecluster have both high driving power and high dependence degree. In this article, we presented an extensive survey on randomized methods for training neural networks, the use of randomization in kernel machines and related topics. We divided this family into several methods based on the network configuration. We believe that, this article, the first survey on randomized methods for training neural network, offers valuable insights into this important research topic. We also offered several potential future research directions. We trust that this article will encourage further advancements in this field.The results from this study demonstrate that the ANN-GARCH model improves the forecasts of the GARCH model by 30.6% for the oil spot price volatility and 29.8% for the oil futuresprice volatility when using 21 days as a horizon. The best results were demonstrated in the21-day spot and futures volatility forecasts using the Euro/Dollar and DJIA as input variablesto the ANN. Also, for 14-day and 28-day forecasts of futures prices, the

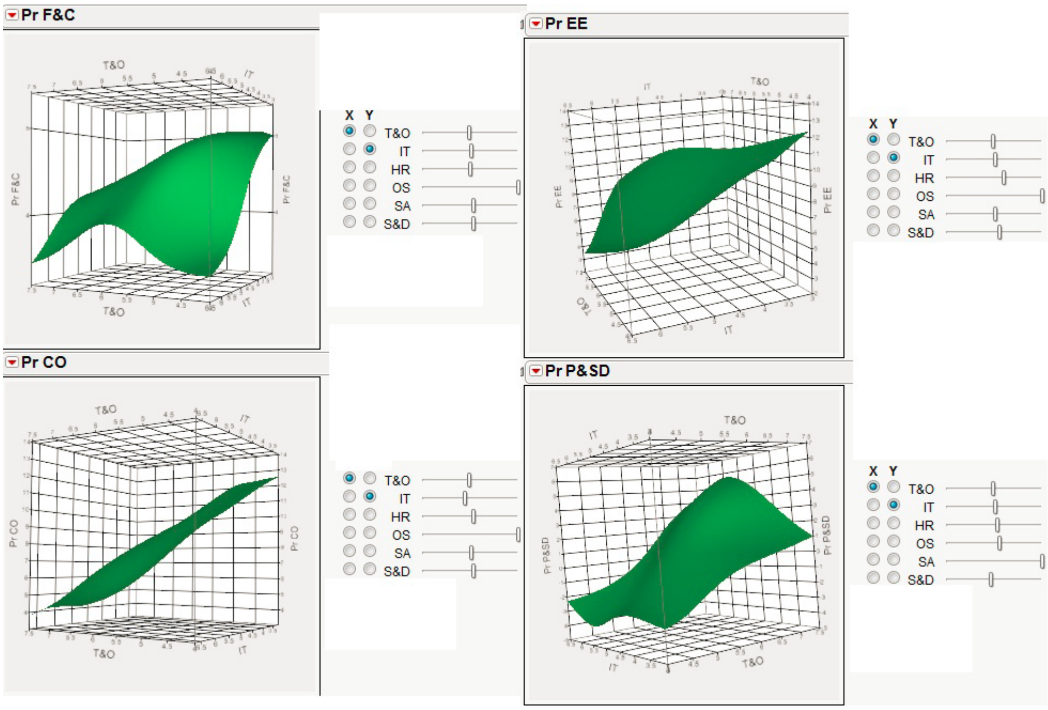


Fig.10. Chart potentiating sensitivity analysis on aspects of agile strategy

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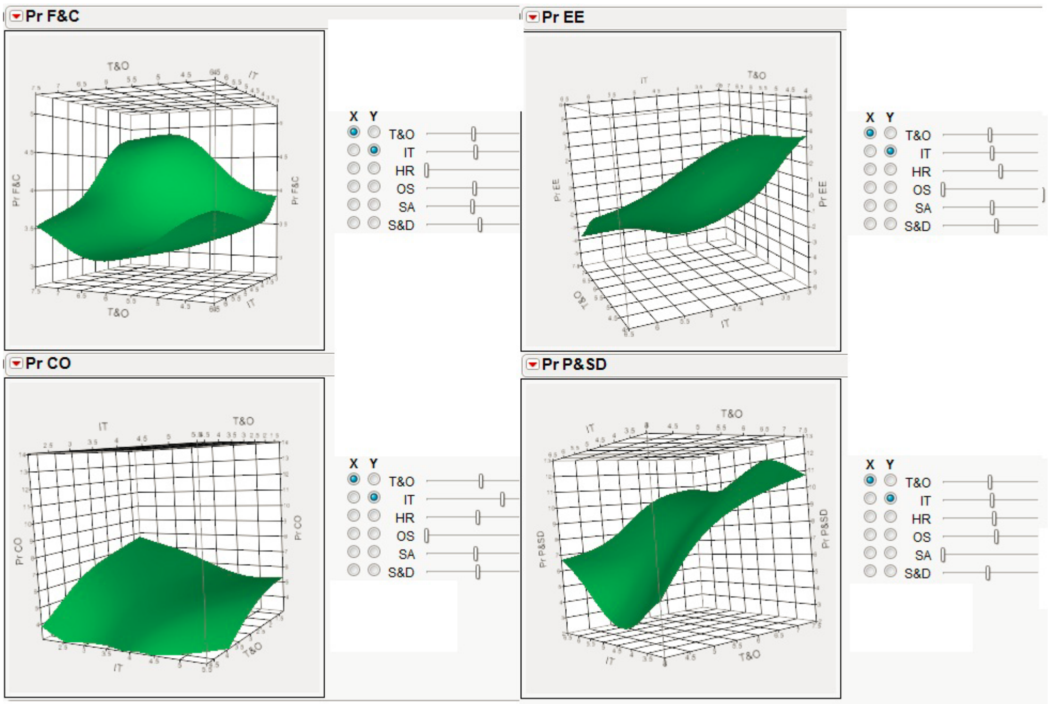

Fig.11. Chart potentiating sensitivity analysis on aspects of agile strategy

results show the bestperformance is when all variables are included. For 14-day forecasts of spot price volatilityand 28-day spot price volatility, the results show the best performance is when only onevariable is included along with the two fixed variables (GARCH forecasting and square pricereturn), being the FTSE returns and the JPY variations, respectively.To overcome these gaps, there are several contributions can be obtained from thisstudy. It offers better understanding of SCA in what particular aspects can assist firms toacquire the competitive advantage with convincible case. The developed closed-loopdecision-making structure enables to consider the interrelationship and interdependenceamong proposed measures simultaneously for reducing the complexity and provides asystematic analysis. Subsequently, this study applies fuzzy set theory, Delphi method,DEMATEL and closed-loop ANP as a hybrid method under uncertainty. This hybrid method isspecific to benchmark the focal firm in dynamic environment, which allows prioritizing the attributes, offering a visual analysis in aspects and demonstrating the relationships between SCAand competitiveness.The significant results reveal that collaboration and information integration are themajor drivers to affect the performance of SCA, which confirmed the result of DeGroote andMarx (2013). Thereinto, collaboration has strong interrelationship with informationintegration and customer-based measures. If a firm has limited resource for improving theSCA performance, collaboration is the trigger that can lead the improvement effectively, andthen it might achieve the competitive in cost. From the competitive advantage point,process integration is the most effective aspects to attain the competitiveness in terms ofinnovation, flexibility and cost, nevertheless, it belongs to the effect group. Therefore, firmswant to reach the competiveness effectiveness and efficiency, information integration is themost influential aspect due to it has strong interrelationship with process integration andcategorize in cause group.

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