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THE INFLUENCE OF MOBILE TECHNOLOGY USAGE BEHAVIOR ON PERCEIVED WORK PERFORMANCE IMPROVEMENT

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ABSTRACT

Mobile technology is a method of internet access and other utilities through mobile devices such as cell phones, iPad, iPhone, iPod, laptops, smart pads and others related. In this study, we investigate if the mobile technology usage behavior affects the perceived work performance improvement. In addition, it was verified if there were some differences between the generations. To accomplish that, we applied a survey to 580 Brazilians which use mobile devices. To evaluate the relations between variables, univariate and multivariate statistics were used. The results evidenced, first that the perceived usefulness and perceived ease of use increase the mobile technology usage behavior. Second, it was found that mobile technology usage behavior increases the perceived work performance improvement. Finally, findings of this study provided that the differences in mobile technology usage among employees from different generations exist.

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INTRODUCTION

Mobile technology is a method of internet access and other utilities through mobile devices such as cell phones, iPad, iPhone, iPod, laptops, smartpads and others related (Vieira and Alcantara, 2011). These technologies have redefined the social dynamics creating new forms of collaboration and interaction (Lyytinen and Yoo, 2002; Pica and Kakihara, 2003) and the widespread reception of mobile phones, smart phones and tablets as communication tools and entertainment is setting a new social contact patterns and providing the most personal freedom for users (Nurullah, 2009). At the same time, its popularity has created new ways of personal and professional communication, including breaking down the boundaries between these two universes (Cavazotte *et al.,* 2014; Chesley, 2005; Cipriano and Nicolaci-da-Costa, 2009). In business, the need for flexible workers is an important factor that motivates them to adopt mobile technologies, and there are high adoption forecasts for the coming years (Huang, 2015). Evidence shows that many companies have been adhering to and applying (and enabling) mobile technologies in the workplace to improve the performance of internal and external communication, promoting flexibility of access to information and workflows (Harmon and Demirkan, 2011; Stieglitz and Brockmann, 2012; Lu *et al.,* 2015). Research also pointed out the benefits of implementing mobile technology in the workplace. Lu, Yueh, and Lin (2015) suggested that the use of mobile technology (smartphones and tablets) in the workplace improves communication between employees, customers and businesses to promote workflows and improve the professional image. Stieglitz and Brockmann (2012) propose the use of a mobile access system helps company employees and receive ad hoc information, making workflow more efficient and transparent. Chang Tseng, and Woodside (2013), in a study of executives from different countries, noted that the use of mobile technologies improves productivity, responsiveness and job satisfaction of employees. Other studies, supported by local realities, confirm these results (Huang, 2015; Lu *et al.,* 2015). To show a small part of this research gap, this study is designed to investigate whether the use of mobile technology has affected the way people work. The analysis was conducted with different generations, considering that the inference of mobile technologies seems to concentrate on generations X and Y (Batat, 2008; Nurullah, 2009; Mcmillan and Morrison, 2006). Nevertheless, it has still numerous studies devoted to company managers, assuming that there are generational

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differences between the workers and the characteristics of people can explain some of the important changes that have occurred over the past decade in the attitudes of employees and expectations. However, only a few scientific researchers have been conducted to test these generalizations (Becton *et al.,* 2014). Therefore, clearly, this study is only one-step in the development of management strategies by understanding the generational differences. The presentation of the study starts by contextualizing the survey and demarcation of the objective problem. Then rescue the literature that supports the research question. The third section presents the methodological aspects of the work, from the design of the survey instrument, the delimitation of the population, sample and data collection, and the analysis of the data. The fourth section presents the results received in the survey, bringing the main discussions and statistics deductions. Finally, the last section is intended for managerial and academic implications, study limitations and future research suggestions.

The mobile technology usage intent

The mobile revolution is a reality. Just watch the routine in malls, cafes, trains, cars, buses, airports and on the streets, and one can easily see how much penetration and adoption of mobile devices are changing the living standards and transforming the way people interact (Martin-Dorta *et al.,* 2011) and communicate (Jarvenpaa and Lang, 2005). In the literature, we can find several models to measure beliefs or other perceptions about technology usage, like the Ajzen's theory of planned behavior (TPB) (Ajzen, 1991), TAM model that added perceived usefulness and perceived ease of use as attitudinal beliefs salient to technology usage (Davis, 1989), and the a synthesized model named UTAUT that suggested that a person's intention to use IT was influenced by four user perceptions (perceived usefulness, perceived ease of use, subjective norm and perceived behavioral control) (Venkatesh *et al.,* 2003; Venkatesh *et al.,* 2012). These associations are well known and have been extensively validated so it was only included perceived usefulness and perceived ease of use in our hypotheses. Therefore, there is vast evidence in the literature showing that perceived usefulness and ease of use of technology influences the usage behavior (Saleemd and Rashid, 2011; Venkatesh and Davis, 2000; Sun *et al.,* 2009; Yueh *et al.,* 2015). Likewise, the conditions and external factors of the use of technology affect the acceptance of the individual to the technology (Venkatesh *et al.,* 2003; Venkatesh *et al.,* 2012). So, it was designed the first two hypothesis.

H1: Perceived usefulness has a positive impact on usage behavior.
H2: Perceived ease of usehas a positive impact on usage behavior.

It is important to contextualize technology usage within work settings in order to maximize its power in organizations. This should provide organizational managers with a broader set of options to increase IT usage within their organizations and assess the impact of such usage on outcomes (such as productivity or performance gains) (Sun *et al.,* 2009).

Improving work performance by using mobile technology and the generation gap: There are some studies linking the mobile use to the work performance. As example, Allen and Bryant (2011) established the relationship between technology use and work performance by surveying 200 employees in startup organizations. The employees agreed that they finished work tasks more efficiently with mobile technology. There are evidences that mobile technology improves employees' work knowledge and capability (Kahle-Piasecki *et al.,* 2012). From the executives' perspective, the mobile technology encourages employees' productivity, communication capability and mobility at lower cost (BEUTNER; PECHUEL, 2012; LU *et al.,* 2015). In addition, Stieglitz and Brockmann (2012) explain howmobile technologies increase organizational performance after surveying 192 CIOs and IT managers in German companies. Yueh *et al.,* (2015) shows that the usage behavior is the sufficient condition of perceived improvement of work performance. Therefore, the relationship between the usage behavior and work performance supports the hypothesis that employees' usage behavior of mobile technology has a positive impact on their perceived work performance improvement.

H3: The usage behavior has a positive impact on perceived work performance improvement.

One of the biggest challenges facing managers today is learning how to lead a multigenerational workforce. Many organizations have four generations of employees working alongside one another, and every generation has different expectations of what they want from the workplace (Lester *et al.,* 2012). A generation is the social construction where individuals born during a similar period and these are influenced by historical, social events, and their experiences making them different from one other generation. These differences continue to be molded as aging (Howe and Strauss, 2007), influencing people's thoughts of authority, money, institutions, family and career (Conger, 2002). There are three classifications of age-based generations: baby boomers (1943-1964) generation X (1965-1977) and generation Y (1978-1990) (Parry and Urwin, 2011; Westerman and Yamamura, 2007), and in recent years we had the inclusion of generation Z, formed by people born after the nineties (Collistochi *et al.,* 2012; Shah, 2009). Several studies, especially those directed to managers of companies, are between Y and Z generations (Batat, 2008; Mcmillan and Morrison, 2006; Nurullah, 2009), from the perspective that these generations are less committed at work (Becton *et al.,* 2014). Likewise, these same generations would be more likely to use mobile technologies. By extension, we hypothesize that the generation affectsboth: usage behavior and perceived work performance improvement.

H4: The generation affects the mobile technology usage behavior.
H5: The generation affects the perceived work performance improvement.

From these evidences, we developed an empirical effort to test the hypotheses verified. The operationalization of the study is ready in the next chapter.

METHODS

The nature of research is quantitative. This type of research aims the objectivity and their results can be quantified. Samples are usually large, and can be considered as representative of the population, in other words, they are considered real portraits of the population (Fonseca, 2002). It was chosen a research using the survey cross-section method (cross-sectional) where the information is found directly with a group of interest concerning the data to be obtained (Santos,

1999). To evaluate the relationship between different variables we used multivariate statistical techniques.

The measures: The data collection instrument was developed from Venkatesh studies, Thong and Xu (2012) and Lunardi, Dolci and Maçada (2010). The adaptation of the data collection instrument remained a concern not to overly the extension of the questionnaire, considering the interest in obtaining respondents of different generations, occupations, training.... Thus, the final questionnaire had four dimensions: (1) respondents profile: consists of questions regarding age, occupation, gender, training and Federative Unit; (2) Usage behavior: measured from six observable variables, using the measurement Likert scale; (3) Perceived Ease of Use: measured from three observable variables, using the measurement scale Likert; (4) Perceived Usefulness: checked by three observable variables; (5) Percieved Work Performance Improvement: measured by four observable variables. Since it was an adaptation of questionnaires, we proceeded to a data collection instrument validation step, made by academics (MALHOTRA, 2001), and the questionnaire was considered appropriate. Considering the desirability of applying the questionnaire to different generations, we proceeded an informal pretest with five distinct profiles, randomly chosen, in order to eliminate potential questionnaire problems, especially as regards the understanding of the questions and fill. It was not identified problems in understanding, this way we proceeded the application of the questionnaire.

Research sample and data collection: We look on this research on Brazilians over 16 years old (able to the job market) and users of mobile technologies. The main criterion used to scale the size of the sample number of respondents was the number needed to allow the use of exploratory factor analysis technique, based on the Kline recommendations (2011). These recommendations show that the minimum sample size should be in terms of the proportion of cases (N) with the number of parameters (observable variables) of the model (Q), considering the ideal proportional sample of 20:1. This way, the suggested sample refers to the minimum of 360 cases. The choice of the sample did not follow statistical methods; it is considered the number of returned questionnaires and filled. For the implementation and application of the research for this population, we adopted the online form tool Google Drive. We apply the online questionnaire because of the large study population. The invitation to participate was sent through the network of contacts involved in the study, collecting data through the collection method called 'snowball'.

This technique is a form of non-probability sample used in research where the original participants of a study indicate new participants which in turn to indicate new entrants and so on, until it reached the proposed objective (the "saturation point"). The "saturation point" is reached when the new respondents begin to repeat the content already obtained in previous interviews, without adding new information relevant to the search (WHA, 1994). Therefore, the “snowball” is a type of technique that uses reference chains, a kind of network. In a complementary manner, considering that the online survey showed a certain group and profile of respondents, we printed some questionnaire and apply personally in large and medium enterprises in the industrial capital of the Midwest of Santa Catarina. Data collection began in early August 2015 and was completed in three months. Therefore, the final sample is 851 interviewed people, which 271 respondents do not use mobile devices or do not use mobile devices at work, this way we considered 580 valid questionnaires. This sample, however, could not be considered as probability because the probability of inclusion of everyone is not known or equivalent (Malhotra, 2001). Respondents belong to 15 Brazilian states, with the clear majority located in southern Brazil. First, we sought to characterize the sample of respondents, to meet the group (see Table 1).

Table 1. Demographic profile (n=580)

Age/Generation	25 or less (Generation Z)	52,6%
	Between 26 and 37 (Generation Y)	31,7%
	Between 38 and 51 (Generation X)	11,9%
	51 or older (*Baby Boomers*)	3,8%
Gender	Male	51,9%
	Female	47,9%
	Chosenotto answer	0,2%
Educational attainment	Incomplete Elementary School	3,3%
	Complete Elementary School	5,3%
	Incomplete High School	3,4%
	Complete High School	10,2%
	Incomplete Undergraduate	35,2%
	Complete Undergraduate	17,8%
	Graduate (MBA, Master or PhD degree)	28,1%
Profession	Retired	1,0%
	Autonomous	8,4%
	CLT*	30,0%
	Entrepreneur	13,4%
	Student (with part-time job)	22,4%
	Government Employee (or civil servant)	24,7%

Source: Authors' calculations based on survey data

* Employees working under the CLT (Brazilian consolidation of labor laws) regulation

As report at Table 1, most of the respondents belong to the X and Z. Surveying the genre indicated that the survey is roughly homogeneous, although most of the respondents are male. As a profession, most acts as CLT, with high education level. As mobile technologies commonly used by the sample we have the notebook (72%), mobile phone or smartphone (71.2%) and smart pads (26.7%).

Data matrix and construct validation: The collected data were analyzed using the SPSS Statistics 21 and IBM AMOS program, by adopting models of univariate and multivariate analysis. Initially, we proceeded the preparation of the input matrix, where the collected data was treated to identify outliers, missing values and normal distribution of figures. Missing values were identified by a simple frequency distribution of missing data, replacing the missing values by the average of the variable. The atypical observations were identified by calculating Z Score, where all the data showed values less than 3 (HAIR *et al.,* 2005).

Thus, in the univariate analysis of outliers were not excluded-questionnaires. Analysis of normality was verified using the Kolmogorov-Smirnov test and no abnormal variables were observed. The validation procedures of the constructs sought to verify unidimensionality, reliability, and convergent and discriminant validity. First, we verified the dimensionality of the constructs by Exploratory Factor Analysis (EFA) with extraction of the main components and anvarimax rotation. The evaluation of the scales reliability was performed by calculating the composite reliability and the average variance extracted for each measure (construct) the suggest by Fornell and Larcker (1981) (see Table 2).

Table 2. Exploratory factor analysis solution

	Observable variables	Cumulative variance (%)	KMO* solution	Extracted variance	Reliability
Usage behavior	6	57.74	0.865	0.67	0.93
Perceived Ease of Use	3	75.72	0.714	0.73	0.89
Perceived Usefulness	3	60.23	0.648	0.78	0.91
Perceived work performance improvement	4	69.76	0.775	0.70	0.90

*KMO: Kaiser-Meyer-Olkin measure
Source: Authors' calculations based on survey data

Table 3. Estimated parameters of the model and hypotheses status

	R^2	Standardized beta	T-value	Sig.	Hypotheses status
H1. Perceived usefulness has a positive impact on mobile technology usage behavior.	0.64	0.32	11.37	***	Supported
H2. Perceived ease of use has a positive impact on mobile technology usage behavior.	0.64	0.52	17.82	***	Supported
H3. The mobile technology usage behavior has a positive impact on perceived work performance improvement.	0.27	0.39	6,72	***	Supported
H4. The generation affects the mobile technology usage behavior.	0.10	-0.12	-3.12	**	Supported
H5. The generation affects the perceived work performance improvement.	0.07	0.11	1,93	**	Supported

Source: Authors' calculations based on survey data
*** p > 0.001; *** p > 0.05

Table 4. Univariate analysis of the dimensions by generation

		Baby Boomers (n = 22)		X Generation (n = 69)		Y Generation (n = 184)		Z Generation (n = 305)		Sample (n = 580)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Usage behavior	Use my mobile is pleasurable.	3.95	0.795	3.86	1.088	3.94	1.179	4.21**	1.011	4.07	1.076
	I have the necessary resources (eg, applications, internet, wi-fi) to use my mobile.	4.18	1.006	4.12	1.157	4.43	1.011	4.50**	0,957	4.42	1.007
	My mobile has a reasonable/high price.	4.05**	0.999	3.41	1.204	3.51	1.178	3.76	1.069	3.65	1.128
	My mobile is a well invested money.	4.00	0.976	3.87	1.013	3.90	1.143	4.00	1.112	3.95	1.105
	The use of my mobile has become a habit for me.	3.95	0.950	3.90	1.190	4.15	1.111	4.39**	0.991	4.24	1.066
Perceived Ease of Use	Use my mobile is fun.	3.59	1.008	3.48	1.093	3.74	1.185	4.05**	1.067	3.87	1.123
	Learn how to use my mobile is easy for me.	3.59	1.008	3.74	1.120	4.35	0.957	4.53**	0.862	4.34	0.973
	I have knowledge to use my mobile.	3.55	0.912	3.62	1.202	4.20	1.060	4.37**	0.880	4.20	1.016
	Use my mobile has become natural for me.	4.45**	0.739	3.99	1.091	4.24	1.019	4.45**	0.884	4.33	0.960
Perceived Usefulness	I realize utility in the use of my mobile.	4.36	0.658	4.45	0.814	4.42	1.037	4.44	0.948	4.43	0.952
	The use of mobile devices increases my productivity.	4.00	0.976	3.74	1.066	3.39	1.280	3.29	1.258	3.40	1.245
	Use my mobile device allows you to combine personal life and work.	4.36	0.790	3.94	1.123	3.97	1.166	4.06	1.139	4.03	1.135
Perceived work performance improvement	Reduces the company's operating costs where I work.	3.23	1.744	3.86**	1.000	3.55	1.398	3.22	1.394	3.40	1.384
	Assistance in obtaining new clients for the company I work for.	3.05	1.558	3.51	1.334	3.30	1.411	3.33	1.492	3.33	1.450
	Increases business productivity in my work.	3.50	1.683	3.80**	1.076	3.42	1.381	3.17	1.349	3.34	1.356
	Increases my company's sales.	2.86	1.670	3.32	1.500	3.24	1.448	3.12	1.461	3.17	1.469

Source: Authors' calculations based on survey data; SD = Standard Deviation
**The difference is significant is 0.05

Acceptable reliability must comply to values equal to or greater than 0.7, for the reliability of the construct and equal to or greater than 0.5 for the variance extracted (Hair Jr. *et al.,* 2005). All measures presented the recommended values.To verify the multicollinearity we used the Variance Inflation Factor (VIF) and no variables presented a high level of multiple associations. The homoscedasticity was performed by the Levene's test at a significance level of 5%. Through an One-Way ANOVA, we found that no variables were heteroscedastic; therefore, no variables were excluded from further analysis.

RESULTS AND DISCUSSION

After scanning the data, and checking the setting of the measures, we effected multivariate statistical analyzes to test hypotheses through multiple linear regression models. Therefore, the analysis of the significance and standardized loads factor and variance allowed the verification of the hypotheses of the study (see Table 3).

The results present on Table 3 showed that all the hypotheses were supported in this study. So, it is possible to infer that: (1) when perceived usefulness increases 1 point, the mobile technology usage behavior increases 0.32 points (supporting H1) and when perceived ease of use increases 1 point, the mobile technology usage behavior increases 0.52 points (supporting H2). In addition, we observe that every 1-point increase on mobile technology usage behavior increases the perceived work performance improvement in 0.39 points (supporting H3). As expected, the results strengthen the evidence of the literature on the history of the use of technology, and both the perceived usefulness and the perceived ease of use have a positive impact on mobile technology usage behavior, like suggested by Saleemd and Rashid (2011) Venkatesh and Davis (2000), Yueh *et al.,* (2015) and others. Not differently, the results of our study confirm that the mobile technology usage behavior increases the perceived work improvement performance, suggested by Allen and Bryant (2011), Kahle-Piasecki, Miao and Ariss (2012), Beutner and Pechuel (2012), Lu *et al.,* (2015), Yueh *et al.,* (2015) and others. About the generation gap, considering

that 1 is equivalent a Gen-Z; 2 is equivalent a Gen-Y; 3 is equivalent a Gen-X and 4 is equivalent a Gen-Boomers, we used to verify the hypothesis the regression analysis (and a descriptive analysis listed in Appendix 1). So, we can observe that every 1 increase in generation, the mobile technology usage behavior decreases in 0.12 (supporting H4). In the other side, every 1 increased in generation increases perceived work performance improvement in 0.11 points (supporting H5). Expectedly, the four generations examined express significant differences. A common misperception is that the older generations are resistant to technology (Becton *et al.,* 2014). Generation Z in general was shown to be more prone to the use of different mobile technologies, far above the other generations. This behavior was expected, considering that Tapscott (2010) and other authors already showed that this generation is considered the internet generation. It infers also that this generation is looking for entertainment and fun at work, in education and social life, being widely accustomed to instant responses, chat in real time (Collistochi *et al.,* 2012; Tapscott, 2010). On other hand, our study suggested that the older generations, like Gen-Boomers, use the mobile technologies at work, and that all the generations believe that the mobile technology use increases their productivity and work performance. However, the results revealed that individualsconsidered Gen-Boomers and Gen-X, valued the mobile technology modes of communicationless than their younger colleagues did. This specifically result is near that Becton *et al.,* (2014) findings.

Conclusions and Implications for Practice

The results showed that the perceived usefulness and perceived ease of use increase the mobile technology usage behavior. Second, we found that the mobile technology usage behavior increases the perceived work performance improvement. Finally, findings of this study provide that differences in mobile technology usage among employees from different generations exist. So, the main purpose of this article was to provide meaningful contributions to the mobile technology usage behavior and the implications of this use at work performance. In addition, this study advances our understanding of generational differences by empirically testing the common assumptions in human resource management. Findings of this study provided further evidence that differences in mobile technology usage among employees from different generations exist. Specifically, our results help managers to understand the working behavior of different generations, and how a possible use of prohibition policy of this kind of technology at work can affect employee productivity, enhancing studies that have occurred over the years. At the same time, the results confirm the strategic importance of mobile technology, which while changes the desktop and leisure of people, it creates many opportunities for new and innovative services provided through mobile devices.
The originality of this study focuses on one of the first empirical efforts in Brazil to analyze strategic and organizational implications of mobile technology. In addition, the results of the study will expectantly serve as a basis for more comprehensive research.

Limitations and future research directions: Even reaching the goals of this study, it had limitations. The first refers to the study design, noting that changes in situational and surface features, the most inherent to the change, were not included. Another limitation of this study is that the study only examined the generational differences, but it possible that some of the differences reported in this study may be attributable to changes because of age or the stage in the life cycle. In addition, this study examined each generation as a homogeneous group, but some researchers suggest that exists a heterogeneity within generations than between generations (Denecker *et al.,* 2008; Parry and Urwin, 2011). So, future studies should examine if socio-demographic variables cause significant variations in work values within a generation.

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