PERSPECTIVES

presents emerging issues and ideas that call for action or rethinking by managers, administrators, and policy makers in organizations

Data Analytics: Hyped Up Aspirations or True Potential?

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Analytics is usually defined, in practice as any fact-based deliberation which leads to insights (diagnostics) and possible implications for planning future action in an organizational set up. It could range from routine tracking and monitoring of business performance and "nice-to-know" validation facts regarding the business domain, to more directed diagnosis of "root cause" of business problems as well as strategic prediction about future business initiatives. The commonality across all these exercises is that it is driven significantly by facts ("rational" by nature) obtained as a part of business and market data collection initiatives by firms.

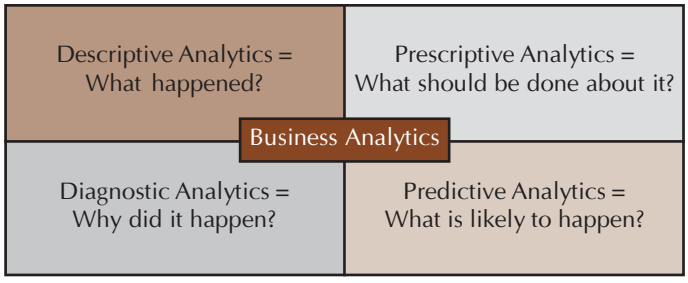
While this discipline has become a mainstream practice only in recent times, the need for factual evidence-based inference as an input to the business decision process has been in vogue from early times of management history. With the advent of better information gathering process and processing tools, more structured insight-building from information is currently the standard expectation in the industry.

ANALYTICS AS A FUNCTIONAL DOMAIN

To analyse is to examine data carefully and in detail so as to identify causes, key factors, possible results, etc. 'Analytics' is the process of analysis of data that is done logically aided by sciences (statistical, computers, etc.).

'Business Analytics' is a term that can be defined as "a set of all the skills, technologies, applications and practices required for continuous iterative exploration and investigation of past business performance to gain insight and drive business planning (Beller & Barnett, 2009). This process, depending upon its outcomes, can be descriptive, diagnostic, predictive, or prescriptive in nature (Gartner Report, 2012) (Figure 1).

Figure 1: Types of Analytics



KEY WORDS

Data Analytics

Business Intelligence

Business Decision-making

Big Data

Culture

Some Illustrative Analytical Approaches

- *Descriptive analytics* describes a phenomenon through different measures that could capture its relevant dimensions. The purpose is to simply unravel 'what happened' or alerting on what is going to happen.
- *Diagnostic analytics* evaluates 'why' something happened. It needs exploratory data analysis of the existing data or additional data if required to be collected using tools such as visualization techniques in order to discover the root causes of a problem.
- *Predictive analytics* seeks options for future business imperatives, predicts potential future outcomes, and explains drivers of the observed phenomena using statistical or data mining techniques – for instance, predicting the sales of a product for the next month or the behaviour of a target segment of the customers.
- *Prescriptive analytics* goes beyond describing, explaining, and predicting to suggest 'what courses of action may be taken' for the future to optimize business processes in order to achieve business objectives. In other words, it associates decision alternatives with the prediction of outcomes. For prescriptive analytics, decision analysis is used which includes tools such as optimization and simulation.

In a typical organization, analytics could be used in different forms:

a) It could be a dashboard kind of application when an organization routinely generates various metrics using data to monitor a process or multiple processes across time. All decision support systems fall into this category. This kind of application could be meaningful to understand, say, the financial health of an organization at a given point of time or to compare it with others or its own across different points of time. Even in such routine applications, what is important is to interpret these numbers and meaningfully connect it with the understanding of the underlying process relevant to decision-making. For such analytics applications, one needs to cultivate the skill of reading relevant facts from figures, connecting them with the relevant decision-making process, and finally, taking a data-driven decision from the business point of view. We would categorize such applications as "descriptive" analytics. Usually, such analytics is used repetitively and routinely in an organization for its day-to-day operations.

b) The second kind of analytics falls under the application category which is not routinely used in an organization. These are investigative in nature and could be either exploratory or confirmatory. For such applications, organizations usually hire consultants or sleuths. Given a business objective, the tasks of the sleuths could be to frame relevant research questions, collect appropriate data, and analyse it intelligently, and finally, to connect the findings with the business objective. Often, during the data collection or analysis stage, some interesting patterns emerge that are considered to be surprising discoveries. For this kind of application, one needs to be smart in posing relevant questions, obtaining intelligent answers with appropriate data, possessing skills of exploring data with the mind of a sleuth and finally connecting the findings with the business objective. Such applications are useful in understanding the business environment, the customers, the risks associated with a new product, etc., generally in making strategic decisions. Such analytics are generally used for forward-looking decision-making. We could categorize these attempts as "diagnostic" or, in some instances, where there are direct implications on the future, as "predictive" analytics.

c) Unfortunately, there are very few examples of good "prescriptive" analytics in the real world. A good reason for the shortfall is that most databases are constrained on the number of dimensions that they capture. Hence the analysis from such data provides, at best, partial insights into a complex business problem. Most prescriptive analytics exercises are therefore half-baked and need to be used with caution. Nevertheless, business analysts have devised "scenario builders" based on statistical analysis of market response data[1] which provide elasticity measures (impacts) of different managerially controlled parameters[2]. Using them, they have devised "what if" simulators that help provide insights about what may be the plausible options that the business ought to implement in order to maintain or strengthen its position in the market.

d) There is another "category" of analytics — Big Data Analytics – which appears to be more of a buzz word

[1] An example of market response data would be sales data of a business organization.

[2] An example of managerially controlled parameters is marketing mix parameters such as product features, price, advertising, etc.

in today's analytics parlance. Today's companies process more than 60 terabytes of data annually which is 1,000 times more than what they used to do a decade ago. Also, huge amounts of data are generated by individuals spread across different geographic regions in different formats like texts, videos, tweets, blogs, etc. More importantly, in 1986, only six percent of the world's data were in digital format compared to 90 percent of it today. So, the real concern is to make use of this huge volume of data to derive meaningful insights and drive fact-based decisions for business success. In the world of big data, filtering the signal out of the noise is the key. Mostly the analytics is exploratory (descriptive) in nature. By making use of exploratory statistical methods (data mining tools), the sole objective is to discover meaningful patterns or unknown correlations that could be used for making business decisions. A later section provides a more detailed perspective about the potential of this emerging field.

In a nutshell, business analytics supposedly spans the past, present, and future to give us more knowledge, better information, and concrete insights. It tends to get more complex and valuable as it moves from descriptive to prescriptive applications.

ANALYTICS INDUSTRY: RAPID GROWTH AND ITS IMPACT

It is important to highlight the significant strides that the analytics industry has made in recent times. Although it has been active in advanced countries as a support process embedded within more mainstream business functions, Analytics as a standalone business process has gained pre-eminence in the past 15 years, more so in countries such as India with the advent of offshoring of information technology-oriented work to cheaper production sites around the world. Hence, India has witnessed the emergence of service units that have assimilated certain specialized tasks that were hitherto part of a large policy making unit in workplaces in the developed markets. Over time, these tasks and processes were farmed out to cheaper labour markets such as India, and consequently, the genesis of standalone analytics processes.

In the recent past, the industry has grown significantly – by almost 14 percent in 2012 – and is slated to grow to a size of $50.7 billion by 2016 (IDC Report, 2011). It is being forecasted that the market for analytics and business intelligence (BI)[3] platforms will be the fastest growing segment in the software markets (Gartner Report, 2012). With emerging trends such as data-as-a-service coming, analytics shall probably see further growth prospects.

A reason for analytics gaining ground is the advent of technology that can compile data in a form that is amenable to analysis leading to decision-making. In addition to the internal business data and well-structured corporate or customer data, organizations can potentially acquire large external data sources (on social networks, internet, e-mails, text documents, etc.), which are usually unstructured, and need to be combined with structured data to conduct meaningful analysis. Managing the sheer volume, variety, and velocity of data that is being generated (with the innumerable technological interface devices) is a relatively new challenge for the typical business organization. As an illustration of the sheer magnitude of data, it is reported that for the year 2012, 2.5 quintillion bytes of data were generated every day[4].

In India, the Analytics and BI industry together is sized around ₹10 billion and is expected to grow by 22.4 percent to ₹26.9 billion by 2017. The major chunk of the analytics usage comprises of the BFSI (Banking, Financial Service and Insurance), Telecom Services, ITES (Information Technology Enabled Services), FMCG (Fast Moving Consumer Goods), and Retail. However, the small and medium enterprise sector is still in a nascent stage of deploying analytics and BI as compared to their larger counterparts, the latter contributing up to 65 percent of the total services utilized in the Analytics and BI market (Netscribes' Report, 2013).

Additionally, the Indian Analytics Industry holds the advantageous position of having one of the biggest shares in the global outsourcing market (total KPO market). With margins as high as 25-30 per cent in analytics off-shoring, Indian analytics service providers delivered $375 million in the total global data analytics outsourcing market of $500 million in 2012. It is also projected that by 2015, the data analytics off-shoring by global companies to India will increase to 21 percent in the total KPO market opportunities of $5.6 billion. Hence, India is expected

[3] A specific form of Analytical process which largely produces descriptive output.

[4] IBM website. Accessed through http://www-01.ibm.com/software/in/data/bigdata

to maintain its edge over major offshore destinations such as China, the Philippines, Eastern Europe, and Latin America (Avendus Capital Sector Overview, 2012).

Analytics is usually a dominant process in industries/domains that are highly data-rich and the major importance of its usage is attached to the reduction of business risks, improvements in revenue accrual, and generally in increasing overall operating efficiencies. As per available records, data and analytics functions are most popularly used in areas of sales and marketing, followed by customer service and R&D, and peripherally by IT and manufacturing. Surprisingly, a few functions like HR are yet to gain grounds on using data extensively for decision-making (TCS Global Trend Study, 2013).

Typically, the role of analytics across functions in major domains (like banking, retail, etc.) broadly encompasses the following tasks (Figure 2):

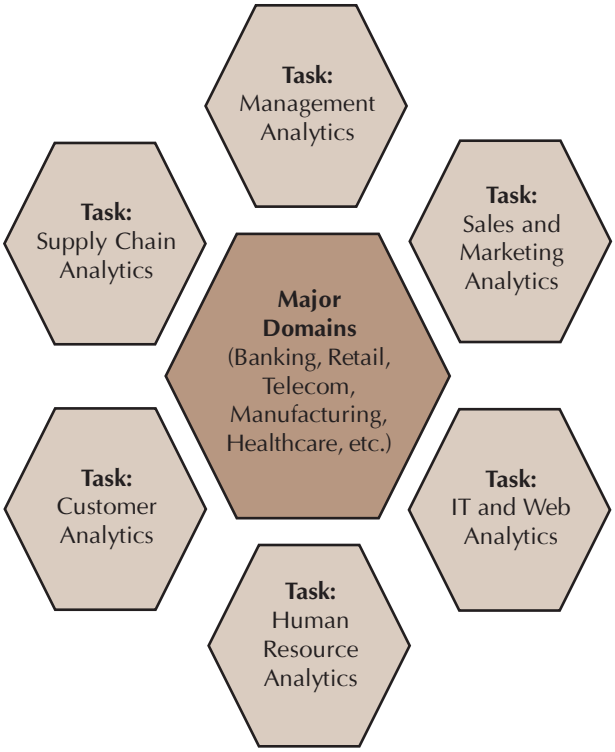


Figure 2: Major Analytics Domains

Some examples of widespread application of Analytics in industry as available from information in the public domain are described below:

a) Retail giants use terabytes of data by way of advanced analytics and seamlessly manoeuvre their daily and strategic operations of managing customers (loyalty and churn), changing existing offerings, introducing new ones real time, etc.

b) Analytically-abled banks use analytics to segment customers on the basis of risk profiles, credit usage, etc., and offer products that are customized for them.

c) Credit firms deploy sophisticated analytics to protect millions of accounts from frauds.

d) Big e-commerce players handle and manage millions of operational data every day and interact with numerous sellers quite efficiently using analytics. They manage supply chains as they are able to analyse data to get insights on efficiencies of suppliers, control material expenditures, assess accuracy of sales, and evaluate order delivery plans. Also, they can actually predict the demand of a particular product and its supply which can then be merged with the help of analytics to calculate optimum pricing that can be done real time (most web vendors practice this) to reduce losses.

e) A variety of service industries (airline industries, hospitality industries, car rental companies, amusement parks, etc.) offering perishable items maximize their revenues integrating demand-side management (like segmentation, pricing, availability) with the supply-side management (like capacity allocation and inventory control) in competitive market environments by building relevant models and using optimization techniques.

f) Relatively new analytics applications in HR allow enterprises to identify workforce trends, or to work out a cost or revenue model that suits their 'hourly pay workforce' models, e.g., contact centres or systems integrators minimizing the number of employees to be billed.

g) Similar applications are reported in the domain of traditional manufacturing and supply chain where market requirements data has influenced decisions based on appropriate analysis to enable optimized inventory planning, inputs sourcing, and scheduling of manufacturing processes. The opportunities to optimize are innumerable, but the limitations of availability of systematically managed data in many traditional sectors have limited the application of analytics to decision-making.

The authors' own experiences in this domain have confirmed such diverse applications in business. However, deeper and more pervasive use of Analytics and BI tools has been largely driven by the availability of data at a large scale and, more importantly, the richness (variety) of information that is captured. Using these yardsticks, it is seen that the retail banking sector, retailing sector, airlines and telecom services and, to some extent, the FMCG sector have had the largest influence of analytical services (in corroboration with published data discussed earlier). In sectors other than these, the role is somewhat muted largely due to the lack of organized data that can be coupled with decision-making. It must be highlighted that many sectors that have built up analytical prowess are blessed by availability of data due to the automatic generation of the data in the day-to-day operations of these sectors. For instance, retail banking operations are primarily "below-the-line" initiatives (customized for individual customers) and every transaction is tracked and maintained routinely at the level of every individual customer identity. Therefore, it is possible to use this rich customer-specific collation of transaction data for analysis and insight development.

The main advantage of using analytics in business decision-making is the possible avoidance of subjectivity. While the human brain is capable of processing many dimensions of data at a time, it lacks the consistency that is available in a rational scientific process using a computational aid. Hence, as a subject matter, data analytics has always been a suitable weapon to counter the risks of inconsistencies of non-rational decision-making. The transition from heuristics to fact-based problem-solving has been ably facilitated by the easier availability of business data, both by voluntary and involuntary methods and the development of smarter processing abilities. On the environmental front, the advent of competitive forces has provided adequate impetus for precision, focus, and efficiency in decision-making, which Analytics can enhance.

The true potentiality of Analytics is dependent on various other factors that influence its impact on business operations. The challenge is to ensure compatibility across data depth, processing skills, and congruence with business objectives, which may finally decide the level of utility this discipline provides for corporations that employ this function. An elaboration of this requirement is described in the next section.

ADOPTION PROCESS OF ANALYTICS IN ORGANIZATIONS

Unfortunately, it has been hard to implement the Analytics strategy in spite of its much touted strategic advantage. The skill set required to leverage its advantages is a heady concoction of data management skills, statistical/data processing prowess, and business acumen. The resource with the "right" mix (Figure 3) is in high demand and, not surprisingly, is available in short supply. Most organizations have evolved their analytic processes around a mix of resources that have varying strengths in more than one of the three key areas.

Facilitators

Data Inventory

Scientific enquiry requires regulated data formats that provide easy evaluation of (in) consistency in the patterns among the data, a requirement for good quality analytics. Hence, if data are available in limited degrees of freedom (less ability to interpret in multiple ways), especially when recorded in numeric system, it lends itself to convenient processing of data patterns to evaluate the evidence of consistency. Any evidence of severe infirmities in the information such as large data gaps, irregular recording, unstandardized formats and non-numeric formats can lead to additional investments in time and cost for appropriate data organization to enable easy analysis.

Processing Capabilities

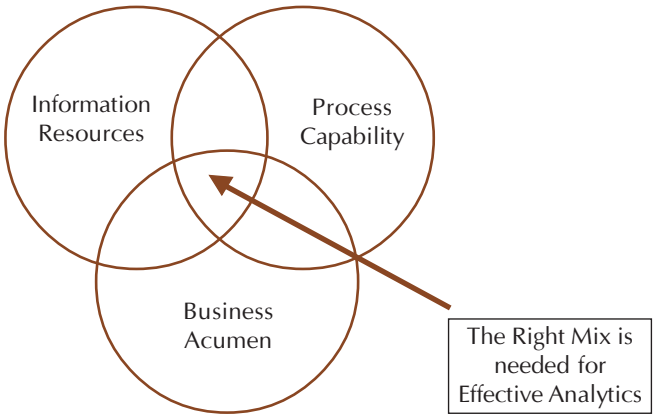
Relatively operational in nature, it is a blend of data management and analytical capabilities – statistical and computational abilities. Among the many investments that are required, this is perhaps the easiest to acquire and there are educational hubs that provide reasonable training to equip human resources to handle these responsibilities.

Business Insight Development (Business Acumen)

Certainly a critical capability, it is second only to the availability of superior quality data. Organizations reaping benefits of data insights need to encourage executives with high business acumen to excel in developing data-driven insight development skills. They need to be comfortable reading data insights and developing the knack of connecting them with their business relevance (also termed

as 'so what'). It is not the easiest capability to be developed. Usually, resources having specialized processing skills and the urge and the capability to participate into active business decision-making have the right mix of skills to drive this activity. However, unlike processing skills which can be imparted, this is a strange mix of data literacy and creative business acumen that develops with exposure to various business problem contexts.

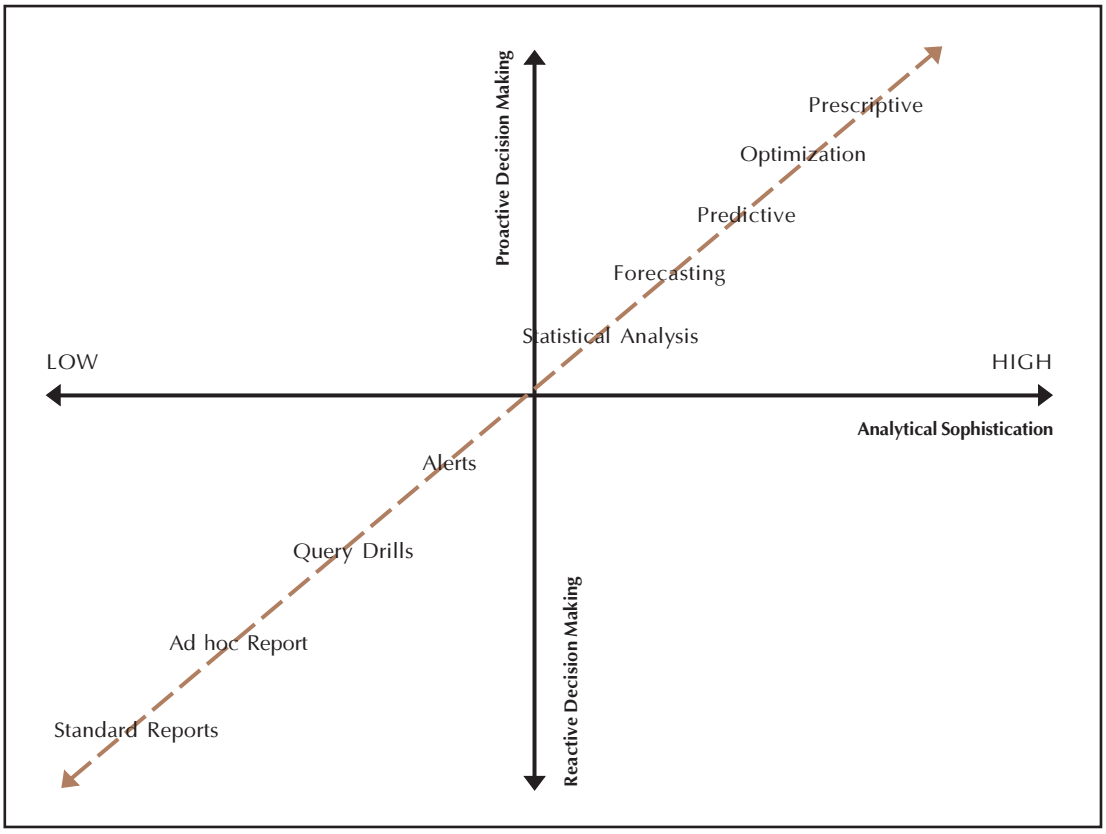
Figure 3: The Constituents of an Analytics Process



What has been the adoption path of these skills in organizations?

Over the years, various tools and techniques with different levels of sophistication and intelligence have been used by businesses to aid decision-making. Earlier, when computer-assisted decision-making began, most of it was based on finding out answers to questions such as what happened, how and where it happened (through standard reports, ad hoc reports, query drill drown, etc.) — that could be broadly termed as reactive decision-making. But with the advent of advanced analytics, businesses can now initiate proactive decision-making with predictive and prescriptive analytics that answer questions on why it happened, what may happen next, and how it can be solved (Figure 4). This type of analytics is proving to be a major differentiator amongst competitors. However, suffice to say that the core activities of analytics in many organizations remain primarily in the lower SW quadrant (Figure 4). Ideally, most organizations would like to scale the "heights of the domain" (NE quadrant in Figure 4), but are restricted largely due to the lack of appropriate

Figure 4: Use of Analytics in Decision-making



data in the organizations. Additionally, organizations in more dynamic environments find it difficult to use past information for planning future activities due to the high rate of depreciation in the value of the information.

One important area for productivity improvement in this domain is related to improved measurement of business impact due to the organization's use of analytics. With wider use and acknowledged importance of this process and also an upward climb on value addition, enough effort is required to document impact in terms of cost savings or improved profitability which is directly related to the establishment of analytic prowess in organizations. While some literature on business impact of analytics is available in the public domain (for instance, Banerjee, 2001), the authors have found a few references to remarkable improvements in business performance due to the investment in these processes. The best references in this respect have been in the offshoring space in India, where the improvement in terms of ongoing cost reductions has influenced transitioning functions to low-cost geographic locations. We lay particular emphasis on this aspect since the long-term consequence of non-measurability of business returns can be unsettling like it has happened in other related industries (Bijapurkar, 1995).

Culture: The Toughest Change

The market environment today has become far more complex and dynamic and is driven by fastidious customers who have little commonality in their requirements. With high levels of competitiveness and a networked globe wherein competition can emerge out of nowhere and almost instantaneously, decision-makers are bound to be on tenterhooks. In such a scenario, they just cannot afford to take decisions in the way they have been doing in the past, that is, with their 'instincts' or 'blind calls'. With the advent of analytics, organizations are trying to build a fact-based culture. Managers do trust their instincts but term analytics as invaluable, for the simple reason that it builds credence and lends support to their decisions as it is backed by empirical data. So, companies that have successfully adopted analytics maintain a proper balance (between 'gut' and 'data') in their decision-making and try to build a culture as they mature in their use of analytics. Analytical culture takes time to be built and gain acceptance, and a typical analytics rich organization has the right data management practices, right set of professionals, right mindset, and right amount of patience to see the fructification of analytics initiatives over time. In such organizations, analytics is introduced with a strong belief, and spearheaded from induction to practice to adoption, by the top management, with conviction.

Besides the general teething problems of an evolving practice, there are some unique complications in this domain, such as the supposed incompatibility between the skill sets required for (a) managing information, (b) processing the information especially if it is in large scale, and (c) developing implications out of the processing results which connect to the resolution of the business problem using the domain knowledge. Historically, these three disciplines have largely stayed distant from each other and hence the need for their synergetic association was never directly required. Research and analytics-based decision-making processes have forced these three hitherto unassociated skills to integrate. No skill development programme for management, to authors' knowledge, has focused on the integration of these three skills on such a large scale as it is required today.

These challenges have grown exponentially when some analytics functions are displaced to outsourced operations[5]. The imbalance is primarily due to the non-availability of certain competencies in the displaced environment. In most cases, the business domain knowledge in outsourced operations is not in line with the requirements on site. Hence, imbalances are created when certain processes that have a higher technology component (data processing capabilities) are relocated to offshore operations and processes with more policy-making components (business acumen) are retained in the home office.

The prime mover for outsourcing and/or offshoring high-end value-added processes to low-cost environs has been cost management. However, imbalances have been caused because business acumen is critical to boost up value addition in the analytics process. Low-cost environs which provide offshore services are associated with market conditions which are not compatible with the developed markets for which the analytical services are rendered. The ability for resources in the offshore environs to appreciate the nuances of domain knowledge of the user (developed) markets is limited, leading to the possibility of suboptimal output. In general, technology in the form

[5] Indian outsourcing of analytics to become a $1.15 billion business by 2015, according to Avendus Capital.

of processing capability (surfeit in its availability in low-cost environ) acts as a poor substitute for business acumen to drive value addition.

Potential Way Forward for Outsourced Analytics Operations

Inevitably, the answer lies in the cross-pollination of skills both within and across environs to improve the competency set. Migration of experts from the domain, development of offshore environs, and better work/information flows across work sites/personnel with differential skill sets can help alleviate the challenges over time (Banerjee & Williams, 2009).

What has been seen is that short-term imbalances in skill sets are compensated at times with emphasis on one or more skills rather than a combination of all. For instance, both in the offshore and onsite (India) operations, availability of technologically superior manpower has resulted in specialized consulting outfits (both internal and external) that focus on one or more aspects of data processing without putting a commensurate amount of focus on the business acumen, the latter being more difficult for standalone specialists (particularly in offshore environments) to imbibe.

Usually, the specialization would follow the intrinsic capabilities of the firms that have expanded their footprint into the Analytics market in the offshore environment. By that logic, one would expect the traditional software[6] firms to veer towards automation and reporting processes (descriptive analytics) whereas the algorithm building firms[7] would be keener to position themselves as modeling and optimization specialists (predictive and diagnostic analytics). Business consulting firms[8] (though less active in the offshore space) tend to rely on their domain skills to offer prescriptions for business problems while depending on more specialized data processing partners for the analysis. The jury is still out on the usefulness of such specialized and piecemeal measures.

[6] For illustrative purposes, a software firm would resemble Wipro, Infosys or Tata Consultancy Services.

[7] For instance, SAS, IBM SPSS or Salford Systems.

[8] For instance, Oliver Wyman, Boston Consulting Group, and McKinsey.

COUNTER VIEWS ON THE IMPACT OF ANALYTICS

There are a few other diverse challenges that are perhaps at best partially surmountable. They are as follows:

- Analytics cannot be used significantly for new initiatives, that is, in greenfield areas since the process largely uses past data already available. Past data used by analytics can largely validate (identify) what has worked/not worked, etc., but in the absence of historical data, analytics is very rarely able to provide insights about new (greenfield) initiatives. Of course, one may be able to build surrogate analysis based on data from indirect sources. However, the appropriateness of such analysis in the context of decision-making is always a moot point.
- In preparing for 'black swan' problems/risks, mainstream analytical tools are of little use. Black swan risks are defined as high-profile, hard-to-predict, and rare events that are beyond the realm of normal expectations; such outlier events carry much larger threats and uncertainty (Taleb, 2010). As on date, mainstream analytics is still not sophisticated enough to predict (identify) such risks.
- Analytics is also seen as an application that kills creativity in decision-making as it is more of a diagnostic and tends to be regressive in approach. Over time it may kill gradual development of decision leaders and instincts that come from heuristics. Non-analytical decision-making may defy logic and may be out-of-the-box but at times can give surprisingly better decisions and direction to problem-solving. The challenge for leaders of tomorrow would be to sense the balance between data-driven decisions and the leeway to be given to experience and creativity (Mcfee & Brynjolfsson, 2012).
- Also, the critiques believe that most organizations are going after analytics because of its "snob" value. Rather than being an opportunity, it has become a compulsion to adopt for the fear of being left alone in the bandwagon. Analytics is still not used in the major part of decision-making (Bloomberg Survey, 2011) in spite of being fully functional and hence may be a fad that may run a little longer.
- The steep learning curve, skill and technological requirements, change management issues, investments and time taken in analytical deployments *vis-a-vis* the time it takes to generate results is a big risk that or-

ganizations take when going forward with analytics. And, if analytical implementation and adoption is not smooth, it brings additional problems and increased frustration of policy makers. Also analytics requires the organization's culture to be tuned to a large extent which takes further effort on the part of the managers who may be already too steeped to consider it worth the effort.

- Employees at all levels may feel redundant at times. For instance, the frontline operational staff may feel as if they are data entry operators and mid or top level employees may see analytics as a threat to the power they might have enjoyed as standalone 'instinct' decision-makers.
- With too much data comes too much power and the critiques of analytics fear misuse of such power to flout ethical norms through analytics. For example, following a net surfer through web analytics and using precision marketing to flash promotions of exactly the same products that he or she might have browsed (even a day before) may be seen as invading the net users' privacy. Similarly, people browsing health websites may be tracked down and unwontedly mailed insurance plans, and the consumer may feel he/she had been unethically subjected to spam mails. Interestingly, use of analytics can actually go to an extent that it becomes corrupt, like the famous case of the Government of Netherlands that used data from one of the major route-mapping GPRS device company (Tom Tom) to implant speed traps, which were later withdrawn on public outcry!
- Also, there has always been a huge hue and cry over existing data and technology – loopholes – like data security, data outsourcing, crashing servers, and disruptive technology changes which may render analytics defunct and organizations and customers in a disgruntled state.

It may be worthwhile remembering these probable limitations while making significant investments decisions in building analytical prowess. The expected returns from such investments need to be tempered based on the possibilities of such constraints.

THE NEW KID ON THE BLOCK: BIG DATA AND ITS APPEAL

No discussion on analytics today can end without some prognosis on the impact of the newest opportunity in the domain – Big Data. We would like to mention that though we have touched upon the so-called 'Big Data' analytics in an earlier section, clearly it was not our intention to delve into a detailed and specific discussion of its impact on business and our life style in general. Rather we intended to keep our discussion on analytics at a more general level avoiding any specification. There are optimists resting high hopes on its potential to bring revolutionary changes in every aspect of our life in the same way as internet had done after its launch in 1970. On the other hand, the sceptics have a feeling that it may eventually be proved to be a 'big dud'. The challenge that 'Big Data' analytics faces is mainly to extract meaningful pattern or correlations from unstructured data which is exploratory in nature. On the other hand, the amount of information such data contains is possibly a miniscule part of it and most of it is just noise.

Be that as it may, it is perhaps important for the industry and academia to quickly evaluate the potential of this new data source(s). Many functional managers who have run mature analytics processes for many years are currently challenged by their senior management to evaluate the prospect of combining this new data source with traditional analytical processes to make them more potent in terms of support to decision-making. The authors have noted multiple instances of (un) realistic demand by top management to find ways to build predictive decision support models by incorporating Big Data with more traditional market and customer panel data. The hunch is that the "conversational" nature of the information from various social media sources (an example of Big Data) may be able to provide early and reliable signals of market behaviour which hitherto was not available. For example, if analytical systems can capture signals regarding "what people are talking with respect to specific brands or products" consistently, the hope is that they may be able to forecast, with better accuracy, people's future behaviour in the marketplace with regard to the same brands or products. If that is indeed true, and if the information can be linked to actual behaviour, managers in organizations with such capabilities may have the advantage of predicting actual performance better and earlier compared to other organizations that do not hold such capabilities.

This would require the analytical prowess to link the disparate data sources together, the ability to glean the information from the new sources of information, and

finally, the ability to integrate the information into traditional analytical models at a faster rate. Among the three capabilities listed, it appears that the major challenge will be the ability to mine the new form of data, since the other two capabilities have evolved in the past 15-20 years with the emergence of data science and analytics.

Just to reiterate the significant challenge in the future, the potential of these newer forms of data to provide information as against noise is still to be ascertained. With more data deluge and at a faster pace, the noise may be increasing faster than the signal. Finding a pattern in it may be like searching a needle in a haystack. Another potential complication that may surface is that people's "conversation" on the e-scape (social media) are not necessarily about all kinds of marketing activities and available products. Consequently, the chances of false discoveries of patterns (and sometimes no discoveries) can increase by leaps and bounds. Eventually, it is the deep knowledge in the domain and consumer behaviour in the context, as also the prudent use of some of the traditional qualitative (non-numeric) data analysis tools (Miles & Huberman, 1994) on a new technological platform that can avert such a catastrophic situation. Hence, like every other nascent discovery, we would advise an open but objective view of the potential value that this information source may bring to society.

An anonymous industry observer's commentary on the current dilemma sums up the situation appropriately:

".....as management pushes for more 'big data' and better capabilities to integrate the resulting insights into their marketing programs, they are stuck like deer in the oncoming headlights of "change" and they are not sure what to do that would have a more acceptable impact..."

It is obvious to us that the last word has not yet been said about the true potential of Big Data.

CONCLUDING REMARKS

Over ten years ago, one of the authors faced an unenviable situation when the senior management of a respectable private sector bank asserted that analytical tools would have little relevance to their enterprise in the long run. It was one of the profitable banks, servicing the creamy segment of the society and barring creativity and impeccable relationship management skills, it did not require much to maintain its business.

Unfortunately, for them, the world moved on in the intervening period and, to their credit, the bank changed its focus admirably by adapting to the new requirements of data science (analytics) in a prudent and timely manner to avoid any significant downturn in its performance. Today, on the other hand, the data science revolution is seemingly passing through a phase of extreme positive euphoria, almost perceived to be the "manna" from heaven that provides the next generation of resolutions to business problems.

Needless to state, both these sentiments are improper representation of the true value of the science of analytics to organizations. Hopefully, over time, this euphoria will be replaced by a more practical and useful perception of its role as pervasive ether in the organization, supporting and guiding all decision-making, yet not getting in the way of common sense acumen. Also, with the advent of better data collection technology, capturing and processing market and business, data will be more efficient which would lead to the construction of timely and better decision support models – from diagnostic to somewhere closer to predictive/prescriptive. Such prudent representation of analytical capabilities is the true example of an evolved business enterprise thriving on the power of information in the long run.

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