

Articles

The Patterns of Business Analytics Adoption in US SMEs: A Qualitative Approach

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With the prevalence of Business Analytics (BA) tools and Big Data through the expansion of social media, cloud-based services, and the introduction of new tools, research is needed to revisit the adoption of analytics technologies by Small and Medium-Sized Enterprises (SMEs). This study interviewed 50 United States (US) SMEs across different industries. We demonstrated whether businesses are aware of new trends in BA, what patterns of adoption have occurred with recent tools, and how businesses' size and industry can change the adoption patterns. We also investigated the different patterns in barriers that SMEs of different sizes and industry experience. Our results provide insights for SMEs to navigate the complicated process of the adoption of many BA solutions. For US SMEs policymakers and technology providers, knowing the state of BA adoption is imperative. Our findings shed light on how technology providers, policymakers, and industry associations can support SMEs to adopt further business analytic tools.

INTRODUCTION

Over the last couple of decades, studies have investigated the adoption of Information Technology (IT) and Information Systems (IS) by large and Small-and-Medium Sized Enterprises (SMEs) (Abrardi et al., 2022; Hansen & Bøgh, 2021). The availability of analytical tools and big data through the explosive development of social media, cloud-based services, and other technologies has dramatically changed the business environment which now demands frequent and new investigation on SMEs' adoption of these new technologies. Larger corporations are relying on big data and analytics now more than at any other time to dominate the business world and SMEs must keep up with the implementation of Business Analytics (BA) to survive and remain competitive (Atan & Mahmood, 2022; Hansen & Bøgh, 2021; Maroufkhani et al., 2020). Maroufkhani et al.'s study (2020) presented that utilizing IT improves SMEs' capabilities to compete with larger corporations. SMEs are the backbone of the worldwide economy, forming more than 90% of employment and economic activities. In 2022, 33.2 million SMEs made up 99.9% of all businesses operating in the US. Over 61.7 million people were employed by these SMEs, making up 46.4% of the current workforce (SBA Office of Advocacy, 2022). These businesses need to utilize technology to stay competitive in the market.

Larger firms can successfully emerge in the global market for analytical technology due to their access to a greater pool of both human and financial capital (Abrardi et al., 2022). SMEs, however, face many barriers to implementing various Business Intelligence (BI) tools and techniques into their daily decision-making processes because they do not

possess the same resources as bigger firms (Maroufkhani et al., 2020). The market for BA tools and practices in SMEs has yet to reach its full potential. SMEs have just begun to realize the importance of BA in implementing data-driven decision-making processes.

Available analytical tools are constantly evolving and changing to appeal to various clients in the competitive market. Many of the analytics services such as Amazon Web Services (AWS) or Google Analytics are cloud-based and offer services specifically targeting SMEs (Attaran & Woods, 2019). For example, Google Analytics Standard and Facebook Business Suite are some of the available BA tools designed to meet the needs of small businesses in managing their customers, operations, marketing, and sales (Gupta et al., 2022). AWS offers cloud computing solutions, currently serving major industries, and providing innovative IT benefits to small businesses. Some services such as IBM Watson are Artificial Intelligence-based services and offer a range of applications from operations and supply chain to customer engagement systems (Yang et al., 2022). The flexibility of these services is an important factor as well. As an illustration, Power BI offered by Microsoft allows users to combine multiple data sources and is more compatible than other services. Many tools such as Tableau, Excel, and Power BI offer interactive data visualization and dashboard systems (Kamaruddin et al., 2020). BI and BA tools can be used for a wide variety of disciplines, some tools are more focused on social media and customer service management, in contrast, others provide data about managing transactions and operations.

Much of the existing literature on the presence and the advantages of IT usage focuses on regions outside the US, mostly in Europe (Bianchini & Michalkova, 2019; Hansen

& Bøgh, 2021; Pighin & Marzona, 2012) and Asia (Jusoh & Ahmad, 2019). Our research aims to fill this gap and identify patterns of BA adoption in the United States by compiling a unique set of data obtained from 50 SMEs across the different industries in the Northeast region of the US. While it is valuable to compare cases in the EU or Asia to cases in the US, our contribution to the literature is substantial because SMEs are treated differently in the US in dimensions such as government policies, marketing tactics, business landscapes, economic climate, and overall culture compared to the rest of the world (Kidalov, 2011). SMEs in the US can look to their European business counterparts for inspiration about BA adoption, but our research's goal is to fill the gap and provide more information on US-based small businesses by investigating the status of business analytics adoption by them.

We find that US SMEs' priorities in implementing BA differ from SMEs in other countries in Europe and Asia. We also show how a firm's characteristics such as size and the industry determine the patterns of BA adoptions among US SMEs. Overall, our results highlight key drivers and barriers to BA adoption in small businesses in the US.

In the next section, we review the literature on the adoption of BA by SMEs followed by the Methodology section that describes the process of selecting participants as well as how the data was collected and analyzed. In the Results and Discussions sections, we analyze our data, report, and discuss some of our key findings. In the end, we conclude the paper with some of the implications and limitations of our study and suggest directions for future research.

LITERATURE REVIEW

Conceptual technology adoption frameworks such as the Technology Acceptance Model (TAM) developed by Davis (1985) and Technology, Organization, and Environment (TOE) model developed by Rogers (1995) can be applied to better understand and explain the barriers and drivers of BA adoption (Brock & Khan, 2017; Härting & Sprengel, 2019). TAM is a widely used model for predicting the adoption of IT and indicates that perceived ease of use and perceived usefulness are the determinants of technology acceptance by individual users. TAM has also been used in studying IT adoption in small businesses (Ghobakhloo & Ching, 2019; Ramphele & Msosa, 2022; Riemenschneider et al., 2003; Tien et al., 2019). Tien et al. (2019) in a Malaysian study discussed TAM and its effectiveness in explaining business analytics adoption by SMEs. A study by Ramphele and Msosa (2022) investigated 150 SMEs in South Africa and demonstrated that perceived usefulness and ease of use were strong determinants of IT adoption among SMEs. In the extended TAM, the perceived usefulness of BA is the driver of the adoption of BA among SMEs whereas the barriers to the adoption of BA are the factors that are limiting the ease of use of the technology (Venkatesh & Davis, 2000).

The usefulness of the applications of BA in businesses is the driver of BA adoption and encourages SMEs to better accept the technology. BA can benefit businesses to perform better at the organizational level in their industry and

the customer level. Additionally, BA allows businesses to perform better within the organization because of more efficiencies and improved decision-making tactics (Abed et al., 2015). At the organizational level, social influence through industry, customers, and competitors can spur BA implementation (Pentina et al., 2012). Another benefit of proper BA utilization at the organizational level is increasing market competitiveness (Bianchini & Michalkova, 2019; Pighin & Marzona, 2012). According to a study of Italian companies by Pighin and Marzona (2012), approximately 60% of small businesses have invested in some form of BA because they believe it will give them a more competitive advantage. On the other hand, there is a plethora of quantitative data that associates internal productivity and profitability growth with the adoption of BA by SMEs (Bakhshi et al., 2014; Bianchini & Michalkova, 2019; Dibrell et al., 2008; Härting & Sprengel, 2019). The Härting and Sprengel (2019) study about SMEs in the UK determined that businesses that self-identify as data-driven were 5% more productive and 6% more profitable than businesses that would not self-identify as data-driven. Bianchini and Michalkova (2019) surveyed 500 privately owned companies in the UK and observed that businesses in the top quartile of online data usage were 13% more productive than firms in the bottom quartile. The study concluded that businesses that partake in data analysis and reporting were found to be the best performers, as data analysis and reporting is the most significant positive influence of the aspects of data activity. Dibrell et al. (2008) reflected that implementing IT increases innovation and performance within small businesses. Bakhshi et al. (2014) also found that UK small businesses that rely on data analysis to make decisions are two times as likely as the average enterprise to have significant benefits from their online customer data, and higher online data leads to over 8% of more productivity.

Previous studies have revealed some barriers to SMEs' entry into the BA world that impact the perception of ease of use among SMEs (Mikalef et al., 2017; Nguyen et al., 2015). Nguyen et al. (2015) emphasized that SMEs are risk averse due to limited resources and proposed a framework that can reduce the risk of SMEs' IT adoption through successful implementation of IT. Mikalef et al. (2017) reviewed 84 journals published since 2010 to reflect on the gap between the technical components of incorporating BA into SMEs and the strategic planning and organizational changes necessary for successfully applying such BA to daily practices.

BA adoption barriers reduce the ease of use for SMEs to enter the world of BA. Some examples are a lack of expertise, the complexity of analytical tools, and challenges in financing IT investments (Bianchini & Michalkova, 2019; Bravi & Murmura, 2021; Esmaeilpour et al., 2016; Perdana et al., 2022). Bianchini and Michalkova (2019) divided the barriers into internal barriers such as challenges of identifying, attracting, and retaining specialists necessary to utilize BA, and external barriers such as limitations of availability of data and regulatory constraints. Bravi and Murmura (2021) in a study of Italian SMEs demonstrated that poor knowledge of possible BA solutions and difficulty

in evaluation of potential technology and tools are major hurdles to SMEs' BA adoption. Perdana et al. (2022) investigated the barriers to Indonesian SMEs' adoption of BA and showed that a lack of understanding of benefits, cultural barriers, and the upfront cost are the major obstacles. SMEs' managers and staff perceived ease of use of technology can be improved if they understand the BA technology better. This can be achieved by staff training and the presence of employees with technical skills to increase a business' understanding and confidence in the application of proper analytical instruments. Esmaeilpour et al. (2016) studied Iranian small businesses and presented factors such as low complexity of technology, the presence of staff with prior or taught knowledge of technical skills, and the support of the government to help employees of SMEs recognize the practicality of BA.

A general awareness of BA's capabilities can change both the perception of usefulness and the ease of use of BA tools. The awareness of what BA can achieve allows SMEs to decide on adopting or not adopting BA. Kiziltan (2018) showed that about 36% of Turkish SMEs are not aware of big data or how BA tools and trends can impact their businesses. The lack of awareness, on the other hand, works as a hurdle that prevents SMEs from implementing such solutions. The analytical technologies providers tend to focus on the installation and machine-like components of BA rather than making sure businesses understand how to integrate analytical tools into the workplace and benefit from it (Pighin & Marzona, 2012). If SMEs have a general understanding and awareness of BA's impact, they will be better inspired to manage the drivers and barriers of adoption.

There is a lack of studies on the impact of other factors such as the size and industry of small businesses on the usefulness and applications of analytics (Trieu, 2017). Muller et al. (2018) studied large US firms and demonstrated that there is a relationship between the industry of firms and their adoption of technology. Mole et al. (2004) and Nguyen et al. (2015) both investigated the impact of firms' characteristics such as age, size, and sector on IT adoption and have found different results. Mole et al. (2004) conducted a study on UK small manufacturing businesses and showed the sector of a business impacts the adoption of technology. On the other hand, Nguyen et al.'s (2015) study on the retail, financial services, and manufacturing sectors did not indicate that the industry sector makes a difference.

In sum, most of the studies in the literature are conducted on SMEs in Europe, Asia, and Africa and not in the USA. They have demonstrated usefulness factors such as gaining productivity and competitive advantage as drivers of the adoption of the BA. They have also highlighted some of the barriers such as lack of awareness that prevents small firms from adopting BA. In addition, few studies have investigated how firms' characteristics such as size and industry impact adoption patterns. Our study intends to fill the gap in the literature and present the key factors that influence the adoption of BA among US small businesses. We aim to identify whether determinants such as SMEs' awareness of tools and trends, their size, and the industry make

a difference in the adoption patterns of the analytical tools, drivers, and barriers that challenge small businesses.

METHODOLOGY

Our study employed in-depth interviews to investigate the understanding and adoption of BA in small businesses in the US, drawing on established research methodologies (Abed et al., 2015; Cooper et al., 2006). By collecting qualitative data through interviews, our research gathered primary data to identify patterns of analytics technology utilization among small enterprises in the US. Al-Qirim et al. (2022) interviewed 27 Kuwaiti micro businesses to investigate the adoption of social commerce by micro businesses. In another study, Bravi and Murmura (2021) interviewed Italian manufacturing businesses to identify the motivators and obstacles to adopting smart technologies.

Businesses invited to participate in our study are mostly small firms with under or around 50 employees. Our study focused on smaller businesses regarding the number of full-time employees (FTE) that differ the most from larger firms in terms of their available resources. The sample was randomly chosen from small business directories including the *Small Business Administration's Dynamic Small Business Search* database. The SBA's database can return a randomized selection of small business contact information based on location, industry, and size criteria. We used the European Commission's definition that divides SMEs into Micro (less than 10 FTE), Small (less than 50 FTE), and Medium sizes (less than 250 FTE) (SMEs definition, 2023). Out of our 50 participating SMEs, 72% were identified as Micro businesses, 22% as Small businesses, and 6% as Medium businesses.

The enterprises that participated in the study are mainly located in the northeastern region of the US and represent diverse sectors across industries. The specific breakdown of industries of the participating businesses that are adapted from the North American Industry Classification (NAIC) can be seen in [Table 1](#).

Participants were provided with an open-ended questionnaire and performed semi-structured hour-long interviews over Zoom. We designed an open-ended questionnaire so that questions are not directive and allow the participating businesses to share their relevant information. Interviewees were provided an overview of the research, the interview questionnaire, and an informed consent form before the interview to acknowledge their understanding of the research's goals and their anonymous participation. The interviews were transcribed and coded using the structural coding method (Saldana, 2021). In the initial phase, the coding process involved reading the transcripts line-by-line and categorizing concepts and quotes into an Excel database, which was designed according to the questionnaire's questions. In the second phase, we aggregated the data into broader, relevant categories. These categories were derived from similarities, associations, and overlaps observed in the coded data from each respondent (Adams, 2015).

The questionnaire was designed based on extended TAM for firms' adoption of technology (Nguyen et al., 2015; Ritz

Table 1. Industry Breakdown

Industry	Number Of Businesses
Manufacturing/Construction	6
Retail/E-Commerce	5
Accommodation and Food Services	6
Information Media, Telecommunications, and Entertainment	9
Financial Services	3
Professional, Scientific, and Technical Services	17
Health, Beauty, and Fitness	4

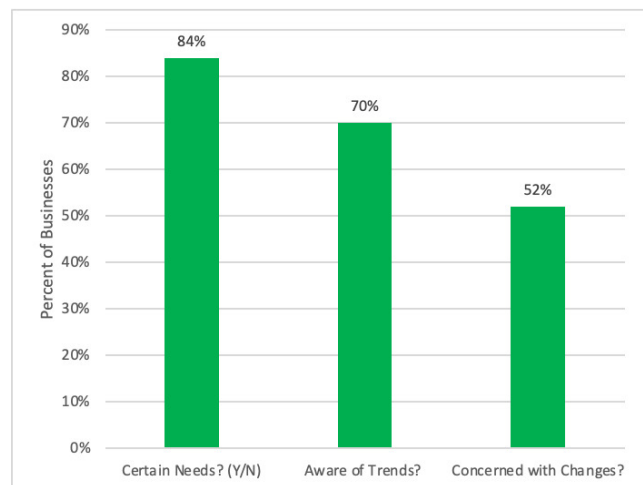
et al., 2019). The focus was on identifying the usefulness of BA that drives the adoption, but also on identifying the ease of BA utilization or any impediments that prevent small businesses from BA adoption. Businesses were asked about their existing data and tools as well as their knowledge and awareness of current trends and capabilities relevant to their businesses in data analytics. This showed us the usefulness of the applications and tools they are utilizing in various areas of their business. Businesses were also asked about their lack of resources as they need many resources to facilitate and support the implementation and utilization of technology. Financial resources, human resources, and available time are among many factors that can bring ease or hindrance to the utilization of BA by small businesses. The responses provided insights into the extent to which businesses are utilizing available technologies, their awareness of data availability, the perceived usefulness of their tools, and the challenges they face in adopting analytics in the context of SMEs. Obtaining firsthand accounts of the experiences and issues faced by US small businesses with BA is crucial for the design and development of more effective analytical tools that cater to the unique needs of small businesses.

RESULTS

We analyzed our data to understand the extent of SME awareness of rising trends and the usefulness of analytical tools. Small businesses in the US that were interviewed revealed many similarities and differences in the kinds of analytical tools they use as well as facilitators and barriers to the process of integrating those tools into their daily decision-making processes. We also investigated the impact of the size and industry of businesses on their adoption patterns.

Awareness

The first important factor that enables SMEs to adopt BA is their awareness of BA tools and usefulness, and any emerging trends or changes in their specific industry area. About 70% of participating businesses say they have a general understanding of BA and can recognize trends of data usage in their sector (Figure 1). In addition, 84% of enterprises in our study acknowledge that there are certain needs in their businesses that the adoption of data analyt-

**Figure 1. Awareness of Trends**

ics can fulfill. Roughly half of the businesses that participated in this research expressed concern about their ability to keep up with the rapidly evolving landscape of BA. Among those who are worried about staying current with analytics, many acknowledge that they “may be missing some opportunities.”

Our results showed four major business areas that the adoption of analytics can help fulfill: Finance, Operations, Sales, and Marketing. These areas help determine the desired outcomes of SMEs when implementing BA (Figure 2). It was determined that Marketing had the most prominent need for data usage in US small enterprises. The percentage of businesses that have Marketing needs is more than quadruple the percentage of businesses in other areas such as Operations and Finance.

Given the close relationship between Marketing and Sales, it is unsurprising that these areas are the top two most cited use cases for data among SMEs. Many of the interviewed businesses expressed that their primary focus is gaining a deeper understanding of customer demands and leveraging analytical tools for more efficient attainment of this goal. As one business respondent shared, they would like to have the capability to “track custom events [they] set up, like purchasing specific items,” in order to strategically ‘run retargeting ads to groups of people who are more likely to buy again.’

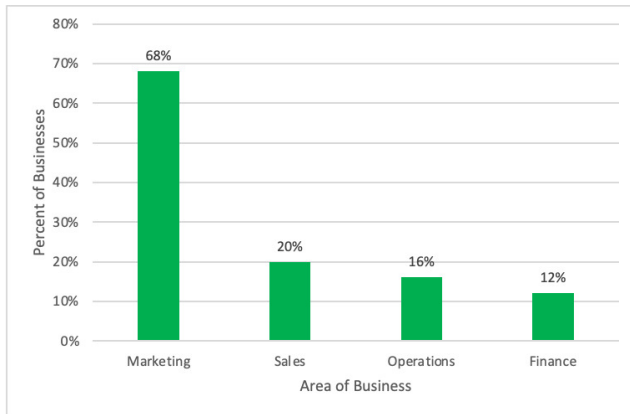


Figure 2. Certain Needs and Usefulness for Business Analytics

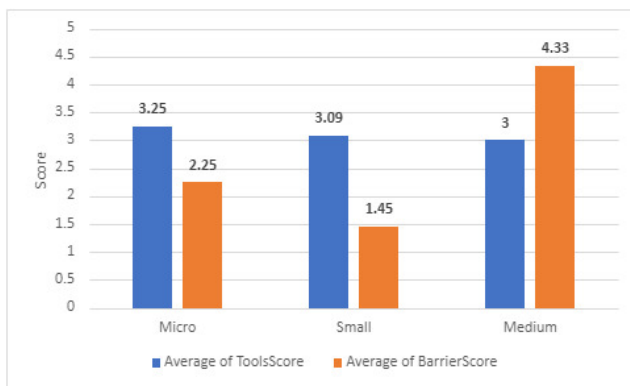


Figure 3. Size vs Barriers/Adoption Scores

Size of Business

We analyzed our data to identify any pattern that demonstrates a relationship between the number of barriers faced by a business and/or the number of tools adopted by a business and the size of the business. A score was formed to represent the number of barriers by adding up the number of obstacles each business faces. This *BarrierScore* gave us an aggregate measure for impediments among our participating SMEs. We also created an aggregate score as an adoption score, *ToolsScore*, to indicate the number of tools utilized by businesses. Our goal was to identify any pattern in tools utilized or barriers experienced by businesses as their size increases. No discernable patterns were observed in the number of barriers as the size of the SMEs increases (Figure 3). It is worth noting that Micro and Medium businesses report more barriers than Small businesses. Moreover, the average *ToolsScore* among different sizes is around three, and the size of the industry did not indicate any major differences.

The analysis was extended to investigate the impact of size on the type of tools utilized (Figure 4). Excel is the most popular tool for all sizes of businesses. One interviewed business stated that “putting data into an Excel sheet is super user-friendly.” The next most popular analytical tools employed by SMEs are Google Analytics, Social

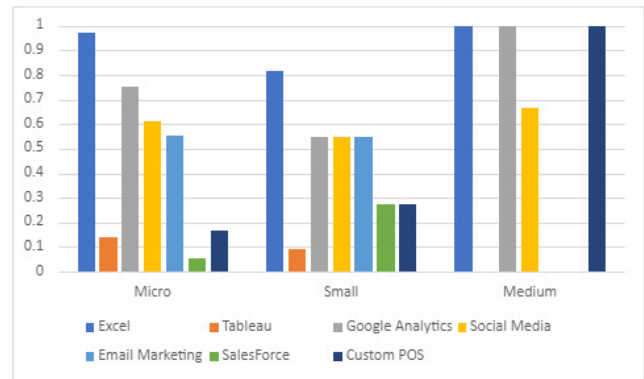


Figure 4. Size vs Tools Utilized

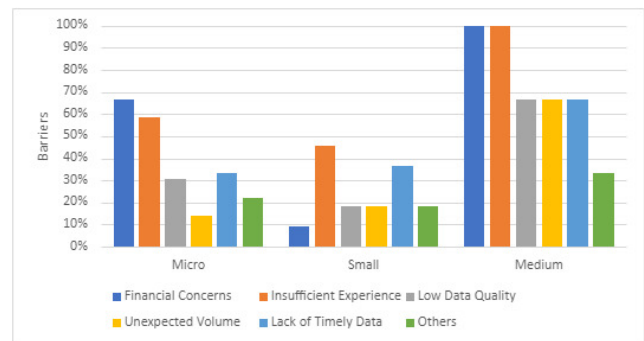


Figure 5. Size vs. Types of Barriers

Media Marketing, and Email Marketing Systems. Another interview participant expressed that “there is a direct need for market analytics and... businesses that do not use it will be deemed obsolete.” Among Micro and Medium businesses, the least popular tool was Salesforce, with less than 30% of Small SMEs and 10% of Micro SMEs currently using the software. Medium SMEs with more than 50 employees more frequently utilized Google Analytics, custom POS systems, and Excel, with 100% usage amongst those businesses. Meanwhile, Tableau and Salesforce were the least popular tools amongst Medium SMEs. The analysis suggests some differences among the different sizes of businesses but does not indicate any correlation between the tools SMEs have utilized and the size of the businesses.

In addition, our study investigated how the type of barriers changed concerning the size of the businesses (Figure 5). Financial concerns are the most common barrier for Micro and Medium-sized SMEs. On the contrary, insufficient expertise has the highest percentage in Small and Medium SMEs. There are different barriers reported by different sizes of businesses, but no upward or downward patterns of most experienced barriers are observed as the size of the business increases from Micro to Medium.

Industry Sector

More regulated sectors such as healthcare or accounting must comply with privacy measures, and their access to data can impact the way analytics is utilized in their services (Abbasi et al., 2012). In other industries such as Re-

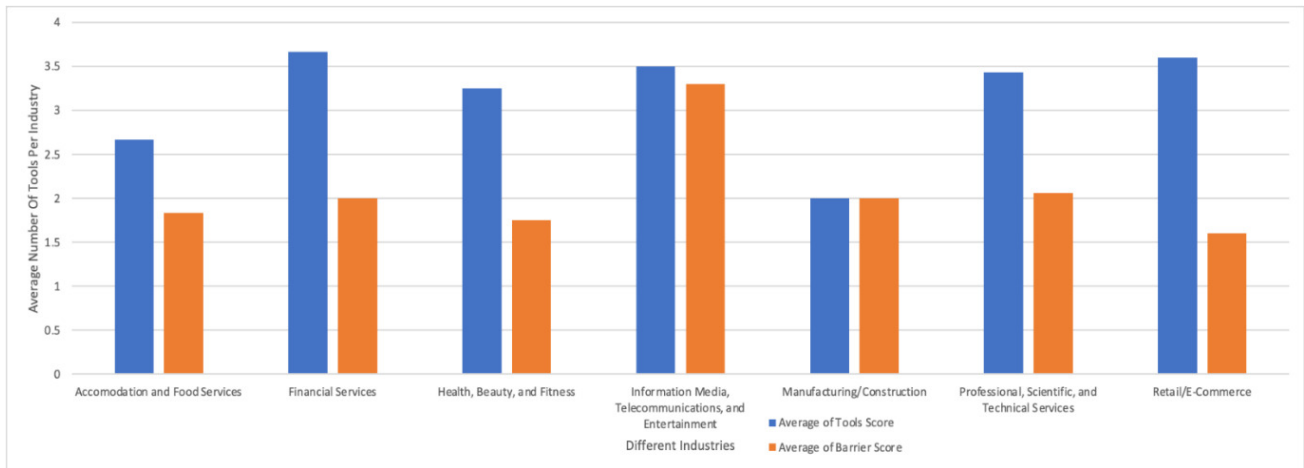


Figure 6. Industry vs. Adoption and Barrier Scores

tail/E-Commerce, competitiveness can cause pressure toward the adoption of analytics. Elbashir et al. (2008) studied the impact of industries on the adoption of business intelligence in large organizations and demonstrated that businesses in non-service industries experience higher performance if they adopt analytics. Conversely, businesses from service industries adopt analytics to respond to fast changes in customers' expectations and to stay competitive.

Our participating SMEs are from a variety of industry sectors, which allows us to explore any relationships between the industry sector and the reported *ToolsScore* and *BarrierScore* (Figure 6). SMEs in the Financial Services and Retail/E-Commerce sectors have the highest rate of adopted tools, whereas SMEs in Accommodation and Food Services and Manufacturing/Construction have the lowest rate. Retail/E-Commerce businesses reported the lowest number of barriers while Information Media, Telecommunications, and Entertainment reported the highest number of barriers in the adoption of technology.

Interesting patterns in the data were present when the tools used were grouped by individual industries (Figure 7). In all industries except for Information Media, Telecommunications, and Entertainment, Excel is the most frequently used tool. However, Google Analytics is used almost as frequently as Excel in the Information Media, Telecommunications, Entertainment, Financial Services, and Retail industries. Social Media Marketing was the most popular tool for the Information Media, Telecommunications, and Entertainment industries. A business in the Information Media, Telecommunications, and Entertainment industries said that they “mostly utilize analytics tools to ascertain how different clients and [their] own business is generating traffic, what opportunities exist for growth, and the success of different ad spend campaigns.” Additionally, in the Health, Beauty, and Fitness industry, Social Media Marketing such as Facebook Analytics is utilized as often as Excel and Google Analytics. This may be intuitive because both industries rely on an Internet presence to reach a wider consumer audience. For example, an interviewed SME currently uses analytics “to examine hits on pages, interac-

tions with the page, the volume of comments left on the page as well as page likes” to identify which days gained the most traction and examine which events may have correlated to the boost in online activity.

Marketing, as well as other sectors such as Professional, Scientific, and Technical Services, prioritize their use of BA differently. These industries excel in meeting customer needs, promoting products and services, and enhancing their online presence. One business that participated in the study highlighted the significance of utilizing analytics for marketing purposes, stating that “clients want concrete data to measure the success of a campaign.”

Another area of interest analyzed was whether certain barriers are encountered more often in certain industries. The most frequently encountered barriers differ among different industries (Figure 8). Retail/E-Commerce SMEs mentioned insufficient expertise as the primary barrier whereas SMEs in Health, Beauty, and Fitness were different and cited financial concerns as the most frequent barrier. The results suggest that each industry struggles with unique barriers.

DISCUSSIONS

Although it is possible to classify small businesses based on variables such as size, location, and industry, pinpointing the precise reasons why the implementation of BA is challenging for SMEs in the US can be difficult. Each business has its own distinct characteristics, such as employee count, client base, and sector, making it crucial to compare findings from existing literature with those of this study to identify overarching patterns and similarities.

Using existing theoretical models helps a research study to better highlight the significance and importance of the work. However, not many studies on BA adoption by SMEs have used such theoretical frameworks. In our study, we centered our investigation around extended TAM which is a rich model to explain key factors in the adoption of technology by SMEs (Perdana et al., 2022). Our results demonstrate that key driving factors such as gaining more competitive advantage and increasing productivity are

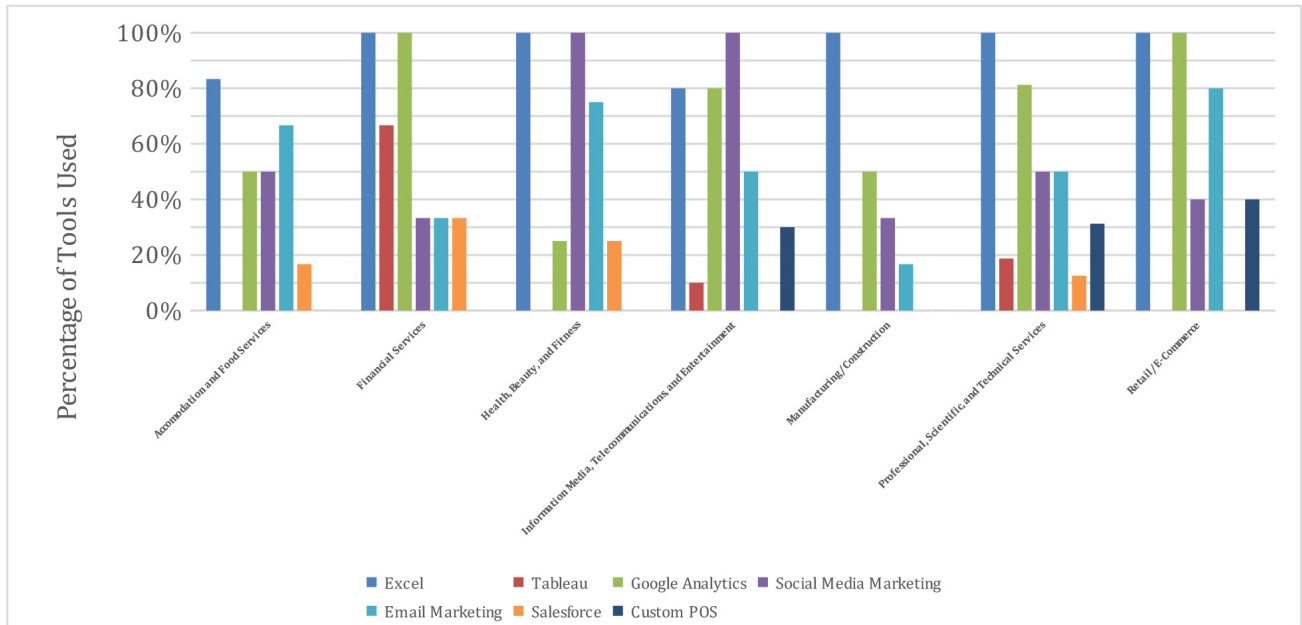


Figure 7. Type of Tools Used Per Industry

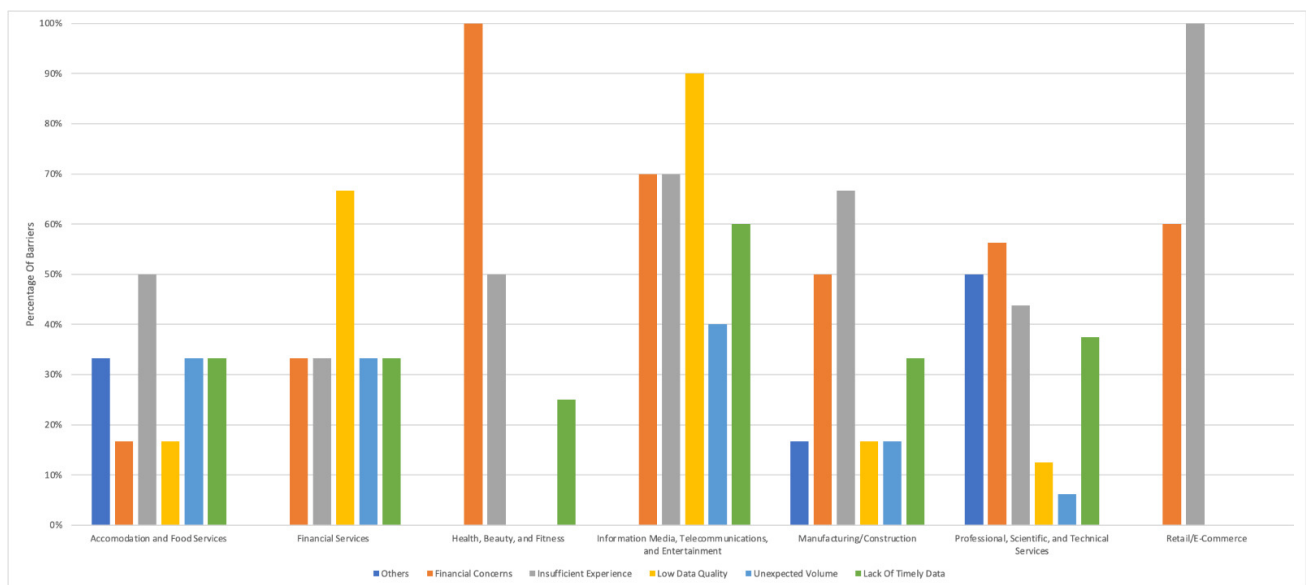


Figure 8. Industry vs. Type of Barriers

examples of the usefulness of the technology, while barriers such as lack of human resources and financial constraints can lower the ease of use of BA.

Previous studies offer some perspective on SMEs' awareness of BA's usefulness and current BA trends in their industries. Of the participating businesses in our study, 70% reported being aware of ongoing applications and trends in analytics. These findings are supported by previous studies. Kiziltan (2018) sampled 171 Turkish SMEs and found that 64.3% of them are aware of analytics and big data. Perdana et al.'s (2022) study also showed about 80% of Singapore SMEs are aware of current tools and trends. Overall, our study demonstrates that awareness is not a barrier to US SMEs BA adoption and US businesses are aware of their

certain needs and what technology trends are available to address those needs.

The Marketing area was the area where analytics was the most useful in our participating businesses. This may be a point of difference between the US SMEs and other countries such as South Korea and Germany, where achieving operational efficiencies is the companies' priority. Park et al. (2010) conducted a comparative study on the adoption of technology between South Korea and the US. It was determined that operational efficiency was not the main reason for US SMEs to adopt technology; instead, the US businesses' priority in adopting technology was to improve marketing strategies through a deeper understanding of their customers. Another study by Bharadwaj and Soni

(2007) on the adoption of E-commerce also demonstrated marketing applications are the most popular among US SMEs.

Our findings did not reveal any pattern in BA's adoption as size changes from Micro to Small and Medium SMEs. However, our analysis suggests that size makes a difference in the type of barriers businesses face. Our results show that Micro businesses have more financial constraints. Medium SMEs, on the other hand, have more data and complexity than smaller SMEs and need in-house expertise to manage their situation, as the participants reported a lack of expertise as a major barrier as well. Pighin and Marzona (2012) found that businesses that tend to take advantage of data warehousing are relatively larger and older companies due to their means to obtain personnel with better knowledge and expertise in BA.

Our analysis of the impact of the industry sector demonstrates that Retail/E-Commerce and Financial Services sectors have the highest rate of adoption while Manufacturing and Construction have the lowest rate. This was also confirmed by a study by Elbashir et al. (2008) on Australian SMEs which established that service sector businesses are under more pressure to adopt technology than non-service sectors. Moreover, our results highlight that industries are challenged with different types of barriers. Some businessmen, such as retailers, discussed their lack of experience and financial concerns. Others list a variety of additional barriers, such as a lack of data quality or lack of time to analyze. One business that was interviewed epitomized this finding by stating that "since we are so small, it is often difficult to find the bandwidth to focus on sales and business development." More research needs to be conducted in this area to investigate the causal relationship between business characteristics such as size and industry and the type of barriers.

Regarding the data and tools currently utilized by small businesses, our study revealed that all 50 participating enterprises employ at least one of the seven commonly used analytics tools. Härting and Sprengel (2019) found that only 0.2% of UK SMEs use advanced BA instruments due to an absence of affordable and manageable infrastructure that supports small businesses in using analytics to process data. However, it's worth noting that Härting and Sprengel's study specifically focused on big data solutions of data mining, which presents challenges related to automation and scalability for small businesses. Our research, on the other hand, broadens the search for analytics instruments beyond data mining that are utilized by smaller businesses. A comparable trend was found in Malaysia, where 83.3% of SMEs use Excel for recording, analyzing, and reporting data due to its low cost and perceived usefulness (Jusoh & Ahmad, 2019). In addition to Excel, our study found that social media and Google Analytics were widely used tools among our SMEs. These tools were valued for their flexibility, accessibility, efficiency, and productivity, which align with the interests and goals of the enterprises. Abed et al. (2015) also showed the popularity of social media in SMEs is due to the lower cost and level of IT skills required to utilize those tools. Social media and email marketing tools

are commonly used to develop more brand and product recognition, understand customers' shopping behavior and eventually reach more customers. Brock and Khan's (2017) study at the University of Liverpool and Thaha et al. (2021) also demonstrated that their big data techniques were being used for marketing and customer intelligence purposes.

Limitations and Future Research

This study is limited to the number of participating businesses and the scope of the investigation. The 50 observations across industries demonstrate substantial and valuable qualitative information for identifying relationships. However, there needs to be a larger sample size of SME data collected through surveys to test causal relationships. While our qualitative study reveals possible patterns in the adoption of analytics in SMEs, more empirical data through surveys would allow for a statistical analysis that can demonstrate if the size and the industry of small businesses are the determinants of drivers and impediments of analytics adoption by small businesses. In future research, it would also be beneficial to add to the scope of study through inquiries about more variables, such as the age and financial capabilities of businesses. This will determine how the characteristics of businesses influence the usefulness of BA applications, awareness about current trends in data analytics, and barriers to BA adoption. Expansion of the scope and the size of the dataset along with statistical analysis can confirm the influence of more key drivers and barriers and make a theoretical contribution to the extended TAM.

CONCLUSION

The exploratory research conducted in this study has provided valuable insights into the incentives and obstacles related to the adoption of analytics technology among SMEs in the US. Many SMEs encounter challenges such as the perceived complexity of BA and the lack of necessary resources for implementation. However, increased competitiveness in the market and enhanced productivity serve as motivators for smaller businesses to adopt BA technology in their day-to-day operations. Small businesses need to prioritize meeting customer needs and leverage the potential benefits of higher earnings, improved efficiency, and informed decision-making through effective BA adoption.

The size and the industry of small businesses made a difference in the adoption rate as well as the types of barriers that challenge businesses. The two main barriers our businesses reported on were insufficient expertise and financial concerns. Business associations, chambers of commerce, and policymakers can support SMEs by offering training and workshops to educate and improve the level of expertise of small businesses. Tech apprenticeship programs supported by the Department of Labor at the state and federal levels can train SMEs in a shorter amount of time and at a lower cost than college degrees do, making BA more accessible and useful for SMEs. Moreover, small business loans and financial incentives provided by the Small Business Administration and other local government entities

can support businesses to bear the financial cost of utilizing BA.

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