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An exploratory study of executive factors that lead to technology adoption in small businesses

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ABSTRACT

The small business setting can be quite competitive, and companies that succeed tend to invest in technology to gain or maintain a competitive edge. Often, the adoption of technology is heavily dependent on the specific will and desires of the CEO or other top executives. This research aims to determine what executive factors affect the adoption of technology among small businesses. We employ the technology acceptance model to test the correlations between technology acceptance and the unique characteristics of small digital printing companies. The results suggest that the executive personality traits of entrepreneurship and technology readiness are indicators of a positive attitude toward technology and market orientation and show that this positive attitude correlates with technology adoption.

Introduction

In the past couple of decades, studies have increasingly investigated the relationship between executive traits, leadership, and business growth. A significant compendium of research has explored the area of technology adoption in the IT industry (e.g., Jung et al., 2008; Makri & Scandura, 2010; Peterson et al., 2008). For example, Hameed and Counsell (2012) conducted a meta-analysis of prior literature on IT adoption to uncover the environmental (e.g., competitive pressure, government support, external pressure) and business leader (e.g., attitude, tenure, innovativeness, IT knowledge) characteristics that may influence the adoption of IT. Their findings showed significant, albeit weak, effects of factors such as CEO attitude, tenure, innovativeness, and competitive pressure on IT adoption. However, external pressure was more significant in terms of adoption. Hameed and Counsell (2012) also noted the lack of research on the effect of environmental and CEO characteristics on IT adoption to include in their meta-analysis. By contrast, Pett and Wolff (2016) examined entrepreneurial orientation (EO) and learning in small to medium-sized enterprises (SMEs) and found that EO leads to higher performance. In a similar vein, Khazanchi (2002) explored the impact of IT-related purchases and found that SMEs strategically benefit from IT implementation. These studies served as motivation for us to conduct similar research in the small business industry with a singular focus on the digital printing industry. Although many studies highlight the tactical benefits of technology adoption (i.e., the performance and strategic benefits of EO and IT), they rarely delve into the potential executive leadership qualities that may affect technology adoption in the firm. Thus, there are opportunities to examine further how executive traits and external factors influence technology adoption in SMEs.

Many companies adopt new technologies to remain productive and maintain competitiveness (Khazanchi, 2002). Several additional factors, such as competitive pressure, cost consideration, industry trends, and purchasing dynamics, may influence technology adoption. In SMEs, the CEO, a decision-making executive, or the owner, usually assumes an essential role in technology adoption decisions. Often, his or her input is the final or only decision on the acquisition and adoption of technology. In addition to external factors, level of investment, and company characteristics, executive traits may be fundamental drivers to

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determine the propensity to adopt new technology for the business (Spencer et al., 2012). Understanding these traits and how they influence technology adoption (Hameed & Counsell, 2012) can help SME CEOs and executives better understand their current leadership gaps, reinforce the current structure, and hire team members with the proficiency necessary to ensure success with technology and implement it in their companies.

The aim of this exploratory study is to determine what executive traits, company characteristics, and external factors lead to the adoption of new technologies among SMEs. In particular, we use the technology acceptance model (TAM) to examine which traits influence the adoption of technology among SMEs in the digital printing industry. Researchers have extensively used TAM to examine IT adoption. Use of the TAM to determine executive traits and their influence on technology adoption in the digital printing industry is a unique application of the framework. In this paper, all references to executives encompass CEOs, owners, or executive leaders in the digital printing industry.

Background Literature

Executive influence is often critical to the success of small businesses. This influence can affect business development, strategy, and firm performance (Wang et al., 2016). Previous research has shown that an organization's innovation strategy is informed by the will of the CEO (Kashmiri et al., 2017). Kashmiri et al. (2017) assessed the influence of CEO narcissism on a firm's innovation strategy and showed that CEO narcissism led to more product innovations within the product portfolio. They note the limited research on leader personality traits, characteristics, and firm innovation and argue that existing research focuses on CEO age, tenure, and functional background. Wales et al. (2013) also examined CEO narcissism and EO on firm performance and showed that narcissism influences entrepreneurial orientation, thus concluding that EO has a positive effect on firm performance. In their study on the impact of charismatic leadership on technology adoption, Neufeld et al. (2007) also showed that those with charismatic leadership qualities who champion the adoption of IT technology exert a positive influence on adoption among corporate users. This study adds to the body of knowledge by examining the effects using the unified theory of acceptance and use of technology developed by Venkatesh et al. (2003).

Research has primarily examined factors such as EO (Pett & Wolff, 2016) and its impact on tactical aspects such as firm performance. Research has also shown that CEOs view innovation as a necessary component of being competitive and improving performance (Palmer et al., 2001). Research has even attempted to assess managers' leadership behaviors and influence on technology usage. Dong et al. (2007) determined that direct managers' leadership behaviors do not influence technology beliefs in the organization. This could be due in part to a direct manager's lack of technology knowledge. In addition, research has found that transformational leadership among generation Y managers has a positive influence on technology adoption for firm performance (Normala et al., 2013).

Research on leadership behaviors and subsequent technology usage is sparse. Harrison et al. (1997) initially investigated the decision to adopt IT among small businesses by using the theory of planned behavior (TPB). They examined executive leaders among various business specialties and determined that attitude, subjective norms, and perceived behavioral control contribute to IT adoption. Similarly, Riemenschneider et al. (2003) validated the use of TPB and TAM to explore small business executives' adoption of a website due to anticipated benefits and social approval. However, they did not assess external variables such as innovativeness or risk-taking among those executives.

There have been many attempts to expand the research factors that influence adoption. For example, Awa et al. (2017) examined three factors that affected the adoption of enterprise resource planning systems among SMEs. They investigated technological, organizational, and environmental factors and showed that all three affect adoption. In particular, that study showed the impact of technology aspects, organizational foundations (e.g., support, employee training), and environmental influence (e.g., normative and mimetic pressure) on adoption, but it did not examine leader influences.

While the aforementioned research may be useful in providing insights into the impact of technology adoption on SMEs, there is an opportunity to investigate additional factors that motivate decision-makers to purchase technology (Becherer et al., 2005). For example, is this motivation based on tactics, personality, or external corporate factors? Most of the research around technology adoption has focused on IT adoption and not necessarily technology products used in capacities other than computer-related usage or enterprise resource planning systems. Finally, research that examines CEO influence on SMEs in the digital printing industry is scant. As such, this research examines this phenomenon.

The core theoretical foundation of this study lies in Fishbein and Ajzen's (1975) theory of reasoned action (TRA) and subsequently, Ajzen's (1991) TPB. These two well-studied theories and models have successfully predicted behaviors that influence adoption in many domains. TRA and more recent TPB primarily aims to explain the

relationship between people's attitudes and behaviors (Figure 1). Many studies have used the theory to predict moral behavior, as it posits that people will behave in a given manner if available knowledge inputs have been considered and influence their actions. This theory essentially established the framework for the creation of the TAM.

Models such as the TAM have also been developed to guide research on technology adoption due to human behavioral elements (Davis et al., 1989). The TAM (Figure 2) was initially designed to explore the acceptability of an information system, as well as how user behavior affects the adoption of IT systems. The model was designed to fulfill three objectives in particular: (1) to determine the significant variables that mediate between system characteristics and actual use of computer-based systems by end-users in organizations; (2) to determine how those variables causally relate to one another, to system characteristics, and to user behavior; and (3) to determine how user motivation can be measured before organizational implementation to evaluate the likelihood of user acceptance of the new system.

The TAM established the casual relationships between external variables and user motivations. Two core user motivations are perceived usefulness (PU) and perceived ease of use (PEOU). These two constructs, in turn, affect attitude toward using technology, thus ultimately influencing actual system use.

We use the TAM herein because it allows investigation into tactics and personality traits and their impact on technology adoption. The TAM framework (Davis et al., 1989) examines an individual's propensity to adopt technology-based on cognitive and other external variables. By using this framework, we can determine the analysis of these factors by how executives' personality traits influence technology adoption. We also include other previously researched traits to understand their influence on technology adoption by executives.

Prior research findings suggest that composite models are useful in the investigation of technology adoption behavior. Since the development of the TAM, several studies have advanced current understanding of the factors that are integral to technology adoption. For example, Hayes (2012) examined the TAM with respect to technology adoption in small businesses and found that the TAM explains only 40% of the variance in computer usage. As such, he explored the external variable of mental models to determine its impact on adoption. Mental models refer to "the user's internal representations of an object, which guide their interaction with that object" (Hayes, 2012, p. 40). From this, Hayes (2012) showed that mental models have an effect on PEOU, which in turn influences intention to use the system. Building on this research, we examine additional variables to determine the impact on executive adoption of technology. More specifically, for the small business context of this study, we identify TAM, entrepreneurial leadership style, innovativeness, risk aversion, market orientation, and technology readiness index as pertinent in predicting rates of technology adoption (Davis et al., 1989; Donthu & Garcia, 1999; Lu et al., 2005; Narver & Slater, 1990; Parasuraman,

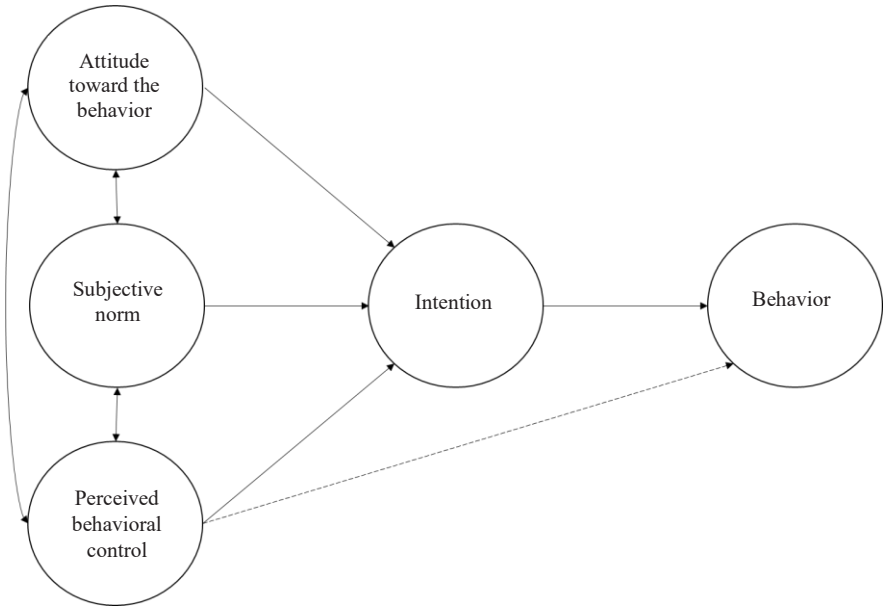

Figure 1. Theory of Planned Behavior
Source: Ajzen (1991)

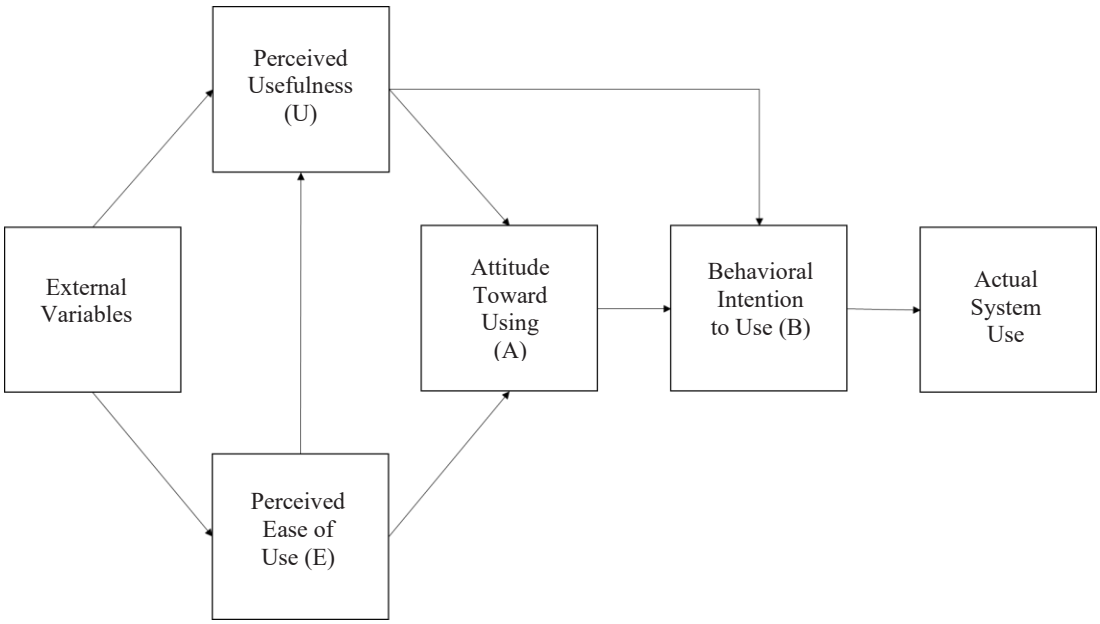

Figure 2. Technology Acceptance Model
Source: Davis et al. (1989)

2000; Penz et al., 2017; Spencer et al., 2012). The TAM has proven to be a valid framework for examining technology adoption across many different areas from consumer adoption to education to hospital management systems (Escobar-Rodríguez et al., 2012; Nagy, 2018; Ratten, 2015).

Method

The label printing industry comprises companies that produce package decoration, such as wrap-around, glue-applied, and self-adhesive labels. This industry has been facing several challenges in recent years. In particular, given the convergence of new technology trends in the industry and customer behavior, the SME printing companies are confronting significant changes forcing the reinvention of their business model and operations management.

The technology trends having a substantial impact on the industry are multi-faceted. First, the digital era technologies have changed how consumers engage with product brands. People integrate their experiences across all possible touchpoints (digital and physical), thus converting packaging to a display for communicating corporate value propositions. The packaging requires the label printer to incorporate improved outputs, such as higher print quality, shorter run lengths, versioning, and customization of the labels. Second, the dramatic increase in the number of brands in the market, vying for consumer attention given limited shelf space, demands greater engagement, interaction, and differentiation within the packaging. Third, pressures are coming from the supply chain, in which shorter market releases, lower inventory levels, and on-demand deliveries with just-in-time production are required. Finally, given environmental sustainability concerns, the companies are under public pressure to minimize waste, provide clean production processes, and print on environmentally friendly substrates.

Older technologies are predominantly analog. Thus, composition, printing, and finishing equipment need economies of scale to be productive. Every change in the design of a label is considered a new job and requires significant preparation time, special colors are difficult to achieve, and strong chemicals are used in many steps of the process. These characteristics of the industry make it obsolete and incapable of meeting brand and consumer demands. Thus, technology adoption is imperative in this industry.

Digital technology has also disrupted the label industry; many vendors are offering a variety of alternatives to digitalize the label-making process, from the composition of the design and automation of the workflow to the printing and finishing steps. However, despite the market requirements and well-developed technologies, many label printers in the United States are reluctant to invest in updating their production fleets. Thus, by not being prepared for this new industry trend, these firms are jeopardizing the future and sustainability of their businesses.

All these points make the label printing industry a useful context in which to examine technology adoption. The United States has roughly 7,000 label printing companies, and 90% of these have fewer than 150 employees (Smithers Pira, 2016).

Model and Hypotheses

We modified the TAM to reflect the framework necessary for analysis and application to the printing industry (see Figure 3). This new conceptual version of the TAM includes variables such as executive traits, company characteristics, and various external factors that influence the decision making of small printing companies.

As this framework is complex, we divided it into two models and tested different hypotheses to determine the effects on small printing companies' technology adoption. The first model highlights executives' attitude toward technology using TAM (see Figure 4). The second model highlights the actual adoption of technology and the relative influence of CEO attitude toward technology (see Figure 5), company characteristics, and other external factors.

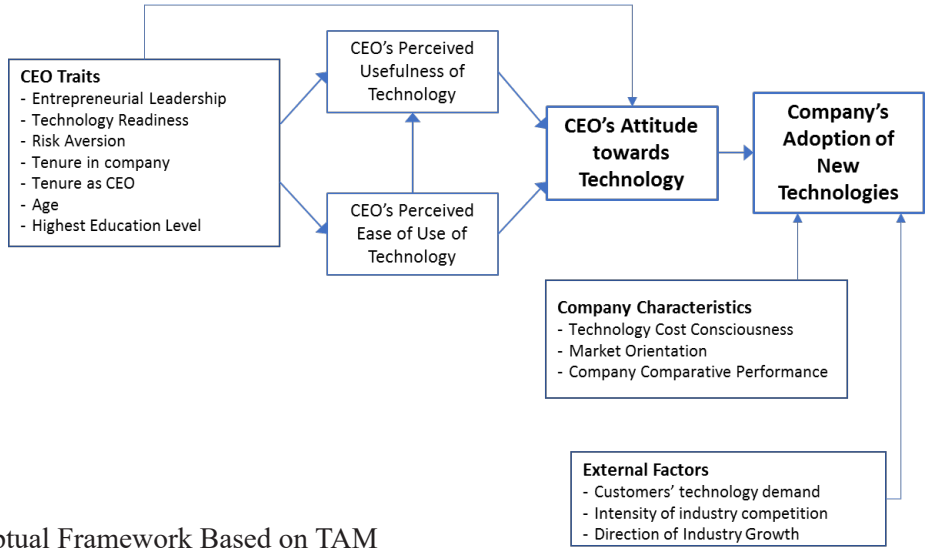

Figure 3. Conceptual Framework Based on TAM

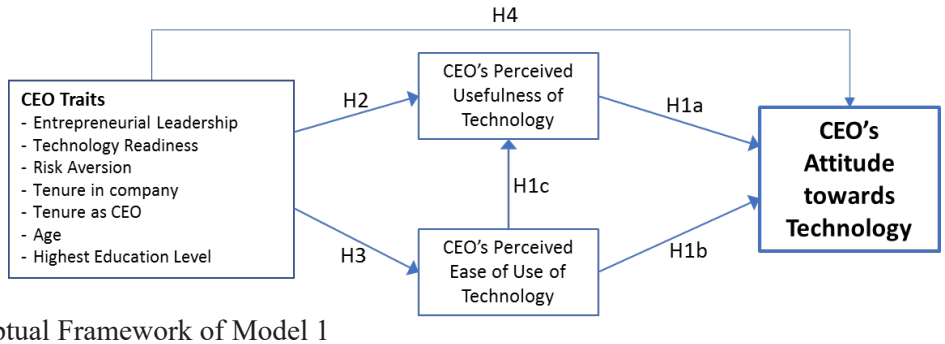

Figure 4. Conceptual Framework of Model 1

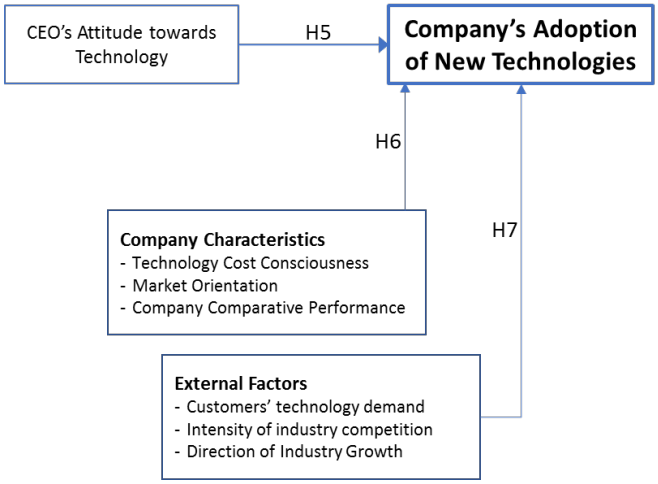

Figure 5. Conceptual Framework of Model 2

Executive Traits

PU and PEOU

To expand on the TAM framework, Porter and Donthu (2006) further used it to measure Internet usage among people based on age, education, income, and race. Using factor analysis, they also expanded on the TAM by measuring PU and PEOU, which predict attitude toward technology adoption. Thus, with their validated construct and scale, we can determine further effects of user motivations on technology adoption among executives in the printing industry. To ensure that the model validates previous studies showing that PU, PEOU, and attitude toward technology are correlated, we analyzed executive responses to these three constructs and tested the following hypotheses:

H1a: Executives' PU of technology positively correlates to attitude toward technology.

H1b: Executives' PEOU of technology positively correlates to attitude toward technology.

H1c: Executives' PEOU positively correlates to PU.

Entrepreneurial Leadership Style

As the focus of the study is on technology adoption among SMEs in the printing industry and executives in these organizations tend to have a great deal of influence on the adoption of technology, the study measures the possible influence of executive leadership style on this decision process. According to Spencer et al. (2012), for small, owner-managed firms, leadership influences technology adoption. It is important for this study to examine the relationship between leadership influence and technology adoption as measured by the TAM. Taking an empirical approach, Renko et al. (2015) created and validated a scale for measuring entrepreneurial leadership using factor analysis and goodness-of-fit measures. Thus, we used questions from their validated scale in the survey instrument.

Innovativeness and Risk Aversion

The next executive trait variables we measure are innovativeness and risk aversion. Lu et al. (2005) showed that innovativeness influences the adoption of technology. In addition to the innovativeness trait, risk aversion is also important to analyze because small business owners may be highly risk-averse but necessarily low-risk takers (Spencer et al., 2012). For these constructs, we implemented the scale of Donthu and Garcia (1999) in the study. They examined the behaviors of Internet shoppers through a survey instrument measuring the adoption of Internet shopping, which was a new phenomenon in the late 1990s. They measured various constructs, two of which were innovativeness and risk aversion. We also included these constructs because measurement of these traits by executives would help determine whether they ultimately influence technology adoption in the printing industry.

Market Orientation

Narver and Slater (1990) examined how market orientation affects a firm's profitability. They inferred that market orientation involves three behavioral components; customer orientation, competitor orientation, and inter-functional coordination and two decision criteria; long-term focus and profitability. From this, they were able to create a validated construct measuring market orientation. As market orientation comprises relevant behavioral and inter-functional components, we used this construct to measure its external influence on executive decision-making regarding technology adoption in the study framework.

Technology Readiness Index

An additional scale included in the analytical framework that has roots in TRA is the technology readiness index. This scale has direct implications because it measures another external variable (i.e., technology readiness) that could influence executives' rate of technology adoption. Penz et al. (2017) showed that the technology readiness index was instrumental in influencing Brazilian businesspeople in the United States and their affinity to introduce technology in their firms. We measured this construct using a scale Parasuraman (2000) created to measure willingness to use new technology for personal and work applications. Parasuraman (2000) developed the resultant scale from a validated questionnaire of 1,200 individuals. The scale measures optimism, innovativeness, discomfort, and insecurity regarding technology. Thus, the technology readiness index is a useful variable to measure executives' technology adoption.

We tested the influence of all these executive traits on PU, PEOU, and attitude toward technology. Age, education, company tenure, and executive tenure are all single-item measures, based on categorical survey responses. We measured these variables to determine how they may influence executives' technology adoption and to verify how influential they are compared with executives' attitudes as determined by the TAM. For the influence of executive traits on

PU of technology, we propose the following:

H2a: Executives' entrepreneurial leadership positively correlates to PU.

H2b: Executives' technology readiness positively correlates to PU.

H2c: Executives' risk aversion negatively correlates to PU.

H2d: Executives' tenure in the company positively correlates to PU.

H2e: Executives' tenure in their current position positively correlates to PU.

H2f: Younger executives are more likely to perceive technology as useful.

H2g: Highly educated executives are more likely to perceive technology as useful.

For the influence of executive traits on PEOU of technology, we hypothesize the following:

H3a: Executives' entrepreneurial leadership positively correlates to PEOU.

H3b: Executives' technology readiness positively correlates to PEOU.

H3c: Executives' risk aversion positively correlates to PEOU.

H3d: Executives' tenure in the company positively correlates to PEOU.

H3e: Executives' tenure in their current position positively correlates to PEOU.

H3f: Younger executives are more likely to perceive new technology as easy to use.

H3g: Highly educated executives are more likely to perceive new technology as easy to use.

For the influence of executive traits on attitude toward technology, we hypothesize the following:

H4a: Executives' entrepreneurial leadership positively correlates to attitude toward technology.

H4b: Executives' technology readiness positively correlates to attitude toward technology.

H4c: Executives' risk aversion positively correlates to attitude toward technology.

H4d: Executives' tenure in the company positively correlates to attitude toward technology.

H4e: Executives' tenure in their current position positively correlates to attitude toward technology.

H4f: Younger executives are more likely to have a positive attitude toward technology.

H4g: Highly educated executives are more likely to have a positive attitude toward technology.

Finally, we measured executives' attitude toward technology to determine whether it was correlated with company adoption of technology:

H5: The more positive executives' attitude toward technology, the more likely the company will adopt new technology

Company Characteristics and External Factors

Company characteristics, external corporate factors, and technology costs are all single-item measures, based on categorical survey responses. We measured these variables as well to determine how they may influence executives' technology adoption and the model. As noted, the second model investigates the impact of executive attitudes toward technology, company characteristics, and external factors on a company's adoption of new technologies (Figure 4). In particular, we measured company characteristics such as technology cost-consciousness, market orientation, and company performance in the study. These characteristics are likely to have a significant influence on potential adoption. Technology expenses, companies' competitiveness in the market, and financial health (company performance) can all affect technology implementation. For external factors, we included customers' technology demand, the intensity of industry competition, and the direction of industry growth to determine their effects, as these factors can also affect technology adoption. Regarding the impact of company characteristics on the adoption of technology, we hypothesize the following:

H6a: Technology cost-consciousness negatively correlates

to companies' technology adoption.

H6b: Market orientation positively correlates to companies' technology adoption.

H6c: Relative company performance positively correlates to companies' technology adoption.

Regarding the impact of external factors on the adoption of technology, we hypothesize the following:

H7a: Customer technology demand positively correlates to companies' technology adoption.

H7b: Intensity of company competition positively correlates to companies' technology adoption.

H7c: Direction of industry growth positively correlates to companies' technology adoption.

Data

We obtained the data for this study by surveying executives of SMEs (with fewer than 150 employees) in the printing industry. The survey collection was a joint effort with Digital Solutions Cooperative (DSCOOP), an association of commercial and label printing firms around the globe. DSCOOP provided the names and email addresses of the executives of its member companies, as it believed that the research output would promote knowledge among its members. Of the 1,292 surveys sent to the executives, 112 respondents opened the survey invitation, 60 fully completed the survey, 36 partially completed the survey (missing data made responses ineligible for our analysis), and 16 declined to participate; 178 emails bounced back. No incentives were given for survey completion. A second reminder was sent out to help increase the response rate. Of the 60 respondents (4.64% effective response rate, 53.6% effective response rate), who completed surveys, 41 self-identified as CEOs, and 19 as senior executives in their organizations. As this study is exploratory and the sample size is small, we used path analysis and correlations to test the hypotheses. We first pretested the survey and made minor revisions before administering the final survey.

Measures

Executive Traits

As part of the survey, we first obtained information about the executives' age, education level, tenure in the company, and tenure in current position, which was based on categorical survey responses. We measured these traits using scales that have been developed and used in prior research: risk aversion scales from Donthu and Gilliland (1996), technology readiness scales from Parasuraman and Colby (2015), and entrepreneurial leadership scales from Renko et al. (2015). Table A1 in the Appendix reports the constructs measured by the series of questions and Cronbach's alpha coefficients of reliability.

TAM

To measure the constructs of the TAM, we adapted multi-item scales from Porter and Donthu (2006) to suit the context of the study. These scales included executives' PU of technology, executives' PEOU of technology, and executives' attitude toward technology. The response choices were based on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). Table A2 in the Appendix reports the constructs measured by the series of questions and Cronbach's alpha coefficients of reliability.

Company Characteristics

We measured companies' market orientation using scales from Narver and Slater (1990). Table A3 in the Appendix reports the market orientation construct measurement and Cronbach's alpha coefficients of reliability. Companies' comparative performance was based on a single question, "Our company's performance compared with other companies in our industry is…," with categorical responses of below average (1), about average (2), and above average (3). Companies' technology cost-consciousness was based on a dichotomous response to the question, "The cost of new printing technologies has negatively influenced our decision to acquire new printing technologies."

External Factors

We aimed to examine influences on the company from the outside and thus included the external factors of customers' technology demand, intensity of industry competition, and direction of industry growth; all are typically outside firms' control. table a4 in the appendix lists the single-question scales created for each construct and the possible categorical responses.

Company Adoption of New Technologies

We measured company adoption of new technologies with the question, "Has your company procured any

new technology valued at over $150,000 in the last three years?" The scale was scored as yes/no. If the respondents answered yes, they were asked to "name the new technology adopted." We chose the value of $150,000 because this is the minimum cost of acquiring technology in the digital printing industry that would differentiate a company from its competitors. We used "3 years" to assess whether the adoption was recent because of the remarkable advancement in printing technology in the past three to five years.

Results

All multi-item constructs had high and acceptable reliabilities. As mentioned previously, considering the exploratory nature of the research and the small sample size (n = 60), we used path analysis and resulting correlations to test the hypotheses. In evaluating the strength of the correlations, we adopted the guidelines Cohen (1988) suggests in the analysis.

Relationship Among the TAM Constructs

We found a high positive correlation between executives' PU of technology and attitude toward technology; thus, H1a is supported. We also found a high positive correlation between executives' PEOU of technology and attitude toward technology; thus, H1b is also supported. Finally, there was a medium positive correlation between executives' PU and PEOU; thus, H3 is supported. Table 1 presents detailed results.

Table 1
Correlations among the TAM constructs

	Significance (p < 0.05)	Correlation
H1a. PU and attitude toward technology	Y	0.694
H1b. PEOU of technology and attitude toward technology	Y	0.560
H1c. PU and PEOU	Y	0.424

Relationship Between Executives' Traits and PU of Technology

As Table 2 shows, we found a medium positive correlation between executives' entrepreneurial leadership and PU of technology. The more entrepreneurial an executive is, the more useful he or she perceives technology to be. Thus, H2a is supported. We also found a high positive correlation between executives' technology readiness and PU of technology. The more technology ready or savvy an executive is, the more useful he or she perceives technology to be. Thus, H2b is supported. There was no statistically significant association between each of the other executive traits (i.e., risk aversion, tenure in the company, tenure in current position, age, and education level) and executives' PU of technology, and therefore, we cannot conclude that these traits are associated with executives' PU of technology. As such, H2c through H2g are not supported.

Table 2
Correlations between executive traits and PU of technology

	Significance (p < 0.05)	Correlation
H2a. Entrepreneurial leadership	Y	0.440
H2b. Technology readiness	Y	0.537
H2c. Risk aversion	N	-0.153
H2d. Tenure in company	N	0.029
H2e. Tenure in current position	N	0.013
H2f. Age	N	-0.170
H2g. Education level	N	-0.218

Relationship Between Executive Traits and PEOU of Technology

As Table 3 shows, we found a small positive correlation between executives' technology readiness and PEOU of technology. The more technology ready or savvy an executive is, the more likely he or she is to perceive technology as easy to use; thus, H3b is supported. There was a medium negative correlation between executives' age and PEOU of technology. This result implies that the younger an executive is, the more he or she will perceive technology as easy to use; thus, H3f is supported. We found no statistically significant relationship between the other executive traits (i.e., entrepreneurial leadership, risk aversion, tenure in the company, tenure in current position, and education level) and PEOU of technology, and therefore, we cannot conclude that these traits are associated with executives' PEOU of technology. Thus, H3a, H3c–H3e, and H2g are not supported.

Table 3
Correlation between executive traits and PEOU of technology

	Significance ($p < 0.05$)	Correlation
H3a. Entrepreneurial leadership	N	0.224
H3b. Technology readiness	Y	0.263
H3c. Risk aversion	N	0.055
H3d. Tenure in company	N	-0.058
H3e. Tenure in current position	N	-0.010
H3f. Age	Y	-0.382
H3g. Education level	N	-0.038

Relationship Between Executive Traits and Attitude Toward Technology

As Table 4 shows, we found a medium positive correlation between executives' entrepreneurial leadership and attitude toward technology. The more entrepreneurial an executive is, the more positive he or she is toward technology; thus, H4a is supported. There was a medium positive correlation between executives' technology readiness and attitude toward technology. The more technology ready or savvy an executive is, the more positive he or she is toward technology; thus, H4b is supported. Ther was no statistically significant relationship between the other executive traits (i.e., risk aversion, tenure in the company, tenure in current position, age, and education level) and attitude toward technology, and therefore, we cannot conclude that these traits are associated with executives' attitude toward technology. Thus, H4c through H4g are not supported.

Table 4
Correlation between executive traits and attitude toward technology

	Significance ($p < 0.05$)	Correlation
H4a. Entrepreneurial leadership	Y	0.361
H4b. Technology readiness	Y	0.488
H4c. Risk aversion	N	-0.109
H4d. Tenure in company	N	-0.097
H4e. Tenure in current position	N	0.139
H4f. Age	N	-0.235
H4g. Education level	N	-0.116

Relationship Between Executives' Attitude Toward Technology and Company Adoption of Technology

We found a small positive correlation between executives' attitude toward technology and company adoption of technology ($r = 0.280$, $p < 0.05$). The more positive an executive's attitude is toward technology, the more likely the company will adopt new technology; thus, H5 is supported.

Relationship Between Company Characteristics and Company's Adoption of Technology

We found a medium positive correlation between companies' market orientation and adoption of technology, in support of H6b. There was no statistically significant relationship between the other company characteristics (i.e., technology cost and company performance) and companies' adoption of technology, and therefore, we cannot conclude that the other company characteristics are associated with companies' adoption of technology. Thus, H6a and H6c are not supported (see Table 5).

Table 5
Correlation between company characteristics and companies' adoption of technology

	Significance ($p < 0.05$)	Correlation
H6a. Technology cost	N	-0.165
H6b. Market orientation	Y	0.302
H6c. Company performance	N	0.186

Relationship Between External Factors and Companies' Adoption of Technology

None of the external factors had a significant correlation with companies' adoption of technology. Thus, H7a through H7c are not supported (see Table 6).

Table 6
Correlation between external factors and company's adoption of technology

	Significance ($p < 0.05$)	Correlation
H7a. Customer technology demand	N	0.227
H7b. Company competition	N	0.079
H7c. Direction industry growth	N	0.196

Discussion and Implications

New technology adoption and its successful usage are among the more relevant differentiators in value proposition and sustainability for small businesses, especially those that are facing significant challenges from competition. Thus, understanding which executive traits, company characteristics, and external factors might lead to the adoption of new technologies is pertinent to SMEs' management and strategy formulation.

This exploratory study examines the relationship of executive traits, company characteristics, and external factors with attitude toward technology and the adoption of new technologies through the lens of the TAM (Davis et al., 1989). The results confirm the TAM model, finding positive correlations of PU, PEOU, and attitude toward technology, as well as a positive correlation of PU with PEOU. These results are not surprising, as the TAM model and its constructs have been validated in previous research. However, the TAM gives this exploratory study a solid base on which to interpret the results from companies in the digital printing industry. In line with the model, the study hypothesized a positive relationship between executive traits and PU and PEOU of technology, as well as a direct relationship to attitude toward technology. The results further reinforce the TAM as a useful framework to gauge technology adoption. In this case, the technology is advanced digital printers, helping us expand the use of the TAM to SMEs.

Entrepreneurial leadership has a positive correlation with the PU of technology and attitude toward technology, but not with PEOU. These entrepreneurship results are not unexpected. In a similar field, Schumpeterian theory (Schumpeter, 1934) states that entrepreneurial initiatives often result in innovation, a situation that might also lead to higher PU of new technology, helping the organization improve and innovate. However, the entrepreneurship trait by itself does not contribute to higher PEOU, which might indicate the need for small business executives to actively search for information that provides a more elaborate and understandable description of the technologies available and applicable to their firms.

As the analysis shows, technology readiness is the only trait that has positive correlations with PU, PEOU, and attitude toward technology directly. These results strongly suggest the need to have that trait inside the company, either directly from the executive or from members of the leadership team. Fortunately, this trait can be quantified and measured in management candidates when being recruited as business leaders. The firm could use the technology readiness index as a tool to gauge this trait in prospective candidates.

In addition, we hypothesized that tenure in the company and tenure in current position would have a positive correlation with PU, PEOU, and attitude toward technology. While we expected that the time leading the company or the length of experience in an executive position would increase the adoption of new technologies, the results show that neither factor is statistically significant. This unexpected result provides solid insight for executives and related stakeholders who tend to believe that the level of technology adoption will be higher with longer-term executives. Thus, we suggest focusing on other traits to accelerate technology adoption and not necessarily depending on experience within a position. In a similar vein, Wang et al. (2016) found that longer-tenured CEOs may be more risk-averse and resistant to change. Such a position will ultimately affect their decisions to invest in new technologies they find expensive, risky, or providing little to no value to the business.

We also hypothesized that younger executives would have higher levels of PU and PEOU of technology. The relationship with PEOU is supported, while it is not with PU. Age might have an "intuitive" benefit on understanding new technology, and younger executives of a small business might better comprehend how technology works, but these factors will not necessarily give them insights into what technology will do for their organizations. Therefore, they will need to invest time in learning the available technologies and how they can positively influence their business.

We analyzed higher education as a predictor of PU and PEOU, with the expectation that through education, executives' attitude toward technology would be positive. Both hypotheses were not supported; highly educated executives do not necessarily have more significant technology adoption tendencies. This result is not surprising as the companies in this industry are mostly mom-and-pop shops, and thus there may not be an abundance of formal education in the management ranks.

One of the primary contributions of this exploratory research is that the traits we found to have correlations with technology adoption are mainly those inherent to executives, such as entrepreneurship and technology readiness. Traits acquired externally, such as tenure in the company, are not predictors of higher technology adoption. With regard to this finding regarding the correlations of entrepreneurship with technology readiness, other studies have also found a complementary interaction (e.g., Penz et al., 2017). These results suggest that in addition to external traits, small business CEOs and executives should scrutinize their internal traits, as these traits may increase the odds of technology adoption.

The second model of this research focuses on external factors and company characteristics to verify whether executives' attitude toward technology leads to company adop-

tion of new technology. Similar to the case with the TAM model validation, executives' attitude toward technology is positively correlated with company adoption of technology. This finding also is not surprising, as it has been validated in other studies; however, it gives strong support to the sample results. While executives may feel positive about adopting technology, other factors may further influence whether they actually purchase the technology.

We hypothesized that cost-consciousness of the technology would be negatively correlated with companies' technology adoption. This assumption was not supported in the small business environment of digital printing. Executives do not necessarily adopt technology based on the cost of acquisition or implementation. By contrast, the relationship between market orientation and technology adoption is supported, which contrasts with the cost-consciousness findings. Companies with a higher market orientation might have a higher level of adoption of technologies, despite being cost-conscious. We postulate that these external factors may ultimately affect firm performance. If the technology is too expensive, the financial costs of purchasing it or implementing it into the business could negatively affect firm performance. Market orientation may positively affect firm performance because it helps ensure that the company remains competitive and can generate additional revenues as a result of the technology adoption (Palmer et al., 2001).

Finally, external factors such as customers' technology demand, the intensity of industry competition, and direction of industry growth were not predictors of technology adoption. These results are also insightful for small business executives, as they indicate that executives should focus more on their individual personality traits and company characteristics than on these external factors. While these factors were not relevant in our study, they can affect firm performance and strategy formation of small businesses (Pollard & Morales, 2015). Palmer et al. (2001) argue that decisions to innovate are complex and specific to organizational contexts and are influenced by resource availability, managerial risk orientations, specific customer needs, and employee acceptance of innovative ideas. This contradiction highlights the opportunity to examine these external factors and their influence on SMEs. Figure 6 illustrates the empirically supported model for our findings.

Limitations

This research is limited in several ways. First, we took an exploratory approach to examine executive traits that lead to the adoption of technology in SMEs. While the invitation to participate in the study was sent to CEOs, 19 of the 60 respondents did not identify themselves as CEOs. It is not clear whether they held titles similar to CEO (i.e., corporate executives) or whether they were indeed at a level lower than CEO. However, the analysis of models 1 and 2 using the 41 respondents who identified themselves as CEOs showed that most (though not all) of the results were consistent for both samples. Second, our sample is restricted to the industry of label printers. A larger sample from varied industries and using causal modeling techniques would enhance and validate the findings across other SMEs. In addition, the small sample size did not allow us to examine which variables mediate the relationships that lead to adoption. Third, the survey may be biased due to self-selection. Self-selection biases can occur because only those who are interested in using or have used technology may be more likely to respond. Additional biases can result from participants expressing their personal feelings, attitudes, and behaviors. A final limitation is the sampling method chosen (purposive sampling, which constitutes a blend of homogeneous and extreme/deviant case sampling due to assistance from DSCOOP), which may not be representative of the population. Further research could account for these limitations. In addition, research could test whether personality traits, business acumen traits, or external company characteristics have more impact on SMEs when adopting new technologies within their business scope.

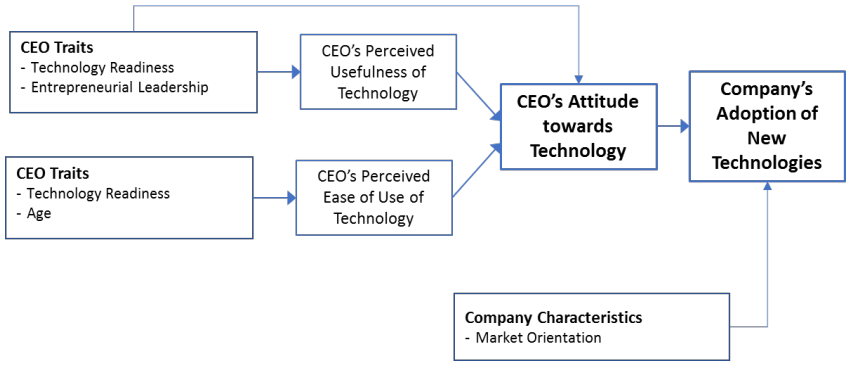

Figure 6. Empirically Supported Model

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Appendix

Constructs, Measures, and Cronbach's Alpha Results

Table A1
Executive trait measures with multiple indicators

Construct	Questions	Alpha
Risk Aversion	I would rather be safe than sorry. I want to be sure before I purchase anything. I avoid risky things.	0.801
Technology Readiness	New technologies contribute to a better quality of life. Technology gives people more control over their lives. Technology makes people more productive. Other people come to me for advice on new technologies. In general, I am among the first in my circle of friends to acquire new technology when it appears. I can usually figure out new high-tech products and services without help from others. I keep up with the latest technological developments in my area.	0.721
Entrepreneurial Leadership	I often come up with ideas of completely new products/services that we could sell. I have creative solutions to problems. I demonstrate passion for my work. I have a vision of the future of our business. I challenge and push people to act in a more innovative way. I want everyone to challenge the current ways we do business.	0.761

Table A2
TAM measures

Construct	Questions	Alpha
PU	Using new Printing technology can make one productive. New printing technology can make things easier. Overall, new printing technologies are useful.	0.919
PEOU	Learning to use new printing technology is easy. Using new printing technology is clear and understandable. It is easy to become skillful at using new printing technology. Overall, new printing technology is easy to use.	0.943
Attitude Toward Technology	I am positive toward new printing technologies. It makes sense to use new printing technologies. People should adopt the latest new printing technology.	0.818

Table A3
Company characteristics measures with multiple indicators

Construct	Questions	Alpha
Market Orientation	Your strategy for competitive advantage is based on our understanding of customer needs. Your salespeople share information within our business concerning competitors' strategies. You monitor your level of commitment and orientation to serving customers' needs. You target customers and customer groups where we have, or can develop, a competitive advantage. You respond to competitive actions that threaten us. Your top management team regularly discusses competitors' strengths and strategies. You understand how everyone in our company can contribute to creating customer value.	0.713

Table A4
External factors measures

Construct	Question	Categorical options
Customers' technology demand	How much do you agree with the following statement? "My customers demand that we invest in the latest printing technology."	Strongly disagree Disagree Somewhat disagree Neither disagree nor agree Somewhat agree Agree Strongly Agree
Intensity of industry competition	In your opinion, what is the intensity of competition you face in your industry.	No competition Not very intense Somewhat intense Very intense
Direction of industry growth	In your opinion, what is the current direction of growth of your industry.	Fast decline Slow decline Not declining/not growing Slow growth Fast growth