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A Hybrid Approach to Identify and Prioritize Success Factors for Business Analytics Outsourcing

Pranav Kudesia[1*] and Asif Akhtar[2]
[1]Growth & Strategy Manager, Accenture Solutions Pvt. Ltd., Bangalore, Karnataka, India.
Email: Pranav.Kudesia@gmail.com
[2]Assistant Professor, Department of Business Administration, FMS&R, Aligarh Muslim University, Aligarh, India. Email: asifakh@gmail.com
*Corresponding Author

Abstract: Outsourcing industry is going through its next wave of change. While the first two waves were driven by contact centers and software development, the third wave of outsourcing will be driven by business analytics services. Organizations across the globe are looking to generate insights from their customer and operational data. These organizations have an option to either acquire analytics skill in-house or leverage third party analytics service providers who excel in generating data-driven insights. The intent of this paper is to identify the key enablers for analytics service providers and develop a contextual model to measure the performance of analytics services providers. Around sixteen enablers were identified from the literature review. These enablers were subject to a hybrid analysis technique comprising of FAHP and ISM to identify the most relevant enablers and develop a contextual relationship between these enablers. These findings were verified by a group of business analytics experts for their relevance and validity. The enablers identified by this analysis are set to have the maximum impact on the performance of analytics service providers.

Keywords: Analytics outsourcing, Fuzzy AHP, Hybrid analysis, ISM, Success factors.

I. Introduction

In the last decade or so, we have seen global outsourcing players set up specialized units to offer these higher value-higher margin services to their clients. There are also these niche analytics service providers, who specialize in generating value from their client's data. The incredible rise of analytics service providers leaves very less differentiation of their offerings and performance from their peers in the industry. Organizations are now on a lookup for structured methods to measure the performance of analytics service providers. A hybrid modeling approach was used for this analysis, comprising of a combination of Fuzzy Analytical Hierarchy Process (Fuzzy AHP) and Interpretive Structural Modeling (ISM). Fuzzy AHP is helpful in establishing the relative ranking of the critical success factors for analytics outsourcing, while ISM is helpful in developing a hierarchical model of these enablers.

II. Objectives of Research

As part of this paper, a comprehensive review of literature was conducted to identify the critical success factor for analytics outsourcing. Following this, a hybrid approach comprising of FAHP and ISM was used to develop a framework for evaluating performance of Analytics Service Providers. ISM is generally used to identify the dependencies of success factors on each other. Fuzzy Analytic Hierarchy Process (FAHP) can be used for multiple criteria decision-making in fuzzy environments, A hybrid approach comprising of ISM and FAHP can help establish interdependencies of success factors and barriers in a fuzzy environment.

III. Literature Review

Business analytics is a revolution that is impossible to miss. At its core, business analytics is about leveraging value from data. Instead of being referred to as the 'sludge of the information age,' data has recently been deemed 'the new oil.' Frank Aito *et al.* (2014) have aptly detailed the opportunities and challenges businesses can expect while working with data. While data can help businesses in identifying new business opportunities, given its veracity and volume, it becomes quite challenging to draw value from it. 'Business Analytics' is a term that can be defined as "a set of all the skills, technologies, applications and practices required for continuous iterative exploration and investigation of past business performance to gain insight and drive business planning (Beller & Barnett, 2009). This makes the case for engaging an analytics' service provider. These providers can bring in the external expertise required for data driven insight generation and can help identify your potential customers and their preferences.

Measuring performance of an analytics service provider has not been extensively captured. This was concluded from the review of literature conducted as part of this research. Table I details the success factors which were identified from the existing literature on this topic.

Table I: Success Factors for Business Analytics Outsourcing

Success Factor	Definition/Description
Outsourcing Regulations	Codes of conduct in the outsourcing of labour regulations, which normally reference the foreign or 'international' standards, must not neglect the relevant domestic laws; rather, they should be always attentive to them and positively correspond to the host country's societal demands (Lin Bai, 2007).
Political Environment	Political environment and risks are crucial to the success of an outsourcing operation as suggested by the studies done by M. Graf (2005), J. Heizer (2008) and Alan D. Smith (2008).
Economic Environment	Economic environment has been a success factor for outsourcing operations as suggested by Dunning (1998), William Applebaum (1966), Divakara K. Varma (1993).
Competitive Environment	A mature competitive environment can assist in garnering government support and creating a steady supply of talent (Hua Li, 2008).
IT Infrastructure	IT Infrastructure is the backbone of ITeS delivery and it is no different for Analytics as suggested by M. Graf (2005) and Hua Li (2008).
Shared Vision	Without a vison and a strategic plan, forms tend to play the hand that they dealt. There are generally differences of opinion among the partners, and often no one is really in charge (L. Gary Boomer, 2004).
Customer Focus	Research suggests that firms with a strong customer focus have an intrinsic motivation to address customer needs. Customer-focused providers more effectively fulfill customer needs when clients and providers share close relational ties (Stefan Wuyts, 2015).
Data Quality	Kent R. Lazarus (2002) highlights the importance of data quality for competitive advantage. As arbitrage competition intensifies, the benefits of incrementally better data is evident.
Cultural Proximity	The influence of national culture on international strategy has been stressed by many authors in the field of international business (Erramilli, 1996; Hitt *et al.*, 2006; Hollensen, 2001; Kogut and Singh, 1988; Tihanyi *et al.*, 2005).
Geographic Proximity	Proximity of services and supplies needed has been cited as a success factor for outsourcing by Alan D. Smith (2008) and J. Heizer (2008).
Co-innovation Opportunity	Co-innovation opportunity with partners and clients helps create products and solutions, which emanate from the combined wisdom and business perspective of these partners.
Analytical Skills	Huge J Watson (2012) considers 'Personnel with Advanced Analytical Skills' as one of the key success factors of an advanced analytics focused organization. Advanced analytics requires three skills: knowledge of the business domain, the ability to work with large datasets, and modeling skills.
Analytical Tools	Huge J Watson (2012) focuses on successful factors that firms should employ in advanced analytics, creating a fact-based, decision-making culture and supporting analytical tools, appliances and skills like data mining, data warehousing in organizations.
Data Security Controls	Data security and confidentially is a critical concern for agencies collecting data about individuals. Given the granularity of data collected to derive evidence-driven customized solutions, data leaks can lead to disclosure of sensitive information, loss of public trust, etc. (Rashmi Krishnamurthy, 2014).
Delivery Experience	With the rise of big data, analytics, self-service and other new technologies, organizations are turning to outside help for experience and expertise.
Innovation Capability	Clusters are geographic concentrations of interconnected companies and institutions in a particular field. Clusters affect competition by driving the direction and pace of innovation, which underpins future productivity growth (Michael E. Porter, 1998).

The long list of factors was categorized as extrinsic and intrinsic factors. Extrinsic factors are factors external to the analytics organization but yet they have an impact on the performance of these vendors. Intrinsic factors are factors internal to the analytics service provider which have due impact on their performance. These factors were further classified into these three broad categories: Environmental factors, customer centricity and analytical capability. This classification of factors has been detailed in the Fig. 1.

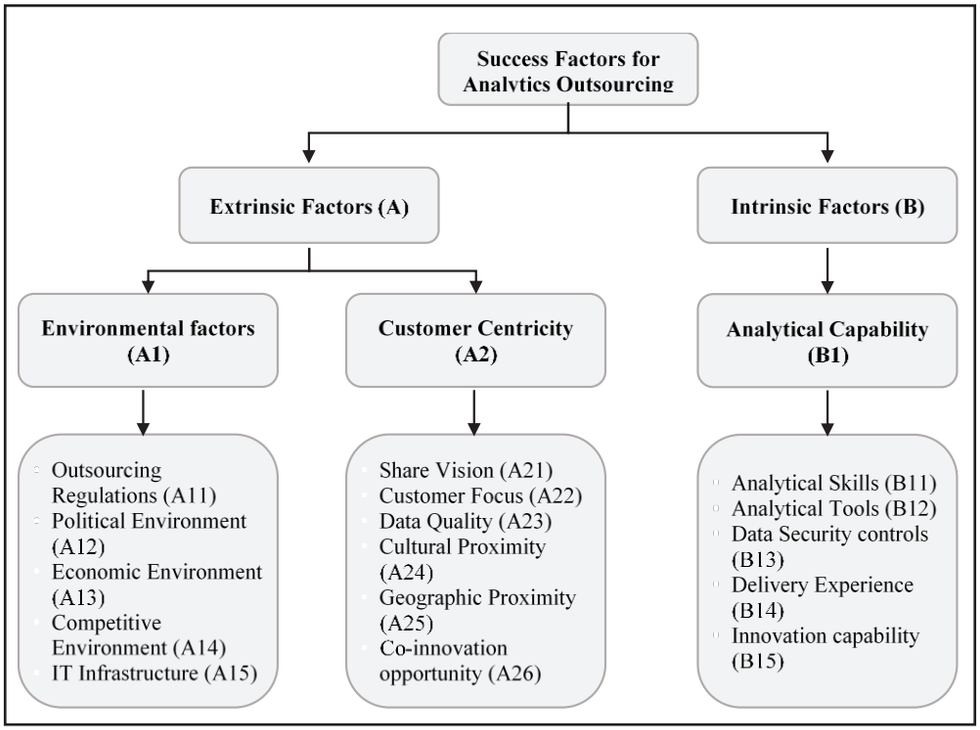

Fig. 1: Classification of Success Factors for Analytics Service Providers

IV. Research Approach

In this paper, a hybrid approach has been used to evaluate the success factors for analytics service providers. A range of studies have been done using hybrid modeling mostly for studying enablers in various industries as well as to assess the impact of these enablers on the performance. A few of these studies also focus on a hybrid approach combining ISM and FAHP methodologies. These include a study done by Divesh Kumar *et al.* (2017) to analyze the enablers of sustainable supply chain and by Changiz Valmohammadi *et al.* (2016) to identify and prioritize the interactive barriers of e-commerce implementation. In all, a very few studies have used a combination of FAHP and ISM to study the enablers or barrier to a particular business. This study presents a unique perspective on the enablers for the analytics service providers emanating from the hybrid methodologies involving ISM and FAHP, and backed by the collective judgement of a group of experts. These steps are detailed in Fig. 2.

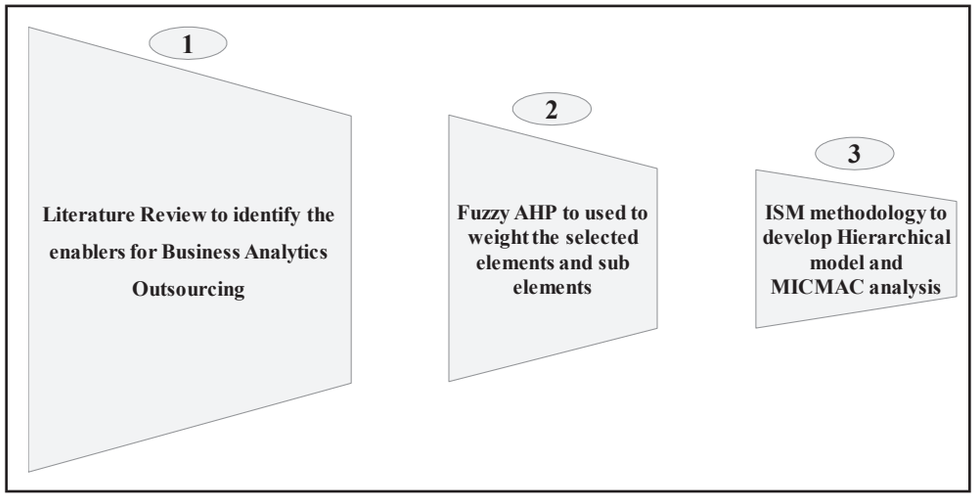

Fig. 2: Hybrid Analysis Technique Using Fuzzy AHP and ISM Methodology

V. Analysis

The factors responsible for a successful business analytics engagement, as identified frm the literature, were subjected to Fuzzy AHP and ISM methdology.

*Fuzzy AHP***:** These elements and sub elements for analytics outsourcing are then weighted using FAHP. A focused group comprising of four analytics experts made compared the relative importance of each element with rest of the elements. We started by making pairwise assessment of the elements and then followed by pairwise assessment of the sub-elements within each of these elements. These relative importance of each element and sub-element was rated using the trianguar fuzzy scale as detailed in the Table II.

Table II: Triangular Fuzzy Conversion Scale

Linguistic Scale	Triangular Fuzzy Numbers (TFNs)	Reciprocal TFNs
Equally Important	(1, 1, 1)	(1, 1, 1)
Weakly more important	(2/3, 1, 3/2)	(2/3, 1, 3/2)
Strong more important	(3/2, 2, 5/2)	(2/5, 1/2, 2/3)
Very strong more important	(5/2, 3, 7/2)	(2/7, 1/3, 2/5)
Absolutely more important	(7/2, 4, 9/2)	(2/9, 1/4, 2/7)

Table III demonstrates the final weights and ranks identified for each of the element and sub-elements using the steps illustrated in Chang's FEAHP methodology (1996).

Table III: Overall Fuzzy Analytical Hierarchy Process

Dimension	Weight	Element	Weight	Sub-element	Weight	Global Weight	Rank
Extrinsic Factors (A)	0.5	Environmental Factors (A1)	0.13	*Outsourcing Regulations (A11)*	*0.41*	*0.0270*	*7*
				Political Environment (A12)	0.10	0.0065	13
				Economic Environment (A13)	0.10	0.0065	13
				Competitive Environment (A14)	0.32	0.0209	8
				IT Infrastructure (A15)	0.06	0.0042	15
		Customer Centricity (A2)	0.45	*Share Vision (A21)*	*0.40*	*0.0900*	*1*
				Customer Focus (A22)	*0.38*	*0.0861*	*2*
				Data Quality (A23)	0.18	0.0414	6
				Cultural Proximity (A24)	0.00	0.0000	16
				Geographic Proximity (A25)	0.00	0.0000	16
				Co-innovation opportunity (A26)	0.03	0.0075	11
Intrinsic Factors (B)	0.5	Analytical Capability (B1)	0.43	*Analytical Skills (B11)*	*0.37*	*0.0788*	*3*
				Analytical Tools (B12)	*0.27*	*0.0580*	*4*
				Data Security controls (B13)	*0.20*	*0.0429*	*5*
				Delivery Experience (B14)	0.09	0.0190	9
				Innovation capability (B15)	0.00	0.0000	16
				Domain specialization (B16)	0.05	0.0098	10
				Vertical specialization (B17)	0.03	0.0065	12

A group of experts was asked to validate the findings of the FAHP analysis and identify the top enablers for analytics outsourcing. A list of seven was drawn from sixteen enablers, which were found to have the maximum impact on the performance of analytics service providers. These top 7 factors, as highlighted in Table III, were broaght forward for the next stage of analysis comprising of ISM**.**

*ISM Methodology***:** Fig. 3 illustrates the steps followed for the ISM methodology to identify the interactions among the top seven success factors from the Fuzzy AHP.

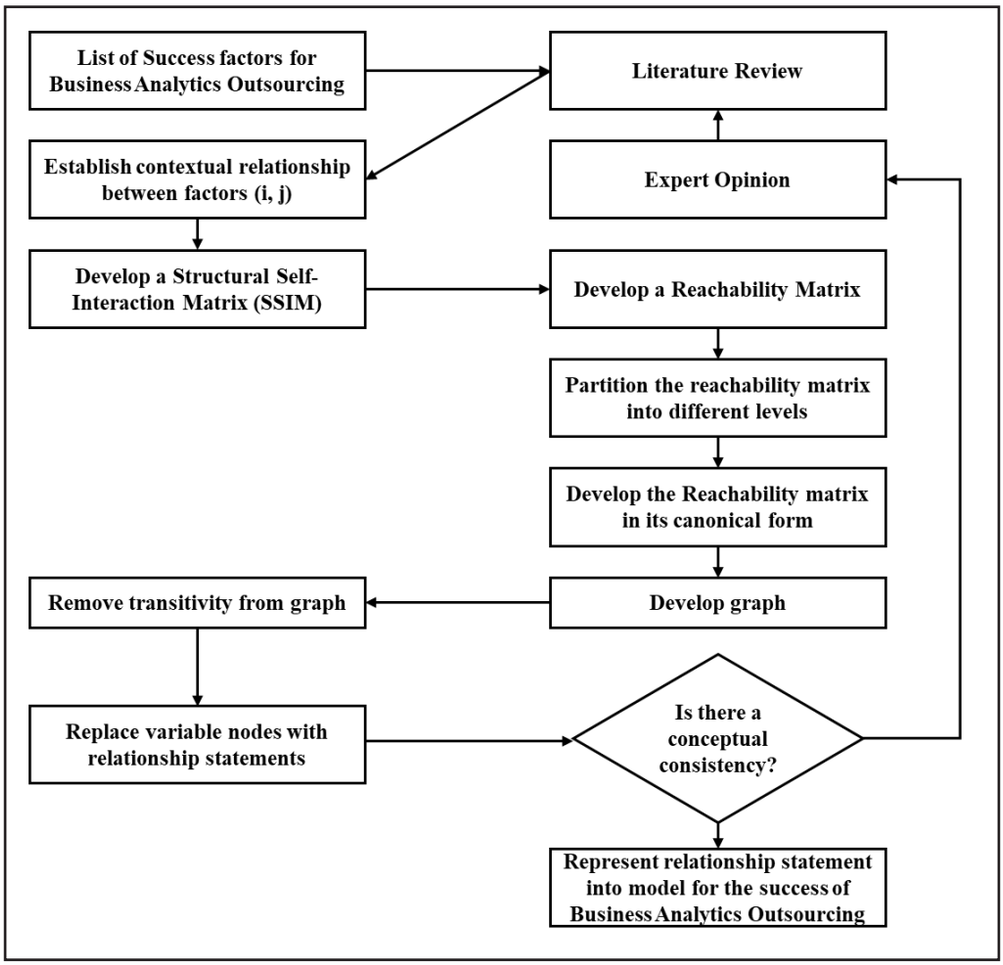

Fig. 3: Steps of ISM Modelling

ISM methodology starts from the creation of a Self-Interaction Matrix which depicts the causal relationship between these seven elements. A focused group comprising of experts from the analytics industry study the relationship between the elements and assign causal relationship between the elements. Senior executives and experts from the analytics industry were brought together for a focused group discussion, for identifying the contextual relationship between the success factors. To analyse the enablers a contextual relationship, the following four symbols were used to denote the direction of relationship between enablers (i and j):

- V: When factor i is helping achieve factor j;
- A: When factor j is helping achieve factor i;
- X: Factor i and j are helping achieve each other; and
- O: Factor i and j are completely unrelated.

The contextual relationship between the factors as identified by the analytics experts is shown in the Table IV.

Table IV: Structural Self-Interaction Matrix (SSIM)

#	BAO Success Factors	7	6	5	4	3	2	1
1	Outsourcing Regulation	V	V	V	V	V	V	
2	Shared Vision	V	V	X	V	X		
3	Customer Focus	V	V	X	V			
4	Data Quality	A	V	V				
5	Analytical Skills	V	X					
6	Analytical Tools	V						
7	Data security controls							

Next step in the ISM methodology is to convert SSIM into the binary reachability matrix. For this purpose, all V, A, and X in the SSIM are replaced is replaced by a digit 1 and O by 0 (zero). Below rules were followed to convert SSIM inputs in bnary inputs for the reachability matrix.

- 'V' in SSIM matrix is replaced as an (i, j) value of 1 and (j, i) value of 0.
- 'A' in SSIM matrix is replaced as an (i, j) value of 0 and (j, i) value of 1.
- 'X' in SSIM matrix is replaced as an (i, j) value of 1 and (j, i) value of 1.
- 'O' in SSIM matrix is replaced as an (i, j) value of 0 and (j, i) value of 0.

The final reachability matrix is obtained by incorporating the transitivity's as detailed in Step 4 of the ISM methodology. This is shown in Table V. The table also demonstrates the driving power and dependence of each of the factor. The driving power of an individual factor can be explained as the number of factors it can help to achieve, including itself. The dependence is the total number of factors which may help achieving it.

Table V: Final Reachability Matrix

#	Success Factors	1	2	3	4	5	6	7	Driving Power
1	Outsourcing Regulation	1	1	1	1	1	1	1	7
2	Shared Vision	0	1	1	1	1	1	1	6
3	Customer Focus	0	1	1	1	1	1	1	6
4	Data Quality	0	0	0	1	1	1	1	3
5	Analytical Skills	0	1	1	0	1	1	1	5
6	Analytical Tools	0	0	0	0	1	1	1	3
7	Data security controls	0	0	0	1	0	0	1	2
	Dependence	1	4	4	5	6	6	6	

The various levels of this analysis involve the factors reachability set, antecedent set and intersection set. The reachability set consists of the factor itself and the other factors, which it may help achieve. The antecedent set consists of the factor itself and other factors, which may help achieving it. Thereafter, intersection of these two sets is derived for all factors. At every step of iteration, the factors having the same reachability set and intersection set are eliminated. The factors eliminated first are the utmost importance of the success of a business analytics service provider, followed by the ones eliminated afterwards. Ths gives us the priority levels for the ISM model as illustrated in Fig. 4.

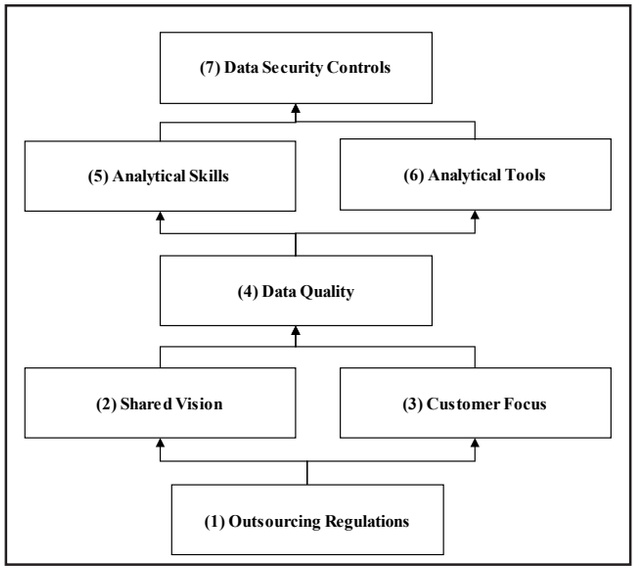

Fig. 4: ISM-Based Model for Success Factors of Analytics Outsourcing

MICMAC Analysis: The method was developed by Duperrin and Godet [8]. The driving power and dependencies identified as a result of Final Rachability Matrix in Table V are useful for this analysis by helping categories the factors into four clusters as shown in Fig. 5 below.

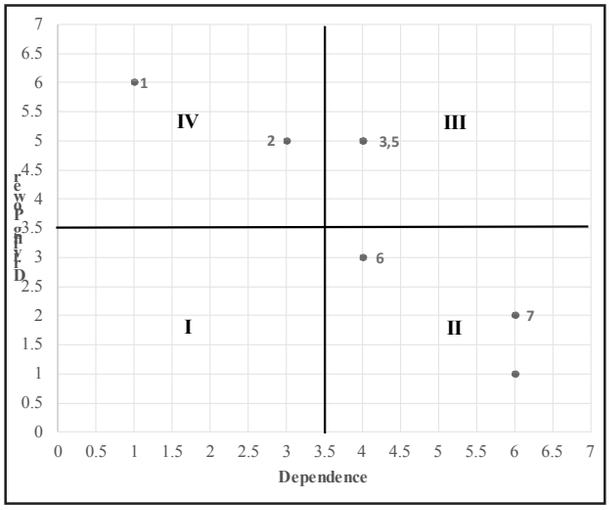

Fig. 5: Driving Power and Dependence Diagram from MICMAC Analysis

The four clusters as identified by the graphical representation can be explained as below:

- *Cluster I comprises of Autonomous Variables* which disconnected from the system. None of the factors have been identified as the Autonomous factors.
- *Cluster II comprises of Dependent Variables,* which, as the name suggests, are dependent on other factors such as Analytical Tools, Data Quality and Data Security.

- *Cluster III comprises of Linkage Variables*, which are unstable factors and any chnages to them can disrupt other factors in the evaluations. Eg. Analytical Skills, Shared Vision and Customer Focus.
- *Cluster IV comprises of Independent Variables***,** which are the most crucial factors with a very strong drive power. Eg. Outsourcing Regulations.

VI. Conclusion

The research uses a combination of Fuzzy AHP and ISM methods to identify and analyze the factors critical for a successful analytics engagement. As one would expect, Outsourcing Regulation is the most fundamental factor identified in this study, which goes on to illustrate the importance of adhering to regulations around business operations, data privacy and data security. This is followed by customer centric factors like shared vision with your clients, analytics organizations' flexibility to accommodate client requirements and the quality of data received from the client. Next in the relative importance are some of the factors internal to the analytics organizations - factors which demonstrate its analytical capability and prowess. These include its analytical skills and tools, which forms the core of a unit delivering insights from client data. It also includes its data security practices which ascertain the privacy of their client's data. Data privacy and security is getting its due attention in analytics organizations and at times it is the primary inhibitors for clients from outsourcing their data analysis to third party service providers.

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