

Research on Barriers to Implementing Business Analytics in Organizations

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Abstract: Business Analytics has been widely applied to multiple aspects with a data-explosive background. People utilize data mining tools and models to guide marketing strategy, organization management, evaluate financial budgets, etc. However, what comes after its popularity is various implemental obstacles, this is why only a few companies have the capacity to run their own business analytics teams and adopt conclusions stemming from data and models into their organizations' operation and decision-making. After reading and organizing previous related papers, and distilling and comparing the findings of different researchers this paper divides the barriers to the use of Business Analytics into six parts and summarizes the causes and possible effects of these barriers. In this context, barriers to implementing business analytics in organizations are introduced in dimensions of data quality, security and accessibility, analytical tools and knowledge, financial investment, human resources, analytics procedure, and organizational barriers. This article provides a basic overview of the barriers and may be useful to guide and improve the practical application of Business Analytics.

Keywords: business, analytics, data, barriers

1. Introduction

In the new century, Business Analytics has become a buzzword in the management field attributed to the Internet and Information Technology boom that cultivated a data-rich environment and underlies a wealth of mathematical and statistical models [1]. In general, Business Analytics is a science or method that incorporates sophisticated mathematical, statistical, machine learning, and network science methods, as well as a variety of data and expert knowledge, to guide descriptively, predictively, and prescriptively analysis and to support accurate, timely, and effective decision-making, answer questions, and solve problems [2].

The huge volume of data comes with the flourishing of the digital media ecosystem and the internet economy has provided organizations with unprecedented opportunities to utilize data to create value for customers, enrich the user experience, boost their satisfaction and loyalty and obtain value. The availability of big data is taking a wave of data-driven decision culture in companies, bringing them strategies to stand out from the market competition and improve financial performance. The need for better business decisions, availability of data, and affordability of the enablers, together with a cultural change towards evidence-based management leads to the popularity of analytics, and the diversity of

applications of analytics span from almost every facet of business practices [3]. Applications of data-driven techniques have been widely utilized in manufacturing, services, retailing, and medical industries, and the list is still growing at a rapid speed.

While business analytics is widely used in almost every aspect of business, there are numerous barriers and challenges to adopting business analytics in organizational applications. Many institutions and scholars have conducted surveys and research on the barriers and challenges to applying Big Data, AI (Artificial Intelligence), and Analytics. Some of them concentrate their studies on the technology itself and relevant methodology, while others focus on very specific domains like Business Processes, Individual Sales, Manufacturing Supply Chain, Performance Management, Human Resources, Telecommunications, etc. Few articles and researchers work on classifying and summarizing these different barriers, especially to their implementation in organizations, and it is exactly what this paper highlights on.

After reading and organizing previous related papers, and distilling and comparing the findings of different researchers, this paper divides the barriers to the use of Business Analytics into six parts and proposes their possible causes and possible effects. In this context, barriers are introduced in dimensions of data quality, security and accessibility, analytical tools and knowledge, financial investment, human resources, analytics procedure, and organizational barriers. These barriers are constraining the availability of data and its blend with customers and market, restricting the generation of a data-driven enterprise culture and managers' effective and precise decision-making in the market. This article provides a basic overview of the barriers and may be useful to guide and improve the practical application of Business Analytics.

Research studies such as technology-organization-environment framework and IT business value in the past suggested that the extent of the organizational performance under IT impact is determined by plenty of organizational factors, which can be summarized as technological, organizational, environmental factors, business analytics' integration with other factors and the level of its adoption [4]. In the absence of these key factors, companies encounter challenges in making effective strategic decisions, in other words, barriers to the use of business analytics in organizations. The six barriers separated at different levels are explained below.

2. Data Barriers

2.1. Data Quality

Called "the oil" of the digital economy, data are playing an increasingly significant role in organizations. Managers harness data to construct and monitor customer relationships, customize products and services, and automate real-time market processes [2]. However, analysis processes can be misled if the original data, which is large in volume and sometimes unstructured, dirty, and messy, is not cleaned and standardized appropriately.

Data complexity and its inherent messiness is a big challenge for organizations to extract the value of big data and utilize it to suggest management and strategy. From the example of ICICI bank, it is observed that data is generated from the smallest to largest segment of the organization, this massive and redundant data collection work may cause duplication, loss of vital data, time and cost extension, and even accumulation of excessive unstructured data [5]. This agrees with the saying that "without the appropriate dataset from which to conduct analysis, the analytic outputs will provide irrelevant information to the decision makers" [6]. Data should be integrated across functions, geographies, and divisions. However, many companies don't have the plan to prepare sufficient addresses for the large rate of data growth. The fact is that the challenges of managing and analyzing various data from multiple sources and formats (structured and unstructured like text, images, videos, messages, maps, etc.) of data are often beyond the organization's capacity [7].

2.2. Security and Privacy

Data contains the majority of customers' details like medical information, consumption bills, and social records, using this kind of data for a company's earnings may trigger some security issues if not properly kept [5]. The absence of backup plans might enhance firms' security-related concerns and consequently, increase their overall perceived risk [8]. Organizations encounter numerous legal and ethical challenges as excessive use of individual data from customer records may reveal and leak their privacy (medical records, financial situation, embarrassing behavior, family relationships), even though the move probably generates a great profit. The use of the personal data of customers should be prevented or highly scrutinized to protect the organization from bad publicity and public outcry, even if it is within legal boundaries [3]. Besides, the law and regulations stipulate and limit managers and organizations in how they can extract user data, increase customer lists and craft their message [9].

2.3. Open-up Data Accesses

Sharing data across organizations is another challenge, as the data must be secure while handling shared data containing different vocabularies on different platforms. What has to be blamed is the issue of data responsibility, some partners are unwilling to engage in data sharing, or it depends on providing incentives and security. Due to a lack of trust and fear of losing control over the data, they may want and should keep certain data confidential, which on the other hand can limit its usability for analytics [10][11][12]. As a result, data-sharing policies and access methods are critical for organizations to keep data for an extended period, scrub data for inaccuracies on a timely basis, and redistribute it appropriately [13].

3. Techniques Barriers

3.1. Skills and Models

The first barrier is a lack of knowledge in approaching and using data, which includes distinguishing between useful and useless data, identifying data suitable for analytics, ideas about the potential value of data, experiences with data-processing techniques, and methods to transform data into valuable information and decision-making strategies [13]. Agencies and enterprises capable to afford analytics technology may not have the expertise to utilize its fullest potential due to the limitation that both business and computer specialists need to be trained and hired. Organizations also have trouble balancing and keeping up with the rate of innovative technology to change, evolve, and advance, while contemporary techniques are working stably [9].

3.2. Tools and Infrastructure

Research has shown that a lack of appropriate data analytics tools slows down smooth production, especially in manufacturing supply chains [14]. Even if it is available, capable, and sometimes affordable, establishing an analytics infrastructure is still a big expense, as the management layer of organizations may not be willing to invest in needed technology without a clear benefit and output [3]. Only a few organizations work with analytics specialized software, meanwhile, the majority are still using office software such as PowerPoint to design organizational charts and spreadsheets to do activity analysis [15]. In addition, to develop IT infrastructure for business analytics, cloud, and heterogeneous computing architectures are although necessary, these technologies would fail to build in high probabilities either from an economic or technical point of view, thus organizations can not avoid data processing bottlenecks [7].

Missing knowledge can lead to unreasonable expectations, impractical demands on analytics functions, and ignorance of its limitations. Considering this, firms are less likely to generate meaningful initiatives for business processes without effective analytical techniques, due to which value underestimation and investment reluctance occur.

4. Finance Barriers

The cost of analytics adoption is mainly prepared for solutions available on the market, acquiring necessary raw data, and system integration, it is considered to be a significant barrier as it is hard to predict the return of the investment in advance [13]. In this regard, Brynjolfsson once makes a point about the “IT product paradox” which points out the paradox that researchers are unable to assess the earnings growth that results when companies increase their investment spending on IT [16]. Even though the situation remains confusing, substantial investment in data recording and storage is required for organizations to develop their data analytics technology. This is an obstacle that many companies need to overcome if they want to reap the rewards of business analytics [17]. Moreover, it is hard to evaluate the breakeven point. Many executives are experiencing a hard time, especially on a big scale, since analytics are not only costly but also complex, its return on investment is difficult to justify if cannot convert the value of analytics into evaluable numbers [3].

5. Human Resource Barriers

A lack of analytically skilled human resources is a great barrier to analytics adoption within organizations.

5.1. Talent

Not only the professionals mastering the analysis of data or business management but also the operators, managers, and decision-makers involved in the process of converting data into value, these comprehensive talents with professionalism and strategic vision are also important factors that influence the application of business analytics in organizations. Given that analytics is new and relevant talents, called data scientists or quantitative geniuses are still being developed today, and are scary and hard to find. The market is in strong need of candidates having solid programming and excellent communication skills, who also should be good innovators with deep business understanding [6]. Early in 2011, Bassi pointed out that there is a demand for individuals to have the ability to use the results of analysis by involving them in business outcomes [18], and conversely, the shortage of well-trained IT personnel may increase “data input errors, data loss or confound data analysis and interpretation” [7][17].

5.2. Training

Business analytics implementation also includes training and coaching employees to adapt to the new working system. However, training could be an issue if an analytic tool was too complicated or took too much time to learn. Inefficient trainers, irrationally designed training programs, inadequate motivation, and incapacity of trainees to execute the skills into work may incur improper training and bring about a huge negative impact on the organization [19][20].

6. Procedure Barriers

6.1. Time

Time constraint is perceived as another primary barrier in organizations owing to the lack of sufficient time to familiarize staff with analytics and its related technologies, especially in the face of a rapid change market [21]. The long period it takes for companies and staff to go from analyzing data and obtaining information to actual output can inhibit other processes that would otherwise generate profits, as it is difficult for organizations to develop parallel initiatives simultaneously [22]. The right implementation time may also be hindered by delays in vendor selection, obtaining funding, or delays due to some uncertain event. In all these cases, costs start to increase, data may become outdated, and disruptions in the organization may appear [5].

6.2. System

The issue of integrating systems impedes the integration of data resources under diverse and incompatible IT circumstances, and the mistakes in this integration of systems will result in inaccurate outcomes and wrong decisions [13][23]. Processes must be implemented, and the organization must establish an appropriate range of measurable metrics by which all project steps can be accurately estimated if completed successfully [9]. The size of the system sometimes incurs delays and administrative inflexibility in data sharing and there is a lacked a uniform, repeatable process across organizations [24]. Furthermore, the approach of implementing advanced analytics, and insufficient care in introduction possibly lead to high expenses with low returns along with low morale and excessive blame [9]. To deploy analytics, organizations must establish processes, governance structures, and teams with complementary data skills, as well as create a strategic roadmap that can leverage existing and new data assets [25].

6.3. Inefficiency

There exists a deep connection between the adoption of analytics technology and the operational efficiency of organizations. The suboptimal business decision generated from an inappropriate technological solution is very likely to impact the firm's operational efficiency [26]. What is worth thinking about is operation inefficiency damages the company's reputation and employees' satisfaction, it narrative the investment in analytics, and under this situation, the market share is adversely affected [26]–[28].

7. Organizational Barriers

No doubt that several effective and profitable transformations are generated by the adoption of analytics, nevertheless, only a few companies are proficient in its use while many more are encountering obstacles, perhaps management and culture-relevant barriers could explain it [5]. Besides, organizational bureaucracy and culture can hinder the necessarily shared vision to adopt analytics tools as well [29].

7.1. Culture

Organizations have to cultivate an analytics-driven culture since a big investment in technology cannot finish a fruitful business analytics implementation on its own [6]. More and more companies are realizing the magnitude of a data-driven culture in adopting analytics techniques into modern business. Through its assumptions, symbol, norms, and value, organizational culture has a profound impact on many facets of a company like its structure, strategy, and procedure [7]. Habits are hard to

break, however, culture no doubt is the most difficult part to change, the shift from intuitive and empirical business judgment to data-driven decision-making is exactly a tough process. Some of these entail processes organizations must go through, including enriching the team's data processing skill set, expanding the range of decisions affected by data, and developing a data-driven decision-making manner rather than gut feelings [30]. Achieving this transition depends largely on senior management believing that the role of data and analytics should have a more prominent place in decision-making [31].

7.2. Management

An analytics-driven culture may assure that members of an organization are on the same page toward a common goal that the analytical system trying to address. The inconsistent business goals stem from the silo effect and mismanagement incurs many failures. Silos are originally set for specific labor and task division to eliminate multiple versions of the truth, nevertheless, decentralization of data authorization and functions across work teams inevitably accounts for mistrust and information asymmetry [6][13]. To acquire positive output, companies must break the barnstorming effect, and governance mechanisms may influence the extent to which the organization's culture is data-driven [32]. Given that businesses are still in the early stages of implementing business analytics, it is critical to have a 360-degree view of its implementation, evaluate time and complexity, and calculate the cost and gains. The lack of oversight of analysis has led to the cultivation of heterogeneous tools, methods, and processes that are possible to develop redundant solutions to similar problems [13]. Sometimes the manager's experience pool may not catch the rapidly changing marketing, and organizations' managerial insights about new information and strategies are somehow insufficient [31]. If a company adopts inappropriate technological solutions due to a lack of governance, it will suffer significant losses [33].

8. Conclusion

While surrounded by rich data resources, many organizations are simply not well prepared to dig the mine underneath and take advantage of its value, as the obstacles generated by data, techniques, investment, individuals, and teams are in the way. Six primary obstacles are summarized as follows. Data quality, security, and accessibility are hard to guarantee, and analysis processes can be misled if the original data are not clean and standardized appropriately. To equip personnel with advanced tools and knowledge and assure its application into practice, infrastructures consisting of hardware and software, property and precise training, and skilled talents are strongly needed, behind which is heavy found investment. Due to an unpredictable return on investment, the paradox of resources and costs is inevitable and hence hinders the adoption processes of business analytics. Besides, many organizations lack an unambiguous objective and a standard procedure of convert data into business strategies and profit, leading to information asymmetry and inefficiency. Apart from the factors mentioned above, data-driven culture and all-around management are also necessary, which require long-term trial and adjustment so that firms hardly achieve it in the early stage of implementing business analytics. Complementary to those mentioned above, key factors in deriving business value from investments include recruiting people with a good technical and managerial understanding of big data and analytics, fostering a culture of organizational learning, and embedding data-driven decisions into the organizational structure. Realizing this value has to overcome barriers caused by a variety of factors such as poor data quality, lack of expertise, outdated technologies, insufficient investment, inefficient procedures, and vulnerabilities in management. Undoubtedly, this means numerous processes need to be implemented, which requires top management commitment and a clear plan to adopt and roll out business analytics company-wide.

This paper mainly focuses on the integration and sorting of various barriers to the application of business analytics in organizations, without much discussion on the comparative analysis of interrelated obstacles and their targeted solutions. Besides, there is a lack of case analysis referring to these hindrances of different types of barriers to specific industries and specific business activities. For research in the future, these barriers can be analyzed with examples and effective optimization and solutions can be chosen as objectives.

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