Business analytics and business value: A comparative case study

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ABSTRACT

With growing adoption of business analytics, it is important for investing firms to understand how business value is created from investments. Studies in IT domain have highlighted how higher investment in technology may not bring more returns, rather how IT as an organizational capability acts as a key mediator in value creation. This research extends the model to business analytics, to identify elements of analytics technology assets and business analytics capability and to understand the mechanism of business value creation using multiple case studies. We capture how analytics resources contribute to business performance by developing operational and organizational performance measures.

1. Introduction

Although business analytics[1] (BA) appears to play a significant role in business, understanding about how BA investments create business value (BV) has been quite limited. For example, *when two organizations in the same domain invest in comparable analytics resources, the differential impact of the investment observed between the firms has not been clearly understood.* Achieving BV in today's challenging economy has driven many companies to focus on their core competencies by leveraging resources such as differentiated knowledge contained within their processes, technologies, and relationships. BV of IT has been a focused area of research in information systems because IT represents a sizable percentage of the budget spending for companies and is a valuable strategic asset [1]. Research on BV of IT examines the organizational performance impacts of IT. Several studies have shown that IT contributes positively to firm performance. Some studies have identified the determinants of business value, such as type of IT, management practices, and organizational structure (e.g., [2]). Information systems for BA has a distinct characteristic, and its implementation strategy and usage differ from those of previous IT systems used in business [3], and as such, BV of BA requires separate attention.

Some studies by market research agencies have documented returns that companies can earn from investments in analytics. For example, International Data Corporation reported that analytics projects for production function had a median ROI of 277%, financial management yielded a median ROI of 139%, and investment in analytic CRM provided a median ROI of 55% [4,5]. Following a large-scale survey of large- and medium-sized firms, Davenport and Harris [5] reported a statistical association between the use of analytics and business performance; the latter measured in terms of profit, shareholder return, and revenue growth. However, the mechanism by which analytics contributes to business performance is not reported in academic studies.

Although concepts such as analytics capability and analytics technology have been used in prior studies (e.g., [5]), it is not clear what are the elements of these concepts and how they contribute to business value. A recent study [6] has examined the value creation process in business intelligence and reported positive and significant linkages of BI capabilities with operational and strategic business value. However, how the nuances of value creation mechanism vary with the type of organizations and the analytics maturity of organizations is not understood well. This paper addresses the following research question:

How does business analytics contribute to business value of firms?

To answer this question, we need to understand the key factors that constitute the BA capability of a business organization. In addition, understanding the antecedents sheds light on the mechanism of BV creation, while BA is deployed. Further, the measures that are used in understanding the contribution of BA to organizational performance and how the BA capability influences the performance of various business functions need to be understood. This research extends the previous studies on IT BV to BA and builds a research model using case studies.

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[1] Business analytics (BA) refers to "the extensive use of data, statistical and quantitative analysis, explanatory and predictive models to drive fact-based management decisions and actions" [5 p.7]. Analytics could act as inputs for human decisions and could also drive fully automated decisions. BA applications can range from simple XL sheets to complex deep learning algorithms and data visualization, applying statistics, mathematics, and econometrics using wide range of techniques such as forecasting, simulation, and optimization to help business organizations make better decisions [57].

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The purpose of this research is to build theory to identify the antecedents and mechanism of creating BV using business analytics. This research contributes to the body of knowledge related to business analytics. In the backdrop of the growing adoption of business analytics, it is important for investing firms to understand how BV is created from the investments. For example, a similar research conducted in IT domain [7,8] has highlighted how higher investment in technology may not bring more returns, rather how IT as a capability, built by the organization, acts as a key mediator in the BV creation. Following a similar approach, we extend the model to business analytics, first to identify elements of underlying concepts such as analytics technology assets and BA capability using multiple case studies. We further capture how analytics resources contribute to business performance by developing suitable operational and organizational measures for performance. Analyzing the analytics BV approach of two organizations, we identify four organizational-level variables that capture the focus areas for practitioners.

2. Business value in business analytics and IS literature

From the 1990s, the term business intelligence (BI) came into use by the IT and business communities. In the late 2000s, BA was introduced to represent the key analytical component in BI [9]. Recently, big data and big data analytics have been used with reference to data sets and analytical applications that are large and complex [10]. According to Davenport [9], BA, in contrast with BI, focuses on developing new insights and understanding of business performance whereas BI traditionally focuses on using a consistent set of metrics to both measure past performance and guide business planning. This suggests a greater focus on statistically and mathematically derived insights in BA. If BI typically stopped at performance reporting, BA encompasses both the reporting of performance and the attempt to understand and predict it.

2.1. Business value studies in business analytics

Studies on BV of BA are scarce at this moment. Available studies have given a head start on BA capabilities. According to Wixom et al. [11], once BA capabilities are established, BV is maximized by using practices that drive speed to insight and by making BA usage pervasive across the enterprise. Along similar lines, the theoretical framework proposed by Gupta and George [12] evidences that Big Data Analytics capability leads to superior firm performance. However, for organizations to become analytically capable, interrelationships between the capabilities and discovery of a pathway to analytical capability have yet to be made [13]. Shanks and Bekmamedova [27,28] argued that dynamic and operational BA capabilities lead to BV and improved competitive advantage. The value creation process is different for various technologies. Therefore, it is necessary to understand the unique value creation mechanism for BA [6]. Outside the sphere of BA capabilities, a manufacturing domain study reported that accurate manufacturing data and advanced analytics could be valuable resources for creating BV [14].

BA performance metrics range from decision-making effectiveness [15] to a complex metric comprising financial perspective, customer/market perspective, process capabilities perspective, and learning and growth perspective [16]. Performance implications for an organization deploying marketing analytics were obtained from the unit's total sales growth, profit, and return on investment [17], whereas Chae et al. [14] used five performance-related measurements: order fulfillment, delivery as promised, delivery flexibility, flexibility to change product mix, and flexibility to change output volume. Regarding the research on BA, as Watson [19] puts it, "Analytics is not fully understood, there are many incorrect, imprecise, and incomplete understandings."

2.2. Business value studies in IT

Because BV of BA draws upon IT BV studies, we refer to the previous literature on BV of IT. Several studies have addressed the issue of IT investment and business performance by using concepts from organizational theory and business strategy, showing that IT BV is dependent on factors including the type of IT, management practices, organizational structure, and competitive and macro environment [2]. In the organization-centric pre-Internet era, the IT BV research was based on the perspectives of internal business processes, organizational structure, and workplace practices [8,20,21]. In the network era, IT is found to be valuable; the extent and dimensions are related to internal and external factors, including complementary organizational resources of the firm and its trading partners, and the competitive and macro environment [2]. Complementary organizational resources include organizational structure, policies and rules, workplace practices, and culture.

Researchers have used many theoretical frameworks to analyze the value of IS for organizations including theories in microeconomics, industrial organization, socio-political, organizational behavior, and business strategy realms [22]. Many others have used the resource-based view (RBV) of a firm as a conceptual framework [2,23,24] to study the effect of IT investments on firm performance. The RBV of a firm has been considered as the primary theory base because it combines the rationale of economics with a management perspective [2]. By using this framework, previous research on IT BV was also focused on obtaining sustained competitive advantage, linking firm strategy and performance by creating IT capability [7,23].

By using RBV, Mata et al. [21] showed that among the four attributes of IT, namely capital requirements, proprietary technology, technical IT skills, and managerial IT skills, managerial IT skills is the only attribute that can provide sustained competitive advantage. The RBV on IT value conceptualizes IS assets as resources and identifies the strategic purpose of IS resources for the firm [25]. Following the RBV framework, some previous studies have also shown that IT investments have a positive relationship with firm performance, measured in terms of financial ratios such as return on assets and return on sales (e.g., [8]). The study by Bharadwaj [8] concluded that firms should be doing much more than merely investing in IT, creating a firm-wide IT capability. However, creating IT capability is complex and requires time and effort, and the underlying mechanisms through which it is created are not clear [8]. Kohli and Grover [26] suggested that by under-researching the intangible value, IT value has been correspondingly under-represented, stressing the importance to recognize the intangible aspects of economic value of IT. Despite that IT BV is one of the widely researched topics, gaps remain in terms of the ambiguity and fuzziness of IT BV construct, disaggregation of IT investments, and the value creation process [22]. Aral and Weill [7] observed substantial variation across firms in the return on investment in IT and suggested that a set of organizational characteristics that are simultaneously associated with both IT investments and organizational performance could explain the variation. This study has further conceptualized IT resources as a combination of investment allocations in certain set of IT assets and a system of competencies and practices, which together form the IT capability of a firm [7].

Although a review of the IT BV studies is a good starting point to understand the BV of BA, BV has also been shown to be distinct from IT in terms of resource characteristics and managerial challenges in implementation and assimilation. Notwithstanding the business performance benefits of ERP and other enterprise IT systems evidenced extensively in prior research, generalizing the same frameworks and findings to BA would not be appropriate. First, ERP and enterprise IT systems bring BV primarily through process standardization and integration. On the contrary, BA systems are evolutionary, are enterprise-wide, and depend on entrepreneurial managerial actions [27,28]. BA focuses on the exploration of data instead of deployment of technology as in the case of IT systems. Second, unlike conventional IT projects with defined tasks, plans, and outcomes, BA projects get initiated from questions to which data may provide answers by developing hypotheses and performing experiments to gain insights and understanding. Third,

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IT systems focus on goals such as improving efficiency, reducing costs, and gaining productivity, whereas BA systems focus on changing the way businesses think and use data for operational and strategic decisions, challenging the assumptions and biases managers bring to decision-making and seeking new insights to serve stakeholders [3]. While the IT and BA systems and projects differ so much in the way they are deployed and used and benefits harvested, it is becoming increasingly clear that measures of BV of IT and BA depend on what is meant by them [2], and any BV research should theorize about the specific technology under investigation including their capabilities and context [29].

While the framework for IT BV developed by various researchers was examined for its suitability for BA, the IT BV performance measures have also been studied for consideration for BV of BA. IS researchers have devised intermediate measures most often for the evaluation of specific technologies (such as POS, JIT, and EDI) or process-level measures, which were limited by suitable objective or financial data. Researchers studying the impact of IT in a product manufacturing setup investigated inventory turnover, capacity utilization, relative quality, relative price, and rate of new product introduction, while those studying in a healthcare setting used patient satisfaction and mortality rates. While the process-level measures from a medical setting cannot be easily transferred to an automotive or general services setting, in firm-level studies, across the board, researchers do not limit the use of productivity, ROA, sales, or other financial measures [30]. Hence, the operational- and organizational-level performance measures have to be evaluated in the context of the specific technology and industry where the technology is deployed.

2.3. Business performance in business value studies

There are differences in the use of performance metrics by various researchers, some have used measures pertaining to business performance limited to operational-level performance impact of IT, whereas others have used organizational-level measures such as Tobin's q, profit, revenues, and financial ratios [2]. The empirical results on IT value depend heavily on what question is being addressed and what kinds of data are being used [31]. Multiple paradigms of IS BV-based measurement approach combination provide a summary of IS BV definitions [32]. Martinsons et al. [33] suggest cost control, revenue generation, strategic alignment, and return on investment as measures for the BV dimension pertaining to IS balance scorecard for organizational performance. Melville et al. [2] define IT BV as the organizational performance impacts of IT at both the intermediate process level and the organization-wide level. This study reviews previous works on BV of IT and summarizes measures of performance as productivity enhancement, profitability improvement, cost reduction, competitive advantage, and inventory reduction. The IS BV has also been characterized as the impact of investments in particular IS assets on the multidimensional performance and capabilities of economic entities at various levels [22].

From the above review, it is evident that most of the BV of IT studies refer to 'Organizational' or "Firm" performance and also use the two terms interchangeably. Different fields of study use different measures of organizational performance because of the differences in their research question [34]. "Business performance" is at the heart of strategic management research. Financial performance, centered around outcome-based financial indicators, achieving the economic goals of the firm is the narrowest definition of business performance. A broader definition of business performance would be on the basis of non-financial indicators of operational performance in addition to the financial performance. This definition of business performance would include measures of technological efficiency within the domain of business performance [35].

Having reviewed the treatment of performance in the IT literature, we now explore the conversion process, wherein the value obtained by

deploying IT systems is converted into a business value. Conversion is the ability of the firm to convert their IT investments into productive outputs. Effective conversion happens because of the quality of management and its commitment to IT, which moderates the relationship between IT investment and firm performance. Some firms have better conversion effectiveness and obtain more performance benefits from their IT investments [36]. Weill [36] found that there are four factors, namely the top management commitment to IT, previous experience with IT, user satisfaction, and internal political stability, that together determine the effectiveness of conversion. The value conversion process is characterized by senior (business) executive involvement, collaborative relationships and shared learning, and integrated business-IT decision-making and business-IT competence [37]. According to Kohli and Grover [26], IT investment [IT] creates Capabilities Required [CR] that in turn creates BV, represented by (IT − > CR − > BV). They also proposed that the firms should first uncover the CR and then identify what it takes to build them.

Our study extends the previous studies on IT BV to BA. Though BA has a substantial Information Systems focus, information systems for BA has a distinct characteristic, and its implementation strategy and usage differ from previous IT systems used in business [3]. While analyzing the current state of research specifically in business intelligence and analytics (BI&A), a recent bibliometric study of academic and industry publications revealed a total of 3602 publications during the 12 year period of 2000–2011, with the largest source being academic conferences [10]. The focus of the BI&A research has been primarily technical with some flavor of specific domains such as supply chain so far with very few publications in the adoption, business process management, strategy, and BV research areas. The RBV and dynamic capabilities theories have been used as the basis to establish some of the BV models.

On the basis of the above literature review, we present a framework in the following section that captures the state of knowledge relating to BV of BA.

3. Theoretical framework

This section provides the theoretical framework to address our research question. On the basis of the RBV of the firm [23] and the review of IT and organizational capabilities literature in IT BV studies (e.g., [7,8]), an a priori framework is developed to serve as the basis for understanding and analyzing the factors behind the BV created by BA in an organization. We subsequently refine our theoretical understanding of the initial framework shown below to obtain the final model using empirical evidence from the analysis of case study data.

While linking IT assets, organizational capabilities, and firm performance, Aral and Weill [7] empirically distinguished assets, defined as investments in different types of IT, from capabilities, defined as practices and competencies that support the use of IT. Firms develop and deploy heterogeneous IT resources, a combination of IT assets and capabilities, on the basis of investment allocations and organizational differences, which explain variation in firm performance between organizations investing in similar assets. In BV studies pertaining to IT investments, IT assets relate to infrastructure, transactional, informational, or strategic categories [7]. However, in the case of BA, we posit that BA technological infrastructure, data sources, and analytics software tools [38] would be the key physical assets. Similarly, organizational competencies and processes pertaining to IT have been used as complementary concepts in defining IT capability [7]. Davenport et al. [39] mention about stage 5 analytical competitors who strive to be the first to market with analytical capabilities. They found analytical opportunities by conducting a systematic inventory of key business processes and finding processes that could benefit from embedding more and better analytics. Following this approach, we posit that quantitative skills, expertise in scientific problem-solving
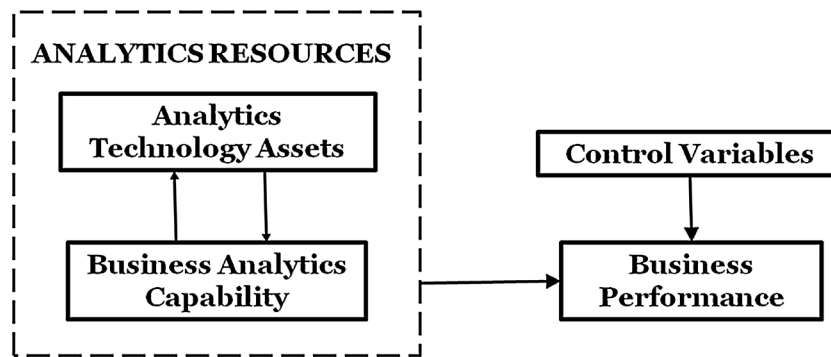
Fig. 1. Theoretical Framework for Business Value of Business Analytics.

approach, business process orientation, and IT skills would be the important constituents of analytics capability [27,28,40]. According to Van-Hau Trieu [41], BI impacts are an uncertain outcome of a conversion process, in which BI assets play a vital role in the firm performance. BI assets form part of the BI resources and consist of BI technology, human resources, and application portfolios. In terms of variables measuring BV, a recent work on BI concluded that BI generated BV, both tangible, an improvement in organizational performance and intangible, a perceived improvement in structural and cultural aspects [6]. On the basis of the review of the performance measures adopted by various IT BV studies, we have considered "Business Performance" to be the dependent variable for our research because it encompasses both the financial performance and operational performance, leaving the domain of organizational effectiveness for future research because BA is in its early stages of maturity [35]. The theoretical framework also includes control variables, which may impact the relationship between analytics resources and business performance. The theoretical framework depicted in Fig. 1 is proposed for further validation.

4. Research methodology

For theory building, we used qualitative case study approach in our research. We used multiple site, multiple case study approach with replication, following Yin [42]42 p.57. Multiple case studies can be a starting point for theory development, and a cross-case analysis provides a good basis for analytical generalization [43]. We purposefully selected two diverse organizations from a population of organizations deploying analytics, representing two sites with extreme situations or polar types, which are likely to replicate or extend the emergent theory [43]. Case study methodology is used to examine a phenomenon in its natural setting by multiple data collection methods to collect information from people, groups, or organizations. Most of the times, the boundaries of the phenomenon are not clearly evident at the start of the research. Case studies offer in-depth understanding of contemporary phenomenon within their organizational context [42]. In addition, case research strategy is well suited to understand the nature and complexity of the phenomenon. It is also an appropriate methodology where studies are scarce, providing an opportunity to gain further valuable insights [44]. BV studies in BA are scarce at this moment, and the mechanism by which analytics contributes to business performance is also not clear. Hence, we chose the case study approach for our research.

For theory building research, though it is preferred to start with an ideal clean theoretical slate of "no theory under consideration" and "no hypothesis to test" [43 p.536], we chose to formulate the research problem with some potentially important variables from extant literature. The approach of starting with an a priori research framework for theory building is based on the "retroduction" strategy, which describes the interplay of deductive and inductive research, referred to as "reality

check.[2,3]" Selection of the case study organizations was done according to the criteria of "best" environment for exhibiting the phenomenon under study, best from the point of view of ease of access and management support [45]. To achieve the analytical generalization [42] of our model, we used a multiple site, multiple case studies approach. The replication logic used in multiple case studies is analogous to that used in multiple experiments, in which each case is considered a new experiment [46]. Our approach did not force the informants into pre-specified constructs, rather it gave us a way to listen and encapsulate the information provided by informants. It allowed for the important dimensions to emerge from the analyses of the interview data and other sources of information collected. Dibbern et al. [46] adopted a similar approach and used an a priori theoretical framework as the basis for analyzing the extra costs in offshoring software projects to Indian vendors. The unit of analysis for the case study was chosen to be the "analytics organizations," which are the analytics teams or analytics departments catering to specific business domains of the case sites.

At both the sites, we were provided with access to the analytics team leaders, who were managers or senior managers, and senior executives of the analytics organization, IT organization and the business units, or customer organization. Data were collected by conducting interviews, and relevant documents were also made available depending on request. At the first case study site, we conducted nine interviews with key informants and informants over a period of 3 months in 2014, and at the second case study site, we conducted nine interviews with the key informant and informants over a period of 5 weeks in 2015. During the preliminary interview with the key informants, informants were identified for further interviews. The key informants and informants were selected according to the criteria that they all had over 10 years of experience including analytics domain experience and had sufficient knowledge to provide information on behalf of the organization they represented. Most of these interviews lasted about an hour, some of them lasted up to 2 h. A semi-structured questionnaire based on the theoretical framework was used as the interview protocol, and the questionnaire was revised after the first interview with the key informant.

The interviews were semi structured, a guided conversation to elicit

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[2] Ideally, any theory building attempts from case studies should be unbiased by a priori theoretical perspectives or propositions. However, in our study we thought to combine the merits of a theory testing with a theory building approach in the same spirit in which it is proposed as useful to combine positivist with interpretive approaches when studying organizational phenomena. This dual approach is consistent with the multiple case study analysis procedure. In either approach [inductive or deductive], the initial version [causal network or theory] is amended and refined as it is tested against empirical events and characteristics [46].

[3] The inductive and deductive methods are intimately related in the activities of doing empirical research and theory building [45]. Koh et al. [58], while studying IT outsourcing success, started off with a similar deductive approach and used a theoretical lens of psychological contracting because no model existed that captured all possible factors affecting IT outsourcing success.

reflective thoughts from the interviewee. The interviews started off with setting the context about the academic research, spelling out motivation and objectives, and assuring confidentiality of information shared. All the informants were informed about recording of the interview, and acceptance was obtained. The interviews followed case study protocol. At the same time, friendly and non-threatening open-ended questions (why and how) were also put forth to understand the organizational context better. The interview was aimed at understanding the evolution of analytics in the organization, the factors contributing to analytics capability, and the mechanism of BV creation. The semi-structured questionnaire comprised of 20 questions covering three areas (Appendix A). Most of the informants were posed Level 1, Level 2, and Level 3 questions during the course of the conversation, and the executive informants (CIOs) were posed Level 4 and Level 5 questions too for understanding the full case study and cross-case perspective.

All the interviews were conducted over phone at the first case study site and were recorded with the informant's permission, and the audio was manually transcribed to text form. At the second case study site, the interviews were a combination of in-person, over Telepresence, over Skype, and over phone. Again, all these interviews were recorded with the informant's permission, and the audio was manually transcribed to text form. We also made extensive notes during all these interviews for reference during data analyses. For the second case study site, the questionnaire was validated by the key informant before the interviews were conducted. Appendix A shows the final questionnaire that was used during the semi-structured interviews along with the considerations that were discussed at the start of the conversation.

In line with the requirements of multiple case studies, the informants represented various analytics departments at the case study sites. Appendix B shows the details of the case study informants, their departments, roles, and experience.

4.1. Data analyses procedure

During the data analyses, the transcribed text across all cases was reviewed case wise to identify the passages and was captured under common items (codings). When we did the encoding of the case study data from the first site, we did not use an a priori list of items, and hence we followed an inductive approach to generate items (codings) from the data (passages), thereby allowing the items to emerge from the case studies. This was applicable for all the case studies from both the case sites, which were analyzed individually. When we analyzed the case studies from the second site, we considered the items generated during the analysis of the case studies from the first site, for re-using the items. These items were then grouped into concepts depending on their relevance to the BA domain and included under the dimensions of the refined model.

The approach to data analyses was two-fold. Although we coded and structured the case studies by using the software Nvivo, we performed them manually also. To establish definitional clarity and reliability of data analyses and also mitigate potential biases [46], another researcher, not related to the project, who had not taken part in the interviews, read and coded the case study interview transcripts independently. Comparison of the two sets of coding was performed for all the case studies across both the sites, mismatched instances were examined, and the final coding was mutually agreed upon between the two coders. In addition, to increase the validity of our data analyses, we examined multiple sources of evidence from different informants in the form of documents and citations.

Eisenhardt [43] recommends "within-case analysis" for preliminary theory generation and "cross-case analysis" for enabling researchers to look beyond the initial impressions and examine evidence using multiple lenses. Following this principle, the case studies from each site were analyzed individually and further followed up with cross-case analysis at site (organization) level. The unit of analysis for the

individual case studies in each site was the analytics organization or the analytics department, and the unit of analysis for the cross-case analysis was the organization [47 p.21]. Approach to cross-case analysis can be case oriented or variable oriented. Miles and Huberman [48] suggested a strategy that combines the two approaches, and we followed it in this research. This was because when we have multiple case studies, just adding up the variables will result in smoothing down the set of generalizations that may not apply to any specific case. Hence, each case study was understood in its own setting and as part of the cross-case analysis, patterns were searched across the cases and similarities and differences were discovered according to the concepts of the proposed research model.

5. Case study

As outlined in the methodology, for the case study, two diverse organizations, CompuCorp and AgriCorp, were selected purposefully from a population of organizations deploying analytics. While CompuCorp is far ahead in terms of deploying analytics and becoming a completely data-driven decision-making organization, AgriCorp is a late entrant into the integrated enterprise systems implementation and deployment of business intelligence and analytics (BI&A), trying to leapfrog a 20-year backlog with an aggressive 5-year plan, learning from the experience of peers. Furthermore, since CompuCorp already had a functional analytics deployment for several years when the study was conducted, it was in a position to provide insights on how BA generates BV. In the case of AgriCorp, which had deployed BI for some years and was in the process of deploying analytics when the study was conducted, it was able to provide insights on generating BV from business analytics.

5.1. Case study site 1 – CompuCorp

CompuCorp is a technology company headquartered in the USA and has shared services center in India. The shared services center hosts a captive analytics division supporting multiple business domains with dedicated analytics teams working collaboratively with the business functions. The organization has been code named "CompuCorp" and its captive analytics division, "CompuCorp Analytics" (CCA).

The analytics division was established 10 years ago primarily to address the reporting needs of the organization. When it was set up, there was no clear strategic direction for analytics. It was established in India mainly because of the availability of talent pool and emulating some of the peer organizations, which had set up analytics division in India and were functioning well. The analytics division functional heads report to the head of analytics division either directly or through a layer of senior management. The Head of analytics division reports to the Vice President, Sales and Operations, Business Intelligence Centre of Excellence.

In the initial years, the business functions were not clear about the contribution of analytics division. There were questions such as "Are they building only models and acting as consultants or are they part of the extended team?" From the point of view of senior management, the analytics division was a strategic partner. From the point of view of operational teams, there were problems for the analytics division as a whole. However, over the years, business has started recognizing that analytics division is part of the extended team. Over the last 10 years, the analytics division has transformed itself completely in contributions made to the business, from a reporting arm to a completely decision sciences-based analytics division, leading to strategic business decisions. The analytics division has teams or departments (a.k.a. "Analytics Organizations") catering to analytics needs of all key business functions of CompuCorp, namely pricing and product, sales and marketing, contact center, service, online, supply chain and operations, and CompuCorp Financial Services (CFS). CCA is a centralized analytics entity having a global view of the entire organization, catering to most

of the analytics needs of the technology company working closely with its global business functions. The analytics division caters to the global business functions in three geographies: Americas, Europe Middle East Africa (EMEA), and Asia Pacific Japan (APJ). The analytics division has its own employees and partners to provide resources for analytics needs. While the business divisions are free to outsource their analytics services requirements to recognized vendors, the captive analytics division is well patronized by the business divisions in terms of funding. Funding for the analytics division is by individual business functional teams (in the form of head counts or human resources) and operates at global level. Central funding also exists for the analytics division. For investments in software and hardware, CompuCorp's IT division provides funds.

At CompuCorp, the reason for setting up CCA was to nurture data-driven work culture. CCA helps CompuCorp's needed insights across their business domains, so that CompuCorp's business domains can take decisions on the basis of data. CCA understands the performance improvement required at organizational level and builds models to help individual business domains achieve their performance level, together.

CompuCorp uses analytics in all the business processes across its business functions – pricing and product, sales and marketing, contact center, services, online, supply chain and operations, and CFS. CompuCorp, being an organization that places strong emphasis on customer engagement, provides priority and focused attention to deploying analytics for the customer facing processes. This includes roping in the business partners also in the analytics deployment. CCA has seen that by doing so, the visibility of the value of analytics is quite high both inside and outside the organization. Some examples where CompuCorp's businesses use analytics for critical decision-making are (a) Marketing and sales domain, analytics is deployed to target customers to up-sell, cross-sell, and target-sell. The CompuCorp has got statistical models in place, which they refresh every quarter – score the statistical models, and depending on the output, they generate marketing campaign lists; (b) Contact center process, CompuCorp needs a set of controls, data points, analysis, and predictions, which support execution. For example, for every single change plan created by the technical support process, it gets support from analytics. The kind of value CCA has brought – business process expertise, cross functional knowledge, and multi-industry knowledge – provides value to the business. Businesses reach out to CCA to get analytic solutions to their problems.

5.2. Case study site 2 – AgriCorp

AgriCorp is a South-East Asia-based leading agri-business organization operating from seed to shelf in 65 countries, supplying food and industrial raw materials to over 13,800 customers worldwide. With 23,000 employees, it has built a leadership position in many businesses including cocoa, coffee, cashew, rice, and cotton. AgriCorp has 44 different products across 16 platforms. The organization has been code named "AgriCorp" in our study.

Until 2010, AgriCorp predominantly had legacy-based systems because the business model was focused on only one type of business, i.e., global trading business with supply chain as the core. Thereafter in 2009, it went into a more vertically integrated value chain business, moving into upstream, i.e., farming; midstream, i.e., manufacturing; and downstream, i.e., distribution. As part of the business strategy, AgriCorp IT decided that they also need to be more value chain based, systems have to be brought on board, and more robust and modern IT systems have to be built, according to transformational IT strategy.

AgriCorp has a global CIO and CTO, with four vertical heads reporting into the role. The vertical heads are separately responsible for SAP; BI&A; Infrastructure & Security; and Commercial, Trade & Risk Management (CTRM) system. The CTO has appointed regional CIOs, one in the US, one in Australia, and two in Africa.

Under BI&A vertical head, there are three divisional heads, one is

for Business Planning & Consolidation (BPC), one for BI&A, and the third for Process Integration (PI), the middleware used for integrating the legacy with SAP. Under BI, there is a structure with one manager for Business Objects (BO) and one for Business Warehouse (BW). The BI&A team has 20 members and is supported by partners for any project-based resource augmentation.

AgriCorp IT has implemented SAP in 22 countries. Roll out of SAP remains as in 2015 in remaining countries. By the end of 2016, about 85–90% of the countries are expected to be covered by SAP. At this point of time, all the major countries are using either SAP or iAgriCorp, and the input for BI comes from 44 countries, which covers 70% of the business. iAgriCorp is a home-grown ERP system, predominantly a financial package, performing the activities of an ERP system.

From a BI&A perspective, over the next 2 years, AgriCorp IT is expected to cover most of the business units (BUs), which are implementing SAP now. At this point of time, by using BI, AgriCorp is trying to cater to the reporting needs of the organization. According to AgriCorp, today there are areas that are being managed more by people's experience and not backed by data. As an example, most of the buying or selling decisions are based on information that is already present in somebody's head rather than factual data. Data capture by their internal systems is also quite limited. They would like to move to an era of data-driven decision-making by deploying analytics across their businesses. Being in commodity industry, AgriCorp faces market risk, credit risk, counterparty risk, and currency risk. To have this information on a real-time basis, they need to have the combined information of the host country and destination country, to run their business. AgriCorp believes that analytics forms the basis for business when it completes the execution of its entire IT strategy.

For AgriCorp, every business, platform, and country it operates in is different from the other. Therefore, it has started deploying analytics for its support business processes (Finance, Human Resources, and Risk Office, to mention a few), with a target of 2 years across 20 countries, and plans to expand to the entire organization covering all businesses, platforms, and countries. Grains has been one of the most advanced BUs as far as usage of BI&A is concerned. The second most advanced was Edible nuts. To an extent, some works have been conducted for Coffee and Cocoa, covered not very extensively. The third BU that AgriCorp was focusing was Cotton and Palm & Rubber. From a need point of view, it was Grains that came first. Moreover, they had growth strategy that was based on setting up many similar manufacturing facilities across different countries. Therefore, it was important to have analytics across these manufacturing facilities to analyze and compare how each of them was performing vis-a-vis the other. Then, the growth area for AgriCorp was palm, rubber, and cocoa – lot of investment was made into these areas. Edible nuts unit was also one of their most profitable BUs. Cotton was added in because of their team interest to do analysis, which they felt they could not do currently. This is how BUs came in and AgriCorp IT started working with them. It was a conscious decision to focus on the high growth, profitable businesses to deploy BI&A.

5.3. Data analyses

For the Case Site 1, the transcripts from the nine case study interviews were collated into a case protocol comprising 30,789 words and 70 pages of text. The case studies were coded and structured by us using the software Nvivo 10. This process resulted in a table of 79 items (codings) and 762 passages with each case study analyzed separately, reusing the coding and creating new ones where required. For the Case Site 2, the transcripts from the nine case study interviews were collated into a case protocol comprising 45,963 words and 76 pages of text. When we did the encoding, we did as if we had no a priori list of concepts, and hence, we did more of an inductive approach to generate items (codings) from the data. For the sake of simplicity, we re-used appropriate items from the Case Site 1 analyses. The case studies were encoded and structured by us using the software Nvivo 11 Pro. This

Table 1
Dimensions, Concepts, and Items (Codings) from Data Analyses.

Dimensions	Concepts	Definition of Concepts	Items	Case Site 1	Case Site 2
Analytics Technology Assets	1. Analytics Tools & Techniques #	This refers to analytics tools, software, and techniques.	Analytics Tools & Techniques	✓	✓
			Lack of commodity trading domain knowledge in partners & inability to move into predictive analytics		✓
	2. Enabling Technology *	This refers to IT and ERP infrastructure, Software, BI infrastructure, Processes such as ETL, Data Sources & Data, and Reporting and Visualization systems. This also includes other supporting technologies that feed into IT systems.	Data & Other Issues from Remote Geographies		✓
			Data Flow for Decision-Making		✓
			ERP Roadmap		✓
			Exploiting Digital Technologies	✓	✓
			Leveraging Data and IT Infrastructure	✓	✓
			Managing Technology through IT	✓	✓
Analytics Capability	3. Analytics Adoption @	This refers to Organization's prioritization of analytics usage in business domains. Typically they begin with efficiency goals, followed by growth objectives, and finally move on to address complex business challenges. As this happens, adoption both spreads and deepens.	Analytics Usage-Adoption	✓	✓
			Data Sensitivity Impacting Analytics Adoption		✓
			Gradual Shift (as a strategy) to Analytics based decision-making		✓
			Impediments for widespread use-adoption of Analytics		✓
			Numbers Doesn't Matter for BI Analytics Adoption		✓
			Organization Culture impacting Analytics Adoption		✓
	4. Analytics Alignment with Business	This refers to the Analytics team and Business team performing the goal setting together. They plan together and agree on the goals and deliverables.	Alignment to Business Goals	✓	✓
			Business Goals (Business & Analytics plan together & agree on goals)	✓	✓
			Business Participation		
			HOSHIN Plan – Analytics & Business Plan together	✓	✓
			Integrating Business & Analytics	✓	✓
			Interest-Pull-Engagement From Business for Analytics		✓
			Stakeholder Alignment		✓
	5. Analytics Culture #	This refers to organizational norms, values, and behavioral patterns resulting in systematic ways of creating, gathering, consolidating, analyzing the data and making them available for the right audience. Includes the extent of using that data to make business decisions and management's support for analytics. This also includes receptivity to learn and disseminate knowledge, inclination to change, and improve the ways of working and making decisions driven by data.	Analyst Alignment	✓	✓
			Analyst Attrition (as Opportunity)	✓	✓
			Analyst Career-Lifecycle Management	✓	✓
			Analytics Culture	✓	✓
			Culture as highest level of Competitive Advantage	✓	
			Driving Business Functions	✓	✓
			Open Culture within Analyst Community	✓	✓
			Organization Culture Assets – Perseverance & Freedom to Learn	✓	✓
	6. Analytics Organizational Structure	Refers to the organizational structure of the analytics team and its positioning with regard to the business divisions or domains to achieve maximum value from the analytics – business collaboration.	Analytics Team Structure	✓	✓
	7. Analytics Skills & People Management #	This encompasses analytics skill set, analytics skill portfolio management, and making work meaningful for analysts. It includes all that makes the analytics human resources stick to the organization and stay ahead contributing to the business in the continued analytics journey of the organization.	Analytics Skill Set (IT, Quantitative, and Scientific Problem Solving)	✓	✓
			Business Domain Knowledge – Business Acumen	✓	✓
			Business Exposure to Analysts	✓	✓
			Embedded On-the-job Training	✓	✓
			End-to-End Business Process Orientation	✓	✓
			Flexible Assignments (to analysts)	✓	✓
			Great Learning, Cross Training Opportunity (for analysts)	✓	✓
			Making work meaningful (for analysts)	✓	✓
			Need for Professional Training (To avoid Trial & Error)		✓
			Opportunities for Work-Life Balance	✓	
			Project Competitions – Awards & Rewards (Individual & Team)	✓	
			Quality of Work – Successful Retention of Analytics Team		✓
			Skill Portfolio Management	✓	✓
	8. Evidence-based decision-making embedded in "DNA" of organization *	This refers to the extent to which evidence-based decision-making is embedded into the values and processes of the organization.	Business Value-based decisions – DNA of Organization		✓
			Data Driven To supplement Latent knowledge driven decision-making	✓	✓
			Data-Driven Work Culture		

7

Table 1 (*continued*)

Dimensions	Concepts	Definition of Concepts	Items	Case Site 1	Case Site 2
Analytics Capability Enhancers	9. Analytics Ecosystem	Refers to leveraging collaborative vendor environment to achieve Organization's analytics goals. In addition, it refers to the Organization's ability to collaborate with academia and other players in the industry, its ability to capture and manage the knowledge assets, artifacts, and processes related to analytics and effectively utilize them, ability to share analytics knowledge internally and externally freely.	Analytics Projects Delivery & Deployment		✓
			Industry & Academia Collaboration	✓	✓
			Knowledge Management	✓	✓
			Level of Expertise in Analytics (Evolved)	✓	✓
			Participation in Analytics Forums (External and Internal)	✓	✓
			Tie-ups with Vendors for Sourcing	✓	✓
	10. Analytics Leadership *	This refers to the extent to which people in leadership position at the analytics organization take initiatives or projects to bring value to the business and steer the entire Organization to use analytics for improved performance.	Leadership – Direct Communication, Goal Sharing	✓	✓
			Leadership Commitment	✓	✓
	11. Enterprise Analytics Strategy	This is a subset of the overall IT strategy, operationalized as part of the enterprise architecture. This view of strategy is based on the level of standardization and integration of organizational business processes and data, and influences business analytics technology and analytics organizational structure.	Analytics as Strategy Formulator (than value deliverer)	✓	✓
			Analytics Framework	✓	✓
			Analytics Maturity (Model)	✓	✓
			Analytics Setup	✓	✓
			BI-Analytics Roadmap & Strategy & Milestones		✓
			Business Acquisitions Changing Data Landscape		✓
			Business Model – Analytics Adoption Fit		✓
			ERP-BI-Analytics Progression and Dependencies	✓	✓
			Emulate Peer Analytics Setup		✓
			Organization Mandate for Analytics Culture	✓	✓
			Organization Structure – Business Model driving BI-Analytics Strategy	✓	✓
			Transformational IT Strategy including Analytics Pillar		✓
			Unique Approach to Business Problems – Change the Business		✓
	12. Enterprise-wide Analytics Orientation *	This refers to the extent to which the Organization has adopted enterprise-wide use of analytics starting from how people are oriented and motivated toward using analytics for business decision-making supported by the availability of the appropriate BI platform and processes to provide a holistic view of the organizational business processes.	Acceptability of Analytics Team	✓	✓
			Analytics Adoption to sense changing customer needs	✓	✓
			Analytics Budget	✓	✓
			Analytics Centre of Excellence (CoE)		✓
			Business Priority	✓	✓
			Clarity between BI and Analytics		✓
			Commoditize Analytics	✓	✓
			Funding by Business	✓	✓
	13. Overcoming Organizational Inertia (OOI) *	This refers to the extent to which the members of the Organization are ready to accept, learn, and use analytics for business decision-making. This includes the change management aspects enabling the people to move out of their current comfortable position into a data-driven decision-making environment.	Biggest Challenge for deploying Analytics – xl and IT Team		✓
			Partnering (Collaboration) With Business for Day to Day Work	✓	✓
			Relationship with Business Partners (Crawl-Walk-Run)	✓	✓
			Soft Factors & Change Management influencing Analytics Adoption (or) Value	✓	✓
			"Telling & Selling" the Value of BI & Analytics		✓

Table 1 (continued)

Dimensions	Concepts	Definition of Concepts	Items	Case Site 1	Case Site 2
Business Performance	14. Organizational Benefits from Analytics Use *	This refers to all the intangible benefits that an Organization derives by leveraging enterprise-wide business analytics use.	Analytics Driving Critical Initiatives	✓	✓
			Analytics Support for Portfolio Level Analysis	✓	✓
			Analytics Support for Project Delivery	✓	✓
			Analytics Support for Sales Force Performance	✓	✓
			BI-Analytics Support for Better Decision-Making		✓
			Benefits Measured in Terms of Metrics	✓	✓
			Business Process Improvement – Define, Measure, Analyze, Improve & Control (DMAIC)	✓	✓
			Business Value of Analytics	✓	✓
			Contribution of Analytics Team	✓	✓
			Customer Focused Support	✓	✓
			Fulfilling Business Needs	✓	✓
			Innovation and Patents	✓	✓
			Management Decision Quality	✓	✓
			Provide Insights	✓	✓
			Qualitative Benefits from BI&A Implementation		✓
			Risk Management driven by Analytics		✓
			SLA Metrics – Timeliness & Accuracy – for routine deliverables		✓
			Visibility of Analytics Value	✓	✓
	15. ROI (Return On Investment)	This refers to established method of calculating the Return On Investment (ROI) or the absence of such a method, substituted by other metrics in measuring the impact for the investment made in analytics.	Alternatives for ROI Calculations	✓	✓
			Challenges in Measuring the Impact	✓	✓
			Cost Benefit Analysis	✓	✓
			Measure Financial Impact	✓	
			Offshore Advantage	✓	✓
			Partner Experience Survey (Net Promoter Score)	✓	
			Performance Improvement – Measurable Impact	✓	✓
			Re-use Analytics Deliverables Across Businesses		✓
			Return on Investment (ROI)	✓	✓
Control Variables	16. Competitive Environment	Refers to factors that are not in control of the business organization – competitors and their strategies, human resource attrition to other analytics players, and peer pressure on analytics adoption.	Competitive Environment	✓	✓
			Relevance & Limitations of BI&A for the Business		✓
	17. Market Factors	Refers to the field dynamics adopted by front-ending personnel, such as Sales force, which is dependent on competition, channels, season, revenue targets and incentives, and similar market factors that affect the implementation of analytics-based decisions.	Consumption Pattern & Consumer Demand Variations		✓
			High-Value High-Risk Environment		✓
			Macroeconomic Factors		✓
			Market-Field Dynamics Impacting Implementation	✓	
			Need for Differentiated Business Model		✓
	18. Regulations	Refers to the policies brought in by governments and politico-economic unions that has an impact on the way business is conducted, and data are handled across the countries and unions by the business organizations. In addition, this includes any internal policies brought in place by the business organizations, which has an impact on the way decisions are taken, especially driven by data.	Data Export Restrictions	✓	
			Regulatory Reasons and Business Imperatives	✓	✓

Note: # indicates similar concepts discussed by Cosic et al. [40]; @ indicates similar concepts discussed by LaValle et al. [49]; and * indicates similar concepts discussed by Seddon et al. [50].

process resulted in a table of 103 items (codings) and 875 passages with each case study analyzed separately, reusing the coding and creating new ones where required. The case study transcripts were also read and coded independently by another researcher, not related to the project, who had not taken part in the case study interviews. Comparison of the two sets of coding was made for all the case studies across both the sites, mismatched instances were examined, and the final coding was mutually agreed upon between the two coders. Comparison of the two sets of coding resulted in an inter-coder reliability of 80%.

Case study data analyses from Case Sites 1 and 2 resulted in a total of 116 items with 66 items common between the two sites. Site 1 (CompuCorp) had 13 unique items, whereas Site 2 (AgriCorp) had 37 unique items. Together, they contributed to 18 concepts, listed in Table 1

.**Mapping of Case study data** − > **Items (Codings)** − > **Concepts** − > **Dimensions**

When the individual case studies were analyzed using the Nvivo software, passages were identified and assigned to items, which were subsequently mapped to concepts (e.g., Data & Other Issues from Remote Geographies and Alignment to Business Goals). These concepts were then mapped to dimensions (e.g., Analytic Technology Assets and Analytics Capability) in the initial framework (Fig. 1) developed from existing literature. Similar concepts were discussed by Cosic et al. [40]; LaValle et al. [49]; and Seddon et al. [50]. Of the 18 concepts that were identified from the case studies, 10 were from existing literature and 8 emerged newly from the case studies. Table 1 provides all the concepts that emerged along with the items (codings) as outcome of the analyses of case studies and the definition of the concepts that emerged from the case study analyses. In addition, Table 1 provides the complete mapping right from case site level (passages) to items to concepts to dimensions. Appendix C provides the complete mapping structure for passages (quotes) for the node Analytics Team Structure (at Case Site 1 level), as an illustration.

6. Discussion

On the basis of the concepts that emerged from the case study analyses, mapping of the concepts to the dimensions of the initial theoretical framework was performed.

6.1. Dimensions of the proposed model

6.1.1. Analytics technology assets

Analytics Tools and Techniques and *Enabling Technology* emerged as key concepts from the case studies, constituting Analytics Technology Assets. In the context of the case study organizations, Analytics technology assets are the analytics tools, software and techniques, IT and ERP infrastructure, Software, BI infrastructure, and processes such as ETL, Data Sources & Data, and Reporting and Visualization tools. This also includes other supporting technologies that feed into IT systems. Analytics technology assets refer to the development and use of hardware, software, and data within BA activities [40]. Davenport and Harris [5] discuss about the management of an integrated and high-quality data resource, while Kohavi et al. [51] mention about the seamless integration of BA systems with other organizational information systems when it comes to BA technology assets. Watson [52] adds conversion of data into information through reporting and visualization systems, and Negash [53] includes the use of advanced statistical analysis tools to discover patterns, predict trends, and optimize business processes. IT organization plays a key role in working collaboratively with analytics division to cater to its increasing IT needs on a continuous basis. As part of the case study, we observed that the analytics technology assets that are key to develop and maintain the Analytics division are in fact owned by the IT organization, and as the analytics organization matures, the processes around creating and managing these physical assets become streamlined and stabilized. Data sources

are also managed by a separate division of IT similar to infrastructure.

Analytics organizations' need for advanced technology assets grows at a pace much faster than the pace at which it gets fulfilled. Streamlined data flow for decision-making along with well-integrated transaction processing system forms the core of ability to leverage the deployed technology. While from the point of view of IT BV, the IT assets are disaggregated into infrastructure, transactional, informational, and strategic assets [7] depending on their strategic purpose, in the case of BA, the research at the case study organizations suggests there are two key areas, namely operational – "run the business" and strategic – "change the business," and these assets can be utilized in any one area or in both depending upon the nature of the projects chosen in each area. Sharma et al. [54] discuss about the need for asset orchestration capabilities of an organization to support the use of BA for strategic and operational decision-making. The case study revealed that "run the business" is most of the times human resource intensive and "change the business" involves deployment of IT/analytics technology assets in addition to human resources.

The concepts related to analytics technology assets stated above were derived from the item categories that emerged from the case study data. Some of the instances at the case study organizations that form part of the item categories are presented here.

At CCA, the usage of different tools and techniques available to them, such as predictive analytics, has evolved – they could use the data and the talent lying with business, domain knowledge, because of the availability of analytics tools. Organizations such as CompuCorp use the direct marketing model (using a website to capture orders and track delivery), invest substantially in IT, and have very good supply chain practices established. They leverage their IT and infrastructure for deriving the value from BA. CCA has purchased over 100 analytics products, augmented by CompuCorp's own products. All these are managed by IT, which gets inputs from analytics teams on analytics products. IT has teams that reach out to various end user teams and keep investing in latest technology wherever there is need. From the point of view of technology and applications/software, CCA uses what market uses – competitors and other analytics companies. Any new technology arrives, CCA evaluates and depending on the business needs, puts them to use.

In the case of AgriCorp, predictive analytics tools were required predominantly for commodity trading and sourcing, for which they do not have any analytics tool in place at the moment. For commodities, they want to align with the best of breed tools in the market. AgriCorp, though had evaluated open source tools, has been apprehensive to go in for one, primarily because it does not want its critical business applications to depend on open source tools. AgriCorp is also in need of analytics tools for various business applications – be it modeling the political or economic situation in a country or the movement of prices and currencies in a country. The lack of availability of these tools has definitely put AgriCorp at disadvantage in pursuing its analytics strategy. On the IT front, AgriCorp has some issues, but they are indeed not IT issues. Data recency remains a challenge in some of its geographies because AgriCorp cannot capture data at source. In some geographies, especially in remote Africa, at times, the initial documentation is on paper, which is then transferred on to the system in the head offices or branch offices, which at times leads to delay in data getting captured into the system. In addition, considering the current implementation status of SAP, iAgriCorp, and other legacy systems across the entire organization, the data flow situation and hurdles in data-driven decision-making are quite understandable.

6.1.2. Business analytics capability

BA capability plays a very vital role in determining the *analytics stage* [5] the organization is currently in and where it is heading to. We observed that in addition to the scientific problem-solving approach, IT skills and quantitative skills identified in the initial theoretical framework, business domain knowledge plays an important role in providing

the right analytics solution to a problem. The analyses of the case studies generated the concepts, *Analytics Adoption, Analytics Alignment with Business, Analytics Culture, Analytics Organizational Structure, Analytics Skill, and People Management and Evidence-based decision-making embedded in "DNA" of organization* as part of the analytics capability dimension.

Analytics adoption refers to organization's prioritization of analytics usage in business domains. Typically, they begin with efficiency goals, followed by growth objectives, and finally move on to addressing complex business challenges. As this happens, adoption both spreads and deepens. *Analytics alignment with business* refers to analytics team and business team performing the goal setting together. They plan together and agree on the goals and deliverables. *Analytics culture* means the organizational norms, values, behavioral patterns resulting in systematic ways of creating, gathering, consolidating, and analyzing the data and making them available for the right audience. This includes the extent of using that data to make business decisions and management's support for analytics, people's receptivity to learn and disseminate knowledge, inclination to change, and improve the ways of working and making decisions driven by data. It also includes the way the analyst community works collaboratively within and between the teams or departments of the analytics organization. When organizations increasingly become analytics driven, analytics culture is what differentiates them from the rest and provides the competitive advantage in market place. *Analytics organizational structure* refers to the structure of the analytics team and its positioning with regard to the business divisions or domains to achieve maximum value from the collaboration between analytics and business divisions. *Analytics skill and people management* encompasses analytics skill set, analytics skill portfolio management, and making work meaningful for analysts. It includes all that makes the analytics human resources remain committed to the organization and stay ahead contributing to the business in the continued analytics journey of the organization. *Evidence-based decision-making embedded in "DNA" of organization* refers to the extent to which evidence based decision-making is embedded into the values and processes of the organization.

The concepts stated above as part of the dimensions were derived from the item categories that emerged from the case study data. Because of paper length considerations, some of the instances at the case study organizations that form part of the item categories are presented here. When this study was on, CCA has been working on finding an appropriate Analytics Maturity Model to measure its analytics capability. About 3 years ago, CCA had a group of students (who were doing executive MBA program) from London Business School who did an internship with them. They assessed CCA at 2.5 on a scale of 5 according to the Davenport model. CCA revisited to reevaluate themselves recently and is currently working on finding a better Analytics Maturity Model in terms of how they would measure it. CCA believes that the model can remain the same, and the approach and measurement can be redesigned. From a people's perspective, CCA measures attrition rate at every domain level. In its experience, CCA found that the best guard against attrition is providing an open learning environment.

The concepts that have emerged out of the case studies also resonate with Cosic et al. [55], who developed a Business Analytics Capability Framework, according to their Delphi study, with the following capabilities as its constituents – Decision Rights & Responsibilities, Strategic Alignment, Evidence-Based Management, Skills & Knowledge (Technology, Business & Management), and Entrepreneurship & Innovation.

6.1.3. Analytics value enhancers

While the factors identified under the dimension Business Analytics Capability contribute to the business value, the case studies have brought to light another set of factors that could be appropriately termed "Analytics Value Enhancers." In the case study organizations, it is observed that these factors serve as the key for enhancing the value

derived from analytics use. The concepts *Analytics Ecosystem, Analytics Leadership, Enterprise Analytics Strategy, Enterprise-wide Analytics Orientation, and Overcoming Organizational Inertia (OOI)* can really make a difference in enhancing the value of BA, explaining the differential impact of BA on business performance when two organizations in the same domain invest in comparable analytics resources.

Analytics Ecosystem refers to leveraging collaborative vendor environment to achieve an organization's analytics goals. It extends well beyond providing requisite human resource pool, to training, sharing the resource requirement fluctuations, and providing support for niche skill project requirements. This also refers to the organization's ability to collaborate with academia and other players in the industry; its ability to capture and manage the knowledge assets, artifacts, and processes related to analytics and effectively utilize them; ability of the organization to move up the analytics ladder in terms of providing diagnostic, descriptive, predictive, and prescriptive modes of analytics outcomes; and ability to share analytics knowledge internally and externally freely. *Analytics Leadership* is the extent to which people in leadership position in the analytics organization take initiatives or projects to bring value to the business and steers the entire organization to use analytics for improved performance. *Enterprise Analytics Strategy*, typically a subset of the overall IT strategy, is operationalized as part of the enterprise architecture. This view of strategy is based on the level of standardization and integration of organizational business processes and data and influences BA technology and analytics organizational structure. *Enterprise-wide Analytics Orientation* is the extent to which the organization has adopted the enterprise-wide use of analytics starting from how people are oriented and motivated toward using analytics for business decision-making supported by the availability of the appropriate BI platform and processes to provide a holistic view of the organizational business processes. *Overcoming Organizational Inertia* refers to the extent to which the members of the organization are ready to accept, learn, and use analytics for business decision-making. This includes the change management aspects enabling the people to move out of their current comfortable positions into a data-driven decision-making environment.

One of the instances that can be quoted from the case study organizations to emphasize the need for Analytics Leadership is given here. At AgriCorp, on the Analytics Leadership, at the executive level, when there were different leaders for Business and IT, the BI&A implementation was scheduled according to the current profitability condition of that business because BI&A implementation was always considered to dent the profitability. However, when the leadership was unified for Businesses and IT, the situation changed and the BI&A implementations started happening faster. For enterprise-wise analytics orientation, because AgriCorp is in the early stages of analytics deployment, in the absence of a clearly defined measurement mechanism or an analytics maturity model, it uses the proxy of number of repeat requests it gets from each business unit to assess the analytics orientation.

In the same way, the Business Analytics Capability concepts resonated with the Business Analytics Capability Framework of Cosic et al. [55], the Analytics Value Enhancers also shares its concepts with the framework's capabilities – Impact & Change Management, Embeddedness, and Executive Leadership and Support.

6.1.4. Business performance

Our analyses brought to light two key factors of business performance, *Organizational Benefits from Analytics Use* and *Return on Investment (ROI)*. *Organizational Benefits from Analytics Use*, considered as a synonym for BV of BA, refers to all the intangible benefits that an organization derives by leveraging enterprise-wide BA use. We found there are a number of items that contribute to this concept. It encompasses all the items that contribute value to the organization – providing data-driven decision-making support to critical initiatives; product portfolio level analysis; business process improvements;

achieving customer satisfaction mandates; improving the quality of management decisions; SLA insights and metrics associated with routine business deliverables, innovations, and patents; managing risks; and contributing to the intellectual capital of the organization, among many others. The concept *ROI* includes all that is tangible – measurable in terms of costs, benefits, profits, and revenues.

While we tend to generalize that managers would make an investment only after due diligence about the BV it might generate, our findings show that managers often do the BV analysis post facto. This is more so when the value is derived from the collaborative efforts using BA and strategic business decisions, as it becomes all the more political to assign the BV only to the analytics component.

Both the case study organizations derive BV from BA and use the following measures to identify the change in business performance. These metrics that emerged out of the case studies were used to derive the item categories and concepts while analyzing the case study data.

In terms of measuring the contribution made by CCA toward the attainment of business goals, CCA adopts the following metrics. The first metric for CCA is performance of SLAs, quality, and timeliness, purely from a day-to-day operational perspective. The second metric is net promoter score. What is the value perceived by the business partners – that itself is a major indicator of how valuable CCA is to the organization. In the last annual survey of business partners, 70% were promoters. There were no detractors and 30% were passive. The third metric is measured in terms of business impact. The fourth metric is the number of IPs created, published white papers and journal papers.

Across the various business domains of CompuCorp, the use of BA has brought about business value, measured by the change in business performance in various ways. Following are some of the ways in which this is measured:

CCA uses BA for targeting new customers. It builds a model working along with the regional marketing partner and provides a list of customers for the implementation of marketing efforts by the partners, driving the program. In addition, at the end, post implementation, the analyst looks at the benefits measured in terms of metrics such as conversion rate, order value, and average rate. CCA has started implementing a template subsequent to the completion of the project to show the dollar impact.

For the Sales and Marketing domain, all impacts are measured against sales. At the beginning of the year, CCA agrees with the online channel head that a particular number will be delivered through the improvement and that would come from the analytics team itself.

CCA takes the DMAIC approach – Define, Measure, Analyze, Improve, and Control by doing initial estimates of quantifying the impact of analytics projects. CCA does the Define, Measure, and Analyze, and the BUs do the Improve and Control during their execution and tracking of the business performance.

For routine 'run the business' activities, CCA does not do any kind of cost benefit analysis. These activities are anyway needed. CCA measures whether they are doing things in a timely and accurate manner, which are hygiene factors. CCA measures two metrics – Timeliness and Accuracy.

CCA measures customer delight and service costs through a metric called repeat dispatch rate, sending across a product again within 7 days. Whenever CCA proposes a solution, they track the metric repeat dispatch rate – whether it has gone down in the period in question. Every time a product is repeat dispatched, there is a certain amount of dollar value associated with it. These are the metrics that they use to obtain a savings value when they submit a proposal. There is a visible dollar impact, visible insight, and visible data value that CCA adds to the solution they provide to CompuCorp.

For supply chain projects, CCA provides an estimate of reduction in cycle time as part of its proposal process. When the recommendations have been implemented, cycle time values are captured and compared. Any reduction in cycle time is associated with a monetary impact and adds value because this metric impacts the business.

In Services Analytics, CCA looks at bunch of financial metrics – cost part of it, the revenue part of it, and the margin – that is a kind of portfolio level analysis generated for the services in delivery support.

In a project completed by CCA, on the reverse supply chain – addressing product returns – 750000 product pieces per annum – because of the issues that customers face, which is a very crucial part of CompuCorp's supply chain and also impacts the brand image very critically. In an years' time, CCA solved key issues on this, and the gross margin of service logistics business benefited by around 11 million dollars on an annualized basis.

CCA follows the "crawl – walk – run" strategy in all the relationships they have with their business partners. Crawl refers to understanding key metrics of the business. Walk refers to understanding the business more by doing some ad hoc projects. Run stage refers to doing projects that are full blown, which needs lot of business insights.

CCA uses the Output driven model and the Outcome driven model for delivering analytics solutions. In the Output driven model, the scope and type of work are well defined between business unit and CCA, and CCA works on it. This is a model where defined outputs are mutually agreed, and CCA gives insights, does a deep dive on the basis of working with the business unit, and delivers the value out of it. In the Outcome driven model, either the CCA initiates certain projects – according to the data analysis, or it comes from the business partner who wants CCA to work on certain areas. For those, CCA does the analysis and modeling and focuses on the particular business problem. The recommendations are implemented, and then, CCA tracks the contribution for which it has built a stable process. These are also called Value Projects.

With BI&A deployment in its nascent stage at AgriCorp, BUs are using the BI tool. They look at data mining, look at historical data, and analyze what they have done in terms of what pricing to which customer, at what profitability, for which month, and what capital investment was used and how profit has moved across the months and years, in month-on-month basis, year-on-year basis, lean months, good months, and how the prices of commodities have moved across. This data linkage provides AgriCorp the basis for making informed decisions.

When BI&A division takes up projects, they ask the BUs to fill up a request form that qualifies the business benefits they are expecting. Right now BI&A team is not doing anything beyond that. The idea is that very soon they can put that into a measurable KPI and then analyze depending on the initial expectation and how much they have been able to fulfill that. At present, it is more qualitative on what they are expecting and not really quantified.

AgriCorp CIO feels that the real ROI would be realized only when 100% of the people who are using the BI&A system are saying that it has made a huge impact and a difference, a positive difference to their operations, to their business.

While both the case study organizations have their own well-defined measures of business performance to assess the BV of BA, it reflects how the literature has dealt with business performance. Because business performance is a well-researched area with regard to the technology in question, from a BV perspective, there is no dearth of business performance measures including "productivity, consumer welfare, accounting profit, market valuation and operational performance" [7]. From the point of view of BA systems, firm profitability (net margin and return on investment), competitive advantage (an organization's ability to make above-average profits within a given industry sector), and innovation (revenues from new and modified products) [5,7] qualify for firm performance. Specific measures will depend on the nature of the business analytics-driven initiatives undertaken within the organization [38].

6.1.5. Control variables

On the basis of the observations in the case study organizations, *Competitive Environment, Market Factors,* and *Regulations* have emerged as variables affecting the outcome other than BA. This is not very

different from the set of control variables in the initial theoretical framework, government policies, firm size, market segments, and competition.

7. Cross-case analysis

A review of the literature on the analyses of organizations deploying BA has brought out certain organizational-level variables. Shanks and Bekmamedova [27,28] identified five dimensions: strategic alignment, governance, people, organizational culture and data, and technology infrastructure, while explaining the impact of strategy on BA systems. Shanks and Sharma [38] developed a theoretical model that explains how organizational strategy relates to both BA technology quality and organizational structure and impacts value-creating actions. Seddon et al. [50] argued that the key to achieving greater BV from BA is to have strong analytical leadership, adopt an enterprise-wide orientation, direct resources toward high-return targets, and embed evidence-based decision-making at organizational level. In an effort to define the primary attributes of analytical competitors, Davenport and Harris [5] also identified a similar set of organizational-level variables for analytics strategy. By performing cross-case analysis, as part of identifying dimensions or organizational-level variables, Eisenhardt [43] suggested to look for within-group similarities coupled with intergroup differences. Dimensions can also be suggested by the research problem or by the existing literature or emerge from the case studies.

7.1. Organizational-level variables

Following Davenport and Harris [5] and Cosic et al. [40], we compared the analytics BV approach of the two case sites at the organizational level. Subsequently, in Table 2, we enlist the similarities and differences between the two case sites using four dimensions – *Achieve Business Vision through Analytics Use, Enterprise-Level Approach to Management of Analytics, Senior Management Commitment,* and *Organizational Change Management.* Achieving the business vision through analytics use means the organization views this aspect of its business as key differentiator from its competitors that makes it successful in the marketplace, achieved through extensive use of analytics. It is also possible that the business vision chosen by an organization may not be well supported by analytics initially. Enterprise-level approach implies managing analytics as an organization or enterprise and ensuring that no process or business unit is optimized at the expense of another unless it is strategically important to do so. Management of analytics and the data on which they are based follow an enterprise-level approach. Senior management commitment to the use of analytics is the adoption of an enterprise-wide analytical approach to business, which requires significant changes in culture, processes, behavior, and skills for employees across the organization. Such changes must be led by senior executives with strong leadership and passion for analytics and fact-based decision-making. Organizational Change Management refers to management of people who are impacted by BA initiatives to accept and embrace technological and process changes. It also includes the provision of training to demonstrate the value and utility of new practices resulting from change, to encourage people to adopt them in their daily work, transforming the culture from ad-hoc decision-making to making decisions on the basis of data.

Table 2 shows how these four organizational-level variables are associated with the concepts derived from the data pertaining to the two case study organizations. We also present a comparison between the two organizations tracing their analytics journey, the evolution of analytics organization, and their understanding of analytics maturity.

7.2. Evolution of the analytics organization

At CompuCorp, analytics organization was set up a decade ago primarily to leverage the availability of skilled analytics human resources, and it functioned as a reporting arm, without any specific corporate goal. As the analytics organization evolved, it was held together by establishing a framework addressing the four key pillars of business, namely partnership, people, process, and profit. The matrix structure that was created around this framework provided an inter dependency among people who nurtured relationships and responsibility to become a pure cross-functional analytics community.

AgriCorp, being a late entrant into the ERP-BI-Analytics game plan, has so far covered 44 of the total 65 countries of its operations with BI systems. The BI&A team was established in 2012 because BI&A is the second pillar of their transformational IT strategy, focusing on value realization from IT core using analytics. Detailed roadmap for analytics will be evolving over the next 2 years when the organization moves into a single ERP (SAP) completely, which is partly on SAP and partly on home-grown ERP, at present. In addition, acquisition-based business model has also introduced dependencies in the ERP-BI-Analytics progression and deployment.

The evolution of analytics has been quite systematic and gradually progressive in the case of CompuCorp to reach the current level of maturity, contributing the BV. In the case of AgriCorp, the IT management has created an aggressive strategy to compress the 15–20-year transformational IT strategy into a 5-year plan, running the IT-ERP-Integrated Architecture tracks in parallel, with overlap, instead of the sequential approach. This is one of the advantages of a late entrant, who has a better understanding over the IT landscape.

7.3. Analytics maturity

Though CompuCorp gives itself a modest score close to 3 out of 5 in the Davenport & Harris' 5 stage model on analytics capability, the analytics organization has come a long way in understanding the stages of maturity in terms of analytics capabilities, what it wants to achieve using business analytics, extent to which the business processes use BA, and the extent of analytics use at business function and enterprise level. Over the past 5 years, it has also tried various Analytics Maturity Models and frameworks for assessing the BV provided by analytics.

AgriCorp, in its current nascent state of Integrated IT/Analytics roadmap, does not have the need to assess its analytics maturity. It has the advantage of learning from early starters such as CompuCorp and leapfrog certain stages on the maturity curve. With the late entrant advantage on one side, it is also aware of the opportunities lost over the last decade because of not having these systems in place.

8. Proposed research model

On the basis of the concepts that emerged from our data analyses, the initial framework has been modified with details, and the proposed research model is presented in Fig. 2.

9. Propositions

With the outcome from the case study data analyses highlighting the need for Analytics Technology Assets and Business Analytics Capability as the key Analytics Resources influencing the Business Performance of the firm in the presence of identified Control Factors, with Value Enhancers and Organizational-Level Variables acting as moderators, we put forward the following propositions for further research from the theory building into the theory testing and validation phases.

9.1. Analytics technology assets and business performance

In the case studies, we observed that through the use of *analytics technology assets* in the form of analytics software tools and flow of data from the data sources have made solutions possible for business problems be it the operational – "run the business" situation or strategic – "change the business" situation. This has resulted in analytics

Table 2
Cross-Case Analysis using Organizational-Level Variables.

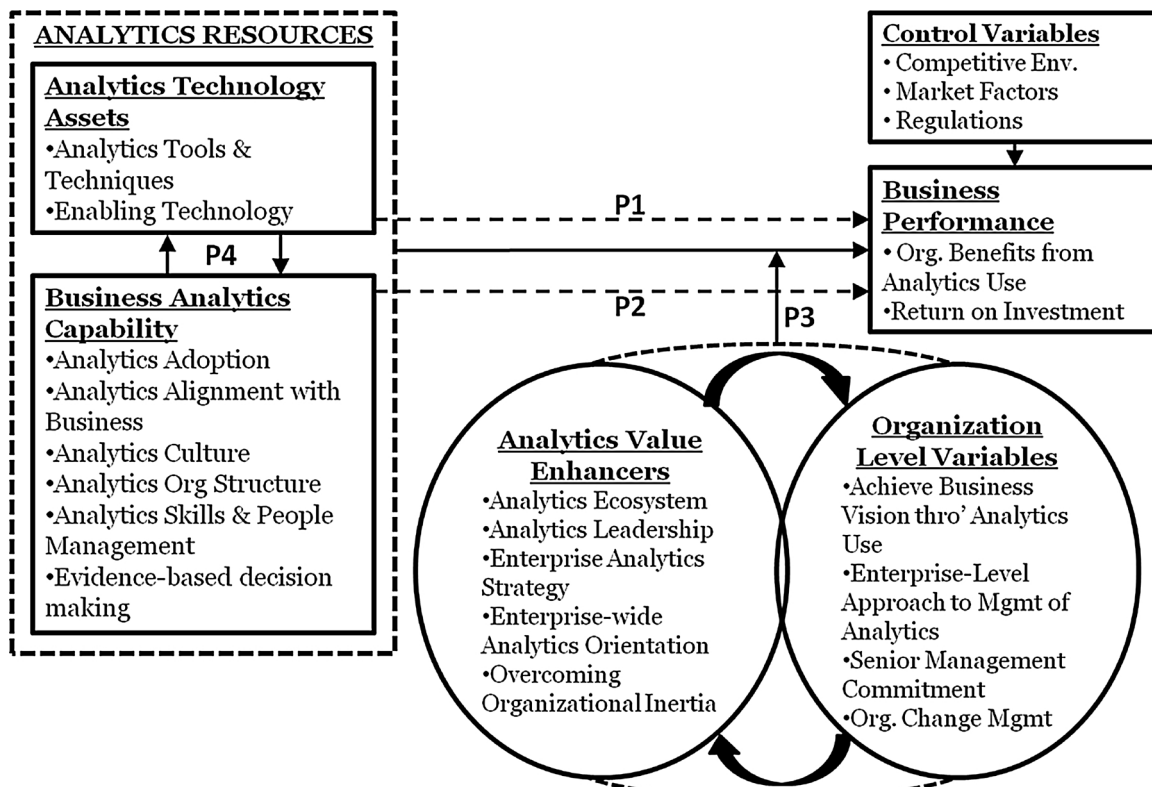| No.	Organizational-Level Variables	Linkages at Case Study Level Analyses	Data from CompuCorp	Data from AgriCorp
1	Achieve Business Vision through Analytics Use	Nature of industry/business and analytics use	Direct marketing through online channels has provided analytics-based decision-making ability to all its business processes. The entire organization is organized in terms of key business processes facing the customer, fulfilling the demand, and managing the supply – uses the four-pillar analytics framework (partnership, people, process, and profit).	Traditional commodity trading business, making decisions by experience and intuition without much data support at this point of time, partly because of the unavailability of right data to support decision-making. The acquisition-based business model has introduced some dependencies in ERP-BI-Analytics roadmap and deployment.
		Well-defined targets agreed between Business and Analytics	HOSHIN Plan (a strategic planning methodology) – Annual business planning happens along with embedded analytics team to ensure that the business goals are shared and that realistic targets are set for achievement.	Transformational IT strategy that may take 15–20 years to achieve has been compressed into a 5-year plan as part of the late entrant strategy (5 pillar IT strategy covering ERP/CTRM, Analytics, Collaboration, Infrastructure, and Digital Technologies), taking business into confidence.
2	Enterprise-Level Approach to Management of Analytics	Organization's ability to standardize business processes across geographies to get them to use BI&A	Decade old analytics organization has addressed remote geography data issues along with IT, and the data flow through well-established business processes is stabilized and smooth.	Geography coverage issues, especially presence in certain remote geographies – non-standard business processes, data issues, and hence, BI &A coverage for those areas still left behind.
		Integrated IT Infrastructure (ERP) and data flow addressed at an organizational level	Unified single ERP is in place. IT department manages data and infrastructure as a routine activity.	ERP implementation is in progress phase-wise, and synchronizing BI&A with the ERP deployment is an ongoing process.
		Evidence-based decision- making embedded in "DNA" of organization	In the last 10 years, most of the decision-making has got a strong angle of statistical merit – of course, there is a factor of judgment, economics, and financials attached to it – but to make every small decision, CompuCorp is now dependent on analytics for insight.	At this point, business has started appreciating BI&A projects only after seeing the initial value. Evidence-based decision-making is constantly evolving.
3	Senior Management Commitment	Leadership commitment – to encourage using analytics	Analytics leadership is driving a federated Centre of Excellence (CoE) model that will help the 500 analysts propagating analytics culture to 99,500 employees effectively.	IT leadership has crafted a 5-pillar Transformational IT Strategy with Analytics as the second pillar.
		Enterprise-wise analytics strategy	As against the extremes – companies who run the business directly from analytics output and companies who barely use analytics for business, CompuCorp has identified and positioned itself in the right segment to craft its enterprise-wide analytics strategy.	Considering the peculiarities of commodity trading, with macroeconomic factors playing their part, the enterprise analytics strategy is created to provide 70% analytics inputs that is considered 100% relevant, and every decision that is made is a combination of analytics and intuition.
		Enabling Structure & People for faster enterprise-wide adoption	After a decade, leadership has envisaged a move from centralized analytics setup to a federated business-owned CoE model to achieve the goal of broader enterprise-wide adoption.	With BI&A adoption at a nascent state, AgriCorp maintains a single pool of analytics people, instead of the highly specialized track wise teams serving specific business domains.
4	Organizational Change Management	Spreading business analytics awareness organization-wide	Popularizing analytics and demonstrating analytics capabilities at organizational level regularly done to attract internal talent from business, apart from the Net Promoter Score (NPS) survey to obtain the voice of internal customers.	"Telling & Selling," as AgriCorp puts it and practices it, is essentially a key change management initiative.
		Establishing business value of analytics – need for a change in mindset	Establishing analytics ROI involves navigating through organizational politics in sharing the credit among the stakeholders.	According to the Head of IT, ROI is irrelevant. If the business says that analytics makes a difference to the operations, it makes a difference to the business, in a positive way, it is the biggest value.
		Creating an analytics culture	Highest level of differentiator in the hierarchy of competitive advantage is Analytics Culture. This is very vital to human resource retention too.	It is more about the data availability constraints rather than anything about culture, especially when it comes to trading, the biggest contributor to revenue.

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Fig. 2. Proposed Research Model for Business Value of Business Analytics.

technology assets' contribution to the firm's business performance. Following exemplified quotes from the case studies highlight the same.

> *"Analytics, not only for trading, several areas you can use (sic). Today, analytics helps even agricultural farming, for example, palm or rice or anything (sic). The meteorological department provides all the weather forecast. Using that you can decide on the plantation, how much of watering is required or not required, all those things you can easily predict (sic), actually. To that extent, you can control cost, to a large extent…"*
>
> Global SAP Practice Head, AgriCorp, on deploying analytics tools across various business areas, contributing to cost reduction

> *"Analytics team provided the data around what has been the failure rate of CDs and how many times the product was dispatched to customer and the problem was not fixed (sic) and we had to send the product again to the customer. This is where the Analytics team provided the data to the business about maximum dispatches happening with CDs without fixing the problem and suggested use of USB drive which later evolved as the downloadable option."*
>
> Senior Manager, Contact Centre Analytics, CompuCorp, on how data provided by analytics team contributed to improved business process and hence cost reduction

Our findings are also consistent with prior studies in IT BV studies that have reported a positive relationship between strategic investments in IT assets and firm value [7,8]. On the basis of the support from our findings and extending IT BV studies to analytics we argue that

Proposition 1- Analytics Technology Assets will have a positive effect on the business performance of a firm.

9.2. Business analytics capability and business performance

In the case study organizations, we observed that the dimension *BA capability,* encompassing the concepts *analytics adoption, alignment with*

business, culture, analytics organization structure, analytics skill and people management, and evidence-based decision-making, is the ability to perform the analytics tasks leading to business benefits. At a high level, the BA capability is perceived to refer only the IT, quantitative, and scientific problem-solving skills required to perform the analytics tasks. However, the business domain skills and the other concepts that have emerged are considered the important constituents of BA capability to bring in business benefits. This is brought about by the following quotes from the case studies.

> *"Where all do you use Analytics? Everywhere (sic). Every single change plan we create, the fundamental ground for that is the output we get from Analytics… …Acceptability is very strong – I don't think there is any business unit today in CompuCorp which doesn't use analytics. Analytics has become indispensable part of decision-making process."*
>
> Director – Technical Support, CompuCorp, on analytics adoption and evidence-based decision-making

> *"The structure that we created to guide the 4 pillars (Partnership, People, Process, and Profit) is – if you are heading the product & pricing analytics, you are responsible for the 4Ps for your organization, similarly if you are heading the online team, you are responsible for the 4Ps for your organization – that way there is a matrix structure responsibility created to drive all these 4 pillars thereby creating an inter dependency among the people and creating relationships across the board tiled horizontally & vertically – that really drove the culture − over a period of time for people to become cross functional, trusting each other, creating a community and so on (sic). That was an important milestone in the journey of Analytics at CompuCorp."*
>
> Director, CompuCorp Analytics, on analytics organization structure driving analytics culture

> *"Everything is analyzed based on how much value they perceive a project will deliver. It is not based on the fact that somebody else is doing this so we should also be doing this or our competitor is doing something, so we*

also should be doing this. Evaluation is always based on the value which somebody can show or they perceive. From that point of view, if I look at even our projects, people have started really appreciating it only after they started seeing the value. That is what I would say is the DNA of this organization is. And from my point of view, this is the only way we will keep growing."

Head (BI&A), AgriCorp, on evidence based decision-making leading to analytics culture and realizing business value

From these findings and consistent with the broad conceptual relationships given by IT capability and firm performance [7], we argue that

Proposition 2- Business Analytics Capability has a positive influence on the business performance of a firm.

9.3. Analytics value enhancers and organizational-level variables

The concepts, *analytics ecosystem, analytics leadership, enterprise analytics strategy, enterprise-wide analytics orientation, and overcoming organizational inertia (OOI),* can make a difference in enhancing the value of BA, explaining the differential impact of BA on business performance when two organizations in the same domain invest in comparable analytics resources. From the cross-case analysis, it is clearly evident that the organizational-level variables (*Achieve Business Vision through Analytics Use, Enterprise-Level Approach to Management of Analytics, Senior Management Commitment,* and *Organizational Change Management*) also have a strong influence on the BV derived. Following are some of the quotes from the case studies that highlight the significance of *analytics value enhancers and organizational-level variables*.

"…there is a frequent re-iteration of all the business leaders in the US – they are especially careful of the fact that we are always kept in the loop whenever key announcements are made and key decisions are being taken. So right from how they set the strategic priorities for the year, they actually get into video conference calls with the team here – we have all the 4–5 leaders of CFS getting into calls with us on a quarterly basis where they communicate the updates, plans for the next quarter and they also use this opportunity to talk about general strategic direction for the entire year. So, we directly get to hear from the leaders, not just the leaders but the entire team from here."

Business Analysis Manager – CompuCorp Financial Services, on the analytics leadership that engages the teams right from planning

"So, with such a complicated landscape, how have we envisaged the analytics roadmap? The way I see it is, in two years, we would have covered most of the BUs which are going (rolling out SAP) now. We are kind of trying to focus on BUs which are most profitable and which are high growth (sic) for the company. So, we are trying to target those for the next two years. The high EBITDA businesses are the ones which we will take up now and that is one of the criteria which drives the investment decisions and the same factors we are using to decide our strategy also."

Head (BI&A), AgriCorp, on the enterprise analytics strategy addressing high potential BUs

"Then what is the role of the 500 people vis-a-vis the rest 99,500 people? I see our role as the incubator of framework and approaches to productize and commoditize Analytics and make it available to rest of 99,500 people. For example, Regression – a technique that every function uses, can we make the business functions use Regression like the addition/subtraction in a calculator, so that the entire 99,500 can use it? Then the Analytics team starts to look at something else, now that this is created and commoditized."

Director, CompuCorp Analytics, setting goals for enterprise-wide analytics orientation

"The vision comes from the top. We have a very top-level goal for that particular business team/segment. When we make our individual goals, we have to align to these business goals. For example, business says this year, we have to reduce the cycle time by 2 days …that becomes the business goal – our partners have their goal – analytics also has the same goal – so whatever analytics projects will be taken, at the end, it has to tie to that goal."

Senior Manager – Product & Pricing Analytics, CompuCorp on achieving business vision through analytics use

From the abundant evidence that emerged from our study, we posit analytics value enhancers and organizational-level variables as moderating variables that influence the impact of analytics resources on the business performance of a firm.

Proposition 3- In the presence of Analytics Value Enhancers and Organizational-Level Variables, Analytics Resources (Analytics Technology Assets and Business Analytics Capability) have an increased positive influence on the business performance of the firm.

9.4. Analytics technology assets and business analytics capability

Drawing a parallel to the conceptualization of *IT Resources* as a combination of *IT assets* and *IT capabilities* mutually reinforcing each other [7], our analyses show that the analytics technology assets and analytics capability combine to form the analytics resources of the firm with analytics technology assets and analytics capability mutually reinforcing each other. This is clearly evident from the following exemplified quotes obtained from the case studies.

"What has also evolved now is the usage of different tools and techniques available to them like predictive analytics – what has happened is that we are able to use the data and also use the talent lying with business – not just the knowledge of data but the domain knowledge also."

Director, Technical Support, CompuCorp, on analytics tools & techniques and availability of data, combined with business domain knowledge, leading to analytics use

"…there are cases where you can leverage certain things. For example, the database (sic). You don't have to pull the data all again if someone else has already got it… …we try to share the knowledge like 'these are the various types of data, already there' and from the IT perspective also, they are driving certain initiatives, creating data labs, where you just go and take the data for use, you don't need to download the data…"

Senior Manager – Product & Pricing Analytics, CompuCorp Analytics, on accessibility to data leveraged by the analytics organization structure

"People is(sic) all about – how do we develop their skills, training (we have a strong curriculum of training), tools, techniques, domain, analytics training for internal teams, export program for outside the team – exporting & importing talent, hiring people from other functions at CompuCorp, going out and hiring talent"

Director, CompuCorp Analytics, on analytics tools & techniques, analytics skill & people management and analytics ecosystem reinforcing each other

Consistent with IT BV literature that has shown an interacting relationship between IT assets and IT capability influencing firm performance [7], we argue that

Proposition 4- Analytics Technology Assets and BA Capability mutually reinforce each other to positively impact business performance.

10. Conclusion

This research contributes to the body of knowledge related to BA

and provides certain key insights for practice in business organizations, particularly firms similar to the case sites.

10.1. Contributions to theory

This research is an early attempt to capture the BV of analytics using a case study methodology by understanding the factors that constitute the analytics technology assets and BA capability, bringing out the mechanism by which analytics contributes to business performance. The case studies have identified the tangible and intangible measures of business performance too. We identified the key predictor and moderator variables and their relationships within and with business performance.

The main purpose of this research is to identify the antecedents and to enhance the understanding of BA value creation by integrating the available BV creation mechanisms of IS and IT and specific BA research done through case studies. Primary contribution of this research is integrating the theory of RBV with the IT capability framework to establish an understanding of the BA Capability and the value creation mechanism for BA. From the constructs that have emerged from the case studies, it is also seen that the BA capability that influences the business performance is not easily imitable or substitutable in the immediate future. This is further supported by the underlying components of value creation mechanism namely the analytics value enhancers and the organizational-level variables that have emerged from the case study data and cross-case analysis, respectively, moderating the impact of analytics resources on business performance, as the final model depicts.

With our proposed model of analytics resources that comprises analytics technology assets and BA capability, with their underlying elements and interactions, the case study research has brought out a set of factors at the organizational level from the cross-case analysis that can further enable BV studies in BA.

10.2. Contributions to practice

Being an academic investigation aiming to conceptualize BV of analytics using theoretical support, this research provides neutral and reliable results to practicing managers.

Contrary to the generally followed practice of starting up the analytics division with human resources banking on their IT and analytics skills and then looking at the benefits to trickle, this research provides a broader view of the underlying analytics technology assets and BA capability factors that need to be considered while setting up an analytics division to provide business benefits. Business managers could prioritize their analytics deployment after understanding the BV created by the investment moving from the current practice where the assessment of BV happens post facto, most of the times. The organizational-level variables that have emerged from cross-case analysis capture the focus areas for the senior management to realize the analytics BV to become a differentiator in the market. Depending on the stage at which the organization is currently in, on the analytics maturity cycle, once it has achieved the BA capability, it can implement the analytics value enhancers to continue to derive increasing value from the analytics investments made.

Business organizations could also examine whether their investments lead to analytics capability building at business division and organizational levels. The management could compare analytics investment on the basis of their contribution to business performance and allocate resources accordingly. While the organizations, irrespective of the analytics stage they are in, are divided about assessing the BV of analytics, the performance measures brought out by this case study goes beyond the financial measures and captures some intangible measures (such as innovations and patents, achieving customer satisfaction level mandates, and visibility from global awards/recognition) as well.

10.3. Limitations and future research

The findings from the data analyses are according to the multiple case studies from two case sites, an organization from computer technology industry, and the other from commodity trading agri-business. For extending this model to other organizations, it is necessary to examine the applicability of these factors that influence the BV of analytics in the organization under consideration. The proposed model offers a good starting point for this exercise.

From a methodology perspective, the research was performed with single level for each case study, and the objective of triangulation has been achieved by considering different levels across the case studies at the same site. The main reason for not going in for multiple level is that the organization is relatively flat because of the nature of (analytics) work. Apart from the heads of the analytics business domains, the lower level managers did not have complete visibility of overall activities of their domain.

While studies published recently have questioned the association between IT capability and firm performance stating that their current analysis showed no significant association between IT capability and firm performance [18], our study has extended the dimensions of capability from IT to BA, contributing to business performance. Inputs from IT capability studies and their contradictions need to be considered before embarking further studies on analytics capability and business performance.

From the case study data, we observed that the organizations tend to over-ride the assessment of BV before embarking on the analytics deployment and perform an evaluation only post facto. Here too, the assessment is done mostly in favor of business divisions to avoid political conflicts because the analytics division always finds it difficult to segregate the effects of strategic business decisions from the benefits brought about by analytics. This anomaly seems to be stemming from assessing the BV of IT. In the long run, this will understate the benefits brought about by business analytics.

Extending the above concern on measurement, we also observed that there are issues around measurement of benefits from business analytics because there are many other organizational initiatives, including the ones in IT that are run along with the deployment of business analytics. For obtaining the propositions, the authors did not presume any relationship, and they were evolved from data. We are not anticipating them, but bringing them out from observations and need to be further tested. Further, theory development is incomplete without identifying relationships among concepts in the form of propositions, which could be converted to testable hypotheses during future studies [43]. Having done the theory building part in this phase of the research, further study could focus on theory testing and validation phases. This involves a factor analysis to better summarize the newly found concepts and a scale development to obtain the final measures. The theory testing phase could follow a quantitative approach useful for statistical generalization.

More case studies from other industry verticals will also help to cover further aspects on the dimensions established in the proposed model, improving the applicability of the model across various industry verticals. While the current research has focused more on the analytics resources aspects, the model could be further extended to cover the measurement aspects of the BV contributed by analytics at an organization level. This was observed to be a potential research work, while this case study was conducted at the organizations.

Extending the current work on analytics capability, further studies on measurement of analytics capability leading to establishing capability maturity models in analytics are needed for benefiting the body of knowledge useful for practice.

Funding

Appendix A. Questionnaire

Business analytics and Business Value (Business Analytics' impact on business performance)

A. Evolution of Analytics/Data-driven work culture in your organization

1. When was the Analytics team formed in your organization? What was the reason behind forming the Analytics team?
2. How big is the Analytics team? How is it organized (Geographies, Markets, Businesses)?
3. How is the Analytics team sourced (In-house/Outsourced/Third party/Partnerships)?
4. What are the Business Processes addressed by the Analytics team?
5. Please provide the Analytics Team Organization Structure. Who owns the Analytics Team in the organization?
6. How has analytics experience evolved over the years in your organization? What have been the milestones?
7. How is the Analytics Organization positioned vis-a-vis IT and Business organization? What are the opportunities for collaboration with IT/Business?
8. How is the acceptability of Analytics Team in your organization?
9. Where do you position your analytics organization in "Davenport's Analytics Organization Stages" and why? (Stage 1: Analytically Impaired; Stage 2: Localized Analytics; Stage 3: Analytical Aspirations; Stage 4: Analytical Company; Stage 5: Analytical Competitor)

B. Components of Analytics impacting business performance

10. How are the Analytics investments (budgets) structured in your organization?
11. From an ROI perspective, how is Analytics generating value for the investments made? How often do you make ROI calculations for investments in Analytics?
12. How is Analytics helping your businesses take better decisions? (examples)
13. How does Analytics lead to Improved Business Performance in your organization? (examples)
14. How do you measure contribution (metrics) made by Analytics toward the attainment of business goals? Why do you think it is fair/unfair?
15. How do the Analytics resources you have (Technology/Infrastructure) provide you competitive advantage?
16. How do you manage the human resources/skill set requirements of the Analytics team?
17. What are the external factors (like policies, competition etc.) that affect the "Analytics Culture" in your organization?

C. Informant Profile

18. Experience (Domain + Analytics)
19. Current portfolio
20. Role in the organization

Considerations:

1. Purpose of the call is purely for Academic Research, assuring the confidentiality of information shared. No commercial/business data are required to be shared.
2. Seek concurrence for the recording the conversation – purely for transcription purposes.
3. In case the informant feels sensitive to share response to any of the questions mentioned above, those questions can be excluded from the discussion.
4. Concurrence requested to publish excerpts of the discussion ONLY in academic work/forums/journals.

Appendix B. Profile of case study participants

See Table A1 and A2

Table A1
CompuCorp Case Study Participant Profile.

No.	Analytics Organization/Department	Participant Role	Total Experience including Analytics (No. of years)
1	Product & Pricing Analytics	Senior Manager	19
2	Financial Services	Manager	10
3	Contact Centre Analytics	Senior Manager	14
4	Services Analytics	Senior Manager	14
5	Online Analytics	Manager	10
6	Marketing Analytics	Manager	10
7	Supply Chain and Operations Analytics	Senior Manager	16
8	CompuCorp Analytics	Head (Director)	20
9	Technical Support, CompuCorp	Director	25

Table A2
AgriCorp Case Study Participant Profile.

No.	Analytics Organization/ Department	Participant Role	Total Experience including BI& Analytics (No. of years)
1	Central IT − BI & A	Head (BI&A)	26
2	Central IT − BPC	Manager (BPC)	19
3	Central IT − BI & A	Delivery Manager (BI&A)	19
4	Finance	Product CFO	21
5	Regional IT	Regional CIO (Africa)	24
6	Central IT − SAP	Global SAP Practice Head	36
7	Regional IT	Regional CIO (Americas)	26
8	Operations	General Manager (Nigeria)	21
9	Central IT	Global CIO/CTO	25

Appendix C. Case study data analysis

Sample Coding Summary for Node: Analytics Team Structure (Case Site 1)

Aggregate	Classification	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified on

Nodes\\Analytics Team Structure

Document

Internals\\1-Senior Manager - Product & Pricing Analytics

No		0.0543	6			
				1	KSN	2/24/2015 11:11 AM

Every team is structured under Ramesh. There are 3–4 directors who report to Ramesh, I report to Product & Pricing Director. We have a global head for analytics and networking. This global head reports into the VP of Global Sales Organization. The VP reports into the Senior Executive of the Global Sales Organization who in turn reports into the CEO of CompuCorp.

				2	KSN	2/24/2015 6:35 PM

One thing what I have seen different in CompuCorp is the way the tracks are structured, they are tied to the business very closely.

				3	KSN	2/24/2015 6:53 PM

Broadly we are covering every domain. Some business functions at regions have their own resources under their control to perform Analytics support for them. In addition, separate organization exists for Procurement Analytics, which works with vendors and suppliers directly. This team was formed since their interaction is more with vendors and suppliers and some part of the CCA moved into this team.

				4	KSN	2/24/2015 6:59 PM

The way we are structured and the way we had taken up some of the projects, collaboration happens much more now, especially with the structure I described, individual analyst is tied to individual business partner at the day-to-day business level - the teams talk to each other every day, work closely, and collaborate. Models are being discussed and operational work happens with future business processes being discussed and analyst learns a lot from that. Sometimes the Analytics team members fill in as a backup for the business organization

Aggregate	Classification	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified on
				5	KSN	2/24/2015 11:02 PM

From an analytics setup perspective, CCA is the biggest chunk of analytics here, but then you have pockets of people where there are analysts and technology also put to use. We work in a centralized and federated setup of analytics. Some businesses want some analysts working near to them. Within the partner organization, they have analysts too. They work along with us and are part of other initiatives too. That way it is distributed, but mostly it is centralized. There is a consolidation that is happening, and more and more such teams are coming under the analytics umbrella organization. Earlier it was more diverse, now all the analytics is coming under one organization.

| | | | | 6 | KSN | 2/24/2015 11:04 PM |

When there is a centralized and federated environment for creation and use of analytics capability, there is a need for centralized knowledge repository for analytics. At CCA, knowledge management portal is fully put to use, and best practices are captured. We give access to this portal to all partners.

Internals\\3-Director - CompuCorp Analytics

No		0.2263	7			
				1	KSN	2/25/2015 12:55 PM

We are organized based on the various functions I described - Marketing, Online, Product Pricing, CFS, Manufacturing & Supply Chain, Service and Call Centre, and our people are operating in those domains and working cohesively with business partners in those domains to solve their problem.

| | | | | 2 | KSN | 2/25/2015 12:59 PM |

We were operating almost like an island - I was actually reporting to a guy who was heading the call center in India – due to historic reasons since this was not a corporate mandate - and since in those days the only big function in India was the call center function. Hence, call center function hosted us - since various functions funding us didn't have an establishment here, it was set up under that umbrella. One and a half year back, the company hired some Strategy Consultants and with focus of Big data and Analytics being key element of many companies. One of the actions initiated by the management was to centralize all Reporting, Analytics, BI related activities under one umbrella. So, our function and two or three different reporting teams, BI function - were all consolidated under my boss - who became the Single Point of Contact to drive Business Intelligence and Analytics - idea is also to control the external vendor - that area was cow-boyish - anyone can go to any vendor and do anything, and sometimes vendors were taking advantage of it.

| | | | | 3 | KSN | 2/25/2015 5:10 PM |

The structure that we created to guide the 4 pillars is - if you are heading the product & pricing analytics, you are responsible for the 4Ps for your organization, similarly if you are heading the online team, you are responsible for the 4Ps for your organization - that way there is a matrix structure responsibility created to drive all these 4 pillars thereby creating an inter dependency among the people and created relationships across the board tiled horizontally and vertically - that really drove the culture - over a period of time for people to become cross functional, trusting each other, creating a community, and so on. That was an important milestone in the journey of Analytics at CompuCorp.

| | | | | 4 | KSN | 2/25/2015 7:32 PM |

The way that I described about the structure of CCA, think about someone had to now setup CCA at a company level - exactly that is what is happening. We already have 5–6 CoEs (Orgs like Product Pricing, Marketing, Online, Finance) existing at CCA, and this is the structure that they want to create at a company level. All the other resources which exist globally in those

functions will be attached to these CoEs and that process is on. Imagine, in that process, in which the business people have had their Analyst team sitting with them - they don't want them to be controlled by a centralized team - they are worried whether they will get whatever they convey to the centralized team. Given that large organizations tend to implement new ideas slowly due to different priorities - some of these are new ideas - but no one wants to change – so they will get it changed - and they will obviously change - if we are 3 now in the larger global team, we may go back to 2 as part of the CoE model. Whether it is 3 or 2.5 or 2, making the change is a challenge.

| | | | | 5 | KSN | 2/25/2015 7:38 PM |

No, it is the same model. Probably the way it is articulated it is not happening. When we setup CCA, was it a CoE model or was it a Centralized model? It is both. The way it was described to you, we could call it by both names. It was a central team, but it was based on CoE. It is actually a change happening at CompuCorp level - so there will be a central team and that is my boss. But organized within that by functions that allows you to engage with the right business partner in the right way. You can't have a purely common pool - one analyst doing product & pricing one day and another day doing supply chain analytics. That function will be hard to kind of double up. Therefore, it is organized into functions. Every company organizes this in a similar way. Some companies are organized based on the Business Units, which I think is not the right way since business units may get reorganized. So. it is better to organize based on the Business Functions - Marketing, Online, Finance - all these functional expertise is not going to go away irrespective of how you organize the company. Setting up based on BU - you will have to reorganize every time there is a change in BU structure. In large organizations, the BU keeps changing every 2–3 years.

Aggregate	Classification	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified on
				6	KSN	2/25/2015 7:43 PM

Yes, they can relate to the details, understand the context, they are embedded in their business, they are trying also to be the thought leaders like I said, delivering value to the business because you define the problem, we keep telling our people that you should be helping define the problem and not solving them, because cattle can solve the problem sometimes for free, though solving problem is a commoditized thing, designing problem is where money is.

| | | | | 7 | KSN | 2/25/2015 7:54 PM |

During different phases, the issues have been different. Initially, as I said, issue was all about creating the right culture and all of that. Now one of the issues obviously which I can't lose sight of is to retain the culture. How do we make sure that we don't go back? I think the way I look at it now is that we are going through a transformation. How do we make sure that we don't go from 3 to 2 or 3 to 2.5. Because of this organizational dynamics and politics, people shouldn't say that oh you know this whole change into the CoE model is not working, CCA was working well and CoE is not a good idea and all of that - because they don't want to shift control, let the initiative also get a bad name or fails. That is the new issue that is coming up which will be the case with any restructuring - certain important initiatives or restructuring dies down and it is important when you want it to

Internals\\4-Senior Manager - Supply Chain and Operations Analytics

No		0.1393	4			
				1	KSN	2/25/2015 9:23 PM

Now, we are moving into what we call as Centre of Excellence (CoE) model - this is a significant change because this is more of an approach for execution excellence. Requests are considered, evaluated, and matched with requirement versus capacity and executed subsequently. In the past/current model was a different one, things were more formal. There were domains such as Manufacturing, within manufacturing sub-domains such as configured services, regular manufacturing pieces, and the partners work with our Analytics team that were responsible for the sub-domain. So, there were multiple touch points. Now, we are moving into this model that is more of a set of centralized processes that defines what is going to be coming to us - we should be focusing on.

| | | | | 2 | KSN | 2/25/2015 9:24 PM |

Probably, CoE should have been the first step, and eventually, we should have gone into multiple touch points - moving more toward efficiencies, but seem to be happening the other way around. Multiple touch points have their own strengths and weaknesses. This is the development that is happening with our practice, which is Operation and Supply Chain. Currently, reporting to Director of Operations CoE (Global Analytics Director for Operations at Austin, Texas).

| | | | | 3 | KSN | 2/25/2015 9:44 PM |

When I started Analytics at CompuCorp, it was not performing at the level it is performing now - from an indispensability standpoint. Part of the reason, why we are moving into the CoE model is for that reason to make (at least in Global Operations) Analytics team here - whatever it does should come from partners through a set of processes - it is considered as the focus area and therefore, you are able to do the work. So, the way the CoE model will help us get better traction with our partners /business - this is getting started off.

| | | | | 4 | KSN | 2/25/2015 9:50 PM |

Now, there is a push within the company saying that all reporting in Analytics to be centralized and that is move toward CoE model. There have been many CoEs. Any reporting /analytics work for the Global Operations function wants to get done has to be done by our CoE. That is the mandate we have now. But in practical, how far it is going to be, we will have to see.

Internals\\5-Business Analysis Manager - Online Analytics

No		0.0389	1			
				1	KSN	2/26/2015 12:45 AM

The competitive advantage is the Analytics Setup we have at CCA. We touch upon all the key verticals of CompuCorp. In case, I am working on an Online problem related to delivery - is the entire information available with online? Not really, it is with online and operations & supply chain. One of the strengths that we have as part of CCA is how we leverage other verticals? We co-exist here. This doesn't stop here. In terms of talent / skill sets, if I have to work on a new Statistica tool, it is very easy to get a knowledge transfer for Statistica, for example, from one of the Orgs since all the 7 orgs are in place. The significant competitive advantage is that all the 7 verticals are co-existing!

Aggregate	Classification	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified on

Internals\\6-Manager - Marketing Analytics

No		0.0802	2			
				1	KSN	2/26/2015 1:11 AM

In Marketing Analytics, my team of Predictive Analytics is focused toward marketing campaigns - telemarketing campaigns, direct mailer campaigns, pamphlets, and emails. Given the limited budget for marketing, we would recommend to the marketing team, which are the customers we should be targeting which have a higher likelihood or conversion rate. The teams are geographically organized addressing the US, Europe (EMEA), and APJ, with me having two teams addressing EMEA and APJ, and there exists a smaller team for US, though not as organized as my team. The US Sales & Marketing team also has its own analytics team in terms of external vendors that they utilize but definitely they utilize some part of work from our end as well. The Central Analytics head operates out of US and has mandate to provide analytics services across the regions, which will be supported by the India office . India office provides shared services.

				2	KSN	2/26/2015 1:23 AM

In terms of work assignment to resources, there is definitely a segmentation in terms of geography, I have a few analysts aligned to APJ and have a few aligned to EMEA. But in terms of the type of work, the APJ team and the EMEA team - it is interchangeable - the analyst can take up whichever work comes up. For example, we would have scheduled something for the entire quarter, but if an ad hoc request comes up, any one of the analysts can pick it up and look at it.

Internals\\8-Senior Manager - Contact Centre Analytics

No		0.0479	2			
				1	KSN	2/26/2015 12:50 PM

Total of 23 people, all at one location, Bangalore. The way we are structured is to address various projects and programs as part of addressing the needs of geographies, APJ, EMEA, NA, and LATAM and also as part of addressing ad hoc analytics needs that arises as and when. Based on the experience and the need, we pick and choose the analyst to deliver the request. Entire team is divided into geographies, and the ad hoc requests are taken up along with the regular work as and when they come by forming small teams out of the people we have.

				2	KSN	2/26/2015 12:54 PM

Ramesh is the Head of CompuCorp Analytics. We have domain leaders for the orgs. I report into the domain leader for Services Analytics

Internals\\9-Business Analysis Manager - CFS

No		0.2330	6			
				1	KSN	2/26/2015 6:57 PM

CFS is the credit arm in the US, with reasonably good portfolio. The 25-member analytics team comprises 3 teams taking care of customer lifecycle business processes, New customer acquisition, Customer management and Collection & Recoveries, Customer Default, and supporting the analytics needs across. Within CFS, functionally the analytics team is divided into Sales and Marketing, Account management & Risk monitoring (my team), and Operations (new accounts, collections, and agent monitoring).

				2	KSN	2/26/2015 7:03 PM

Our interaction with business owners is usually routed through this team, and few times in a quarter, we directly interact with the business owners presenting our summaries. The model development team interacts directly with Business Owners.

				3	KSN	2/26/2015 7:24 PM

It is a fairly symbiotic relationship, and we partner with them on a daily basis - obviously we are there to solve business problems and we typically as managers here, the three managers here work with our partners there to prioritize projects, analysis based on a tradeoff between how much of analysts' time is available and which projects demand the most attention - that is how typically it happens - we prioritize with our senior partners, and once that is done, analysts can work on it, deliver reports, analysis, and send it back. On a quarterly basis, at least 2 or 3 presentations happen with VPs of the business (Marketing, Risk, and Operations) to whom, we regularly present and also the feedback on the direction we take on a quarterly

Aggregate	Classification	Coverage	Number of coding references	Reference Number	Coded by Initials	Modified on
				4	KSN	2/26/2015 7:29 PM

Issues does arise and they are dealt on a case to case basis based on who is the analyst at their end and who is the person here and how well are we communicating with our partners. Just ignoring those challenges that are more personality based, overall, I think the structure works, the reason why it also works is because there is a clear flow of how all of these works - our team and the team in the US that is close to the business has clear directions from the business, and we are reliant on them and dependent on them to help us, make all this bit more practical on a regular basis, whatever strategy/direction is laid out is being followed. That really helps - we are dependent on them for that and conversely they are dependent on us for the analytical inputs that we provide in terms of tracking all of these, giving feedback on what strategies are working, what is not providing recommendations on what else you can do next. So I think from a structure-wise that is how I would envisage it to work, I wouldn't see the conflict of interest because in terms of at least transparency in this organization it is pretty clear - it is not like there is some shielding of information at any of these layers which is when these conflicts of interests arise.

| | | | | 5 | KSN | 2/26/2015 7:36 PM |

One of the things that helps with the structure is - there is a frequent reiteration of all the business leaders in the US - they are especially careful of the fact that we are always kept in the loop whenever key announcements are made and key decisions are being taken. So, right from how they set the strategic priorities for the year, they actually get into video conference calls with the team here - we have all the 4–5 leaders of CFS getting into calls with us on a quarterly basis, where they communicate what are the updates, plans for the next quarter, and they also use this opportunity to talk about general strategic direction for the entire year. So, we directly get to hear from the leaders not just the leaders but the entire team from here.

| | | | | 6 | KSN | 2/26/2015 7:38 PM |

Second, what we also do is with our own teams here on a quarterly basis in our business meetings we reiterate the same message, so that everyone is aligned on what the business priorities are and then it is the manager's prerogative to break this down to tactical decisions for his own analysts in terms of what they need to do for the year. That is how goal plans get structured, and typically, what we do is we align our goal plans with our partners, the other team of 15 analysts in the US to make sure all of us are on the same page.

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