Can Data Save Small Businesses?
Benefits and Challenges of Big Data Analytics Adoption among Small-sized Clothing Retailers

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Background and Objective
Big data analytics (BDA) is innovating the ways businesses draw insights from the ever-increasing amount of information available about consumer behavior. Big data represents the massive amount of structured and unstructured consumer interaction data which provides actionable descriptive and predictive insights. If captured and analyzed properly, big data is known to help businesses achieve efficiency, reduce fraud, increase sales, enhance customer service, and lower operation costs (Olufemi, 2019). Despite these benefits, the adoption and use of BDA have been mainly restricted to large and multi-national companies (Baldwin, 2015). Small businesses, which hire fewer than 500 employees, are lagging since they often lack trained specialists with analytic expertise (Coleman et al., 2016). Recently, small-sized clothing retailers were hit especially hard by the COVID-19 pandemic, thus there is a critical need for these small businesses to meet the changing consumer behavior and industry trends through big data. The purpose of the study is to understand the status of BDA adoption and utilization among small-sized clothing retailers through interviews with business owners.

Literature Review
Prior research on small businesses has mainly examined how businesses can improve firm performance by enhancing their relationships with consumers and outcompeting other companies through data-driven operation (Cheng & Shiu, 2019). However, research guiding how small businesses can adopt and utilize BDA to gain market competitiveness in the face of industry disruption is significantly lacking as most of the research has been conducted with larger-scale, general enterprises. To fill this gap, this study used the technology-organization-environment (TOE) framework, which explains how the firm's three contexts (technological, organizational, and environmental) influence the adoption decisions of new technology or innovation. Technological context refers to the relative advantage, complexity, risk, and compatibility associated with the new technology, and organizational context concerns with top management support and readiness to adopt new technology. Environmental context deals with any external factors including competitive pressure, government regulations, and environmental uncertainty (Effendi et al., 2020).

Methods
Since small firms tend not to disclose strategic and organizational information (Matarazzo et al., 2020), direct and individual interaction has been essential in understanding the profiles of small

businesses. Hence, in-depth interviews were conducted via zoom with seven key decision-makers of fashion retail owners in a midwestern state (3 owners, 3 VPs, and 1 CFO). Questions such as the factors that led to the adoption of BDA, benefits, and challenges of using BDA, and the availability of BDA training resources were asked. Shopify, Amazon Analytics, and Google Analytics were identified as commonly used tools among the interviewees. After the completion of interviews, researchers thoroughly read each interview transcript to identify and compare similar words, phrases, and sentences. Then, researchers clustered the invariant constituents into themes, focusing on structures of the meaning, and grouping them into the themes of the TOE.

Results
Key takeaways from the analysis were categorized into the TOE framework. With regard to the *technological aspect*, BDA gave small business owners both competitive advantage and technological challenges. When it comes to competitive advantage, several interviewees mentioned that BDA helps optimize their marketing tool, forecast sales/trends, and support strategic decision-making. One of the small business owners said, *"We look at sentiment [data] in [customer] reviews, and that helps us identify new products to bring to the market"*, and others were using BDA to make objective, data-driven decisions in day-to-day operation, such as hiring personnel, new product launch, or new market identification. Technical challenges were also echoed, mainly derived from the lack of understanding of data and the analytical tools. While many acknowledged the potential benefits, some interviewees did not know how to comprehend and utilize all the data being generated, oftentimes being overwhelmed by the size of the data. One owner said, *"There can be so much data, and making sure you're using it efficiently is challenging. Because there can be too much information."*

Regarding the *organizational aspect*, the availability of time and training resources within the business organization emerged as a key adoption barrier. As small business owners, they have to take care of many different facets of the business operation by themselves, not leaving much time to learn new tools like BDA. Even those who were willing to learn BDA had a difficult time finding training support, making them self-taught. One pointed out, *"As a small business owner, we wear so many hats."*, and *"[BDA] is available online if you're willing to search for it, but you need time."* Further, adopting new analytic tools or hiring a data analyst was not easy: *"Even just finding who could help us with [BDA] is just a battle in itself."* A need for organizational and leadership support was also discovered, *"Leaders have to be bought into the idea that data can help run my business better, and that is what's going to allow a company to succeed with data."*

For the *environmental context*, BDA has allowed small-sized retailers to adapt to rapidly changing environments. At the height of the pandemic when the stay-at-home orders and business lockdowns were mandated, BDA helped owners pivot their operations. Many business owners who mostly relied on offline sales expanded their retail channel online through the use of BDA. One recalled, *"Without the pandemic, I wouldn't have implemented Instagram marketing and web sales (Shopify). It has brought valuable analytics, sales, and all things assets."* In

addition to the pandemic, some owners expressed their concerns that it is not easy to follow up with the rush of new media platforms and analytic tools. One owner expressed this saying, *"I think the way of the future seems to be TikTok, and that's a whole different set of analytics. The need for an online presence grows, so does the need for analytics."*

Discussion and Implications
Small businesses, which are the backbone of the U.S. national economy, have been considered a minority in both academics and industry. To fill this gap, this study used the TOE model to understand the benefits and challenges associated with BDA adoption for small-sized clothing retailers. While BDA has been considered as an exclusive tool for big businesses, many small business owners are now adopting BDA given its potential to support their decision-making processes, enhance firm performances, and adapt to sudden industry shifts. Nonetheless, more challenges were identified than benefits, including the lack of resources (e.g., limited time and budget, talent, and support systems), which suggests the need for government and industry support (e.g., free BDA training tools) and educating our students with analytic capability.

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