Ambidextrous Supply Chain: The New Model for Supply Chain Excellence

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Abstract

In this world of ever growing competition, organizations are focusing on excellence in every aspect of their operation to gain competitive advantage. The success of organizations largely depends on their supply chains. This has given rise to competition among supply chains. Many supply chains focus on exploiting the available resources which brings the problem of obsolescence and scarcity of resources to them. Whereas many other supply chains focus on exploration only and hence they fall into the failure trap because of not being able to garner the benefits of even a single idea or exploration. Hence supply chains need to have a balance of both exploitation and exploration. It should exploit the existing resources while continue to explore the new opportunities and ideas. And hence become an Ambidextrous Supply Chain.

The purpose of this study is to rank the enablers of exploitation and exploration according to their relative impact on a supply chain. The supply chain managers can then focus on these enablers in order to orient their supply chains as an ambidextrous supply chain. Analytic Hierarchy Process (AHP) based approach has been applied to perform the pair-wise comparisons to measure the relative significance of enablers (criteria). Pair-wise comparisons of enablers of exploitation and exploration were performed by the experts from industry as well as academia. The results were synthesized by calculating the geometric mean of the matrices and finally deriving the priority and respective rank of each enabler of exploitation and exploration. The study concluded that support of top management, internal relations, information technology and information sharing are the major enablers of exploitation while transformational leaders, tailored approaches, customer relations, structure of the organization and technology are the major enablers of exploration which affect the supply chain of the organization.

Keywords: Ambidextrous Supply Chain, Exploitation Enabler, Exploration Enabler, Analytic Hierarchy Process (AHP).

Introduction

As per the definition of Supply Chain Council (2002), the supply chain encompasses every effort involved in producing and delivering a final product from the supplier's supplier to the customer's customer. Supply Chain Management (SCM) assists organizations to achieve competitive advantage (Bowersox and Closs, 2001; Pozo, 2010).

Supply Chain Management (SCM) practice aids in re-aligning the supply chains by providing functioning solutions for company needs in supply & demand planning and forecasting, sourcing & procurement, supply chain execution and enterprise asset management.

Supply chain management has evolved over a period of time as outsourcing became a more approved and common practice. Co-ordination and integration of different processes both upstream and downstream throughout the supply chain is the essence of SCM. The concept of SCM has been derived from two bodies of knowledge (1) purchasing and supply management and (2) transportation and logistics management (Tan et al, 1998). "According to purchasing and supply management perspective, SCM was synonymous with rationalization of supply base and integration of suppliers into product development and manufacturing activities (Krause, 1997) whereas according to transportation and logistics management perspective, the focus of SCM was on reduction of inventories both within and across the organizations in the supply chain and improvement of service level (Alvarado & Kotzab, 2001)".

Supply chain managers encountered continuously changing market dynamics, new global markets and stressful competitive environments with the evolution of global markets (Mehra & Inman, 2004). Traditional tradeoffs no longer remained an option and firms were realizing the need to optimize their supply chain strategies over a much broader base (Meredith & Roth, 1998). This fierce competition and declines in markets enforced the supply chain management to transform. Quality management is one such initiative having the potential for dealing with these challenges (Mehra & Inman, 2004).

Supply chain performance has never been as important as it is today because in an economy where supply chains and not companies, competes with one another, it is the performance of supply chain that determines who will win the competition. Many companies are still not aware of the performance of their supply chains or they even don't know what kind of supply chain they have. Supply chain management becomes immensely complicated when firms participate in market segments that vary in their product development rate for competitive reasons. Managers participating in alternatively paced markets (e.g. Lo and Power, 2010; Selldin and Olhanger, 2007) increasingly seek to work with 'ambidextrous supply chains', which necessitate a combination of both efficient and agile supply chain capabilities (Vorst et al., 2001; Selldin and Olhanger, 2007).

Literature Review

The concept of ambidexterity is like pursuing the objective of "getting the best of both worlds", has gained momentum not only as organizational ambidexterity on the firm level, but also in the area of supply chain management (Kristal, Huang and Roth 2010). Ambidexterity can help in uniting two apparently contradicting objectives or capabilities for enhanced firm performance (Duncan, 1976, Tushman and O'Reilly, 1996).

The general concept of ambidexterity strategy is simultaneous pursuit of both exploration and exploitation. Following March (1991), Im and Rai (2008) propose that "exploitation refers to the use and refinement of existing knowledge, and exploration refers to the pursuit of new knowledge and opportunities." Initially, exploitation and exploration were considered to be substitutes (or trade-offs) because of the scarcity of firm's resources and limitations of managerial scope. In other words, conventional wisdom posits that organizations would be better off if they either sharpen up and extended their existing supply chain competencies or focused on the acquisition of new ones. To the contrary, others suggest that exploitation and exploration are complementary competencies (Katila and Ahuja, 2002; Gupta et al., 2006; Im and Rai, 2008; Knott, 2002; Levinthal, 1997). This notion of complementarities is consistent with March's (1991) assertion that organizational "adaptation requires both exploitation and exploration to achieve persistent success".

Duncan (1976) proposed the construct of an ambidexterity strategy to capture the complementary view of exploration and exploitation. "The basic argument is this: exploitation and exploration alone are inadequate to support manufacturers competing in a hypercompetitive and dynamic environment". Exploitation within supply chain management is the set of practices that improve and expand existing skills and resources whereas exploration relates to practices that develop new supply chain competencies through experimentation and acquisition of new knowledge and resources. For manufacturers, the supply chain exploitation practices characteristically involve leveraging their existing supply chain competencies to achieve lower costs and reliability; whereas with exploration, practitioners would incessantly search for new knowledge and ideas within supply chain relationships. "Illustrating a SC exploitation practice is the use of information technology to automate cross-organizational tasks (e.g., automated billing, report preparation, inventory management, and financial analysis) with the explicit goal of enhancing efficiency. In contrast, supply chain exploration may employ systems for cross-entity business intelligence information gathering that supports organizational decision-making and the exchange of new ideas, such as understanding the new trends in sales and customer preferences as well as supply network innovations".

Drawing upon the complementarity basis versus trade-offs, manufacturers that give precedence to supply chain exploitation are likely to be trapped in suboptimal stable equilibrium, and therefore, would be less able to acclimatize quickly to environmental changes. On the other hand, manufacturers that rely on continuous supply chain exploration practices are prone to find themselves trailing in efficiency because they cannot acquire the benefits of too many underdeveloped novel ideas. There is some anecdotal evidence that successful ambidextrous organizations are more prosperous, lending the credibility to complementary view of exploration and exploitation (Tushman and O'Reilly, 1996; Kauppila, 2007). While empirical investigations of ambidexterity strategy have attracted more attention, most studies emanate from organizational theory and strategic management literatures (Gibson and Birkinshaw, 2004; Lubatkin et al., 2006; Holmqvist, 2004; Siggelkow and Levinthal, 2003). Yet, with a few exceptions (Adler et al., 1999; Lin et al., 2007; Im and Rai, 2008), empirical investigations of ambidexterity within operations and/or supply chain management performance implications are scant.

Variables impacting supply chain:

Certain variables were identified, which can be termed as enablers impacting the supply chain. The enablers were further divided into two sub-groups, i.e. enablers of exploitation and exploration.

Enablers of Exploitation-

1) Internal Relations: Internal Relations refer to activities and manners in which these activities are carried out within an organization to aid the process of building up and maintaining customer relationships. It is analogous to the concept of intra-organizational connectedness which refers to the extent of formal and informal direct contacts among employees across departments (Jaworski and Kohli, 1993).

2) Support of Top Management: Managerial commitment to SCM is necessary for attaining collaboration breakthrough (Akkermans et al., 1999; Lummus and Vokurka, 1999) and customer responsiveness (Storey et al., 2005). Top management support, broad-based functional support, channel support, and infrastructure/governance support are required for achieving the highest levels of supply chain success (Fawcett et al., 2006). It is important for top management to fully support the internal communication department in order to align business strategy with supply chain strategy and business processes by being accessible by serving as a model for communication, and expecting other managers in the organization to be strong communicators (Powers, 1996). Involvement and influence are the two dimensions of management participation (Gerbing et al., 1994).

3) Information sharing (IS): Information-sharing has been identified as an essential enabler for supply chain alignment (Frohlich and Westbrook, 2002; Tarn et al., 2002; Soosay et al., 2008). The lack of transparency and visibility across supply chains is the main barrier to internal and external alignment (Christopher and Gattorna, 2005) and collaborative planning (Barratt, 2003; Holweg, 2005). The lack of alignment between Information Technology (IT) and Information Systems (IS) with business strategy has long been identified as the key hindrance to organizational success (Luftman, 1998). Incompatible information systems, standards and operating procedures often hinder collaboration across independent enterprises (Houlihan, 1985). Information sharing helps to improve visibility (Lethonen et al., 2005) and therefore improves the allocation of inventory (Lee et al., 1997), production scheduling and knowledge transfer process (Bagchi and Skjoett-Larsen, 2003; Barratt and Oliveira, 2001; Simatupang and Sridharan, 2004).

4) Organizational learning: Organizational learning is "collective learning by members of the organization" (Yukl, 2009). Individual learning is comprised of learning the skill to perform jobs, and understanding the conceptual outcome of implied knowledge (Kim, 1998). Individuals who have these skills can then pass on their knowledge to the organization, which results in an accumulation to the repository of organizational memory. Learning can further be categorized into four categories – team orientation, system orientation, learning orientation and memory orientation (Hult, 1998). In supply chain setting, organizational learning is studied from different perspective - knowledge supply chains (Cha et al., 2008); and, intra-organizational learning, also known as learning that takes place as a consequence of collaboration between various companies (Knoppen et al., 2010).

5) Collaboration for integrating the supply chain and integrating business management capabilities with supply chain organization: Value chains now are experiencing competition, and the feeble link in every value chain defines the might of the entire value chain. There are three levels at which collaboration can take place: across function, across the value chain, and beyond the value chain. The first level is taking place, while the second level that is, across the value chain level is being integrated by all organizations, and the third level that is, beyond the value chain level is being adopted by some organizations. Increase in supply chain expectations prompts the call for a rethink on capabilities essential for managing the supply chain. Supply chain leaders vigorously invest in managing their workforce requirements by predicting the need for different skills and hence developing the talent accordingly through cross-functional approaches and customized training programs (Kearney, 2013).

6) Managing complexities effectively: Shorter product life cycles, broader product portfolios, and more demanding consumers increase the supply chain complexity. In all planning processes the finest strategies of supply chain amalgamate complexity management to eliminate all which is non-value added and make the best use of which is value-added (Kearney, 2013).

7) I.T's role in enhancing operational performance: A piece of inventory in the supply chain accrues cost and decreases margin as its number of days in inventory increases. Supply chain IT solutions have small impact on the time taken by a piece of inventory during its progress between the nodes in the supply chain, but they have substantial effect on the time spent in inventory buffers by that same piece of inventory. The motive of Inventory buffers is to compensate for uncertainty of supply or demand. Complete information sharing across the supply chain together with latest IT solutions, not only decrease uncertainty, but the number of inventory holding levels also get reduced (Greening, 2009).

Enablers of Exploration-

1) Structure of the Organization: Structure of the organization like formalization, centralization, and hierarchy, have to be aligned with strategy and the environment (Thompson, 1967; Lawrence and Lorsch, 1976). Structure of organization must be able to accommodate the evolving interdependencies among new and existing businesses for achieving effective alignment (Burgelman and Doz, 2001).

2) Customer Relations: Customer Relations refer to customer interactions which aid the course of building up and sustaining customer relationships. CR is grounded in the boundary spanning literature. Boundary spanning capability is claimed to allow organizations' processes to focus on providing higher value to external or internal customers (Day, 1994; Tracey et al., 2005). Market sensing, customer linking and channel bonding are the boundary spanning activities that are necessary to improve relationships with customers. Roles like liaison, task force, standing committee and integrating managers are assigned by the focal firms that emphasize on boundary spanning (Danese and Romano, 2004; Godsell et al., 2005).

3) Business performance management systems (BPMS): The performance measurement system would either enable or inhibit alignment. Performance measurement system is eventually accountable for maintaining alignment and coordination (Melnyk et al., 2004). BPMS enables alignment by motivating staff and ensuring alignment in strategy and process (Waggoner et al., 1999; Gunasekaran et al., 2001; Holmberg, 2000; Chan et al., 2003; Morgan, 2004). BPMS assists in decision-making by signifying how good an organization or a supply chain has performed where they currently are and where they need to be. To do this successfully BPMS needs to be appropriate and connected with strategic objectives and the measures have to be approved and shared by the users especially when they involve different groups and organization units (Fawcett and Cooper, 2001; Chenhall, 2005).

4) Transformational leaders: Transformational Leaders have an ability to encourage their adherents to perform beyond their in-role job performance (Bass, 1985) and hence as a result of this, adherents demonstrate their extra-role performance (Podsakoff, et al., 1990). They motivate their adherents with their vision, demonstrates a model for them to follow, and sets high performance expectation. The role of transformational leadership on organizational performance in supply chain has been examined by Defee, et al. (2010) and the results demonstrated that transformational leaders influence information availability, promote informal communication, and encourage holistic performance.

5) Tailored approaches should replace 'one-size fits all' approach: Supply chains with one-size fits all approach does not match with more than ever diverse Indian organizations. Leading organizations are employing dissimilar approaches to manage diverse products and market requirements. Virtual supply chains can be there, sharing the same physical assets, such as factories and warehouses but having different inventory norms and product flows (Kearney, 2013).

6) Frequent planning across multiple horizons and Pull replenishment strategies across the value-chain: Supply chain manager must be ambidextrous – that is they must be competent enough to perceive the larger picture while simultaneously focusing on the minute details. This can be accomplished by programming frequent and multi-horizon planning sessions: weakly reviews of short terms planning, and regular reviews for long term planning. Capacity planning and risk assessment can be done by having a single demand forecast for the entire organization, using total cost optimization. Implementing the pull replenishment strategies assist in dealing with pressures on costs and services across the complete value chain from the customers to the vendors. This can be accomplished by having a solid information infrastructure, regular inventory calibration, and the elimination of artificial demand distortions (Kearney, 2013).

7) Technology and automation choices should be driven by business needs: Technology and automation are becoming vital to triumph over challenges in India because technology assists in decreasing complexity and enhancement in information-sharing, processing and analysis; whereas increasing cost-of-labor, worker availability issues, can be settled automation. Technology and automation can be incorporated and customized according to the needs of business (Kearney, 2013).

Research Gap

There is dearth of literature regarding the importance of the enablers of exploitation and exploration. Moreover, studies pertinent to relative ranking and the respective share of each of the enablers of exploitation and exploration are also lacking. This study identifies the important enablers of exploitation and exploration and presents their relative ranking and their respective share.

Research Methodology

Research Objective

The basic objective of this study is to understand the importance of enablers of exploitation and exploration affecting a supply chain in order to identify which enablers are relatively more important when compared to other enablers. This identification of importance of enablers would help the supply chain managers to make better decisions regarding the supply chain of their respective organizations. This categorization will enable managers to prioritize their decisions according to the requirement of their supply chains. Hence, it will improve the effectiveness of decision making and thus will help in developing competitive supply chain.

Research Tool

Analytic Hierarchy Process (AHP), originally developed by Prof. Thomas L. Saaty, is one of the methods for multi criteria decision making. It is a method in which ratio scales are derived from paired comparisons. The input can be acquired from definite measurement such as price, weight etc., or from subjective judgment such as satisfaction, feelings and preference. Small inconsistency in judgment is allowed in AHP because human judgment is not always consistent.

“AHP is a widely used technique for multi-criteria analyses of alternatives that can support decision makers examine the interaction of multiple factors in complex situations” (Saaty and Kriti, 2008). AHP was used as a multi criteria decision making technique to measure customer requirements (Lu et al., 1994), and an integration of AHP with the determination of customer requirements was proposed (Aswad, 1989). AHP has been applied to various decision making problems like ranking, resource allocation, prioritization, quality management and benchmarking (Bhushan and Rai, 2004; Forman and Gass, 2001; Wei et al., 2005).

Research Design

Analytic Hierarchy Process as a multi criteria decision making model assists in ranking the different enablers (criteria) affecting a supply chain. It facilitates in deciding the level of relative significance of each of these enablers and the level of impact they have on the supply chain. In the formation of pair-wise comparison matrices, consulting or taking opinion from a group of experts is used to avoid the biased attitude of the decision-maker (expert) towards a particular criterion (Jharkharia & Shankar, 2007). Dyer and Forman (1992) have recommended several ways for including the opinion of a group of experts in the formation of final pair-wise comparison matrix. These are (i) consensus, (ii) vote or compromise, (iii) geometric mean of the individual's judgments, and (iv) a separate model. Therefore as mentioned above AHP requires expert opinion and hence keeping this in mind data (pair-wise comparison of enablers of exploitation and exploration) was collected from 5 experts. After the data was collected from all 5 experts, the next step was implementation of AHP in which geometric mean of all the individual opinions of five experts was calculated. After the calculation of geometric mean computed pair-wise matrix, the relative priority, ranking and the respective share of each enabler of exploitation and exploration was computed.

The next step after the formation of all the matrices is to calculate the maximum eigen value (λmax) for matrix. The λmax value is an important validating parameter in AHP (Saaty, 2000). It is used for calculating Consistency Ratio of the estimated vector in order to authenticate whether the pair-wise evaluation matrix provides a consistent evaluation or not. Consistency ratio (C.R.) helps in determining the consistency of the judgments. Consistency Index and Consistency Ratio are calculated in the next step and their values are verified. The steps listed below (Fig.-1) should be followed to calculate CR:

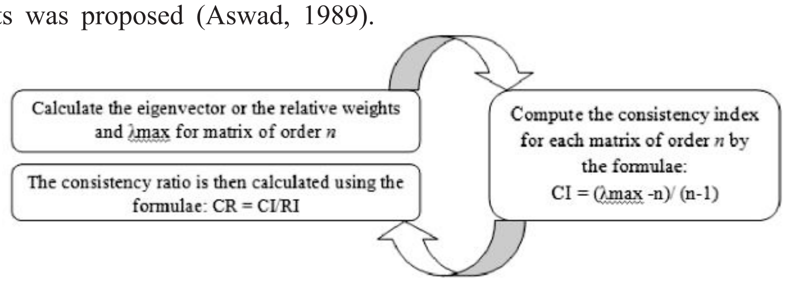

Fig.-1

RI is the Random Consistency Index (RI) varies depending upon the order of matrix.

The acceptable range for CR varies according to the size of matrix i.e. for a 3 by 3 matrix it is 0.05, for a 4 by 4 matrix it is 0.08 and for all larger matrices (n> 5) it is 0.1 (Saaty, 2000). An acceptable consistency ratio helps in ensuring reliability to the decision-maker in determining the priorities of a set of criteria. Consistency ratio helps in validating the responses of different experts. Table-1 and table-2 shows the criteria and the abbreviations used in order to take responses from the experts.

Table-1: Exploitation Criteria and Abbreviation Used (Source: Created by authors)

S. No.	Exploitation Criteria	Abbreviation Used
1	Internal Relations	IR
2	Support of Top management	STM
3	Information sharing	IS
4	Organizational learning	OL
5	Collaboration	C
6	Managing complexities effectively	MCE
7	I.T.'s role in enhancing operational performance	IT

Table-2: Exploration Criteria and Abbreviation Used (Source: Created by authors)

S. No.	Exploration Criteria	Abbreviation Used
1	Structure of the Organization	SO
2	Customer Relations	CR
3	Business Performance Management Systems	BPMS
4	Transformational Leaders	TL
5	Tailored Approaches	TA
6	Frequent Planning and Pull Replenishment Strategies	FPPRS
7	Technology	T

Analysis

AHP systematically analyses the opinions of different experts belonging to different fields as it helps in avoiding bias by consulting more experts from different fields, which otherwise might be present when the expert(s) are consulted from only a single field. In this study, five experts were consulted and their opinions were recorded. Of the five experts, three were from academics and two from industry. The pair-wise comparison was carried out on the ratio scale of 1 to 9 given by Saaty (1994). The five experts separately performed the pair-wise comparison for both the exploitation enablers as well as the exploration enablers. Pair-wise comparison matrices of enablers of exploitation and exploration were administered personally so as to minimize the chances of any error. The pair-wise comparisons of the enablers of exploitation performed by the five experts are shown in table-3, 4, 5, 6 and 7 respectively.

Table-3: Pair-wise comparison matrix of the enablers of exploitation by 1st expert

	IR	STM	IS	OL	C	MCE	IT
IR	1	1/9	7	5	1/5	1/5	3
STM	9	1	9	8	9	9	6
IS	1/7	1/9	1	5	6	5	2
OL	1/5	1/8	1/5	1	6	6	6
C	5	1/9	1/6	1/6	1	6	6
MCE	5	1/9	1/5	1/6	1/6	1	4
IT	1/3	1/6	1/2	1/6	1/6	1/4	1

(Source: Created by authors)

Table-4: Pair-wise comparison matrix of the enablers of exploitation by 2nd expert

	IR	STM	IS	OL	C	MCE	IT
IR	1	1/3	4	5	3	2	1/4
STM	3	1	1/5	4	5	5	1/4
IS	1/4	5	1	3	3	4	1/6
OL	1/5	1/4	1/3	1	2	1/3	1/7
C	1/3	1/5	1/3	1/2	1	1/5	1/5
MCE	1/2	1/5	1/4	3	5	1	1/4
IT	4	4	6	7	5	4	1

(Source: Created by authors)

Table-5: Pair-wise comparison matrix of the enablers of exploitation by 3rd expert

	IR	STM	IS	OL	C	MCE	IT
IR	1	1	7	1	1	6	5
STM	1	1	9	1	1	8	8
IS	1/7	1/9	1	1	1	1/5	1
OL	1	1	1	1	1	7	1/6
C	1	1	1	1	1	8	1/8
MCE	1/6	1/8	5	1/7	1/8	1	1/4
IT	1/5	1/8	1	6	8	4	1

(Source: Created by authors)

Table-6: Pair-wise comparison matrix of the enablers of exploitation by 4th expert

	IR	STM	IS	OL	C	MCE	IT
IR	1	3	1	5	3	1	7
STM	1/3	1	3	5	5	3	9
IS	1	1/3	1	1/3	3	5	1
OL	1/5	1/5	3	1	1/3	1/5	1/3
C	1/3	1/5	1/3	3	1	3	3
MCE	1	1/3	1/5	5	1/3	1	9
IT	1/7	1/9	1	3	1/3	1/9	1

(Source: Created by authors)

Table-7: Pair-wise comparison matrix of the enablers of exploitation by 5th expert

	IR	STM	IS	OL	C	MCE	IT
IR	1	1/2	3	4	4	3	1/3
STM	2	1	3	4	4	3	2
IS	1/3	1/3	1	5	4	4	1/4
OL	1/4	1/4	1/5	1	1/3	1/4	1/6
C	1/4	1/4	1/4	3	1	1/2	1/4
MCE	1/3	1/3	1/4	4	2	1	1/5
IT	3	1/2	4	6	4	5	1

(Source: Created by authors)

Geometric mean was calculated for aggregating the individual preferences received from the 5 experts. Table 8 shows the consolidated matrix for the pair-wise comparisons of exploitation enablers.

Table 8: Geometric mean computed Pair-wise comparison matrix of the enablers of exploitation

	IR	STM	IS	OL	C	MCE	IT
IR	1	0.56	3.58	3.47	1.48	1.48	1.54
STM	1.78	1	2.71	3.64	3.90	5.04	2.93
IS	0.28	0.37	1	1.90	2.93	2.40	0.61
OL	0.29	0.28	0.52	1	1.06	0.93	0.38
C	0.67	0.26	0.34	0.94	1	1.70	0.65
MCE	0.67	0.20	0.42	1.07	0.59	1	0.85
IT	0.65	0.34	1.64	2.63	1.55	1.17	1
Sum	5.34	3.01	10.21	14.65	12.51	13.72	7.96

(Source: Created by authors)

Each column is divided by its respective sum and then the elements of each row are added to obtain the priority and the respective rank of each of the enabler of exploitation (as shown in Table 9).

Table 9: Priority and Respective rank of enablers of exploitation (Source: Created by authors)

	IR	STM	IS	OL	C	MCE	IT	Priority	Rank	Share (%)
IR	0.19	0.19	0.35	0.24	0.12	0.11	0.19	1.39	2	19.86
STM	0.33	0.33	0.27	0.25	0.31	0.37	0.37	2.23	1	31.86
IS	0.05	0.12	0.10	0.13	0.23	0.18	0.08	0.89	4	12.71
OL	0.05	0.09	0.05	0.07	0.09	0.07	0.05	0.47	7	06.71
C	0.12	0.09	0.03	0.06	0.08	0.12	0.08	0.58	5	08.29
MCE	0.12	0.07	0.04	0.07	0.05	0.07	0.11	0.53	6	07.57
IT	0.12	0.11	0.16	0.18	0.12	0.09	0.13	0.91	3	13.00

The next step is to calculate the maximum eigen value (λmax) for the matrix. For calculating λmax, each value in the first column of the geometric mean computed pair wise comparison matrix is multiplied by the priority of the first item; each value in the second column of the geometric mean computed pair wise comparison matrix is multiplied by the priority of the second item; this process is carried out for all columns of the geometric mean computed pair wise comparison matrix. Sum the values across the rows to obtain a vector of values labelled "weighted sum." The computation for the exploitation enablers is as follows:

$$\text{Weighted Sum Vector} = 1.39\begin{pmatrix}1\\1.78\\0.28\\0.29\\0.67\\0.67\\0.65\end{pmatrix} + 2.23\begin{pmatrix}0.56\\1\\0.37\\0.28\\0.26\\0.20\\0.34\end{pmatrix} + 0.89\begin{pmatrix}3.58\\2.71\\1\\0.52\\0.34\\0.42\\1.64\end{pmatrix} + 0.47\begin{pmatrix}3.47\\3.64\\1.90\\1\\0.94\\1.07\\2.63\end{pmatrix}$$

$$+ 0.58\begin{pmatrix}1.48\\3.90\\2.93\\1.06\\1\\0.59\\1.55\end{pmatrix} + 0.53\begin{pmatrix}1.48\\5.04\\2.40\\0.93\\1.70\\1\\1.17\end{pmatrix} + 0.91\begin{pmatrix}1.54\\2.93\\0.61\\0.38\\0.65\\0.85\\1\end{pmatrix}$$

$$= \begin{pmatrix}1.39\\2.47\\0.39\\0.40\\0.93\\0.93\\0.90\end{pmatrix} + \begin{pmatrix}1.25\\2.23\\0.82\\0.62\\0.58\\0.45\\0.76\end{pmatrix} + \begin{pmatrix}3.19\\2.41\\0.89\\0.46\\0.30\\0.37\\1.46\end{pmatrix} + \begin{pmatrix}1.63\\1.71\\0.89\\0.47\\0.44\\0.50\\1.24\end{pmatrix} + \begin{pmatrix}0.86\\2.26\\1.70\\0.61\\0.58\\0.34\\0.90\end{pmatrix} + \begin{pmatrix}0.78\\2.67\\1.27\\0.49\\0.90\\0.53\\0.62\end{pmatrix} + \begin{pmatrix}1.40\\2.67\\0.55\\0.35\\0.59\\0.77\\0.91\end{pmatrix} = \begin{pmatrix}10.5\\16.42\\6.51\\3.4\\4.32\\3.89\\6.79\end{pmatrix}$$

IR = 10.5 ÷ 1.39 = 7.55 IS = 6.51 ÷ 0.89 = 7.31 C = 4.32 ÷ 0.58 = 7.45

STM = 16.42 ÷ 2.23 = 7.36 OL = 3.4 ÷ 0.47 = 7.23 MCE = 3.89 ÷ 0.53 = 7.34

IT = 6.79 ÷ 0.91 = 7.46

The maximum value of eigen vector for the above matrix,

λmax = (7.55 + 7.36 + 7.31 + 7.23 + 7.45 + 7.34 + 7.46) ÷ 7 = 7.39

Consistency index, C.I. = (λmax -n) ÷ (n-1) = (7.39 – 7) ÷ (7-1) = 0.065

Random Index for the matrix of order 7, R.I. = 1.32

Consistency Ratio, C.R. = C.I. ÷ R.I. = 0.065 ÷ 1.32 = 0.049

A consistency ratio of 0.10 or less is considered acceptable for the matrix of the order n>5. Since, the pair wise comparisons for the enabler's (criteria) of exploitation show CR as 0.049 (which is less than 0.10); we can conclude that the degree of consistency in the pair wise comparisons is acceptable. Similar process was carried out for the pair-wise comparison matrices of enablers of exploration. The pair-wise comparisons of the enablers of exploration performed by the five experts are shown in tables-10, 11, 12, 13 and 14 respectively.

Table 10: Pair-wise comparison matrix of the enablers of exploration by 1st expert

	SO	CR	BPMS	TL	TA	FPPRS	T
SO	1	6	5	1/5	6	7	5
CR	1/6	1	4	5	6	9	8
BPMS	1/5	1/4	1	4	5	5	5
TL	5	1/5	1/4	1	6	5	7
TA	1/6	1/6	1/5	1/6	1	6	6
FPPRS	1/7	1/9	1/5	1/5	1/6	1	1/5
T	1/5	1/8	1/5	1/7	1/6	5	1

(Source: Created by authors)

Table 11: Pair-wise comparison matrix of the enablers of exploration by 2nd expert

	SO	CR	BPMS	TL	TA	FPPRS	T
SO	1	1/6	1/2	9	4	1/5	1/4
CR	6	1	3	1/4	1/5	1/2	1/3
BPMS	2	1/3	1	1/6	1/4	1/5	1/4
TL	1/9	4	6	1	1/6	5	1/5
TA	1/4	5	4	6	1	3	1/5
FPPRS	5	2	5	1/5	1/3	1	1/4
T	4	3	4	5	5	4	1

Table 12: Pair-wise comparison matrix of the enablers of exploration by 3rd expert

	SO	CR	BPMS	TL	TA	FPPRS	T
SO	1	1/9	7	1/7	1/6	4	1
CR	9	1	9	1/8	1/7	7	1
BPMS	1/7	1/9	1	1/8	1/5	1/7	1/6
TL	7	8	8	1	8	8	8
TA	6	7	5	1/8	1	7	1/8
FPPRS	1/4	1/7	7	1/8	1/7	1	7
T	1	1	6	1/8	8	1/7	1

(Source: Created by authors)

Table 13: Pair-wise comparison matrix of the enablers of exploration by 4th expert

	SO	CR	BPMS	TL	TA	FPPRS	T
SO	1	3	5	1/3	1/5	1/6	9
CR	1/3	1	3	1/5	1/5	1	5
BPMS	1/5	1/3	1	1/5	1/5	3	5
TL	3	5	5	1	3	1	3
TA	5	5	5	1/3	1	5	3
FPPRS	6	1	1/3	1	1/5	1	3
T	1/9	1/5	1/5	1/3	1/3	1/3	1

(Source: Created by authors)

Table 14: Pair-wise comparison matrix of the enablers of exploration by 5th expert

	SO	CR	BPMS	TL	TA	FPPRS	T
SO	1	1/2	4	3	1/4	1/3	1/5
CR	2	1	5	4	2	4	1/3
BPMS	1/4	1/5	1	1/2	1/4	1/3	1/5
TL	1/3	1/4	2	1	1/3	1/2	1/4
TA	4	1/2	4	3	1	3	1/3
FPPRS	3	1/4	3	2	1/3	1	1/5
T	5	3	5	4	3	5	1

(Source: Created by authors)

Table 15: Geometric mean computed Pair-wise comparison matrix of the enablers of exploration

	SO	CR	BPMS	TL	TA	FPPRS	T
SO	1	0.70	3.23	0.76	0.72	0.79	1.18
CR	1.43	1	4.38	0.66	0.59	2.63	1.35
BPMS	0.31	0.23	1	0.38	0.42	0.68	0.73
TL	1.31	1.52	2.60	1	1.52	2.51	1.53
TA	1.38	1.71	2.40	0.66	1	4.52	0.68
FPPRS	1.26	0.38	1.48	0.40	0.22	1	0.73
T	0.85	0.74	1.37	0.65	1.46	1.37	1
Sum	7.54	6.28	16.46	4.51	5.93	13.5	7.2

(Source: Created by authors)

Table 16: Priority and Respective rank of enablers of exploration

	SO	CR	BPMS	TL	TA	FPPRS	T	Priority	Rank	Share
SO	0.13	0.11	0.20	0.17	0.12	0.06	0.16	0.95	4	13.59
CR	0.19	0.16	0.27	0.15	0.10	0.20	0.19	1.26	3	18.03
BPMS	0.04	0.04	0.06	0.08	0.07	0.05	0.10	0.44	7	06.30
TL	0.17	0.24	0.16	0.22	0.26	0.19	0.21	1.45	1	20.74
TA	0.18	0.27	0.14	0.15	0.17	0.33	0.09	1.33	2	19.03
FPPRS	0.17	0.06	0.09	0.09	0.04	0.07	0.10	0.62	6	08.87
T	0.11	0.12	0.08	0.14	0.25	0.10	0.14	0.94	5	13.45

(Source: Created by authors)

$$\text{Weighted Sum Vector} = 0.95\begin{pmatrix}1\\1.43\\0.31\\1.31\\1.38\\1.26\\0.85\end{pmatrix} + 1.26\begin{pmatrix}0.70\\1\\0.23\\1.52\\1.71\\0.38\\0.74\end{pmatrix} + 0.44\begin{pmatrix}3.23\\4.38\\1\\2.60\\2.40\\1.48\\1.37\end{pmatrix} + 1.45\begin{pmatrix}0.76\\0.66\\0.38\\1\\0.66\\0.40\\0.65\end{pmatrix}$$

$$+ 1.33\begin{pmatrix}0.72\\0.59\\0.42\\1.52\\1\\0.22\\1.46\end{pmatrix} + 0.62\begin{pmatrix}0.79\\2.63\\0.68\\2.51\\4.52\\1\\1.37\end{pmatrix} + 0.94\begin{pmatrix}1.18\\1.35\\0.73\\1.53\\0.68\\0.73\\1\end{pmatrix}$$

$$= \begin{pmatrix}0.95\\1.36\\0.29\\1.24\\1.31\\1.20\\0.81\end{pmatrix} + \begin{pmatrix}0.88\\1.26\\0.29\\1.91\\2.15\\0.48\\0.93\end{pmatrix} + \begin{pmatrix}1.42\\1.93\\0.44\\1.14\\1.06\\0.65\\0.60\end{pmatrix} + \begin{pmatrix}1.10\\0.96\\0.55\\1.45\\0.96\\0.58\\0.94\end{pmatrix} + \begin{pmatrix}0.96\\0.79\\0.56\\2.02\\1.33\\0.29\\1.94\end{pmatrix} + \begin{pmatrix}0.49\\1.63\\0.42\\1.56\\2.80\\0.62\\0.85\end{pmatrix} + \begin{pmatrix}1.11\\1.27\\0.69\\1.44\\0.64\\0.69\\0.94\end{pmatrix} = \begin{pmatrix}6.91\\9.2\\3.24\\10.76\\10.25\\4.51\\7.01\end{pmatrix}$$

SO = 6.91 ÷ 0.95 = 7.27 BPMS= 3.24 ÷ 0.44 = 7.36 TA = 10.25 ÷ 1.33 = 7.71

CR = 9.2 ÷ 1.26 = 7.30 TL = 10.76 ÷ 1.45 = 7.42 FPPRS=4.51 ÷ 0.62 = 7.27

T = 7.01 ÷ 0.94 = 7.46

The maximum value of eigen vector for the above matrix,

λmax = (7.27 + 7.30 + 7.36 + 7.42 + 7.71 + 7.27 + 7.46) ÷ 7 = 7.40

Consistency index, C.I. = (λmax -n) ÷ (n-1) = (7.40 – 7) ÷ (7-1) = 0.067

Random Index for the matrix of order 7, R.I. = 1.32

Consistency Ratio, C.R. = C.I. ÷ R.I. = 0.067 ÷ 1.32 = 0.051

Since, the pair wise comparisons for the enabler's (criteria) of exploration show CR as 0.051 (which is less than 0.10); we can conclude that the degree of consistency in the pair wise comparisons is acceptable.

The above prioritization and ranking provides a course of action for supply chain managers to follow in order to transform and orient their supply chain to an ambidextrous supply chain. The supply chains need to become ambidextrous to overcome the huge competition in the business environment and to gain the competitive advantage over their competitors as well. Still many supply chains focus mostly on exploitation and ignore the exploration aspect. Hence, these supply chains reach the position of equilibrium, where they cannot further exploit the resources which they previously possessed. On the other hand, some supply chains focus largely on exploration and pay limited attention on exploitation. Due repeatedly new exploration, these supply chains are unable to implement a single idea completely over a considerable period of time. Due to this regular exploration, the organizations are unable to garner the benefits of even one of their new idea. This can be termed as Failure Trap. For illustrating this, we have proposed a model given in Figure-2 which highlights the importance of Ambidextrous Supply Chain.

The two aspects of ambidexterity, exploitation and exploration are complementary in nature. The adoption of anyone of these aspects leads to the adoption of the other aspect. The supply chains need to recognize this complimentary nature between exploitation and exploration. The supply chains therefore need to develop such strategic intent where they can give exploitation and exploration an equal weight-age. And hence the supply chains need to focus equally on both of these aspects. The organizations turning their supply chains into ambidextrous supply chain will bring benefits not only for the organizations but for all the stakeholders in the supply chain.

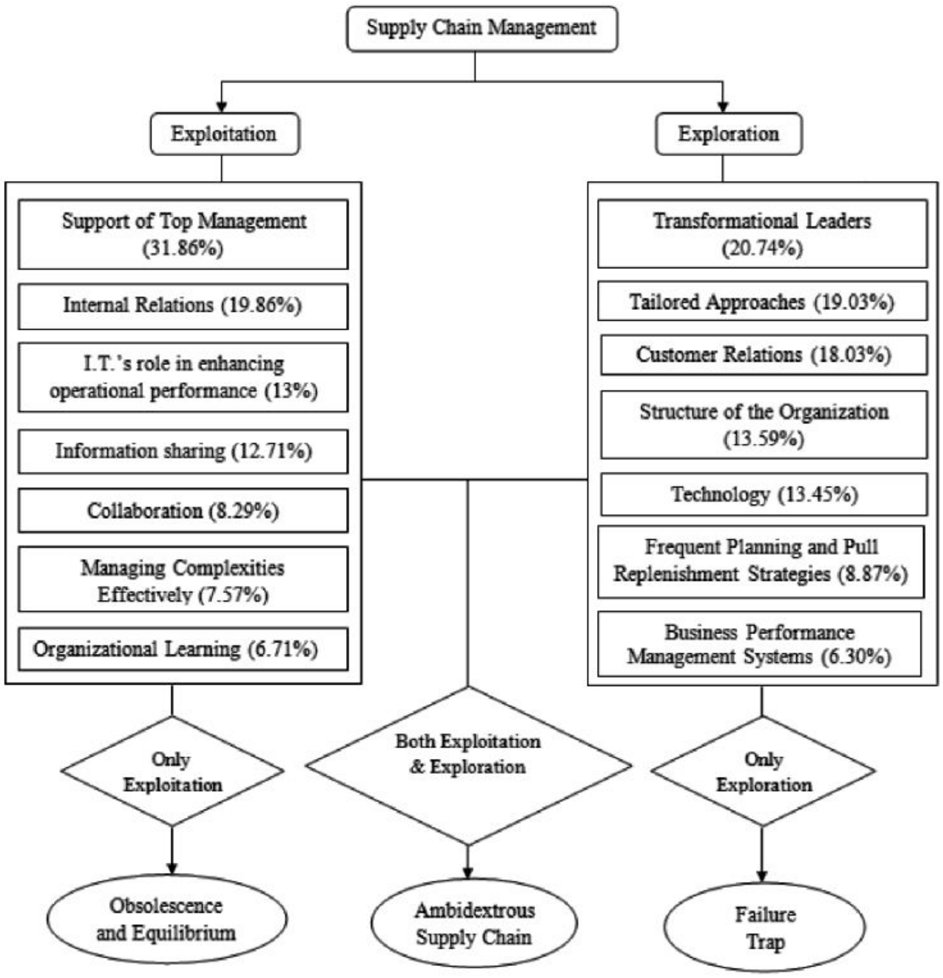

Figure-2: Ambidextrous Supply Chain Model (Source: Created by authors)

Conclusion

Support of top management, internal relations, information technology and information sharing are the major enablers of exploitation affecting a supply chain of an organization. Support of top management facilitates in decision-making with regard to exploitation of a certain resource possessed by the supply chain. It assists in deciding the extent and duration to which a resource should be exploited. Support of top management with regard to a particular activity brings in clarity at the workplace and thus motivates the workforce. Internal relations have an impact on the working of the supply chain. Good internal relation has a positive effect and thus promotes unity of task in the supply chain whereas bad internal relation has a negative effect and thus hinders the working in the supply chain. Therefore, maintaining good internal relations will improve the environment of the workplace. Information technology facilitates in enhancing operational performance as it tracks all the activities from upstream to downstream which aids in visibility and movement of the raw material or product whenever required. Information technology presents information to the management at each level which facilitates in decision-making at every stage. Information technology aids in sharing of information among the different stakeholders of the supply chain. Quality (right) information must be shared at right time, thus enabling the management to take correct decisions at the right time. Information not shared in time or incomplete information takes away the opportunity of being responsive and competitive. Collaboration, managing complexities effectively, organizational learning also facilitates in optimal exploitation. Collaboration with upstream or downstream members provides strength to the supply chain as it can now focus more on its core competency without allocating much time and resources to the activities related to upstream or downstream. Organizational learning promotes sharing of knowledge or skills among different members of the supply chain, thereby enabling each member with the ability to effectively and efficiently carry out various tasks. Managing complexities effectively is essential for a supply chain as it shows the expertise of the supply chain to deal with numerous challenges. The more expertise possessed by the supply chain, more it can deal with challenges posed by the uncertainties of the market forces. With the support of top management, good internal relations, updated IT enabled services, quality information sharing, collaboration with various partners and organizational learning assists in managing the different complexities of the supply chain effectively. Therefore, making the supply chain more and more competitive and providing competitive edge to the supply chain.

Transformational leaders, tailored approaches, customer relations, structure of the organization and technology are the major enablers of exploration affecting the supply chain of the organization. Transformational leaders set the milestone by leading from the front by dealing with the challenges with their proper planning and strategies. They lead with example and present solutions to various problems encountered during the different activities of the supply chain. They also encourage their organizational members for performing the different activities and tasks with ease and effectiveness. They are an important resource for the entire supply chain. Tailored approaches aid the supply chain to deal with different markets and products according to the challenges presented by them. Through tailored approaches the decision of resource allocation is made by the supply chain managers keeping in view the markets and products they are dealing with or have to deal with in the near future. Tailored approaches cater to the dissimilar demands of different customers by adopting the process of customization. Through tailored approaches (customization) the demand of the customers are fulfilled according to their needs and requirements. Tailored approaches help in achieving optimization of resources and thereby benefit the supply chain in the long run. Good customer relations are vital for the success of the firm. Catering to the needs and demands of the customer with the right product, at the right place, right price and right time is essential requirement in today's competitive business. Retaining of existing customers by fulfilling their demands and bringing in new customers is highly necessary for organizations because of the availability of substitute products/services and the presence of competitors in the market. Every organization needs a customer base for its survival and growth in the ever-changing and competitive market. The distribution of work portfolio or the hierarchical control depends upon the structure of the organization. Structure of the organization aligned with its strategies assists the supply chain in performing the existing activities as well accommodating the new ones. Strategically aligned structure of the organization decreases the chances of conflict among the organizational members, defines the work duty of each and every member and also specifies their span of control. Technology assists the supply chain by decreasing the level of involvement in a particular activity and easing the activity process for the workforce. Technology has always played the role of a facilitator and promoter of efficiency, innovation and has enabled the supply chain to achieve optimization in their activities. Technology enhances information sharing and decreases the complexities involved in various processes. Frequent Planning and Pull Replenishment Strategies and Business Performance Management Systems also assist in achieving finest exploration. Frequent Planning and Pull Replenishment Strategies prepares the supply chain to meet the changing demands of customers and equips it against any threat posed to its product or services. Frequent planning assists the supply chain to gear itself and prepare in advance against change which may prove adverse for the supply chain, thus avoiding any new or massive loss. Business Performance Management Systems aligned with the activities and requirements of the supply chain helps in bringing its different groups and units at one platform. Business Performance Management Systems helps in measuring the performance of the supply chain and thus enables the management to precisely define the supply chain goals and set its standard.

The supply chains need to exhibit these enablers of exploitation and exploration in order to become ambidextrous. Being ambidextrous makes the supply chain competitive enough to deal with challenges of the changing market environment. Ambidextrous supply chains are more successful as they have a competitive advantage over other supply chains. Thus, to be ambidextrous, supply chains need to focus more on support of top management, good internal relations, updated information technology, sharing of quality information in time for achieving optimal exploitation as well as also need to lay stress on transformational leadership, moving towards tailored approaches, improving customer relations, aligning structure of the organization, employing advanced technology for achieving finest exploration. The supply chains also need to empower themselves with collaboration with partners, managing the complexities involved effectively and efficiently, promoting organizational learning, better planning and replenishment activities, enhanced and strategically aligned business performance management systems. In the ever-increasing competition among the organizations where supply chains compete with each other, ambidexterity enables the supply chain to sustain and compete and develop a competitive advantage over others. Therefore, the supply chain in order to achieve excellence must embrace ambidexterity and thus become an ambidextrous supply chain.

Supply chain managers can enhance and ease the process of their decision-making by acknowledging the affect which these enablers of exploitation and exploration have on supply chain. Supply chain managers can easily identify the importance of each of these enablers and can respectively decide on the level of importance to be given to each of them. Supply chain managers can easily set their priorities and hence can allocate their resources, time and energy wisely.

Limitations and directions for future research

The study has focused on seven enablers each of exploitation and exploration, for further elaboration and explanation more enablers can be added in the future studies. The data has been collected from five experts, for further amplification and more precise results data can be collected from more experts, like 7 experts, etc. The complete analytic hierarchy process requires significant time in collecting the pair-wise comparison responses from different experts and then calculating the final relative significance of each of the enablers (criteria). Therefore, it should be applied for the long-term strategic decisions.

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