

The Effect of Technological Factors on the Adoption of Cloud Based E-banking Among Private banks Employees in Libya

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Abstract

Studies on cloud based e-banking (CBEB) is dominated by technical studies and industrial report. Most of previous studies focused on the individual perspective related to the usefulness and usability of the technology while the technological perspective that focus on security, privacy, trust, and availability received limited studies. The purpose of this study is to investigate the effect of technological related factors such as security, privacy, trust, and availability on the adoption of CBEB among employees in Libya. The population of this study is the IT professional employees in nine Libyan private banks. Data was collected using random sampling technique. A total of 309 responses were collected. Findings of the study indicated that technological factors affect the behavioral intention to use CBEB. Satisfaction mediated partially the effect of technological factors on behavioral intention to use CBEB. Enhancing the trust, security, and privacy will lead to better adoption of CBEB among employees in Libyan private banks.

Keywords: Cloud computing, banking, private banks, user satisfaction, Cloud Based E-banking

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I. Introduction

The banking industry is one of the late adopters of the cloud computing (CC). Cloud Based E-Banking (CBEB) is one of the new technology and has received little attention from researchers (Asadi et al., 2016). Majority of the studies regarding the CC adoptions by banks are industrial reports of CC providers or consultancy companies (Boulton, 2016; IBM, 2016; Mckinsey, 2016). Several advantages can be gained by financial institution when using CBEB. These advantages include cost minimization, on-demand usage, business continuity, as well as business agility, and green IT (Boulton, 2016). Nevertheless, one of the most important steps before using CBEB is to assess the acceptance of employees for the new technology (Cagemini, 2011).

Organizations that deploy the CC has reported low feasibility of the projects due to the low acceptance rate of individuals who are supposed to use the technology (Elzamy et al., 2016). The banking industry is confronting exceptional changes. Control is presently in the hands of the client, instead of the bank. Clients are driving new plans of action. Their utilization of innovation is driving business change. Banks need to respond to this new client driven condition with development in plans of action, activities and IT. For banks, the incentive for distributed computing influences the whole business. Cloud innovation offers another model for conveying inventive customer encounters, compelling joint effort, enhanced speed to showcase and expanded IT productivity. Cloud organizations are spreading and the innovation is ended up being secure (IBM, 2013)

Currently, CC is widely used in all countries. However, majority of the studies are conducted in developed countries while few have examined the issue of adoption in less developed countries (El-Gazzar, 2014; Guner and Sneiders, 2014). In Libya, the banking industry is suffering due to the ongoing conflict in the era after the collapse of previous regime. Many international reports by the World Bank, the United Nation (UN) referred to the severity of the challenges that face the Libyan economy. Nevertheless, several private banks have introduced the services of online banking in Libya since 2009 but the acceptance of these services are still limited (Mohamed, 2013).

A decent number of studies examined the adoption of other technologies such as e-commerce, e-government, e-learning, and e-business. However, CBEB has been investigated in few studies (Elkaseh et al., 2015). The online banking technology usage rate in Libya is minimal (Eljayash, 2015). The Libyan banking industry is now lagging behind and in extreme need of essential change to enhance its banking system, as it has been continuously criticized for its inadequate and inefficient services (Mohamed, 2013). However, the studies regarding CBEB adoption in general are few in Libya and in all countries (Boulton, 2016; McKinsey, 2016; IBM, 2016). Recent studies showed that the perspective of customers toward the adoption of CBEB was

investigated however; a lack existed in the perspective of employees toward adoption of CBEB (Asadi et al., 2016).

Deploying the technology in banks improve their organizational performance and lead to competitive advantages (Alaarj et al., 2015, 2016). Nevertheless, the most critical factors that face the wide usage of the technology in the banks is the perspective regarding the safety of transaction in an online environment. Previous studies focused on factors that are related to the individual perspective such as the usefulness of the technology (e.g. usefulness in TAM, and performance expectancy in UTAUT) or the ease of using the technology (e.g. ease of use in TAM, and effort expectancy in UTAUT) (Davis, 1989; Venkatesh et al., 2012). Other factors that affect the technological perspective of technology such as security, privacy, trust, and availability were used in limited number of studies (Kayali et al., 2016; Lian, 2015).

Theoretical adoption model such as TAM and UTAUT were criticized for not including variables that are related to the technological aspects of adoption such as trust and security in its conceptualization (Alharbi, 2014; Behrend, Wiebe, London, & Johnson, 2011; Min, Ji, & Qu, 2008). Trust in cloud provider as well as the privacy and security issues, are crucial for ensuring the successful adoption of an appropriate cloud (Al-otaibi, 2014; Flack and Dembla, 2014; Singh and Chand, 2014). Therefore, the purpose of this study is to examine the effect of technological related factors on the adoption of Cloud Based E-banking (CBEB) in Libya. The study also aims to investigate the mediating role of user satisfaction on the effect of the technological factors on the behavioral intention to use CBEB. The next section discusses the literature review, research methodology, findings, discussion, and conclusion.

II. Literature Review

This section discusses the CC and the development of the hypotheses.

2.1 Cloud Based E-Banking

CC is a new technology in the information technology that have been recently developed to enable users and business to access software, hardware, and application on demand basis from anywhere (Low et al., 2011; Shawish and Salama, 2014). Therefore, the cloud resulted in shifting the applications to service platform rather than to be installed on the personal computers of users. A widely used definition of CC is provided by the American National Institute of Standards and Technology (ANIST). ANIST defined it “a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” (Mell and Grance, 2011).

Researchers agreed that for CC, there are three main layers that are the Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) (Lian, 2015; Low et al., 2011). In addition, researchers also highlighted the importance of the deployment of CC. One important consideration for the adoption of CC is the deployment of a cloud-based computing resource. CC deployment can be divided into four types: private clouds, public clouds, community clouds, and hybrid clouds (Mell & Grance, 2011; Lian, 2015). Each deployment model has its benefits and drawbacks (Zhang and Chen, 2010). The decision of choosing a proper CC deployment model should consider technological as well as organizational factors (Zhang and Chen, 2010).

The usage of CBEB can make an agile and adaptable banking condition that can react rapidly to new business necessity. This is additionally taken a toll sparing, as banking institution are required to pay on the usage-based for useful utilization and the services that they utilize (Alaarj et al., 2017a, 2017b; Patani et al., 2014). Albeit numerous extensive banks are sure about the acknowledgment of cloud innovation, others are more watchful and anticipate the administrative difficulties to be addresses before hopping onto the temporary fad. With sever and tight monetary related confinements, develop fiscal programming commercial centre and quickly evolving controls, there is requirement for banks to seek after innovative answers for meeting business prerequisites in today fierce competitive environment (Alaarj et al., 2017a; Apostu et al., 2012).

2.2 Conceptual Model and Hypotheses Development

The proposed conceptual model is presented in Figure 1. In this study, the focus in on the technological factors that are related to the technological perspectives of the employees toward using the CBEB in Libya. The study operationalized the technological factors to include the factor of trust (TR), security (SE), privacy (PV), and availability (AV). User satisfaction (SA) with the technology is a core variable that can enhance the explanation of the relationship between technological factor and the behavioral Intention (BI). Thus, this variable is proposed in this study as a mediator between technological factor, and the BI to use the CBEB. Figure 1 presents the proposed framework of this study.

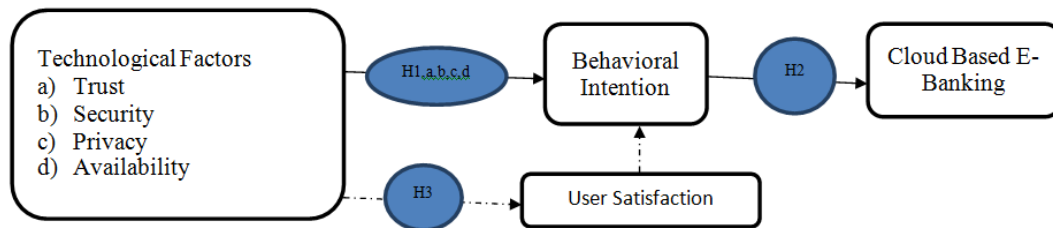


Figure 1: Proposed Conceptual Model

2.6.2 Technological Factors

Technological factors includes trust, security, privacy, and availability. Many researchers included and tested the effect of technological factors on the adoption of CC technology. Lian et al. (2014) utilized Technology-Organization-Environment (TOE) model and found that technological factors are the most important construct for the adoption of CC in Taiwanese hospital. Picoto et al. (2014) found that technological factors such as convenience and computability are the most important predictors of CC use and performance. Similarly, Oliveira et al. (2014) found technological context of adoption is highly significant predictor of CC adopting among American companies. Accordingly, in this study, it is expected that the technological factors will have a significant effect on the BI to adopt CBEB by employees at Libyan banks. Thus, it is hypothesized:

H1: Technological factors have a significant positive effect on the BI to adopt CBEB by employees at Libyan banks.

2.6.2.1 Trust

Trust is defined as “the belief that cloud computing providers will behave in accordance with users’ expectations of using the cloud computing services” (Wu, 2011). Lian (2015) found that trust in on CC significantly influence the adoption of e-invoice on CC. Picoto et al., (2013) found that trust in suppliers has significant influence on the adoption of CC. Previous studies found that trust has strong effect on the adoption of CC (Burda and Teuteberg, 2014; Michael et al., 2015; Alkhater et al., 2014). Voutinioti (2013) examined the direct effect of trust on the behavioral intention on adopting cloud computing and found that trust has a significant effect on behavioral intention. Similarly, Alaiad and Zhou (2014) examined the influence of trust on the usage intention of cloud computing and found that trust is a predictor of usage intention of cloud. Following Voutinioti (2013) and Alaiad and Zhou (2014) this study proposed direct link between trust and BI. Thus, the following can be hypothesized:

H1a: Trust of CC affects positively the employees’ BI to use CBEB at Libyan banks.

2.6.2.2 Security

Security is defined as “the extent to which a person believes that using a particular application will be risk free” (Xu et al., 2003). Studies that pertaining to the influence of security on the adoption of CC showed that the security is a critical factor. Lian (2015) found significant influence of security on the adoption of E-invoice using CC. In a study pertaining to SMEs, Gupta et al., (2013) found that security is the third most significant factors for the adoption of CC by SMEs. Many other studies have found similar results and pointed out the importance of security for the adoption of CC (Wu, 2011; Lian et al., 2014; Shin, 2013; Lim et al., 2015). Al-khater et al. (2014) linked directly the security to the intention to adopt cloud computing. Following Alkhater et al. (2014), and Lian (2015), this study proposed direct link between security and BI. Thus, the following can be hypothesized:

H1b: Security of CC affects positively the BI of employees at Libyan banks to use CBEB.

2.6.2.3 Privacy

Privacy is defined as “the potential loss of control over personal information” (Akturan & Tezcan, 2012). Privacy in banking refers to “the degree to which employees fear that their privacy will be violated and anxiety that banks will divulge personal information to other companies or to cross sell other banking products” (Aldás-Manzano et al., 2009). In CC environment, Gupta et al. (2013) and Wu, (2011) found that privacy has a significant effect on the CC adoption. Sulaiman and Magaireah (2014) found that privacy of CC affect the healthcare adoption of the technology. Similarly, the findings of Tehrani (2013) indicated that privacy of CC is one of the predictor of adopting the technology. Arpaci, Kilicer and Bardakci (2015) found that privacy has a significant effect on the BI to adopt CC. Accordingly, in this study, it is expected that high level of privacy will encourage the employees to adopt the CC technology. Thus, it is hypothesized:

H1c: Privacy of CC has a significant positive effect on the BI of employees at Libyan banks to adopt CBEB.

2.6.2.4 Availability

Availability refers to “an individual's perception of the extent to which ubiquitous technology provides a personalized and uninterrupted connection and communication with other individuals and/or networks” (Kim and Garrison, 2008). Phaphoom et al. (2015) investigated the effect of availability on the CC adoption and found that it has a significant effect. Al-khater, Wills and Walters (2015) found that availability has a significant effect of the adoption of the CC. Atcharyachanvanich et al. (2015) investigate the effect of availability on the adoption of CC e-learning and found the effect is significant. In this study, it is expected that availability have a significant effect on the behavioral intention to adopt cloud computing. Thus, it is hypothesized:

H1d: Availability has a significant effect on the BI to use CBEB by employees at Libyan banks.

2.2.7 Behavioral Intention and Cloud Based E-Banking

BI is defined as “a person's perceived likelihood or subjective probability that he or she will engage in a given behavior” (Venkatesh et al., 2003). Most previous model in technology acceptance proposed that BI affects the use behavior of new technology (Davis, 1989). Bellaaj, Zekri and Albugami (2015) found that BI affects the use behavioral of educational technology system. Arpaci, Kilicer and Bardakci (2015) found that BI affects the CC usage in educational institutions. In this study, it is hypothesized that:

H2: BI has a significant effect on adopting CBEB.

2.2.8 Mediating Role of User Satisfaction

SA is defined as “an affective state that is the emotional reaction to the entire CC experience of a user” (Burda and Teuteberg, 2014). Park and Kim (2014) investigated the effect of SA on the intention to use mobile cloud services and found the effect is significant. Pilevari, Toloie and Sanaei (2013) pointed out that users would adopt and use the technology once they are satisfied with it. Burda and Teuteberg (2014) found that satisfaction with the technology affects positively the trust as well as the usefulness of the cloud. DeLone and McLean (2003) proposed proposing SA as a mediator between information quality, system quality and service quality, and the intention to use of technology. Wixom and Todd (2005) found SA mediate partially the effect of service and system quality on ease of use and usefulness. It is well established in the marketing research that SA can mediate the relationship between variables (Chiu and Francesco, 2003; Rezvani et al., 2016; Spagnoli and Caetano, 2012). However, this relationship needs to be examined in CC adoption field. Thus, it is hypothesized:

H3: SA mediates the effect of technological factors on the BI

III. Research Methodology

The population of this study includes all the private banks in Libya ,which have experience of online banking and intended or have a CC technology existed in their banks. According to the central bank in Libya, the country has 18 public and private banks. The total banks that using the online banking are 11 out of which nine are private banks. These nine banks are the target population of this study. Number of employees at these banks are estimated to be 26000 employees including the branches of the banks. Out of the 26,000, there are 6000 employees who are involved in IT related tasks. These 6000 are the target population of this study. This study uses the random sampling selection method to determine the sample size from the population. Accordingly, the sample size of this study is 361 and it is sufficient for the use of AMOS (Lowry and Gaskin, 2014).

3.1 Instrument of the Study

This study is using a questionnaire as a tool for data collection. The questions are measured using five-point Likert scale. Measurement of security (4 items), privacy (5 items), and user satisfaction (4 items) were adapted from Park and Kim (2014), Wu (2011) and Shin and Shin (2011). BI (5 items) and trust (6 items) were adopted from Lian (2015). Use behavior or CBEB (5 items) was adopted from Gupta et al. (2013) and Davis et al. (1989). Two experts validated the instrument of this study and a pilot testing was conducted to ensure that the measurements are reliable. Cronbach's Alpha for all the measurement were greater than 0.70 indicating the reliability of the measurements.

3.2 Data Collection

After confirming the instrument validity and reliability, the data was collected by distributing 397 online questionnaire. Follow up procedures were applied to increase the response rate. Emails and other social media tools were used to post the questionnaire and request to be answered by IT staff in the banks. A total of 324 responses were collected representing a response rate of 81%. These responses are sufficient for the use of AMOS (Alaaraj et al., 2018).

3.3 Data Examination

A series of analysis was conducted to refine and prepare the data. Missing value analysis showed that there is no missing value. Outliers analysis indicated the existence of 15 univariate and multivariate outliers. This has resulted in 309 complete and usable responses. The data is normally distributed and the value of skewness and kurtosis are within the recommended range of less than absolute value of two and there is no multicollinearity issue because the tolerance is greater than 0.10 and the variance inflation factor (VIF) is less than 10.

IV. Data analysis

The data was analysed using SPSS and AMOS version 22.0. This section presents the profile of respondents and the result of hypotheses testing.

4.1 Demographic Information

Table 1 shows the demographic information of the respondents. A total of 309 respondents has participated in this study. Respondents are males (76.7%) while females accounted to 23.3%. A total of 37.9% of the respondents are between 20 and 30 years while 50.8% are in the age group between 31-40. A total of 9.1% are older than 40 and younger than 50. Those who are above 50 years accounted to 2.3%. The respondents are holders of bachelor's degree (77%) while 5.8% are holders of master degree and 1.9% are holders of PhD degree. They have access to internet and CC with 58.9% have experience of using the internet for more than six years and less than nine years. 37.2% have experience of more than nine years. A total of 3.9% have experience between two to five years.

Table 1: Background of the Respondents

Variable	Label	Frequency	Percentage
Age	20-30 years	117	37.9
	31-40 years	157	50.8
	41-50 years	28	9.1
	above 50 years	7	2.3
Gender	Male	237	76.7
	Female	72	23.3
Education	Diploma	47	15.2
	Bachelor	238	77.0
	Master	18	5.8
	Ph.D.	6	1.9
Access	Yes	309	100.0
Length of using the Internet	2-5 Years	12	3.9
	6-9 years	182	58.9
	More than 9 years	115	37.2

4.2 Measurement Model

Measurement model was conducted to assess the model of this study. In this stage, the factor loading (FL) as well as the indices were checked. Factor loadings were greater than 0.60. Almost all the indices such as goodness of fit index (GFI) was 0.883, Tucker lewis index (TLI) was 0.941, Comparative fit index (CFI) was 0.939, and Chisq/df was 2.824, were achieved. The GFI is below the threshold of 0.90. However, Hair et al. (2010) suggested researchers to proceed with the analysis if three at least of the indices were achieved.

4.2.1 Convergent Validity

Convergent validity is achieved when the FL is greater than 0.60, Cronbach's Alpha (CA) greater than 0.70, composite reliability (CR) greater than 0.70, and Average Variance Extracted (AVE) is greater than 0.50. Some of the items were deleted to improve the indices and achieve the validity. Table 2 shows that all the thresholds were achieved. Thus, convergent validity was achieved.

Table 2: Convergent Validity of Sub-Variables

Variables	Items	FL >0.60	CA>0.70	CR>0.70	AVE>0.50
Privacy	PV1	.914	0.961	0.953	0.803
	PV2	.876			
	PV3	.900			
	PV4	.882			
	PV5	.908			
Trust	TR4	.910	0.931	0.922	0.798
	TR2	.916			
	TR1	.853			
Security	SE1	.832	0.922	0.914	0.727
	SE2	.862			
	SE3	.842			
	SE4	.874			
Behavioral Intention	BI1	.850	0.931	0.920	0.742
	BI2	.828			
	BI3	.880			
	BI4	.887			
Use Behavior (CBEB)	UB2	.731	0.912	0.906	0.709
	UB3	.873			
	UB4	.936			
	UB5	.814			
User Satisfaction	SA1	.861	0.911	0.905	0.705
	SA2	.816			
	SA3	.873			
	SA4	.807			

4.2.2 Discriminant Validity

The discriminant validity of the variables was achieved because the square root of AVE (bold and underlines) is greater than the cross loading of the variables. Table 3 shows the discriminant validity.

Table 3: Discriminant Validity

Availability	Privacy	Trust	Security	Behavioral Intention	CBEB	User satisfaction
<u>0.868</u>						
0.576	<u>0.896</u>					
0.475	0.434	<u>0.893</u>				
0.641	0.707	0.586	<u>0.853</u>			
0.437	0.469	0.242	0.429	<u>0.862</u>		
0.324	0.345	0.114	0.339	0.465	<u>0.842</u>	
0.386	0.434	0.223	0.505	0.522	0.401	<u>0.840</u>

4.3 Hypotheses Testing

Structural model was conducted to test the hypotheses. All the indices were achieved except GFI.

4.3.1 Direct Effect

The hypotheses testing of the direct effect of technological factors is presented in Table 4. The table shows the hypotheses number (H), dependent variable (DV), independent variable (IV), standard error (S.E), critical ratio (C.R), and p-value (P).

Table 4: Result of Hypotheses Testing of Technological Factors

H	DV	Path	IV	Estimate	S.E.	C.R.	P	Label
H1	Behavioural intention	<---	Technology Factor	.856	.127	6.758	.000	Supported
H1a	Behavioural intention	<---	Trust	.148	.050	2.991	.003	Supported
H1b	Behavioural intention	<---	Security	.152	.063	2.405	.016	Supported
H1c	Behavioural intention	<---	Privacy	.161	.062	2.593	.010	Supported
H1d	Behavioural intention	<---	Availability	.085	.058	1.466	.143	Rejected
H2	CBEB	<---	BI	.291	.053	5.382	.000	Supported

Table 4 shows that the technological factors has significant effect on the BI toward using CBEB in Libyan banks. Thus, H1 is supported. For the effect of trust, it can be seen in Table 4 that the effect is significant. Thus, H1a is supported. Similarly, for H1b and H1c it can be seen that the effect of security and privacy on BI is significant Thus, H1b and H1c are supported. However, it can be seen from Table 4 that the effect of availability on the BI is not significant. Accordingly, H1d is rejected. For the effect of BI on the CBEB, the results showed that the effect is significant. Thus, H2 is supported.

4.3.2 Mediating Role of User Satisfaction

The third hypothesis predicted that SA mediates the effect of technological factors on BI. Table 5 presents the result of mediation role of SA.

Table 5: Result of Mediation Role of SA

Direct effect before mediator	Direct effect after mediating	Indirect effect	Mediation occurred?	Type of mediation
Technological factor → BI .856***	Technological factor → BI .691***	Technological factor → SA → BI .165**	- Yes	- Partial

Note: *** significant at 0.000, ** significant at 0.05, * significant at 0.10.

Table 5 shows that the direct effect of technological factors on BI reduced from .856 in Table 4 to .691 in Table 5 (after including the mediator). This indicates that the mediation occurred. In addition, the indirect effect through SA (Technological factor → SA → BI) is significant. Since both; the direct effect and the indirect effect are significant, the mediation is partial and H3 is supported.

V. Discussion

The findings of this study indicated that the technological factors are important for the CBEB adoption among IT professional employees in private banks in Libya. The study found that privacy is the most important technological factors followed by security and trust. The study also found that availability of the CBEB has insignificant effect on the BI. Further the BI has a significant effect on the CBEB. User satisfaction mediated partially the effect of technological factors on the BI. This finding indicates that decision makers have to focus on the technological factors and have to give priority to the privacy of the IT professional employees. In addition, the security of the CBEB is important factors to increase the use and the adoption of CBEB among employees. Further, the service providers must be trustworthy and information of the users must be confidential, secure, and no third party should be allowed to have access to these information. The satisfaction of users can play important role in increasing the adoption of CBEB.

The findings of this study regarding the technological factors and the components of trust, security and privacy are in agreement with the findings of Lian et al. (2014) who found that the effect of technological factors is important for the adoption of CC. In addition, the findings of other studies found that security, privacy and trust are important for the adoption of CBEB (Bellaaj et al., 2015; Lian, 2015; Cao et al., 2013). In addition, BI affects the CC adoption (Arpaci et al., 2015). In addition, the SA has a partial mediating effect indicating that SA can explain part of the relationship between technological factors and BI.

This study has contributed to the literature by examining the effect of technological factors since few studies have do so in the developing countries. In addition, the studies related to CBEB are few. Thus, this study enriched the body of knowledge regarding the adoption of CBEB. The study also focused on technological factors while previous studies focused on the individual related factors. The study also examined the trust and security as well as user satisfaction in the context of CBEB.

This study was conducted on IT professional employees in nine private banks in Libya. The findings can be generalized on the private banks. However, for generalizing the findings on public banks, more studies are needed to examine the adoption among these banks. The study also focused on the technological factors. Future studies are recommended to investigate other factors such as the organizational factors. Future studies are also recommended to investigate the adoption among customer and non-IT employees.

VI. Conclusion

This study was conducted in Libyan private banks to examine the effect of technological factors on the adoption of CBEB among IT professional employees. The study collected the data from this group and analyzed the data using AMOS. The findings indicated that privacy is the most important technological factors followed by security and trust. Availability was insignificant predictor of BI. Further, the BI has a significant effect on the CBEB. User satisfaction mediated the effect of technological factors on the BI. This finding can support the efforts of the decision makers to increase the adoption of CBEB among IT professional employees. However, the findings can be only generalized on the private banks and for more generalization of the result, future studies

are recommended to examine the adoption of CBEB in public banks. Other respondents are suggested such as customers and non-IT employees.

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