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Abstract

Outsourcing as a concept existed even before the Industrial Revolution, however, the structural formalization in its contemporary form took place not until 1970s and 1980s. Globally competing organizations felt that they were handicapped by the lack of agility and need for diffused managerial structure. Thus, to be flexible and to focus upon core competencies, it became expedient to outsource certain functions traditionally performed in-house. Since 2000, outsourcing as a strategic decision has been extensively researched and studied. Like any other strategic decision, outsourcing has its own pros and cons. Existing body of research provides a structured framework of outsourcing risks and decision criteria. However, limited quantitative research work validates the importance of these criteria during outsourcing decision making process. This research focuses objectively on testing these criteria, by using the multi attribute technique of Analytical Hierarchy Process (AHP), in the light of new outsourcing behaviours observed in the industry. We found that cost was the single largest attribute influencing the decision with nearly half the weight assigned to it. Together with Quality and Expertise (and Cost), the top three attributes influence nearly 90% of the outsourcing decision-making process.

Keywords: Outsourcing, Outsourcing decisions, Fuzzy Analytical Hierarchy Process (F-AHP), Multi Criteria Decision Making (MCDM)

1. Introduction

Over the years, rapid globalization, coupled with ease of information accessibility, has led to organizations expanding their base outside their traditional markets and often outside their country of origin. Further, with global operations becoming an integral part of an organization's strategic objective, organizations have gradually started decentralizing operations so that they can focus on their core competencies (Gunasekaran et al. 2015). This, has led to outsourcing, which is broadly stated as the process of obtaining products and services from an external organization rather than creating the product or service in-house (Atkinson et al., 2015). The

concept of outsourcing stemmed from the fact that organizations can no longer afford to manage all their activities internally and competitive advantage may be gained when products or services are produced more effectively and efficiently by third party vendors (Lankford and Parsa 1999). Outsourcing has also become a popular operations strategy as it allows organizations to concentrate on their core competencies, while at the same time making them more responsive to market based changes and improving their performance (Bustinza et al. 2010; Kakabadse and Kakabadse 2005; Gunasekaran et al. 2015). Therefore, outsourcing (and/or offshoring) is no longer restricted to just manufacturing or information technology (IT) related tasks, but has subsequently extended to a plethora of other business activities like customer care centres and engineering, as well as product development and other knowledge-intensive activities (Musteen 2016). Outsourcing has also been observed to lead towards increase in innovation capability (Nieto and Rodríguez 2011), better utilization of organizational and human capital (Musteen and Ahsan 2013) and improved competitiveness (Di Gregorio et al. 2009). Furthermore, since the organization can have certain set of skills that can maintain and support firm's legacy systems and an outside vendor may have technical capabilities in areas where in-house staff are inexperienced, outsourcing can result in a higher quality service as well as easier access to new technologies, thereby, increasing an organizations competitive advantage in the market (Atkinson et al. 2015). Finally, it has also been argued that outsourcing might lead to cost reductions through elimination of substantial amount of fixed costs during recessions and the transfer of adjustment costs to the outsourcer during newer technology adoption (Aubert et al. 1996).

According to Mudambi and Venzin (2010, p. 1511), outsourcing can be best evaluated as an important pillar of "global disaggregation of the value chain and attempt by firms to combine the comparative advantages of geographic locations with their own resources and competencies to maximize their competitive advantage". However, the function of outsourcing is not devoid of risks and uncertainties (Atkinson et al. 2015; Cezar et al. 2017; Modak et al. 2019; Quélin and Duhamel 2003). As a result, organizations have started paying careful attention towards the outsourcing decision making process. It has been observed that although the operational process of outsourcing started off from cost dimension, it has subsequently made inroads as an organization's strategic decision and has started to take into account a wider range of factors other than cost (Platts et al. 2002). In fact, the concept of outsourcing has stretched itself much beyond than improving operational effectiveness (Quélin & Duhamel 2003) to a plethora of other business functions like economies of scale, expertise of the outsourced firm, greater control of operating costs and quality (Assaf et al. 2011), better utilization of organizational and human capital (Musteen and Ahsan 2013) and global competitiveness (Di Gregorio et al. 2009), among others. Additionally, outsourcing practices have been observed to aid an organization to achieve growth by overcoming barriers of resource limitation and capabilities (Bhalla and Terjesen 2013), including limited operational knowledge and high resource commitment (Bustamante 2018).

The process of outsourcing involves multiple, and often conflicting criteria, which are generally prioritized in order to arrive at the best possible decision(s). Therefore, the use of multi-criteria decision-making (MCDM) models is of growing popularity which can be attributed to today's understanding of sourcing decision as multivariate problems (Westphal and Sohal 2013). MCDM has been extensively used to analyse various dimensions of outsourcing (Ganguly et al. 2008; Hahn et al. 2016; Tavana et al. 2016; Wang and Yang 2007; Udo 2000). However, limited amount of current research work uses Fuzzy Analytic Hierarchy Process (F-AHP) in

analyzing outsourcing decisions, something that the current study has attempted. The strength of F-AHP lies in its ease of comprehension and application, despite the subjectivity of experts' opinions in the evaluation (Ganguly et al. 2019). While Fuzzy logic, on one hand, does not have the capability to assess the level of consistency in the judgments, the standard AHP process, on the other, cannot capture the subjectivity (or fuzziness) of human judgements (Ishizaka 2014). As a result, F-AHP, which integrates the two approaches was adopted for the study. Furthermore, a major consequence of decision-making in a fuzzy environment is the acknowledgement and allowance for imprecision in the judgments made (Tang and Beynon 2006). F-AHP accommodates for decision-makers judgement related incompleteness through mathematical fuzziness.

This paper is organized as follows - beginning with a review of the theoretical foundation behind the research, this paper goes on to identify a set of critical outsourcing decisions that organizations need to ensure the success of the outsourcing process. The identified set of decisions have been subsequently analysed to assess their relative criticality. The findings of the study have been discussed alongside the extant literature and study's contribution to the academic and managerial domain. Finally, the paper concludes with recommendations along with providing future research directions.

2. Theoretical foundations of the concepts
2.1 An overview of outsourcing and outsourcing decisions
Over the years, outsourcing has become an important source of revenues for organizations, and therefore its effective management is critical for continued success (Kakabadse and Kakabadse 2005). Outsourcing can be defined as "the procurement of products or services from sources that are external to the organization" (Lankford & Parsa 1999 p. 310). Outsourcing is a managerial approach that allows delegating a certain set of tasks to external agents,' including operational responsibility for products and/ or services previously delivered by the organization itself (Franceschini et al. 2003). It has been observed that a successfully designed and implemented outsourcing strategies can improve organizational competitiveness and performance, along with providing it with the opportunity to restructure entrenched departments that are reluctant to change (Barthelemy 2003).

Over the years, organizations have initiated effective decision-making processes for outsourcing. Gunasekaran et al. (2015), in their study of decisions pertaining to outsourcing, identified that effective outsourcing decision-making is essential for 'pre, during and post stages' of outsourcing. While the pre outsourcing decision-making mainly comprises of deciding whether the organization has the capability to outsource and thereby successfully compete in the current business environment (Gunasekaran et al. 2015; McIvor 2008), the decisions during the outsourcing process mainly rests on sharing of knowledge and resources, collaboration between the 'outsourcee' and 'outsourcer', and the extent to which these they work in a mutually supportive environment (Gunasekaran et al. 2015). Finally, the decisions associated with post outsourcing phase involve the costs of negotiating, monitoring, and supervising external contractual parties (Jiang et al. 2006, 2007), as well as the level of risk attached with failure of the contract or selection of another vendor (Gunasekaran et al. 2015). Thus, it is evident that outsourcing decisions are pivotal for success or failure of an outsourcing project. The current study tries to shed some more light on this important strategic issue.

2.2 A brief overview of Fuzzy Analytical Hierarchical Process (F-AHP)

The concept of Analytical Hierarchy Process (AHP) was developed by T. L. Saaty (1980) and is a multiple criteria decision-making process for prioritizing alternatives attributes of a decision-making problem (Ganguly and Merino 2015). AHP applies the properties of reciprocal matrices to achieve consistency in pair-wise judgments leading to a cardinal ranking of actions, objectives, attributes and criteria relevant to the decision situation (Hughes 2009). The process of AHP starts with the construction of a hierarchy that describes the basic objective/ problem statement and subsequently breaks it down to a set of hierarchical structure. An AHP hierarchy can have as many levels as needed to fully characterize a particular decision situation (Dave et al. 2012).

Although AHP has been widely used to solve multi-criterion decision-making problems, its most important disadvantage is that it uses a nine-point scale, which cannot handle uncertainty in decisions while comparing the attributes (Kilincci & Onal 2011). F-AHP, on the other hand, can effectively deal with the fuzziness of the decision process through using triangular fuzzy numbers (Table 1, Column 3) to replace of nine-point of scale used in the traditional AHP and then calculate the synthetic extent value of the pair-wise comparison using extent analysis method (Kilincci & Onal 2011). Table 1 below provides the reader with a comparative illustration of AHP vis-à-vis the F-AHP process.

Table 1. A comparison between AHP vis-à-vis F-AHP scales
(Adapted and modified from Ayhan (2013))

AHP Scale	Definition	F-AHP scale
1	Equally important	(1,1,1)
3	Somewhat important	(2,3,4)
5	Fairly important	(4,5,6)
7	Strongly important	(6,7,8)
9	Extremely important	(9,9,9)
2,4,6,8	The intermittent values	(1,2,3), (3,4,5), (5,6,7), (7,8,9)

Following the F-AHP scale above, if *attribute A* is strongly preferred over *attribute B,* then it is denoted by the fuzzy triangular scale as (6,7,8) and its inverse as (1/8, 1/7, 1/6) and so on. Based on this scale, the relative prioritized weights at each level of the hierarchy is determined, which is subsequently used to arrive at the final alternative.

3. Research objective and methodology

The purpose of the current study was to identify and prioritize a set of important factors that might govern the outsourcing decision process of an organization. The first stage of the research process consisted of identifying a set of factors that might influence the outsourcing decision

process. This was done through a thorough review of the extant literature in the field of outsourcing and discussions with subject matter experts. The subject matter experts selected as a part of this study were eminent industry professional with substantial knowledge of outsourcing, and were directly associated with the outsourcing decision-making process of various organizations. Additionally, the experience and qualifications of the individual were controlled while selecting the subject matter experts. Once the final set of attributes were determined (Figure 1, Section 5), the next stage comprised of determining the relative criticality of the attributes using the MCDM technique of F-AHP. A set of 14 experts were shortlisted and selected as respondents for the study. Findings along with inferences were drawn post finalization of the list of prioritized attributes.

4. Identifying the factors affecting outsourcing decisions
3.1 Reduction in operational costs
Since, the days of early adoption of outsourcing, the central premise of outsourcing is conceptually aligned to transaction cost economics (Aubert et al. 1996), which states that organizations seek to reduce costs intenral to the firm by forming alliances or selecting structures and practices from outside that will lead to improved efficiency (McCarthy and Anagnostou 2006). Additionally, one of the primary reasons that has been attributed behind almost every outsourcing decision has been the low labor cost in the country where the task is outsourced (Bhalla et al. 2013; López and Ishizaka 2017; Musteen 2016). Additionally, multiple research works on outsourcing have repeatedly indicated that one of the primary reasons for outsourcing has been to reduce the capital investment and operational cost of an organization (Bustamante et al. 2018; Gunasekaran et al. 2015; Kakabadse and Kakabadse 2005; Ketler and Walstrom 1993; McIvor 2008; Modak et al. 2019). Outsourcing has also been observed to convert fixed costs into variable costs as well as eliminating the need to show return on equity from capital investments in its non-core areas (Pai and Basu 2007). Thus, cost savings has been often considered as the primary rationale behind most outsourcing decisions. The authors, after reviewing the extant literature on outsourcing decisions and in consultation with the experts, decided to consider 'reduction in operational costs' as one of the factors affecting outsourcing decisions.

3.2 Achieving higher quality
Fill and Visser (2000), while studying outsourcing decisions, identified quality as one of the primary drivers of outsourcing decisions. Their view was subsequently supported by multiple studies establishing the importance of considering quality as a factor for outsourcing decision (Atkinson et al. 2015; Cezar et al. 2017; Gunasekaran et al. 2015; Kakabadse and Kakabadse 2005; Musteen 2016; Tjader et al. 2014). While Tjader et al. (2014) emphasized that quality improvement should be a strategic objective for outsourcing decision, Atkinson et al. (2015) argued that the 'oursourcee' may have certain technical capabilities that might lead to an improved quality of product and/ or service. Additionally, the study by Tate et al. (2009) also highlighted the fact that outsourcing creates strategic advantage in terms of increasing the quality of the product/ service delivered, while the service quality of the vendor is also considered as an important factor for outsourcing decision (Yang et al. 2007). Therefore, the authors (and the experts consulted) included 'achieving higher quality' as a part of the final set of identified factors affecting outsourcing decision.

3.3 Need for specialized expertise

Outsourcing can provide an organization with advanced technology and expertise (Lankford and Parsa 1999). Heikkilä and Cordon (2002), in their study on outsourcing as strategic decision for organizations, emphasized that in many cases, organizations lacking the know-how on certain areas can benefit from outsourcing, this was further supported by Power et al. (2004) in their study of 'outsourcing traps'. Furthermore, it has also been observed that organizations can benefit from outsourcing if they can't achieve economies of scale or lack expertise (Barthelemy 2003; Cezar et al. 2017; Gunasekaran et al. 2015; Kakabadse and Kakabadse 2005). McIvor (2008), in his study, cited an example where the specialized expertise of the outsourced vendor enabled the 'outsourcee' to manufacture more complex products, thereby improving their efficiency and productivity. The need for specialized expertise being an important component for outsourcing decision-making process has also been highlighted by other research works by Atkinson et al. (2015), Mudambi and Venzin (2010), Pai and Basu (2007) and Platts et al. (2002). Therefore, 'need for specialized expertise' has been chosen as one of the critical factors.

3.4 Harnessing new technology to achieve higher innovation
De Quinn (2000), in his study on the outsourcing activities of pharmaceutical organization, highlighted the fact that a strategic factor behind outsourcing decision can be to make the best use of a new technology. Kakabadse and Kakabadse (2002) has also emphasized on the importance of accessing new technologies through outsourcing. Outsourcing decision framework developed by Platts et al. (2002) considered technology as one of the primary factors governing the outsourcing decision. This was subsequently echoed by other researchers (Quélin and Duhamel 2003; Sanders et al. 2007; Tjader et al. 2014; Westphal and Sohal 2013), which reemphasized the importance of harnessing new technology as a factor affecting the overall outsourcing decision process and has been considered as one of the factors for this study.

3.5 Achieving flexibility with changing market dynamics
The importance of operational flexibility as a competitive strategy for an organization has been researched since the early twenty first century (Slack and Lewis 2002). Therefore, organizations have started considering flexibility of operations as a part of their outsourcing decision-making (Arias-Aranda et al. 2011). Modak et al. (2019), in their study of the Indian mining sector, found out that outsourcing aids an organization to gain more operational flexibility and responsiveness and in turn gain a higher competitive advantage in the market. Enhancing flexibility of the 'outsourcee' has been considered as a major benefit of outsourcing (Jennings 2002; Lynch 2003; Lau and Zhang 2006; Lockamy III and McCormack 2010; Quélin and Duhamel 2003). Outsourcing has been observed to improve capacity shortages and increase production flexibility (Chang et al. 2008). Operational flexibility as an outsourcing decision has also been discussed by Beaumont and Sohal (2004), Wu and Chien (2008) and Yang et al. (2007). Therefore, achieving flexibility with changing market dynamics' was considered as the final factor to be considered as a part of the current study. Figure 1 exhibits the basic AHP model for the current study.
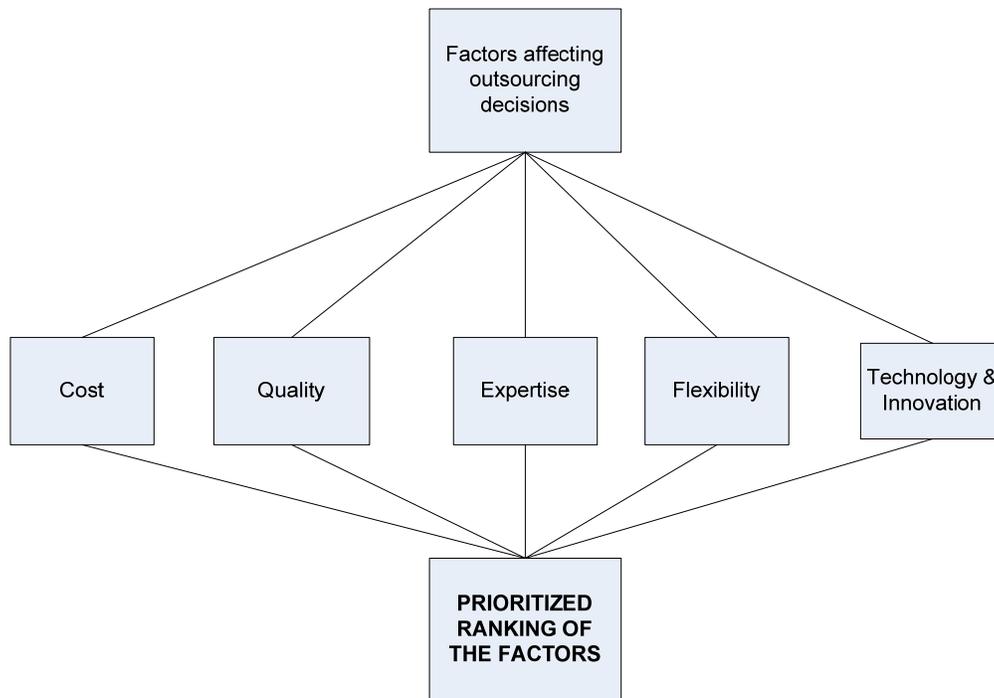
Figure 1. The basic AHP model for supplier selection

5. Using F-AHP to select the preferred supplier

The first step in AHP analysis, after construction of the hierarchy (Figure 1), consists of calculating the weights of the identified factors based on a primary survey of the subject matter experts. The subject matter experts were selected on the basis of a set of pre-determined criteria, to increase the robustness of the survey. The survey instrument, a structured questionnaire, was administered to 14 experts who were associated with various outsourcing activities of their organizations. The survey was administered to the experts separately and individually in order to eliminate any possible response biases. The AHP questionnaire facilitated answering of pair-wise comparison questions. The relative preference of one attribute/ sub-attribute over another was decided based on the responses provided by the experts. The remainder of this section provides a step-by-step process of using F-AHP in outsourcing attribute identification.

Once the AHP hierarchy was identified, the next step was to survey a set of identified experts using a structured questionnaire. The scale used in the questionnaire was the AHP scale provided in Table 1. Although the questionnaire administered included the classical AHP scale, it was subsequently converted to the F-AHP scale. Tables 2 illustrates the pair-wise comparison matrix of the identified factors associated with outsourcing decisions as identified by one of the respondents[1].

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[1] *It should be noted here that tables 2 & 3 exhibit the results of one of the respondents out of the 11 respondents surveyed. The primary reason for this is that the AHP response matrix for all the respondents surveyed have the same structure with different values. The final table (Table 4) exhibiting the final, prioritized values, is an average of all the survey responses.*

Table 2. Pairwise comparison of the identified factors

	Quality	Flexibility	Expertise	Cost	Technology & Innovation
Quality	(1,1,1)	(6,7,8)	(1,1,1)	(1/4,1/3,1/2)	(6,7,8)
Flexibility	(1/8,1/7,1/6)	(1,1,1)	(1/8,1/7,1/6)	(1/9,1/9,1/9)	(1,1,1)
Expertise	(1,1,1)	(6,7,8)	(1,1,1)	(1/4,1/3,1/2)	(6,7,8)
Cost	(2,3,4)	(9,9,9)	(2,3,4)	(1,1,1)	(9,9,9)
Technology & Innovation	(1/8,1/7,1/6)	(1,1,1)	(1/8,1/7,1/6)	(1/9,1/9,1/9)	(1,1,1)

The third step of the process comprised of determining the geometric mean of the fuzzy comparison value for each of the attributed and sub-attributes. Once the geometric means are determined, fuzzy weights of the attributes are determined, followed by de-fuzzying and normalizing the weights. The fuzzy weights are determined by multiplying the geometric mean ($\tilde{r}_i$) with the reverse Fuzzy Triangular Numbers (FTNs), arranged in ascending order. The determined fuzzy weights are then subsequently de-fuzzied and normalized, thereby accounting for the final set of attribute and sub-attribute weights[2]. The findings are shown in Table 3.

Table 3. Geometric mean and normalized weights of the identified factors

	Geometric Mean ($\tilde{r}_i$)			Fuzzy weights (w_i)			M_i	N_i
Quality	1.55	1.75	2.00	0.17	0.23	0.28	0.23	0.23
Flexibility	0.48	0.30	0.31	0.05	0.04	0.04	0.05	0.07
Expertise	1.55	1.75	2.00	0.17	0.23	0.28	0.23	0.21
Cost	3.18	3.74	4.19	0.35	0.49	0.59	0.48	0.45
Technology & Innovation	0.28	0.30	0.31	0.03	0.04	0.05	0.04	0.04
Total	7.04	7.83	8.82					
Inverse (power of -1)	0.14	0.13	0.11					
Increasing order	0.11	0.13	0.14					

M_i = Non-fuzzy weights and N_i = Normalized weights

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[2] *For detailed explanation of the Fuzzy AHP process and the Fuzzy Triangular Distribution please refer Ayhan (2013) and Singh and Prasher (2019).*

A summary of the weights of the attributes along with their critical relativity is provided to the readers in table 4.

Table 11. Overall rankings of the factors affecting outsourcing decision

	Global weights	Rank
Cost	0.45	1
Quality	0.23	2
Expertise	0.21	3
Flexibility	0.07	4
Technology & Innovation	0.04	5

Finally, it will be worthwhile to mention that although the AHP structure exhibited in Figure 1 includes the alternatives, but the current study limited itself to prioritization of attributes and the sub-attributes, the last level of hierarchy was considered to be beyond the scope of the current study. Additionally, it should also be mentioned that following the methodology suggested by Leung and Cao (2000), a consistency test for the pairwise judgements were performed and consistencies came out to be within the permissible limits. The following section is devoted towards a detailed discussion of the findings.

6. Discussing the findings of the study

The highest Eigen vector weight was attributed to cost at 0.45 (Table11). Meaning, nearly half of the times outsourcing decisions are influenced by cost. This is very similar to the findings of Atkinson et al. (2015) study of outsourcing in IT organizations, where, the AHP based eigen vector weight for financial risk was highest at 0.44 (five major criteria and 58 base criteria) for a two tier AHP model. However, considering that an organization's decisions are influenced by short term of long-term profit sustainability, all attributes related to outsourcing decisions ultimately directly or indirectly would lead towards costs dimensions. Hence, the high eigen vector weight for cost. This is also supported by Fill and Visser (2000) study of outsourcing using a composite approach and Bustinza et al. (2010) study of competitive strategies and firm performance amidst outsourcing. In both of these studies cost based financial performance were studied as dependent variable and strong relationships were found with antecedents like flexibility, operational performance and technological improvement etc. The AHP uses consistency ratio and pairwise analysis to remove or add such layering of emphasis and hence, we can state that, while outsourcing decisions are adopted for improvement in multiple dimensions, nearly half of the time they are due to cost/ benefit considerations.

   Quality (0.23) and Expertise (0.21) are the second and third most important attributes leading to outsourcing decisions. However, the difference between the eigen vector weights in minor and hence, both of them can considered equally important. Further, it can be said that they influence the outsourcing decision one-fifth of the times. The result are similar to the study done by

Gandhi et al. (2012), where Quality was most important aspect among ten other outsourcing decisions for existing markets and was fourth most important for new markets. Expertise while outsourcing has two dimension, one is expertise of the supplier or vendor and second is the attached internal risks due to loss of expertise. Both of these dimensions have been studied and have been found to be important, sometimes as part of the outsourcing environment and vendor service quality (Rank 1; 10 attributes) (Yang et al. 2007) and sometimes as intra-organisational competency (Sanders et al. 2007). A detailed study by Tjader et al. (2014) of firm level outsourcing decision using score card approach found Quality ranked fifth and Expertise ranked fifteenth among seventeen parameters. Hence, it could be said that though there is well establish agreement among researchers regarding importance of Quality for outsourcing, there seems to be conflicting views regarding expertise of employee and vendor. Further research can be taken up to examine whether, this has bearing in industry specific characteristics or not.

   Further, we found that the other two attributes Flexibility and Technology and Innovation, had the least eigen vector 0.07 and 0.04 among the five attributes. While, Flexibility (also encompassing Agility) has been one of the major reasons behind outsourcing decisions (Tjader et al. 2014; Westphal & Sohal 2013), Technology and Innovation has been one of the major reasons for outsourcing however, in most of the cases the innovation by the outside firm has been the reason behind the outsourcing decision by the outsourcing organization (Musteen 2016; Lewin et al. 2009) and hence, for within the firm innovation, has lower eigen vector.

Overall, we can state that this research work provides an idea, that irrespective of long-term or short-term outlook and competitiveness of the firm, cost dimension remains the most influential attribute while making outsourcing based decision. Further, Cost, alongside quality and expertise are the three attributes while solely influence the outsourcing decision. Hence, it could be said that though other attributes are also important and might vary based on the industry or firm's characteristics, majority of the outsourcing decisions are made to optimize cost, improve quality and expertise within the supply chain or service provision.

7. Conclusion and future research avenues

In this research work we identified five important attributes which are considered while making outsourcing decisions by the organisations. We used AHP based questionnaire filled by Industry and Subject Matter Experts to identify their relative weights and importance. We found that Cost alone is a major attribute half of the time, while decisions of outsourcing are majorly or mostly dependent upon three attributes namely – Cost, Quality and Expertise (90% influence).

Our research provides a clear guiding path to all managers regarding introduction of outsourcing in their respective organizations, if it significantly reduces their cost, improves quality from the product perspective while also introduces improved expertise within the supply chain. For researchers, it provides a path where, further sub-attributes can be identified for these three important attributes. Additionally, industry specific study of attributes and sub-attributes can be taken up from the outsourcing decision-making perspective to gain further insights.

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