# Challenges facing small-to-mid-sized businesses in choosing to adopt cloud-based big data analytics

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**Introduction**

Cloud computing was one of the fastest growing areas of IT in 2020 (Gartner, [2020).](#_bookmark10) It can provide for very cost-effective solutions and allows for numerous advantages in terms of performance, availability, scalability, reliability, to name a few (IBM, [2020).](#_bookmark12) Large-scale integrators and consulting firms are investing billions to support cloud services for clients and are making cloud computing central to their core strategies (Accenture, [2020](#_bookmark1)). For its many benefits, choosing cloud computing comes with risks for businesses. These include the costs of moving to cloud, disruptions during the move, training needs and costs, compliance requirements, latency, and incompatibilities with current system architectures (Cook, [2019).](#_bookmark7)

For all of these risks, however, cloud computing is the most cost-effective, and easiest means for companies to engage in “massive-scale and complex computing,” it is the natural platform upon which to build big data analytics (BDA) tools (Hashem et al., [2015).](#_bookmark11) Companies with aspirations to leverage BDA capabilities in customer management, supply-chain management, and business information tools are well advised to pursue a cloud strategy (Talia, [2013).](#_bookmark24)

Small-to-mid-sized companies are facing a serious strategic problem: when and how to develop BDA capabilities given the associated up-front costs and risks while balancing the long-term benefits (Ajimoko, [2018).](#_bookmark2) This is a problem that nearly all companies must contend with if they wish to utilize the benefits that BDA provides. The simple reality is that data driven companies are more productive and more profitable than their competitors (Alsghaier et al., [2017).](#_bookmark3) Yet the risks to small-to-mid-sized companies, with inherently limited IT budgets and less access to highly talented IT staff, are significant. Researchers have noted that there is little understanding of how BDA investment helps some companies become a successful data driven company but not others (Moreno et al., [2020).](#_bookmark16)

# Impacts

The most critical impact in facing this strategic problem is that there is evidence that becoming a data driven company is necessary for competitive advantage (Alsghaier et al., [2017).](#_bookmark3) Yet, it is also understood that many companies do not see the expected

returns on BDA investment in terms of value creation (Fink et al., [2017).](#_bookmark8) Researchers have not focused sufficiently on how BDA translates into competitive advantage (Trieu, [2017)](#_bookmark26) to provide answers to this problem. Further in many domains, such as supply chain management, business experts and computer science experts disagree as to the value of specific BDA returns (Roßmann et al., [2018).](#_bookmark20)

Researchers have noted that firm characteristics beyond simply investment into BDA capabilities are linked to value creation (Božič & Dimovski, [2019).](#_bookmark4) This state of affairs means that most businesses, while recognizing the cost and performance advantages of engaging in BDA in the cloud, very few companies are actually doing this well, with only about 20% of a company’s “cloud journey” being complete (Kenelly, [2019).](#_bookmark14)

Small-to-mid-sized companies have some advantages in moving to the cloud given their small environments. Yet, their leadership is conflicted upon how and when to move the most critical and expensive computing environments. This comes from a few factors: the inability to move unique workloads due to technology or compliance constraints; the fear of vendor locking and the inherent complexity of working with multiple cloud vendors; and, importantly, the lack of relative skills (ibid).

The risks associated with lack of information system and infrastructure support, the capital outlay; and technical uncertainty (Raguseo, [2018)](#_bookmark19) mean that small-to-mid-sized companies are caught in a “no-win” situation. They can either convert to IT as a service now, absorbing the associated costs with little guarantee of successful value generation from their BDA and cloud investments; or they can wait for industry clarity but then likely suffer by being behind early adopters.

# The Underlying Cause

The main causes of this situation have already ben touched upon, but it is worth repeating them clearly.

First, and arguably most importantly, there is simply a shortage of people who posses the technology skills to properly engage in BDA (Dawson et al., [2019).](#_bookmark9) US Census data shows that the size of an enterprise directly impacts average pay rates (US Census Bureau, [n.d.).](#_bookmark27) In technical fields the pay disparity is even greater (Pofeldt, [2015),](#_bookmark18) which may well make it even a greater challenge to hire the people needed for this type of work. An even greater skill gaps exists in the Cloud Computing space, and is a leading concern for corporations (Sayegh, [n.d.).](#_bookmark21)

Second, the issue of multiple cloud vendors is a major cause of concern (Gartner, [2020).](#_bookmark10) Multi-cloud strategies are strategically necessary to avoid vendor lock-in, but drastically complicate the necessary architecture and deployment of IT resources.

Providing secure data access across cloud vendors in non-trivial and requires advanced IT skills and careful planning to do securely and with the necessary performance attributes to facilitate BDA activities1. This cause has a multiplicative impact on small-to-mid-sized companies because of the first underlying cause, a lack of adequately skilled employees.

Third, the problem of uniquely complex workloads again exacerbates the situation for small-to-mid-sized companies. Even though most US companies in this category recognize the need to use new technologies in order to survive, their transition is complicated by reliance on antiquated legacy systems that are not well suited to

“lift-and-shift” cloud deployments (SMB Group, [2021).](#_bookmark23) Rather, they are faced with needing to move re-platform to new critical systems while at the same time switching infrastructure. And, again, they are faced with this demand while dealing with a lack of adequately skilled employees.

1 The author has 25+ years experience in IT consulting and is a certified AWS Cloud Architect working as a consultant with Accenture. He has been involved in multiple multi-cloud projects.

# Evaluating the Research Utility

With the issue clearly defined, how useful is the research in addressing the question of how and when to shift data to the cloud in order to develop BDA capabilities for

small-to-mid-sized companies?

The overall status and direction of technology is well covered by Sheng et al. [(2019).](#_bookmark22)

The numerous tables of research categories will help practitioners quickly locate relevant studies and understand the types of questions academics are struggling with. Practitioners will also be well-served to read López-Robles et al. [(2019)](#_bookmark15) in order to understand the importance of establishing normative terminology while discussing topics related to BDA and Business Intelligence. The authors adequately lay out not only the importance of the topics, but how the various concepts relate to each other.

In order to address the question system development, and provide a case study of how at least some big-data systems can be developed quickly, Ji et al. ([2019)](#_bookmark13) provides a case study. However, it has limited utility as it does not provide the necessary insight into how to choose underlying BDA architectures. Still, it clearly shows that developing

big-data systems are within the reach of companies that dedicate themselves to the effort.

Companies with specific goals would be well served to references Roßmann et al. [(2018)](#_bookmark20) simply to note the importance of evaluating expert advice from multiple domains. The disparity between the views of seasoned experts can vary wildly, and this paper is a useful reminder that practitioners should seek a variety of viewpoints around any complex subject. Further, the paper provides good examples of how and to some extent why assessments of BDA utility differs by domain expertise.

Given the risks associated with BDA investment for small-to-mid-sized companies, Božič and Dimovski [(2019)](#_bookmark4) is an important theoretical work to understand. By proposing and testing a model to show how BDA translates into corporate performance, the authors outline the importance of non-technical considerations. Success in such endeavors are shown to be strongly influenced by elements that are within leadership control. By

understanding how the firm needs to function culturally to be successful at BDA, the practitioner will be able to more fairly evaluate if the firm is ready for a significant BDA investment or not. Indeed, other researchers have found that small-to-medium-sized enterprises often neglect assessing their capability to move their IT infrastructure to their detriment (Carcary et al., [2014).](#_bookmark5)

Practitioners also need to understand that BDA capabilities once built are not magic. The old adage of “garbage in, garbage out” will still apply. So on top of evaluating the firm’s capability to engage in BDA successfully, Souibgui et al. [(2019)](#_bookmark25) provides meaningful insight into the importance of data quality methods and tools. This study is particularly useful for its practical, empirical testing and comparison of four different data quality tools.

Cheng et al. [(2020)](#_bookmark6) and Lozada et al. [(201](#_bookmark17)9) both outline the value that BDA capabilities can have for the small-to-mid-sized company. These studies look at internationalization and co-innovation respectfully. These are areas where

small-to-mid-sized companies, by virtue of their ability to be agile, can utilize BDA and cloud capabilities to outmaneuver larger, slower to change firms. At a practical level, reaffirming this advantage that firms in this size bracket posses can help in evaluating when the right time to move is.

# Conclusion

A key capability for businesses is becoming the ability to have a cost-effective, scaling, resilient, reliable BDA tool-set. This reality is recognized by business leadership. Business leaders in small-to-mid-sized companies have a problem with deciding when to shift their IT environment to a cloud-based, BDA capable environment. This shift can offer firms many competitive advantages, but comes with numerous risks. For small-to-mid-sized companies, the causes of the greatest risks are predominately tied to a single underlying cause: their limited ability to attract adequately skilled talent in this domain. Other causes

include the complexity of legacy systems and the multi-vendor reality of the cloud marketplace. However, this additional causes are made even worse for companies in this bracket because of the talent shortage.

The research examined offers numerous practical insights for those trying to make this decision. However, none of these papers on their own or collectively provide any real strategy for addressing the primary reason that these companies are struggling with this question: talent. With a global shortage of adequately trained BDA and cloud engineers, and inadequate abilities to compete for talent based on pay, these companies face a very limited capacity to address the problem directly. Industry watchers such as Gartner see this shortage continuing for many years, and thus, the problem will likely remain unresolved for some time.

Still, these companies must remain aware of the numerous advantages such capabilities give them. And while risky, for companies that have the proper culture and leadership capacity, pursuing a cloud-based BDA architecture can be greatly beneficial.

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