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A fuzzy ANP based approach in the selection of the best E-Business strategy and to assess the impact of E-Procurement on organizational performance

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Abstract E-Procurement reduces the cost of purchasing process and takes the activities of purchasing process from an operational to a strategic level. From organizational and inter-organizational perspectives, this study proposes a model to select the best E-Business strategy and to assess the impact of E-Procurement on organizational performance. The proposed model considers the following strategic dimensions: cost reduction, profitability, quality of products/services and IT infrastructure. Fuzzy ANP approach, along with the extent analysis, has been applied to compare E-Procurement with other two E-Business strategies viz; E-Coordination and E-Commerce. The results show that E-Procurement system is preferred over the other alternatives to enhance the efficiency of the organization, improve sales performance and better relationships with trade partners and suppliers.

Keywords E-Procurement · E-Commerce · E-Coordination · Fuzzy ANP · Performance measurement

1 Introduction

Research on the impact and value of inter-organizational information systems has shown that they are largely positive in improving the efficiency of business processes and the overall performance of organizations [26]. The improved processing and communication of the data within the organization improves the accuracy and quality of the information, which in turn helps to increase the overall effectiveness and efficiency of the organization. Globalization and information technologies (IT) have really changed the face of business and organization. IT is adopted by nearly all the organizations and they have invested a huge amount of money in IT infrastructure for the overall success of their business. Many firms have adopted new practices based on IT to deliver better products/services to customers, virtual integration, just-in-time purchasing, vendor-managed inventory, collaborative planning, forecasting and replenishment programs [45]. Despite of the initial high investments, the relevance of these technologies and the actual benefits that can be gained by the organization through its adoption has been debatable and a subject of intense research since long. The impact of IT is not guaranteed upon implementation of the system and they are also not uniform across the organization. The emerging issue is that how IT can be used to reshape the organizations and provide competitive advantage. Given the complexity of the technology and the difficulty of implementing it in organizations, some systems may be effective, while others may bring negative returns and therefore by aggregating over all systems, the favorable impact of effective systems may be nullified by poorly designed systems [27, 28].

The electronic marketplace is a virtual place where customers and suppliers can make economic transactions [52]. Internet based Electronic Business (E-Business) applications represent a form of interorganizational systems that enable buyers to interact digitally with suppliers [21]. As organizations adopt new IT techniques to enhance their organizational performance, E-Business along with E-Procurement, Electronic Coordination (E-Coordination) and Electronic Commerce (E-Commerce) comes in the

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forefront [9]. Successful implementation of these IT systems results in the increased effectiveness and efficiency of the organization. Thus, it is critical to evaluate the impact of E-Business on the performance of the organization. In this study key constructs (e.g.: efficiency, sales performance, customer satisfaction and relationship development) and relationships associated with organizational performance affected through E-Procurement have been developed based on the concepts drawn from the interrelated literature streams of inter-organizational systems and strategic management. Specially, from organizational and inter-organizational perspectives, this study proposes to develop a comprehensive performance impact model of E-Procurement for direct purchases, encompassing operational and strategic impacts. This paper is organized as follows: Sect. 2 describes the review of literature. The proposed model for the study is discussed in Sect. 3. Fuzzy ANP has been applied for the analysis of the model and therefore Sect. 4 deals with the overview of Fuzzy ANP. Extent Analysis has been applied as the solution methodology which is discussed in Sect. 5. Discussion and concluding remarks are finally provided in Sects. 6 and 7 respectively.

2 Literature review

During the 1980s–1990s, organizations all over the world faced the strategic and the organizational challenges related to the management of their organizational facilities. As a result of these challenges, wide ranges of strategies were developed to increase organization's efficiency, innovativeness and responsiveness. E-Business is one such strategy that involves the application of information and communication technology (ICT) in all the activities of the business. The development of ICT is greatly changing the way to do business for several manufacturing companies and especially, Business-to-Business (B2B) applications are demonstrating the capacity to provide real value to manufacturing industries by allowing better global performances [53]. In the previous years, a surprising number of studies have appeared in the management literature, trying to describe and better understand the E-Business phenomenon, mainly exploring the potential advantages, the changes required in current management and organization of the companies, the possible business models of adoption of Internet tools and one of the points that was clarified is that the concept of E-Business itself is rather wide, since it includes a number of different applications and uses of the IT [2]. However, a mere willingness to adopt may not in itself lead to high levels of E-Business implementation, but such willingness must be backed by an adequate absorptive capacity that facilitates: (1) the quick recognition of new developments in the E-Business arena, (2) an understanding of how E-Business initiatives can augment existing operations and (3) a continuous scanning of the environment for successful implementation stories that can be replicated [47]. For the successful implementation of any of the new technology it should be well planned and sequentially implemented in phases. Basically there are three phases of technology deployment and they are: adoption, implementation and post-implementation. To have positive outcomes through these technologies critical examination after each phase in essential. Once the adoption process is complete, the emphasis shifts to measuring the benefits of the implementation in next phase and the impacts are of two types: (a) direct strategic impact (typically in terms of sales gains) and (b) transaction processing impact typically in terms of process-based operational measures and finally in the last phase, the improvement in operational measures as evidenced in the previous phase bring in further (indirect) strategic benefits [26]. Subramani [38] has proposed a two stage model related to IT benefits that includes: (1) First order benefits—that are related to firm actions and can be influenced directly by firms (e.g. operational benefits and strategic benefits) and (2) Second order benefits—that are competitive outcomes and incorporate the influence of external factors such as competitors' moves and environmental changes that are beyond the control of an individual firm.

Unfortunately the investment in IT has been criticized in many cases for not yielding the expected results. It is due to the reason that technology and performance are linked through many factors, out of which some are controllable and some uncontrollable [16]. Both are equally important for the better understanding of the role of technology. Initially productivity and output were used to determine the effects of IT on the performance of the organization. Later on, researchers suggested measuring the effect of IT on intermediate variables (e.g. capacity utilization, inventory turnover, relative inferior quality, relative price and new product) and progressing to higher order effects in terms of market share and return on assets [1]. Thus, on the basis of reviews of 16 models on the impact of technology on performance, Heine et al. [16] proposed a general model of technology and performance, that represents the proper fit (balance) between four dimensions: (1) technology, (2) individual and their roles, (3) structure of the organization and (4) management processes that facilitate planning and control required for any technology to enhance the performance of the organization. Through an exhaustive literature review, De-Boer et al. [7] have suggested that the organizational impact of implementing ICT may be considered from a number of perspectives: (1) impact on a firm's primary and supportive processes, (2) impact on the organizational structures used to co-ordinate these

processes, (3) impact on and compatibility with existing IT systems and (4) contribution to the goals of various stakeholders of the firm. Analysis of the impact of E-Business examines three areas—procurement, customer relationship management and fulfillment process [4].

There are a number of classifications of E-Business strategies available in the literature and some of them have been discussed here. Some of the researchers have considered E-Commerce, E-Procurement and Electronic Collaboration (E-Collaboration) to be the three classes of E-Business applications that use the Internet to strengthen the relationships along the supply chain, exchanging data and making joint decisions [22]. Frohlich and Westbrook [11] have classified web-based supply chain integration strategies into following categories: low integration, demand integration (similar to E-Commerce), supply integration (similar to E-Procurement) and demand chain management integration (which is the joint application of the previous two strategies). Cagliano et al. [2] have classified E-Business as: (1) E-Commerce—that refers to sales and customer service and support, (2) E-Procurement—that refers to the use of the Internet in purchasing activities, including procurement of both strategic and standard parts and lastly (3) E-Operations—that refers to the use of the Internet in the operational activities across the company value chain, including order processing and tracking, production planning and scheduling, inventory management and transportation planning.

E-Procurement is the set of Internet applications by which buyers and sellers find each other and transact according to some pre-specified protocols and involves private or/and public marketplaces [22]. Till mid 1980s most of the research dealt more closely with the operative than the strategic impact of E-Procurement, but nowadays the strategic impact of procurement activities on a company's overall competitive position is indisputable [44]. The electronic execution of purchasing activities improves both the operational efficiency dimension and the strategic dimension [42]. The electronic purchasing activities improve organisational-level efficiency as well as the interorganizational dimension [18]. Electronic purchasing activities improve organizational-level efficiency as well as the inter-organizational dimensions [18]. The use of E-Procurement is expected to result in the reduction in two critical B2B measures—the transaction costs of procurement and the price paid for the items procured [40]. Process efficiency and process integration capabilities provide a significant contribution to ensure an uninterrupted flow of raw materials at the lowest total cost and to improve the quality of the final product and to react rapidly to market changes [29]. Phillips and Piotrowicz [30] have proposed a broad framework to assess the impact of E-Procurement on organizational performance and stated that alignment among business strategy, E-Procurement strategy, E-Procurement tool, strategic IT capability and strategic typology have a positive influence on a company's strategic performance. Quesada et al. [31] have proposed a model of the relationships between E-Procurement usage, procurement practices and procurement performance to investigate the impact of E-Procurement on procurement practices and procurement performance. De-Boer et al. [7] have concluded that the impact of implementing E-Procurement in an organization may relate to four areas: organization, IT, cultural and financial. Subramaniam and Shaw [39] have suggested the impact of E-Procurement on performance measures can be studied in terms of: (1) higher process quality, (2) lower total procurement costs, (3) increased user satisfaction and (4) increased responsiveness of the system. Tai et al. [43] have suggested that the four intermediate performance measures related to e-procurement are: (1) impact on cost reduction, (2) impact on internal efficiency, (3) impact on managerial effectiveness and (4) impact on coordination.

E-Coordination automates business processes within the organization and includes activities like: electronic purchase order systems, online catalogues and online linkages with suppliers to exchange information regarding fulfilment activities [19]. The reported benefits of E-Coordination are diverse and varied, including cost savings from process improvements and price reductions, greater visibility of orders, improved supplier competition and fewer requests for proposals that elicit no bids from suppliers [10]. Frohlich [12] found that E-Coordination had a strong effect on E-Business performance (percent of procurement and sales revenues conducted using the Internet) and operational performance (faster delivery times, reduced transaction costs and enhanced inventory turnover).

Kalakota and Whinston [20] have defined E-Commerce from four different perspectives: (1) from a communications perspective—it is the delivery of information, products/services, or payments via telephone lines, computer networks, or any other means, (2) from a business process perspective—it is the application of technology towards the automation of business transactions and workflows, (3) from a service perspective—it is a tool that addresses the desire of firms, consumers and management to cut service costs while improving the quality of goods and increasing the speed of service delivery and (4) from an outline perspective—it provides the capability of buying and selling products and information on the Internet and other online services. The benefits that can be realized from E-Commerce adoption are: (1) improved internal knowledge sharing, (2) improved competitive position, (3) enhanced and efficient service, (4) attract new customers, (5) improved supply and (6) recruited staff online [6].

3 Proposed model

In this paper a model is proposed as shown in Fig. 1 to assess the impact of E-Procurement on organizational performance. The framework is adopted for the purpose that contains determinants (criteria), dimensions (sub-criteria), attributes (enablers) and alternatives in different sublevels. All the determinants along with their dimensions and attributes have been selected from the existing literature. Since there exits number of determinants, dimensions and attributes that affect the organizational performance and help in the selection of the best E-Business strategy therefore the most dominant and prevalent factors in the Indian scenario as suggested by the executives of the organizations have been considered in this model.

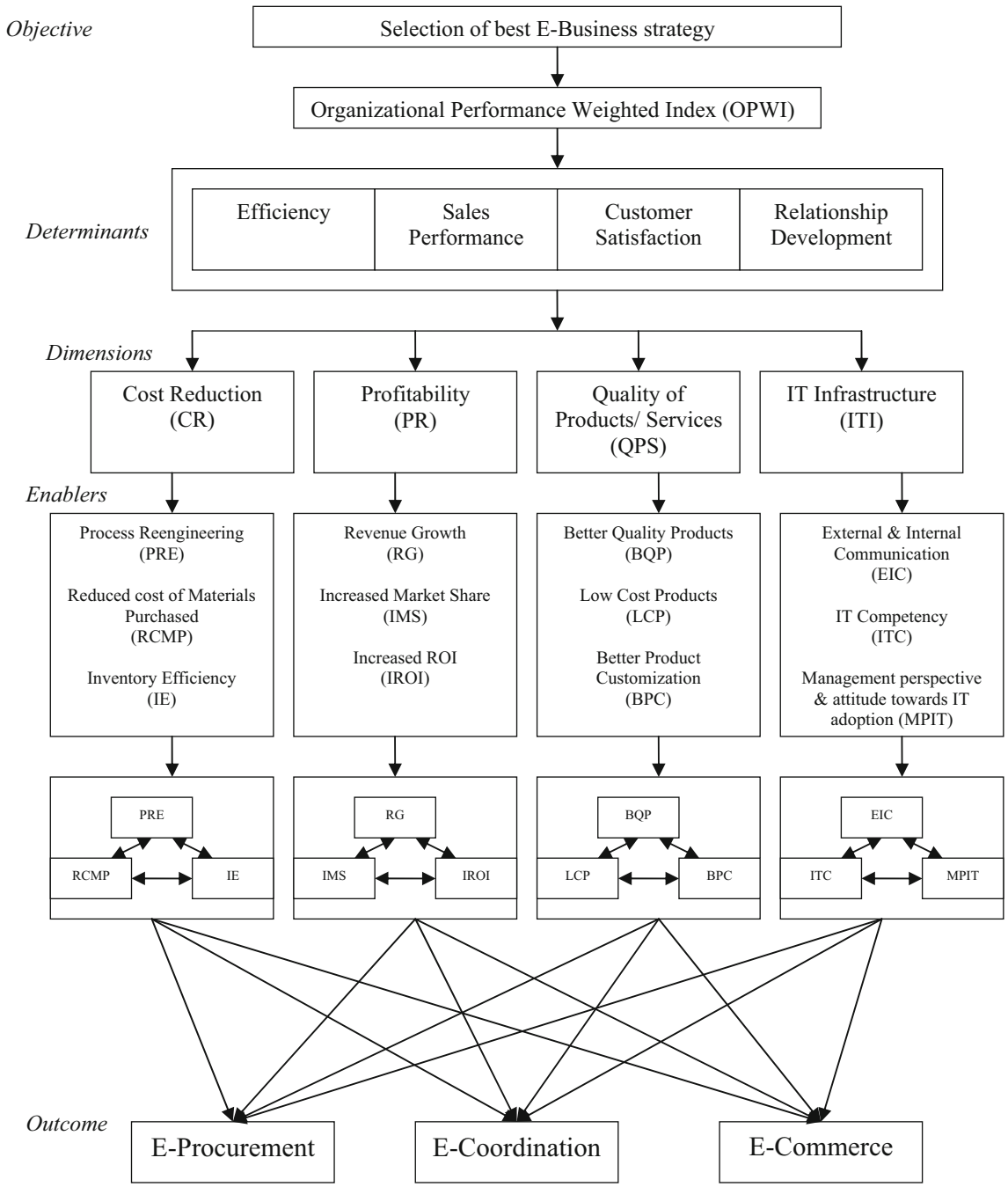

Fig. 1 ANP based proposed model

3.1 Determinants of organizational performance

Based on the review of literature four variables have been considered in this model to assess the impact of E-Procurement on organizational performance. These variables are: (1) efficiency, (2) sales performance, (3) customer satisfaction and (4) relationship development.

3.1.1 Efficiency

Efficiency is the ratio of output and input. Increase in efficiency refers to the increased output with reduced cost by having the maximum utilization of the available resources (human, financial, material and machine).

3.1.2 Sales performance

Sales refer to the purchase of goods and services by the customers. E-Business facilitates in improved sales performance by better product advertisement through Internet and facilitates the customers to place their orders directly through Internet.

3.1.3 Customer satisfaction

Customer satisfaction directly correlates to the success of any organization. Any organization having customer orientation better understands the needs of their customers and provides them with the superior value products/services. Customer orientation has been defined as the adoption of a continuous, proactive disposition toward meeting customers' needs [15]. The main objective of customer focused organization is to provide the customers with the best innovative and customized products of high quality at relatively low cost.

3.1.4 Relationship development

E-Business helps in improved relationship between the organization and its trade partners and suppliers through better information sharing, communication and cooperative practices. An important precursor to E-Business is the commitment of resources by the business and its suppliers (and/or partners) to ensure that their business processes and systems are mutually compatible and such commitment can foster trusting, lasting relationships and can credibly signal the parties' intentions to ensure the long-term success of their business relationship [17].

3.2 Dimensions and attributes

3.2.1 Cost reduction

Use of newer technologies that are being introduced almost everyday along with the era of globalization and moves of the competitors have forced the organizations to seek out cost reduction for maintaining their presence in the market. Customers are being provided with increased options in terms of reduced cost, increased quality and enhanced product features. Thus to provide the customers with high quality products/services at reduced costs is the necessity of the day for all the organizations. The enablers of cost reduction are: (1) process reengineering, (2) reduced cost of material purchased and (3) inventory efficiency.

3.2.2 Profitability

It refers to the increased profit margins obtained through sales of products/services. The stiff global competitions from the competitors have forced the organizations to cut off their profit margins. Application of IT systems in business activities helps in reducing the cost of the product/service and thus results in the increase in the profitability of the organization. The enablers of profitability considered in the proposed model are: (1) revenue growth, (2) increased market share and (3) increased return-on-investment (ROI).

3.2.3 Quality of products/services

To provide the customers with the high quality products/services is one of the advantages of the use of IT systems. Use of IT in the operational activities along with the process reengineering increases the quality of products/services. The enablers related to quality of products/services that are considered in the proposed model are: (1) better quality products, (2) low cost products and (3) better product customization.

3.2.4 IT infrastructure

Successful implementation of any of the E-Business activity is facilitated and enforced by the availability of IT power (Internet, Intranet and Extranet) that enables inter-organizational electronic communication and information processing. The deployment of IT is considered as an investment in process infrastructure since throughout its lifetime it affects process efficiency by simultaneously determining the levels of automation and flexibility which further on refers to all activities, which are done up front and then repeatedly used for day-to-day operations [13]. Managerial initiatives should be directed at developing an integrated IT infrastructure and leveraging it to create process capabilities for the integration of resources between a firm and its partners [32]. System compatibility and system integration are the two main issues for successful implementation of IT systems. The IT platform should be compatible within the business unit and between the unit and its trading partners so that it can be effectively

integrated. Database should be complete and linked properly within the business unit as well with the trading partners. Level of IT infrastructure definitely depends upon the size of the organization. Large organization requires high IT infrastructure for better coordination both within the unit as well as with the trading partners. The enablers that are considered for IT infrastructure in the proposed model are: (1) external and internal communications, (2) IT competency and (3) management perspective and attitude towards IT adoption.

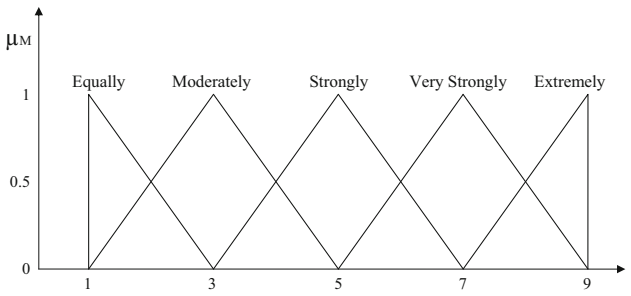

Fig. 3 Membership function of TFNs

4 Overview of fuzzy ANP

Fuzzy logic began in 1965 with the proposal of fuzzy set theory by Zadeh [49] and is a form of many-valued logic; it deals with reasoning that is fixed or approximate rather than fixed and exact. The vague data may be represented using fuzzy numbers, which can be further subjected to mathematical operation in fuzzy domain [48]. A triangular fuzzy number (TFN) M is shown in Fig. 2. A TFN is denoted by (l, m, u) where 'l' represents the smallest possible value, 'm' represents the most promising value and 'u' represents the largest possible value respectively. Fuzzy numbers can be represented by its membership functions (μ) ranging between 0 and 1 as shown in Fig. 3. M is a fuzzy number if and only if M is normal and convex fuzzy set of X.

The analytic hierarchy process (AHP) proposed by Saaty [33] in 1977 has been successfully used for multi-criteria decision making problems (MCDM). The basic assumption of AHP is that the decision making problem can be decomposed in a linear top-to-bottom form as a hierarchy, where the upper levels are functionally independent from all lower levels and the elements in each level are also independent [36]. However, many decision making problems cannot be structured hierarchically, or there exists strong interactions and dependencies between inter-level and/or intra-level elements and therefore in order to overcome this limitation, Saaty continuously proposed a "supermatrix" approach call Analytic Network Process (ANP) [34], which extends the AHP for the problems with dependencies and feedback. The ANP generalizes the AHP and provides a framework for dealing with decision-making problems within which assumptions about dependencies between criteria and alternatives are unnecessary [35]. Similar to AHP, the performance of the weights of criteria and the scores of alternatives in the ANP are assessed indirectly from pair-wise comparison judgments, where the pair-wise comparison process assumes that the decision maker can compare any two criteria and provide a numerical value for the ratio of their importance [46]. However, the ANP method deals only with crisp (numerical) comparison ratios and in many cases the preference model of the human decision maker is uncertain and it is somewhat difficult for the decision maker to provide exact numerical values for the comparison ratios. One reason is that decision makers usually feel more confident to give interval judgments rather than expressing their judgments in the form of single numeric values [5].

Fuzzy AHP (FAHP) method was proposed by Mikhailov and Singh [23] that derives crisp priorities, including the weights of the criteria and the scores of alternatives from crisp, interval and fuzzy judgments using its core technique, called 'fuzzy preference programming' (FPP). Mikhailov and Singh [24] presented the Fuzzy ANP (FANP) method along with the linear and nonlinear modifications of the FPP method for deriving priorities from fuzzy pairwise comparisons.

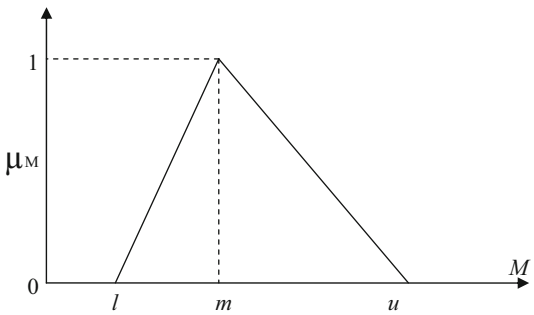

Fig. 2 Triangular fuzzy number (M)

5 Solution methodology

Chang in 1992 introduced a new approach for handling pair-wise comparison scale based on TFNs followed by use of extent analysis method for synthetic extent value of the pairwise comparison [3, 50]. The first step in this method is to use TFNs for pairwise comparison by means of a given scale and then the next step is to use extent analysis method to obtain priority weights by using synthetic extent values. The fuzzy evaluation matrix of the criteria was constructed

through the pairwise comparison of different attributes relevant to the overall objective using the linguistic variables and triangular fuzzy numbers. The fundamental Saaty scale is represented in the form of TFNs in Table 1.

The fuzzy comparison matrix is constructed by the pairwise comparison of the different criteria relevant to the overall objective. Let $X = \{x_1, x_2,\ldots, x_n\}$ be an object set and $U = \{u_1, u_2,\ldots, u_m\}$ be a goal set. Each object is taken and analysis for each goal, gi, is performed, respectively. Therefore, m extent analysis values for each object can be obtained from Chang extent analysis [3, 14].

An objective of this section is to assess the impact of E-Procurement on organizational performance using the proposed model. The first step in the fuzzy extent analysis is creating a pair-wise comparison matrix. In order to perform a pair-wise comparison among the attributes and sub-attributes, the linguistic scale for the triangular numbers and fuzzy conversion scales as given in Table 1 are used in the proposed model. First, the pair-wise comparison matrix is constructed with the help of the discussions with the expert team. The expert team comprised of the executives of some of the organizations actually involved with E-Procurement related activity and mainly all the executives were having engineering background and holding middle level management position in their respective organization. The aggregated decision matrix as shown in Table 2 is constructed to measure the relative degree of importance for each criterion, based on the Chang's extent analysis [3].

To check the inconsistency of the above matrix, consistency ratio (C.R.) is calculated as per the formula given by [34]. The results obtained are: largest Eigen value of matrix, $\lambda_{max} = (4.3984)$; Consistency Index (C.I.) = 0.0805; and C.R. = 0.0894. As the value of C.R. < 0.1 the level of inconsistency present in the information stored in comparison matrix is satisfactory.

The normalized weight vectors are calculated as W = (0.4127, 0.3221, 0.2010, 0.0642). The weights of the criteria represent the ratio of how much more important one criterion is than another, with respect to the goal or criterion at a higher level.

Furthermore calculate the weights of all the pair-wise comparison matrices of dimensions, attributes, interdependencies and alternatives in the similar fashion. In the next stage, form the Super Matrix that depicts the detailed results of interdependency relationships between attributes for the determinant of organizational performance clusters. In the next stage the super matrix is converged to get a long-term stabilized set of weights which is known as the converged super matrix. Thus there will be same number of converged super matrix as the number of determinants and in this study it is four. Then calculate the desirability index for the entire converged super matrix obtained [25]. The final weights obtained from the desirability index matrix are used to calculate Organizational Weighted Performance Index (OPWI) for the each determinant. The OPWI for an alternative 'i' is the summation of the products of the desirability indices and the relative importance weights of the determinants of the organizational strategy to select the best alternative of E-Business. The results of pair-wise comparisons for determinants (Table 2) show that the efficiency determinant is the prime preferable criteria for organizational performance. The final OPWI matrix is obtained which is shown in Table 3 and it concludes that effective most significant E-Business strategy is E-Procurement in the present context as shown in Fig. 4.

The results of the above analysis show that with respect to efficiency, E-Procurement is the most preferred activity having the weightage of 0.1753, next is E-Coordination with weightage of 0.1701 and the least preferred is E-Commerce with the weightage of 0.0356. It is due to the reason that efficiency is related to the cost reduction and in case of E-Procurement the significant cost reduction occurs due to reduced cost of materials, along with the operational and transactional cost. E-Coordination counts to the reduction of cost due to the automation of the business processes within the organization, process reengineering, reduced transactional costs and reduced inventory. With respect to sales performance, the most preferred activity is E-Procurement with weightage of 0.2006, the next being E-Coordination with weightage of 0.1602 and the last being E-Commerce with the weightage of 0.0203. Since sales performance is related to profitability and through E-Procurement the maximum profit can be obtained, so it is the most preferred activity. With respect to customer satisfaction, E-Commerce is the most preferred activity with weightage of 0.2164, the next being E-Procurement with weightage of 0.1308 and the last being E-Coordination with weightage of 0.0339. Customer satisfaction is directly related to the cost and quality of the product/services. E-Commerce is the

Table 1 The fundamental scale of absolute numbers (*Source*: [36])

Linguistic scale for importance	Triangular fuzzy scale	Triangular fuzzy reciprocal scale
Equal importance	(1,1,1)	(1,1,1)
Weak or slight	(1,2,3)	(1/3,1/2,1)
Moderate importance	(1,3,5)	(1/5,1/3,1)
Moderate plus	(3,4,5)	(1/5,1/4,1/3)
Strong importance	(3,5,7)	(1/7,1/5,1/3)
Strong plus	(5,6,7)	(1/7,1/6,1/5)
Very strong importance	(5,7,9)	(1/9,1/7,1/5)
Very, very strong	(7,8,9)	(1/9,1/8,1/7)
Extreme importance	(7,9,9)	(1/9,1/9,1/7)

Table 2 Pair-wise comparison matrix for relative importance of determinants

Determinants	Efficiency (EF)	Sales performance (SP)	Customer satisfaction (CR)	Relationship development (RD)	Weights
Efficiency (EF)	(1,1,1)	(1,2,3)	(1,3,5)	(3,4,5)	0.4127
Sales performance (SP)	(1/3,1/2,1)	(1,1,1)	(1,2,3)	(1,3,5)	0.3221
Customer satisfaction (CR)	(1/5,1/3,1)	(1/3,1/2,1)	(1,1,1)	(1,2,3)	0.2010
Relationship development (RD)	(1/5,1/4.1/3)	(1/5,1/3,1)	(1/3,1/2,1)	(1,1,1)	0.0642

Table 3 Organizational Performance Weighted Index (OPWI) for various alternatives

Alternatives	Criteria				OPWI	NORM
	Efficiency	Sales performance	Customer satisfaction	Relationship development		
	0.4127	0.3221	0.2010	0.0642		
E-Procurement	**0.1753**	**0.2006**	0.1308	**0.1399**	0.1722	**0.4520**
E-Coordination	0.1701	0.1602	0.0339	0.1245	0.1366	**0.3585**
E-Commerce	0.0356	0.0203	**0.2164**	0.1167	0.0722	**0.1895**

Bold values represent the highest value among the three options and it is more dominant for the particular strategy

activity being performed between the organization and the customers and thus is able to translate the needs of the customers to customized products. Customer satisfaction achieved through customized products results in E-Commerce being more preferred. E-Procurement helps in the significant cost savings along with the increased quality and therefore is the next preferred one. E-Coordination does not count much to the customer satisfaction and therefore is the least preferred one. With respect to relationship development, E-Procurement is the most preferred one with weightage of 0.1399, the next being E-Coordination with weightage of 0.1245 and the last being E-Commerce with weightage of 0.1167. Relationship development with the trade partners and suppliers can be accomplished with the extent of IT infrastructure. In this regards, since E-Procurement is directly related to the supplier side, so it leads to better supplier relationships and is therefore the most preferred one. E-Coordination helps in the relationship development with the help of improved communication and information sharing and is therefore considered at the next position.

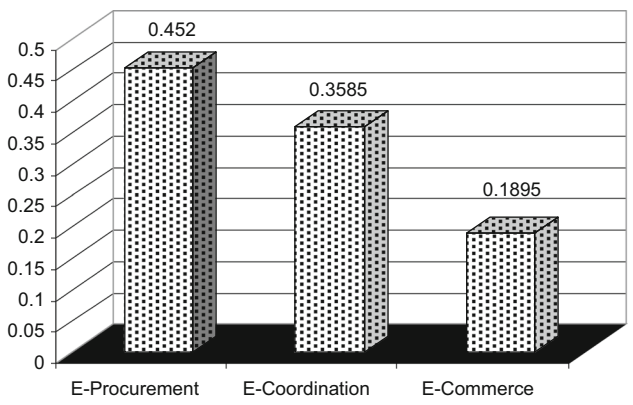

Fig. 4 OPWI for alternatives

6 Discussion

This study aims to ascertain the impact of E-Procurement on organizational performance. Since there is no thumb rule or fixed set of parameters to ascertain the impact of E-Procurement on organizational performance so numbers of factors have been considered in this study. Furthermore, this study also provides a framework for the selection of the best E-Business strategy. In this research, the focus is on handling the uncertainty associated with the various variables of E-Business strategy selection. An effective method for performing E-Business strategy selection based on the attributes and criteria have been proposed in this paper. The fuzzy numbers presents a more accurate method to draw forth the preferences of decision makers. All the strategic arguments, related to E-Business strategy selection such as: efficiency, sales performance, customer satisfaction and relationship development have been integrated together through a framework provided by ANP methodology. Since E-Procurement is considered to be a new technology and is adopted only by a limited number of organizations in India at the moment, so the response rate towards this survey is low which counts to one of the major limitation of this work. Due to the small sample size of respondents, as such statistical authenticity regarding the

findings cannot be claimed. Never the less, the findings of this study do present some valuable insight into the state of affairs prevailing in Indian organizations with regards to the major issues related to E-Procurement. However, the model presented here does not consider all the possible factors and criteria associated with E-Business strategy selection. So, the future scope of this work will be to increase the efficacy of the proposed methodology by the introduction of new variables such as green supply chain, logistics, cloud computing, competitive pressure, etc.

7 Conclusions

The above study leads us to conclude that E-Procurement affects the organizational performance through increased efficiency, increased sales performance and improved relationship development. With the implementation E-Procurement increased efficiency can be gained through reduced cost of materials purchased, reduced inventory levels and reduced transactional costs. E-Procurement also leads to increase in sales performance through increased profit margins, increased market share and increased revenue growth by reducing the cost of the product/services. Improved customer satisfaction can be obtained through E-Commerce by providing the customers with customized products of high quality at reduced cost which is the underlying principle of mass customization. Finally, better communication and improved information sharing along with the supplier's involvement in the organization's planning and policy decisions leads the organization to have better relationship with suppliers. The results of this study obtained through FANP approach are in agreement to the findings of the survey carried by the authors among Indian organizations which show that E-Procurement helps a great deal in increasing the organizational performance.

This study also leads us to conclude that in Indian market, E-Procurement is the most preferred E-Business strategy over the other alternative strategies i.e. E-Coordination and E-Commerce. In the initial E-Business implementation phases, E-Commerce is not a preferred E-Business strategy due to the reason that the initial cost of setup for E-Commerce is quite high in comparison to other E-Business strategies like: E-Procurement and E-Coordination. In spite of anecdotal accounts, evidence on the benefits to firms from E-Commerce initiatives is mixed, while the costs of entry are real and staggering [41]. Chang et al. [51] have concluded that partner relationships, information sharing and supply chain integration as the processes through which E-Procurement contributes to supply chain performance. The Gartner Group estimates that firms creating E-Commerce sites spend $1 million in the first 5 months and $20 million "for a place in cyberspace that sets them apart from the competition" [8]. Moreover, these costs are projected to increase at a rate of over 25 % per year over the next 2 years [37]. Today, in the age of cloud computing, organizations are providing their trading partners the easy assess to their organizational portal. The trading partners can easily download the required software and platforms required for business with the organization at no cost. This reduces the overall initial setup cost required for E-Procurement and thus E-Procurement is the most preferred alternative among E-Business strategies. Use of IT by the organization for the internal business activities and required coordination at different levels has given a thrust to E-Coordination. Since E-Coordination within the organization can be achieved at the reduced cost in comparison to cost of E-Commerce, therefore E-Coordination has finally emerged as the second most preferred E-Business strategy. Finally, it is concluded that for organizations willing to enter in the arena of E-Business, with a view to improve the performance E-Procurement holds enough promises.

To have a greater insight into the E-Procurement practices pursued by Indian organizations, three case studies have also been undertaken. Though the observations made on the basis of these representatives case studies, cannot be claimed to be a true reflection of Indian organizations, nonetheless the findings are important in providing some general trends. The first case study is from the automobile industry, second from the polyester staple fiber manufacturing company and the third case study is related to the company which is engaged in providing products and systems to transmit and distribute electricity, manage smooth energy flows and operate efficient networks through information management. Executives of all the above mentioned three organizations had a general agreement to the validation of the proposed model and the results obtained from the individual analysis of the three organizations also yield a similar type of result with some minor and general deviations that exist due to the difference in the nature of organization and the organizational culture.

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