

## **Information Technologies (IT) adoption by Small and Medium Enterprises (SMEs): a meta-analysis**

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### **Resumo**

In the last decades, technological changes have promoted the increase of academic studies that analyzed the consumers' and firm's adoption of new technologies. In this context, the small and medium enterprises (SMEs) are an important subject because IT is viewed as a source of innovation and competitive advantage for those firms. Despite the number of studies investigating IT adoption in SMEs context, conflicting results have been reported, e.g. concerning the role of usefulness, ease of use and perceived costs. Hence, we conducted a systematic review and quantitative integration of the empirical findings using meta-analysis. Based on the review of 59 studies and a cumulative sample of 19,739 respondents, we developed and tested a theoretical model. Our main findings indicate that usefulness, perceived compatibility and ease of use were the main predictors of IT adoption. In addition, two of the three proposed antecedents (i.e., resources and market turbulence) were significantly associated with IT adoption. On the other hand, support service was not significant in explaining IT adoption. Moreover, IT adoption presented significant effect on the outcomes (e.g. relative advantage, efficiency, profit and revenues). Finally, uncertainty avoidance cultural orientation was found as a significant moderator.

## Information Technologies (IT) adoption by Small and Medium Enterprises (SMEs): a meta-analysis

### Abstract

In the last decades, technological changes have promoted the increase of academic studies that analyzed the consumers' and firm's adoption of new technologies. In this context, the small and medium enterprises (SMEs) are an important subject because IT is viewed as a source of innovation and competitive advantage for those firms. Despite the number of studies investigating IT adoption in SMEs context, conflicting results have been reported, e.g. concerning the role of usefulness, ease of use and perceived costs. Hence, we conducted a systematic review and quantitative integration of the empirical findings using meta-analysis. Based on the review of 59 studies and a cumulative sample of 19,739 respondents, we developed and tested a theoretical model. Our main findings indicate that usefulness, perceived compatibility and ease of use were the main predictors of IT adoption. In addition, two of the three proposed antecedents (i.e., resources and market turbulence) were significantly associated with IT adoption. On the other hand, support service was not significant in explaining IT adoption. Moreover, IT adoption presented significant effect on the outcomes (e.g. relative advantage, efficiency, profit and revenues). Finally, uncertainty avoidance cultural orientation was found as a significant moderator.

### Introduction

The internet promoted an unprecedented revolution in the relationship between customers and firms (Villa et al., 2018). This phenomenon was predicted in the late 90's by Evans and Wurster (1997) and is reinforced year by year from statistics that demonstrated this context relevance for enterprises. According to the U.S. Census Bureau (2018), e-commerce shipments of US manufacture were \$ 3,469.9 billion, representing 64.8 percent of all manufacture shipments. In the service context, in the same year, the revenues in the electronic context were 608.7 billion and 389.1 billion in U.S. retailers (U.S. Census Bureau, 2018). Internet has also benefited small and medium enterprises (SMEs), since they can use the Internet to expand their market and promote their products/services in different platforms (e.g. websites, social media). In this line, information technology (IT) sources became a very important opportunity to SMEs to promote innovation in marketing and increase their competitive advantage (Villa et al., 2018; Al-Somali et al., 2015).

According the IT importance in the management context, the academic field also has been impacts in order to generate more depth understanding about this phenomenon. Over the last decades, several studies were conducted in a variety of management contexts (e.g. IT, marketing, finance, strategy, organization behavior). In this way, theoretical debates are based on technological adoption behaviors. For example, the research conducted by Davis et al. (1989) that proposed a technological model acceptance (TAM) was cited by more than 40 thousand others studies according *Google Scholar* search (2019). In this citations universe, more than 2,000 are related to SMEs contexts.

Although there has been a major expansion of IT knowledge, also in SMEs contexts, as a result of the countless works that have been published over recent decades, we found some conflicting results in the literature (Villa et al., 2018). For example, we can find divergences in the relationship between resources and I.T. adoption in SMEs. In this case, some studies pointed positive effects (e.g. Miao and Tran, 2013), others neutral (e.g. Madisha, 2011) and also we can find studies that presented negative effects (e.g. Brdese, 2013). We can also note divergences in relationships between IT and firm outcomes. Again studies

pointed positive (e.g. Khalifa, 2008), neutral (e.g. Shah et al., 2011) and negative (Lacka and Chong, 2016) effect-sizes.

These conflicting results may be associated with some issues. For example, methodological elements, such as sample size or type of publication (Hedges & Olkin, 1985; Pan & Zinkhan, 2006) can promote divergences in the effect-sizes. Cultural and economic situation of a country also can address evoke conflict effects (Zarantonello et al., 2013).

In this sense, some studies are made to promote more comprehensive understanding about firms IT adoption. Hameed et al. (2012) made a meta-analysis research to investigate the relationship between organization characteristics and IT adoption and Villa et al. (2018) published a bibliometric analysis about the factors involved to electronic commerce adoption. These studies highlighted the importance of more investigation of IT adoption in the SMEs context since they made a more broad investigation (all firms' contexts). The phenomenon analysis in specific contexts are important, because the different contexts tend to present specific constructs and moderations and them, promote different effect-sizes. So, it is common to find, for example, meta-analysis made in specific contexts as Szymanski and Henard's (2001) that promote consumers meta-analysis satisfaction in marketing context and Brown and Peterson's (1993) that applied the meta-analysis to investigate the satisfaction in the organization environmental.

In this context, this study aims to analyze the antecedents, consequents and moderators of IT adoption in SMEs context, based on meta-analytical approach. We intend to advance knowledge about IT adoption in the following ways: *First*: we will able to find definitive conclusion about IT adoption in SMEs from the meta-analysis perspectives (Dickersin, 2005); *Second*: we will tested possible moderation about the relationship between IT adoption and SMEs outcomes that could explained some conflicting results of primary studies; *Third*: we will able to point some opportunities for future reaches because the systematic review carried out can indicate relationships that are still incipient; *Fourth*: we will be able to offer assistance to SMEs managers in their decision-making processes because our findings are more consistent than those of traditional primary surveys (Hunter & Schmidt, 2004). So, the results enable SMEs managers to make more precise decisions.

## IT adoption theory

IT adoption is related to factors that encourage or inhibit some technological devices in firms practices (Sila, 2013). In the first moment, the main studies that analyzed such factors were focused on the consumers' perspective (Vize et al., 2013). However, in the recent years the enterprises context were incorporated into the theoretical framework, mainly because IT adoption was perceived as strategic attribute to generate competitive advantage (Villa et al., 2018).

In this way, some studies pointed that *institutional pressures* are an important antecedent of IT adoption by firms (Chwelos et al., 2001; Sila, 2013). In this case, the firms adopt new technologies to legitimate their institutional environments (Sila, 2013). Another theoretical perspective proposes that institutional environmental and organization structures and practices affect the IT adoption (Goodstein, 1994). In this line, Teo et al. (2003) made an interesting link with the isomorphism and collective rationality theory presented by DiMaggio and Powell (1983) in organizational fields. They associate the IT adoption to gain social legitimacy (isomorphic pressure), to respond to formal or informal pressures, such as governmental regulatory (coercive pressure) and to meet the suppliers, customer and business environmental's needs (normative pressure).

Moreover, in the SMEs context, Sutanonpaiboon and Grandon (2006) identified that SMEs adoption are related to financial and technological resources. They also noted that this

kind of firms face external pressure to integrate technological devices into their organization. Govindaraju and Chandra (2011) found that human sources and source of information factors are the most important barriers for IT adoption in Indonesian SMEs firms. The study of Ghobakhloo and Tang (2013) investigate the role of manager in adoption of electronic commerce in small business. In this case, the authors used the theory of diffusion of innovations to propose a theoretical model and find that usefulness, ease of use, compatibility, risks and complexity are determinants of IT adoption by SMEs. More recently, Esmaeilpour et al. (2016) applied the technology acceptance model (TAM) to investigate the attitude and intention of use in SMEs and found a positive effect of usefulness and ease of use on both attitude and behavioral intention.

As we describe, the studies of IT adoption in SMEs are diverse. There are a number of studies testing different relationships. We build upon such models to produce a systematic review of the main factors associated with IT adoption in SMEs context (e.g. antecedents, consequences). We discuss that in the next section.

### **Antecedents of IT adoption**

Based on the systematic review, we identified three main constructs as antecedents and one as a consequence of IT adoption. The antecedents most frequently tested with IT adoption in SMEs were: (1) resources; (2) support; (3) marketing turbulence. The consequent was: (1) outcomes. Below we detail each constructs mentioned and present the expected relationship with IT adoption.

*Resources:* This antecedent comprises the human and technological infrastructure that supports the implementation of the technology (e.g. technology competence; IT infrastructure; technology infrastructure). Such firms' characteristics increase the perception of usefulness and use satisfaction since they will improve the internal process (Aboelmaged, 2014). In this line, employees will perceive the new technologies as an ally to increasing the productivity and the own performance and also as a task helper (AlGhamdi et al., 2012). This assumption has been tested and findings indicate that the higher the resources available the more favorable the IT SMEs adoption. For example, in Iran, Hajli et al. (2012) found positive relationship between organization IT readiness and E-commerce adoption, Ramayah et al., (2005) also found positive impacts of technology infrastructure on IT adoption in Malaysia. So, we expected that:

*H<sub>1</sub> – Resources positively impacts IT adoption in a SMEs context.*

*Support:* This construct was formed by different elements that support SMEs firms in promoting the IT adoption (e.g. governmental, regulatory and management). In the context of SMEs it is common to find, for example, governmental and regulatory support in order to promote the IT adoption. As reported by Doig (2000), Australian governments promote an intervention to increase the e-commerce platforms to small firms. In case of Israel, the governmental promote tax incentives (Vinig et al., 1998). On the other hand, the management support is strategically important to motivate the IT adoption, which occurs because they increase feeling of organization commitment around all employees (Al-Somali et al., 2010). This assumption were confirmed by studies made in Malaysia (Rahim et al., 2015), in Pakistan (Al-Somali, 2010) and Iran (Ghobakhloo et al., 2011). In this line, we presented the hypothesis H<sub>2</sub>.

*H<sub>2</sub> – Support positively impacts IT adoption in a SMEs context.*

*Market turbulence:* market turbulence comprises the changes in the competitive environment (e.g. competition, competitive environment; competition intensity, competition pressure, turbulence process) that affect how the company will compete with others and how it will respond to changing consumer needs, together with its development process in the industry (Drnevich & Kriauciunas, 2011). We believe that market turbulence will positively impact IT adoption since they will perceive as a competitive advantage to achieve the firm's outcomes (Premkumar and Ramamurthy, 1995). This probably occurs because the competitive contexts will demand more competitive and innovative strategies in order to survive in this context (Mackay et al., 2004). In this line, Levy et al. (2001) demonstrated that technologies increase SMEs survival rate in dynamic environmental context. In this way we propose:

H<sub>3</sub> – *Marketing turbulence positively impacts IT adoption in a SMEs context.*

### **Consequences of IT adoption**

The outcomes construct were formed by elements that demonstrate some firm competitive advantage (e.g. relative advantage, efficiency, profit and revenues). The literature points that the implementation of IT technologies tends to promote better performance. This perception are based on the studies that pointed the IT adoption evoke better employment and consumers communication, fasten access to market information (Hayes, 2008) and a high level of productivity (Nielsen, 1993). So it is possible to expect that IT adoption in a SMEs context will promote firms 'outcomes. In this line we propose:

H<sub>4</sub> – *IT adoption in a SMEs context has a positive impact on firm outcomes.*

### **Moderation effects between IT adoption and outcomes**

As previously mentioned, we analyzed some possible moderating relationships between the IT adoption and outcome. In this case, we analyzed the possible moderation effect of uncertainty avoidance and human development index. Below we detail each moderator and the expected relationship. This investigation is important because they could explain any conflicting results or heterogeneity in the relationships between IT adoption and outcomes.

*Uncertainty avoidance:* We chose to investigate the cultural dimension of uncertainty avoidances because this cultural dimension is directly linked to technology (Hofstede, 1981; Laukkanen, 2015). Firms that are inserted in cultures with lower (higher) uncertainty avoidance tends to present more (less) willingness to adopt IT technologies. The reason is that high uncertainty societies feel threatened by uncertain or ambiguous situations (Hofstede, 1981). Uncertainty avoidance is associated with the degree of restlessness of a society faced with an uncertain future (Hofstede et al., 2010). Therefore, we could suppose that a country's level of uncertainty avoidance may have a negative effect on the relationship between IT adoption and outcomes. So, we propose.

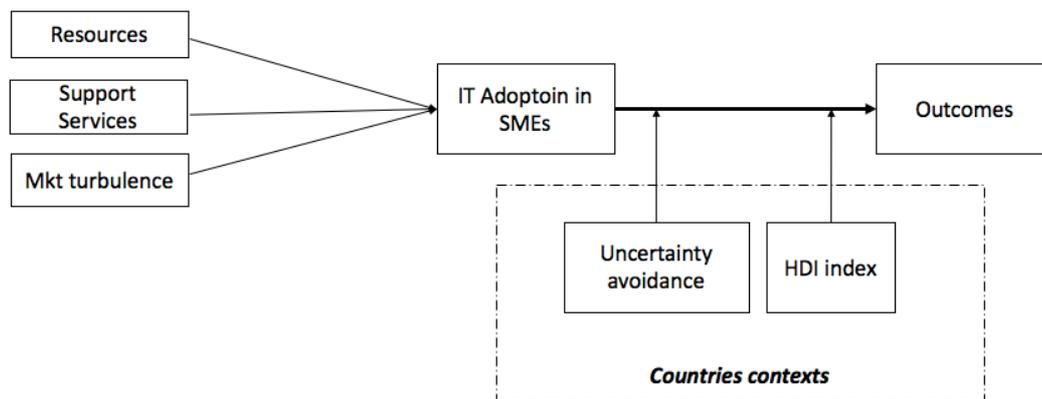
H<sub>5</sub> – *In cultures with higher (lower) levels of uncertainty avoidance the relationship between IT adoption and outcomes will be weaker (stronger).*

*Human development index (HDI):* We addressed the economic dimension by means of the HDI index, which was created by the United Nations Development Programme and compares wealth, literacy, life expectancy and birth rate for each country. We expected that a

stronger relationship between IT adoption and outcomes was presented in more developed countries. The assumption is that individuals from more developed countries are more confident with electronic devices, online interactions and transactions (Kim and Peterson, 2017). In this line we present:

*H<sub>6</sub> – In countries with higher (lower) HDI index, the relationship between IT adoption and outcomes will be stronger (weaker).*

Based on the above theoretical discussions, we present Figure 1 to illustrate the direct and moderating effects.



**Figure 1: Theoretical model**

## Methods

We applied the PRISMA protocol to conduct the systematic review (Moher et al., 2009). Three main steps are followed: (1) data search; (2) data collection and (3) data coding and analysis, which are described below. This is also the method suggested by Copper et al. (2010) to identify published and unpublished studies that report empirical results for a meta-analysis.

*Data search:* We accessed eight databases: EBSCO, Elsevier Science Direct, Emerald, Google Scholar, JSTOR, Scopus, Taylor & Francis and ProQuest platform. Search was conducted using the combination of following terms: “IT adoption”, “IT readiness”, “Technology adoption”, “Technology readiness”, “SMEs”, “Small”, “Medium”, in abstract, key-words or titles. Initially, we identified 610 papers. About this total, 339 studies were not included in the final sample because they did not present quantitative results. Other 212 studies were not included because they did not present statistical information to calculate the effect-size (e.g. ARIMA; forecasting estimates). After that, 59 studies could be used as final sample, producing 497 effects sizes and 19,739 respondents. From the final sample of studies, 44 (75%) were published in peer review journals and 15 were published in conferences or dissertations/thesis. We decided to include this unpublished studies to address the discussion of the file-drawer problem (i.e. published studies present significant and stronger effects, Rosenthal, 1995).

*Data collection:* After the identification of the studies, we plain the coding extraction process. We followed the Rust and Coil (1994) procedures. The first step was a discussion about the procedures among the researchers. After this, two researchers made the same manuscripts information’s extractions (e.g. journal; sample size; country origin; SMEs sector;

effect-sizes; scale used; reliability of scales). Finished the extraction process, the results are compared. In this case we found 90% of agreement. In the cases that present disagreement, a third researcher assessed the differences, with questions analyzed together in group meetings. Such procedures are similar to the ones used in other meta-analyses (e.g. Purnawirawan et al., 2015; Kim and Peterson, 2017).

*Data coding and analysis:* In the initial analysis, we followed the Hedges and Olking (1985) meta-analysis calculation procedures. In this case, we performed the Pearson correlation coefficient ( $r$ ) and Fisher's Z-distribution adjusted by the reliability of the scales and the sample size of each study (Hedges and Olking, 1985). We also analyzed the confidence interval index at 95% level (Hunter and Schmidt, 2004). Our analysis also detected the heterogeneity about the studies. In this case we use the Q-test and  $I^2$  parameters (Lau et al., 1998). Finally, we applied the fail-safe number index (FSN) to evaluate the number of non-significant or unpublished studies necessary to refute the findings in this research (Rosenthal, 1979). In this case we used the two (Rosenthal and Orwin Index) commonly parameters presented in meta-analyses (e.g. Santini et al., 2016; Pan and Zinkhan, 2006).

To test the theoretical model proposed in this study, we used the meta-analytic structural equation modeling (MASEM). This procedure integrates meta-analysis (MA) findings with structural equation modeling (SEM) by producing an aggregate correlation matrix obtained from the reviewed studies (Cheung and Chan, 2005; Cheung, 2015). We emphasize that this procedure is usually adopted in other meta-analyses (e.g. Montazemi and Qahri-Saremi, 2015).

To test the moderation relationships, we run the hierarchical linear meta-analysis (HiLMA). This analysis uses a regression-based multivariate format (Geyskens et al., 2009) from the variables inserted in the model. This technique is also widely used in meta-analytic research (Rosario et al., 2016).

## Results

First we presented the pairwise associations between the variables of the model. In this case we consider all constructs that are tested with IT adoption in SMEs context. Importantly, the analyses were made when there were at least three relationships between the antecedent/consequent and IT adoption. This is the minimum number recommended in meta-analytic studies (Hunter and Schmidt 2004). As presented on table 1, the systematic review identified 9 antecedents of IT adoption in SMEs.

**Table 1** - Relationships between antecedents and consequences of IT adoption

<i>Antecedents and consequences of IT adoption in SMEs</i>												
<i>Variable</i>	<i>k</i>	<i>O</i>	<i>N</i>	<i>r</i>	<i>ICI</i>	<i>ICS</i>	<i>Z</i>	<i>P-value</i>	<i>Q</i>	<i>I<sup>2</sup></i>	<i>FSN R</i>	<i>FSN O</i>
<i>Usefulness</i>	7	13	5026	.379	.132	.581	2.942	.003	960.17	98.75	4059	188
<i>Ease of use</i>	17	11	5018	.325	.173	.462	4.066	.000	474.82	97.82	3704	122
<i>Resources</i>	33	89	10044	.224	.139	.307	5.052	.000	4216.4	97.91	35145	653
<i>Social influences</i>	9	18	2703	.129	.049	.207	3.149	.000	183.73	90.74	415	24
<i>Support services</i>	23	43	8965	.242	.121	.356	3.851	.000	1271.7	87.48	7478	315

<i>Market turbulence</i>	25	47	9289	.289	.204	.370	6.445	.000	56801	94.54	6321	200
<i>Perceived compatibility</i>	9	11	1854	.332	.323	.424	6.257	.000	67.49	85.18	697	59
<i>Perceived Costs</i>	10	11	2389	.115	.008	.219	2.107	.035	75.11	86.68	87	16
<i>Perceived security</i>	12	19	3995	.174	.070	.275	3.260	.001	253.81	92.90	691	47
<i>Outcomes</i>	33	59	9446	.259	.153	.359	4.673	.000	2303.9	97.74	4499	340

**Notes:** (k) Number of studies evaluated; (O) Number of Effect-sizes tested; (N) Cumulative sample of studies; (r) Effect-size fixed; (ICI) Lower confidence interval; (ICS) Upper confidence interval; (Z) Standardized Effect-size Score; (p-value) Significance level of effect-size; (Q) Individual heterogeneity test; (I<sup>2</sup>) Level of heterogeneity; (FSN) Number of observations null or with contrary results that are necessary to find to refute the finding; ( $\beta$ ) Coefficient beta; ( $r^a$ ) Effect-size fixed of the level; (FSN R) Fail safe number Rosenthal and (FSN O) Fail safe number Orwin.

The first construct presented on table 1 was usefulness and ease of use perception, which are dimensions proposed by *Technological Acceptance Model* (TAM) developed by Davis (1986). Usefulness is related to the perception about the enhanced user performance and experience promoted by a new technology (Venkatesh & Bala, 2008). Ease of use is associated with the interaction elements that the technology generates in the user (Davis, 1986). In case of this study, these two constructs demonstrated significant and positive relationship with IT adoption in SMEs. In this line, we observed stronger effects for usefulness ( $r = .379$ ) when compared to ease of use ( $r = .325$ ). Both dimensions demonstrated consistent relationships since the fail safe number index were high.

The other two antecedents were social influence and perceived compatibility. Social influence is related to the perception regarding others' opinions on one's behavior (Fishbein & Ajzen, 1975). On the other hand, perceived compatibility refers to the perception regarding compliance of a technology with individual values and beliefs (Rogers, 1995). Again, the results demonstrated significant and positive relationships between these two constructs and IT adoption in SMEs contexts. In this case the effect of compatibility was stronger ( $r = .332$ ) than social influence ( $r = .129$ ).

Our meta-analysis also presented positive relationship between perceived costs and IT adoption ( $r = .115$ ), although revealing smaller effects. Likewise, perceived security was positively related to IT adoption ( $r = .174$ ). This is consistent with the notion that decisions about IT adoption in SMEs contexts are based on the perception of security, safety and privacy that technology should promote (Luarn & Lin, 2005) and also about the reduction of costs that technology can promote (Luarn & Lin, 2005). Important to observe that, compared to the other links, these relationships are less consistent in terms of the Rosenthal parameter of fail safe number (security = 47; cost = 16), i.e. a relatively smaller number of studies with null results would change the overall interpretation.

In the sequence, we tested the proposed relationships using the MASEM approach (i.e. a correlation table is produced based on the systematic review and this table is used as input for multivariate analysis). About the antecedents, market turbulence presented the stronger effects with IT adoption ( $r = .289$ ), following by support services ( $r = .242$ ) and resources ( $r = .224$ ). About the outcome consequent, the results also present positive and consistent relationship with IT adoption ( $r = .259$ ). In the next section we presented the direct relationship tested by MASEM.

### Direct relationships tested by MASEM

We estimated a full model with all the direct relations entered simultaneously using Meta-Analytic Structural Equation Modeling (MASEM). The indices of the final model indicated a good fit (Cheung, 2015; Jak, 2015) to the data tested (CFI = .85, and RMSEA = .02). Table 2 presents MASEM results for IT adoption in SMEs context and main antecedents and consequents.

**Table 2** – MASEM results

<i>Independent Variable</i>	→	<i>Dependent Variable</i>	<i>Beta</i>	<i>ICI</i>	<i>ICS</i>	<i>P-value</i>	<i>R<sup>2</sup></i>
<b><i>Antecedents of IT adoption</i></b>							
<i>Resources</i>	→	<i>IT adoption</i>	.429	.266	.610	.000	56%
<i>Support Service</i>	→	<i>IT adoption</i>	.139	-.114	.347	ns	
<i>Market turbulence</i>	→	<i>IT adoption</i>	.321	.137	.517	.000	
<b><i>Consequents of IT adoption</i></b>							
<i>IT adoption</i>	→	<i>Outcomes</i>	.561	.470	.660	.000	68%

Note: (ns) Not significant |  $p > .05$

Note that the first relationship tested was resources and IT adoption. The MASEM approach consolidated the finds that were presented before. Again we observed a positive and significant effect ( $\beta = .429$ ,  $ICI = .226$ ;  $ICS = .610$ ;  $p < .001$ ). In this way the results supported that firm human and technological infrastructure were essential to promote IT adoption in SMEs context. Hence, findings support hypothesis 1.

About hypothesis 2, we proposed that support service was antecedent of IT adoption. This assumption proposed that incentives coming from government, regulatory agencies and management are very important to promote to IT adoption by SMEs. Results presented by meta-analysis and correlation perspective was significant and positive ( $r = .242$ ). However, when we analyzed the same relationship with the meta-analytic structural equation modeling approach the results are different. In this case the effects are not significant ( $\beta = .139$ ,  $ICI = -.114$ ;  $ICS = .347$ ;  $p > .05$ ). So, we did not confirm H2.

The third hypothesis analyzed the relationship between marketing turbulence and IT adoption. This hypothesis proposed that firms will need to enhance their competitive advantage by IT adoption once the competitive environment will demand more innovations . As we can see on table 2, the effects are positive and significant ( $\beta = .321$ ,  $ICI = .137$ ;  $ICS = .517$ ;  $p < .001$ ) and then we confirmed the hypothesis 3.

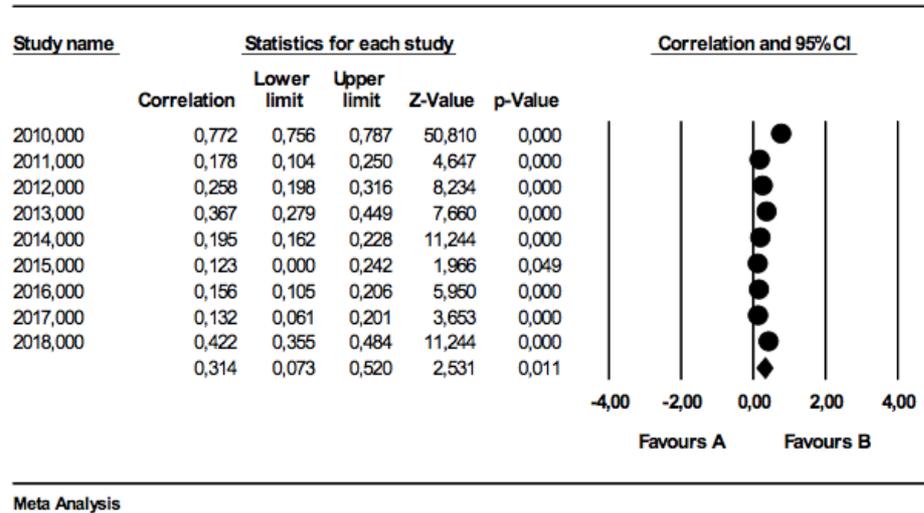
Finally, we analyzed the hypothesis 4, that proposed a positive impact of IT adoption on firm outcomes. As we can see on Table 2, the assumption was confirmed ( $\beta = .561$ ,  $ICI = .470$ ;  $ICS = .660$ ;  $p < .001$ ). These findings reinforce the assumption that IT adoption enhance the competitive advantage once they will produce better communication with stakeholders, faster marketing information and increased productivity.

### Moderation analysis

We also analyzed some possible moderation effect about IT adoption and firm outcome in order to find explanation for heterogeneous results (see figure 2 below). As we

mentioned, we analyzed two main possible moderators: uncertainty avoidance and the economic context (HDI index).

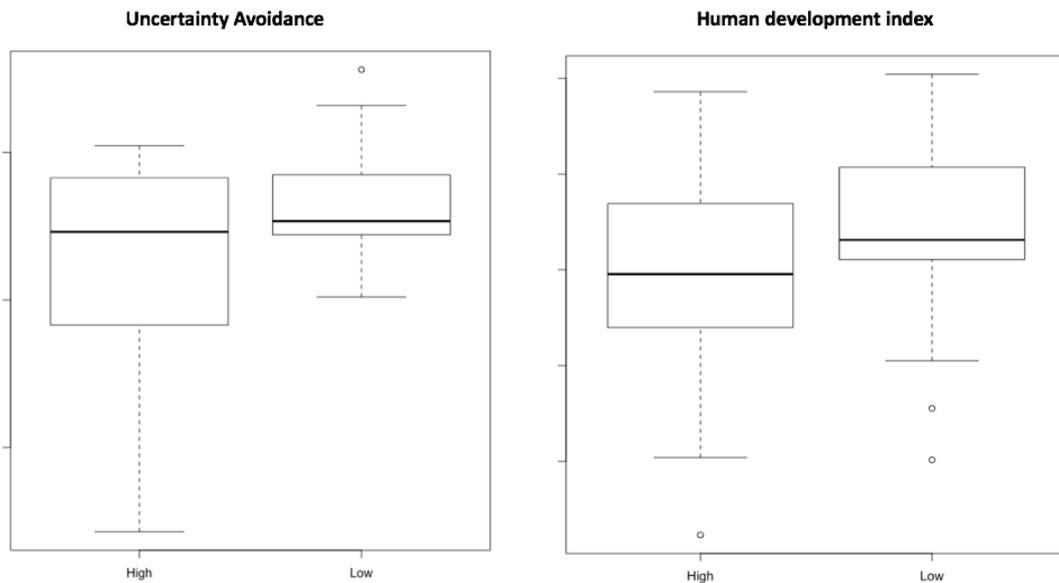
**Figure 2:** Results of the relationships between IT and outcomes by Florest Plot (2010 to 2018).



First we analyzed the possible effect of uncertainty avoidance on the relationship between IT adoption and firm outcomes. The results presented confirmation about this proposition ( $\beta = .138$ , ICI = .010; ICS= .287;  $p < .05$ ). In this case cultures with low level of uncertainty avoidance presented stronger effects ( $r = .316$ ) than cultures with high level of uncertainty avoidance ( $r = .143$ ). These findings confirm hypothesis 5 and reinforce that cultures with low uncertainty are more willing to adopt IT technologies since they are more tolerant with risk perceptions related to technologies devices (Laukkanen, 2015).

Finally we investigated the possible moderation effect of HDI. In this case we assumed that firms inserted in more developed countries should present stronger effects in the relationship between IT adoption and outcomes. In the case of our analysis the proposition was not confirmed, since the effects are not statically different ( $\beta = .203$ , ICI = .110; ICS= .295;  $p > .001$ ;  $r_{lowhdi} = .261$ ;  $r_{highhdi} = .192$ ). So, we cannot confirm the hypothesis 6. Figure 3 illustrates the moderation analysis and group differences.

**Figure 3:** Moderation analysis by Boxplot



## Discussion and Conclusions

The current paper used MASEM to test a theoretical model of the main antecedents and consequences of IT adoption in SMEs context. A systematic review was conducted of 59 studies. Through this meta-analysis, we identified these main direct and moderating relationships. Important to note that this meta-analysis approach provide generalization about the IT adoption once they provide accurate estimates of the effect size in all respects (Lipsey and Wilson, 2001; Hunter and Schmidt, 2004). In this line, the study provides important directions for marketing and information managers, since it was possible to detect the elements that significantly affect the IT adoption by SMEs. Hence, this meta-analysis contributes to SMEs field by (1) testing all direct relationships with IT adoption; (2) testing the proposed theoretical model with the main antecedents and consequences of IT adoption and (3) revealing that the cultural dimensions of uncertainty avoidance play a moderation effect about the relationship between IT adoption and outcomes.

First, meta-analytic results demonstrate that all nine antecedents play a positive and significant relationship with IT adoption. Interesting to note that TAM's construct dimensions (usefulness and ease of use) and perceived compatibility presented stronger effects among all antecedents. Results are interesting because such constructs explain the IT adoption in SMEs contexts almost three times more than social influence, perceived cost and security. It is also interesting because they consolidate the understanding about the relationship between IT adoption and firm outcomes since some primary results demonstrated conflict findings.

Second, the theoretical model tested by MASEM provides more robust conclusions, if compared to simple correlation effects. Such analyses are more consistent because they aggregate a correlation matrix obtained from different studies that applied potentially diverse methodologies (Cheung, 2015). In this case, we demonstrated that support service is not a significant predictor of IT adoption in SMEs context. On the other hand, resources and market turbulence play an important role. It is also important to note that these antecedents explain 56% of variance. We also reinforce by MASEM approach the positive and consistent impact of IT adoption in SMEs context on firm outcomes.

Third, the moderation analysis demonstrated that firm located in low uncertain culture tends to potentiate in almost two times more the effects of IT adoption in SMEs. These

findings highlighted the assumption that high uncertainty society feels threatened by uncertain or ambiguous situations (Hofstede, 1981). So, it is important to think about new strategies to cover this perception of uncertainty in countries with higher levels of uncertainty.

It is also important to highlight some important limitations. First, only quantitative studies were considered for this analysis, which is a limitation of any meta-analysis. Thus, we suggest that new studies incorporate qualitative investigations based on methodologies that are distinct from this meta-analysis. We note that one of the problems in this type of analysis is the elimination of adverse concepts that might exist in different secondary data; because they are empirical data from different authors, such data may be adverse. The present article generates insights that researchers and academics can use to better build their research into IT adoption in SMEs contexts, its antecedents, consequences and moderators. It is therefore important to carry out a larger number of cross-cultural studies and bring other moderators not raised here that could help in explaining the relationships.

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