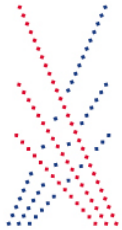

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A Resource-based Perspective on ICT Use and Firm Performance: A Meta-analysis investigating the moderating role of Cross Country ICT Development Status

SHARMIN NAHAR
Essex Business School, University of Essex,
Southend Campus, 10 Elmer Approach,
Southend, Essex SS1 1LW, UK.
E-mail: sn16075@essex.ac.uk (Corresponding)

M. SHAMSUL KARIM
Essex Business School, University of Essex, UK
E-mail: mskarim@essex.ac.uk

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ABSTRACT:

Over the past few decades, Resource-based view (RBV) has emerged as a critical theory explaining firm performance. Since the early 1990s, many studies have explored RBV's claim that there is a positive relationship between firms' strategic resources and their performance. Though Information and Communication Technology (ICT) is considered a strategic resource for organizations, the existing literature on ICT and Firm Performance Relationship report heterogeneous outcomes depending on different ICT tools (general purpose technologies and enabling technologies). This heterogeneity in outcomes necessitates a meta-analysis to comprehend the direction and the scope of the relationship between ICT and firm performance. Besides, whether the ICT and firm performance relationship depends on the status of the ICT development status of a country or not is not apparent in the existing literature. To address this research gap, this meta-analysis combines the results of more than twenty years of research on how the presence of ICT development context of different countries impacts the relationship between ICT and firm performance. Thus, this meta-analysis synthesizes the existing literature on this topic by analysing 106 studies with a total of 271527 observations, and therefore, adds value to the empirical and theory-driven research in the field of Strategic Entrepreneurship, Entrepreneurial eco-system, and Business Performance.

KEYWORDS:

Meta-Analysis; RBV; ICT; Business Performance; ICT Development Index

Word Count: 7000

1. *INTRODUCTION:*

Finding the underlying reasons for some firms outperforming others remains a priority of Strategic management research (Crook et al., 2008). On the other hand, creating a connection between strategic management and entrepreneurship literature remains a goal of Strategic Entrepreneurship research (Kuratko and Audretsch, 2009). Along these lines, Hitt et al. (2001) have defined Strategic Entrepreneurship as the combination of entrepreneurial (opportunity-seeking) and strategic (advantage-seeking) viewpoints with a view to formulating and implementing entrepreneurial strategies for wealth creation. Therefore, it can be inferred that firm performance is also a concern of strategic entrepreneurship research. Resource-based View (RBV) has proven a widely used theory to explain this difference in firm performance in the past two decades. According to RBV, firm performance is determined by the ownership of strategic resources. But in spite of the widespread belief that ICT is an essential strategic resource for the survival and growth of a firm (Bharadwaj, 2000), the extant literature on ICT and Firm Performance Relationship does not provide any conclusive result (Chen et al., 2016; Higón, 2012; Lopez-Nicolas and Soto-Acosta, 2010; Popa et al., 2018) largely depending on the types of ICT tools being explored.

These varied outcomes in the primary studies include negative outcome (Bauer, Dehning and Stratopoulos, 2012; Malhotra, Gosain and Sawy, 2005); zero outcome (Venkatraman and Zaheer, 1990); a conditional positive outcome (Tippins and Sohi, 2003; Wu et al., 2006) and also a direct positive outcome (Falk and Hagsten, 2015; Hagsten and Kotnik, 2017; Lopez-Nicolas and Soto-Acosta, 2010). To consolidate these dissimilar views and findings, it is essential to run a meta-analysis to examine potential trends in this domain. These contradictory results in the primary studies might be a statistical artefact instead of real differing results (Hunter and Schmidt, 1995). In such condition, meta-analysis proves to be relevant since by using a group of systematic and quantitative methods, it can statistically test the outcomes of previous studies to derive patterns of comparatively consistent casualties and relations (Hunter, Schmidt and Jackson, 1982). Since meta-analysis is known as analysis of analyses (Hunter, Schmidt and Jackson, 1982), this paper in itself provides a significant synthesis of the literature of the past two decades.

The popularity of RBV is growing over time in explaining firm performance which is a central concern of this meta-analysis. The Web of Science, an online subscription-based scientific citation indexing service, along these lines, reveals that by January 2019, the seminal works of Wernerfelt (1984) and Barney (1991) on RBV have attracted over 7,415 and 15,765 citations respectively. These two articles jointly received 1249 citations in 2008, and this number increased to 1755 in 2018-an increase of 41 percent over 2008.

RBV argues that a firm needs to own strategic resources to create a competitive advantage or superior performance (Barney, 1991). A resource meets the criteria of being a strategic resource if it is valuable enough to either reduce expenses or enhance value for the customers, rare in such a way that competitors are unable to access the same resources to create similar value, and hard to substitute or imitate, which makes it difficult for competitors to gain parity (Barney, 1991). As per this view, ICT meets one condition of being a strategic organizational resource by being a valuable resource for firms (Liang, You and Liu, 2010). However, according to some scholars, some ICT tools do not meet the other three criteria (e.g., rare, inimitable and non-substitutable) for being a strategic resource. For example, some ICT tools are not rare and inimitable because competitors can easily buy the same ICT tools (e.g. hardware related technology) or implement the same ICT project (Ross, Beath and Goodhue, 1996). This is consistent with the categorization of technology into General Purpose

Technology (GPT) and Enabling Technology (ET) categories based on whether they are widely used or not (Teece, 2018). Following this, we categorized widely used ICT tools such as Mobile/Telephone, computer, etc. as GPTs whereas not so widely used technologies such as Enterprise Resource Planning (ERP), Information Management System (IMS) etc. as ETs. Because of its exclusivity (Teece, 2018), The enabling categories of ICT meet all the criteria (valuable, rare, inimitable and non-substitutable) of being a strategic resource of the firm irrespective of their separate usage or usage along with the GPTs (explained in details in the literature review section).

Consequently, considering (1) the significance of understanding business performance in strategic entrepreneurship field (Ireland et al., 2001) and (2) the growing popularity of RBV, we believe it is necessary and timely to contribute to the Strategic Entrepreneurship literature by applying a meta-analysis to assess the extent to which broader constructs such as ICT (e.g. ETs alone and both GPTs & ETs) as strategic resources impact performance. Also, it contributes to Business Performance literature significantly since business performance is one of the key constructs of this paper.

Additionally, most of the ICT impact studies in existing literature did not take into account country level infrastructural factors typically contributing to successful ICT adoption and use (Fuchs et al., 2010). This is one of the first meta-analyses which take into account the moderating impact of country-level ICT development in terms of infrastructure and uptake on ICT-Performance relationship. It also digs deeper to see whether country-level ICT development in terms of infrastructure and uptake in primary studies moderates the above-mentioned ICT-performance link differently when different ICT tools (e.g. ETs alone and both GPTs & ETs) are used. This relationship is vital to explore since a strand of previous studies reported a positive effect of country-level ICT development on national economic growth (Roller and Waverman, 2001). Since, national economic growth is the amalgamation of the individual firm's economic growth located in that country (Roller and Waverman, 2001), we can assume that better national ICT development affects firm performance positively.

It can be claimed that our meta-analysis study is the first one which explores the relationship between ICT and performance taking into consideration the status of ICT development at the country level. Hence, it contributes to evidence-based research in the fields of strategic entrepreneurship, entrepreneurial eco-system and entrepreneurship & regional development.

The principal covariates consist of dummies denoting a range of ICT tools (ETs alone and both GPTs & ETs) as strategic resources explored in the primary studies. Further, we used a considerable number of factors to control study specific heterogeneity. These factors include Firm Size, Sample Size, Presence of industry related controls, firm performance measures (profitability, growth or other performance measures), and finally Quality of study (published or unpublished).

We arranged the rest of this paper in different sections. In the "Literature review and research framework" section, we carried out a literature review on RBV and ICT-firm performance to consolidate various independent, dependent, and moderator variables applied in primary studies to build our research model. Then, in the "Research methodology" section, we included Literature Search and Selection Strategy, inclusion criteria, coding and method of analysis. Next, in the "Results" section, we reported the results of the analysis. Finally, in the "Discussion and Conclusion" section, we included the findings, limitations and avenues for future research.

2. LITERATURE REVIEW AND RESEARCH FRAMEWORK:

2.1. Resource-Based View and Firm Performance:

Resource-based view (RBV) which claims that the key resources of a firm determine its competitive advantage has become a pre-eminent theory in the field of strategy (Lockett, Thompson and Morgenstern, 2009), strategic management and strategic Entrepreneurship over the last 30 years. It originated from the seminal work of Penrose (1959) who describes a firm as an amalgamation of productive resources and how these current key resources by means of effective utilization impact the future growth of the firm. Wernerfelt (1984) supported this and added that resources facilitate effective strategies in the product market. Scholars like Amit and Schoemaker (1993), Barney (1986, 1991), Collis and Montgomery (1995) and Peteraf (1993) strengthened this theory by developing specific criteria for organizational resources to be qualified as 'strategic resources' which help firms to formulate strategies to create and maintain competitive advantages.

According to RBV, resources are heterogeneously dispersed among firms, and some resources are not entirely substitutable or imitable (Barney, 1991). When a firm has distinctive groups of resources, it is called Resource heterogeneity (Peteraf, 1993). When resources are not possible to imitate by competitors; it is referred to as Imperfect imitability (Barney, 1991). When there is the unavailability of substitute resources to formulate and deploy strategies as effectively or efficiently as the original resources, those resources are inferred as non-substitutable (Barney, 1991).

For a number of resources, certain qualities, for example, their social unpredictability, the underlying ambiguity encompassing the way they work, or the one of distinctive historical circumstances under which they were gathered make it troublesome for the competitors to acquire equivalent, or substitute set of resources (Dierickx and Cool, 1989; Lippman and Rumelt, 1982). To the degree that such separating components are available, heterogeneity remains a persisting condition despite competitors' endeavours to recreate strategic resources (Rumelt, 1984). And, resource heterogeneity ensures that some firms have more strategic resources than others. Strategic resources develop competitive advantages for firms by generating economic value (Crook et al., 2008). Furthermore, these competitive advantages have more chances to be sustainable in the long term since strategic resources cannot be effortlessly replicated (Hoopes, Madsen and Walker, 2003). Therefore, firms possessing strategic resources should enjoy sustained competitive advantages over the competitors lacking such strategic resources (Barney, 1991).

Since competitive advantages are hard to quantify (Ketchen, Hult and Slater, 2007), numerous scholars have tried to empirically connect strategic resources with firm performance (Barney and Arikan, 2001). The underlying argument is that if strategic resources are related to firm performance, then a competitive advantage ought to exist (Crook et al., 2008). Since competitive advantage is 'generally used to describe the relative performance of rivals in a given (product) market environment' (Peteraf and Barney, 2003: 313), many scholars have been using the term as the synonymous of performance (Crook et al., 2008). Consequently, according to RBV, the degree to which firms owns strategic resources should impact firm performance positively (Crook et al., 2008).

2.2. ICT as a strategic resource and its impact on business performance:

Over the last few decades, a great evolution and development of ICT have unfolded all over the world influencing firm performance globally (Chen, Jaw and Wu, 2016; Falk and Hagsten, 2015; Luftman, Lyytinen and ben Zvi, 2017).

The terminology 'ICT' has been defined in diverse ways in the existing literature extending beyond hardware and software. ICT includes a broad range of contextual factors related to its diverse uses in firms (Markus and Robey, 1988). In fact, ICT is an inclusive terminology which incorporates a wide range of tools and applications ranging from the simple technologies like mobile telephony, internet to more complicated and sophisticated technologies such as computer science and technologies, information systems, ERP etc. These tools are used to saving, operating and transmitting any information, for example, content, voice, picture etc. (Sin Tan et al., 2009).

There exist a number of studies in several streams capturing the impact of ICT on organizational performance. Though each study addresses a similar research question, each one has its own theoretical and empirical perspective. Consequently, an ambiguity has appeared because of a lack of integration of divergent approaches in diverse studies. Earlier research often focused on ICT conceptually, frequently through a resource-based view, arguing that organizations can differentiate based on their ICT related resources, which creates organization specific capabilities and can contribute to sustainable competitive advantage (Bharadwaj, 2000; Melville, Kraemer and Gurbaxani, 2004; Mithas, Ramasubbu, and Sambamurthy, 2011; Ray, Muhanna and Barney, 2005). Empirical research shows that ICT can improve profit ratio (Santanam and Harton, 2003) or Tabin's q (Bharadjaj, Bharadjaj, and Konsinski, 1999) and can catalyze firm-specific assets in the process of international diversification (Chari, Devaraj and David, 2007).On the contrary, a debate has appeared in the past few decades whether "IT matters" or not (Carr, 2003) arguing that numerous firms not only have overestimated as well as overspent on ICT which is an extension of IT.

Parallel to the above pattern, investigation on ICT has started to move forward lately. Matthews (2007) argues that advancement can be observed in the ICT usage in firms, with organizations advancing from general to enabling technologies. Along these lines, a stream of literature has divided technologies in 2 categories. They are General Purpose Technologies (GPTs) and Enabling Technologies (ETs) (Bresnahan and Trajtenberg, 1995; Bresnahan, 2010; Martin. 1993; Teece, 2018).

2.2.1. Use of General Purpose Technologies (GPTs) and business performance:

The key qualities of General Purpose Technologies (GPTs) are the ability to be widely used; capability of continuous technical improvement and catalysing complementary innovations in the sectors where they are applied. A considerable number of ICT tools are viewed as typical general purpose technologies (Jovanovic and Rosseau, 2005) including fixed-line telephones, mobile, computer hardware, and software, internet, online social media, etc. For example, with more than 5 billion global subscribers (GSMA, 2017), mobile telephony is one of the most widely used GPT tools ever. It can provide transformative opportunities to users, particularly access to the internet for most of the global population which is almost 3.3 billion people (GSMA, 2017). Mobile telephony and the Internet provide essential connectivity to firms which allows them to access the customer base (Majumdar, Carare and Chang, 2009; Rochet and Tirole, 2006).

GPTs get better over time, and as they improve, their application spread across all the firms, achieving overall productivity gains across the whole economy (Bresnahan and Trajtenberg, 1995; Guerrieri and Padoan, 2007). Hence, GPTs do not meet the criteria of being rare and inimitable to become strategic resources because of their extensive use. Therefore, GPTs alone cannot bring about firm-specific sustainable competitive advantage.

2.2.2. Use of Enabling Technologies (ETs) and business performance:

The Term Enabling Technology (ET) was first coined by Teece in 2018 stating that ETs are the extensions of GPTs. ETs are similar to GPTs in terms of capability of continuous technical improvement and capacity of catalyzing complementary innovations. On the other hand, ETs are different from GPTs in one criterion and that is they are not as widely used as the GPTs (Teece, 2018).

ETs meet all the criteria (valuable, rare, inimitable and non-substitutable) of being a strategic resource of the firm. Because they are not widespread across the economy (Teece, 2018) and they are still exclusive for a few firms in an economy. Consequently, ETs fulfill the resource heterogeneity condition of RBV and they thus create a competitive advantage for a firm. Moreover, complementary capabilities development in the human resource of the firm remains a precondition for the deployment and optimum utilization of ETs (Ram, Corkindale and Wu, 2015). Consequently, competitors find it difficult to imitate ETs since they need not only the technology infrastructure but also the human resources, technological know-how (Ram, Corkindale and Wu, 2015) and a considerable investment (Lightfoot, Baines and Smart, 2011) to replicate the success of ETs of a firm.

Furthermore, ETs provide unique benefits or values such as rendering new business opportunities, continuously being the foundation of organizational strategies and business models, etc. (Gibson, Rosen and Stucker, 2015). Any kind of GPTs cannot substitute these. Therefore, according to RBV, ETs meet all the criteria to be considered as strategic resources.

As per the above definition of Enabling Technologies, several ICT tools fulfill the requirements of being considered as Enabling Technologies. For example, Artificial Intelligence (AI), Cloud computing, machine learning, IMS, Customer Relationship Management (CRM), e-commerce, etc. can be categorized as ET tools (Posada et al., 2015).

The usual benefits brought about by GPTs are not enough for today's firms and their stakeholders since they expect technologies to provide more than before. These expectations include catalyzing more innovations, increasing customers' engagement, improving revenue growth and enhancing profitability. Achieving all these targets simultaneously from technology have become troublesome for many organizations,. Hence, the ICT tools categorized as enabling technologies offers a comprehensive solution to abovementioned problems (Maine and Garnsey, 2006).

Though opponents of ETs contend that they increase service delivery cost as the increased sophistication of these technologies make them comparatively costly (Lightfoot, Baines and Smart, 2011). However, the proponents of ETs argue that by providing improved responsiveness and better utilization of existing resources, they (ETs) impacts the business performance in terms of increased product/service reliability and availability, better product/service design, less manual supervision, streamlined supply chain, improved client service,. All these, in turn, contribute to lessening the service delivery costs of a firm (Lightfoot, Baines and Smart, 2011).

As per the above discoveries, we propose the following hypothesis to test the impact of the use of ETs as strategic resources on firm performance. Hence:

H1: Use of ETs as strategic resources affects firm performance positively.

2.2.3. The combined use of GPTs and ETs and business performance:

As mentioned earlier, GPTs are widely used and provide value across the economy (Bresnahan and Trajtenberg, 1995; Guerrieri and Padoan, 2007). Hence, the value provided by GPTs cannot ensure a competitive advantage for a firm because GPTs do not fulfill the preconditions of being rare/heterogeneous, inimitable and non-substitutable like ETs. Therefore, GPTs alone cannot act as strategic resources.

Conversely, from a business model viewpoint, capturing value from ETs is not as easy as capturing value from comparatively simpler technologies like GPTs (Maine and Garnsey, 2006). However, ETs ensures better utilization of existing resources such as GPTs when they are used jointly. Consequently, when GPTs and ETs are used together in a firm, it can be considered as a strategic resource for a firm since it fulfills the criteria of being valuable, rare, inimitable and non-substitutable. Accordingly, their combined use can create a sustainable competitive advantage for the firms. For example, when GPTs and ETs are used together in a firm, they increase productivity by influencing every single distinctive factor including organizational procedures and schedules, product and process related knowledge, the organization of production and service facilities, regulatory mechanisms, and financial organization and managerial coordination practices. At the same time, these different areas interact with one another in case of combined use of GPTs and ETs which further amplify the productivity results (Majumdar, Carare and Chang, 2009). It additionally gives choices to improve interaction with suppliers or organization of new distribution frameworks. Interior procedures get streamlined, lessening capital needs through better use of tools and decrease in inventories and thus requirements for a physical location. Enhanced correspondence and more far-reaching and timely information exchange diminish coordination and labour costs as well as catalyze improved decision making (Arvanitis and Loukis, 2009). The use of GPTs and ETs together also increase innovations by re-inventing processes and activities in various departments (Majumdar, Carare and Chang, 2009). They also decrease the cost of accessing information and participating in markets (Leff, 1984; Norton, 1992).

As per the above discoveries, we propose the following hypothesis to test the impact of combined use of GPTs and ETs on firm performance. Hence:

H2: Use of both GPTs and ETs together as strategic resources affect firm performance positively.

2.3. Contextual Moderators of the ICT-Performance Relationship:

2.3.1. Country wise ICT development and ICT-Firm Performance Context:

Though the use of GPTs has proliferated to a great extent in the last decade in both developed and developing countries (Çilan, Bolat and Coşkun, 2009) but the use of ETs is not yet prevalent in developing countries compared to developed countries (Huang and Palvia, 2001; Hawari and Heeks, 2010; GSMA, 2017). Access and Use of different ICT tools to a large extent depends on the ICT infrastructural development in a country (Madon and Krishna, 2018). Despite the proven benefits brought about by the ICT resources, there still exist severe disparities in access to and use of ICT tools across countries which can be attributed to the existence of a different level of ICT infrastructural development (Park, Choi and Hong, 2015). Some prior studies also reported that ICT related disparities are closely related to the economic development of the country (Kraemer et al., 2005) where developed countries own

better ICT infrastructure compared to developing countries. But these differences also vary according to different ICT tools. Though GPTs related infrastructure has proliferated to a great extent in the last decade in both developed and developing countries (GSMA, 2017) but the availability of ETs in terms of infrastructure is not yet prevalent in developing countries compared to developed countries (Hawari and Heeks, 2010).

There exist evidence in the existing literature that the ICT infrastructure of a country impacts the ICT-Firm performance relationship (Park, Choi and Hong, 2015; Ruivo, Oliveira and Neto, 2012). Existing research also reports that the availability of a robust ICT infrastructure remains crucial for the implementation (Huang and Palvia, 2001), improvement, better use of ICT tools (Chandrasekar Subramaniam, 2002; Dai and Kauffman, 2002). To be specific, a robust ICT infrastructure at the national level is essential for facilitating the development and implement of ETs like e-commerce at the firm level (Chandrasekar Subramaniam, 2002; Dai and Kauffman, 2002) which leads to better use of e-commerce at the firm level. Similarly, the ERP use at the firm level in different countries also depends on the ERP infrastructure (Ruivo, Oliveira and Neto, 2012). Since, better use of information technology causes better output (Devaraj and Kohli, 2003), we propose the following hypothesis:

H3: The country wise ICT development impacts the ET-firm performance relationship in such a way that the country with better ICT development impacts the ET-performance relationship more positively.

GPTs such as fixed-line telephones, mobile, computer hardware, and software, internet, online social media have an impact in two diverse ways. To begin with, they catalyzed a substantial transformation in the intensity, enormity and the ease of use of the ICT practice. For example, widely used mobile telephony, computer, internet, and online social media have gone through and still going through continuous improvement and also, catalyzing complementary innovations like cloud computing, e-commerce, and other ETs. For example, these ICT related GPTs have made globally calls convenient, less expensive and more innovative by having a video call facility. All these facilitate more advanced technologies like e-commerce tools (Biagi, 2013; Corrado, Haskel and Jona-Lasinio, 2017).

However, according to Wong (2002), implementation and use of both categories of ICT tools ensure better yield at the firm level. However, firm-level combined deployment and use of GPT and ET tools are not very likely if national ICT infrastructure does not support that adoption (Mody and Dahlman, 1992; Rogers, 2001). This leads to the following hypothesis:

H4: The country wise ICT development impacts the ICT-firm performance relationship in such a way that the country with better ICT development impacts the ICT-performance relationship more positively when both GPTs & ETs are used as strategic resources.

For example, according to Deloitte (2017), approximately forty years after the introduction of the first mobile, pretty much every developed as well as developing nation surveyed reported somewhere around 90 percent mobile phone penetration (Deloitte, 2017). Therefore, GPTs like mobile phones now are less dependent on national ICT development status (James, 2007). But ETs are more unequally distributed in different countries compared to GTs, and the deployments of ETs are comparatively more dependent on the national ICT development status. For example, the ERP infrastructure at the country level affects the adoption and use of ERP tools in firms located in that country (Ruivo, Oliveira and Neto, 2012). Consequently,

the uneven ICT development between developed and developing countries have a profound impact on the use of ETs (ITU and UNCTAD, 2007).This leads to the following hypothesis:

H5: Use of ETs as strategic resources separately add more to firm performance when the country of the study has a better ICT development status than what both GPTs and ETs as strategic resources add to.

Grounded in the above literature review, we represent our research model in Figure 1.

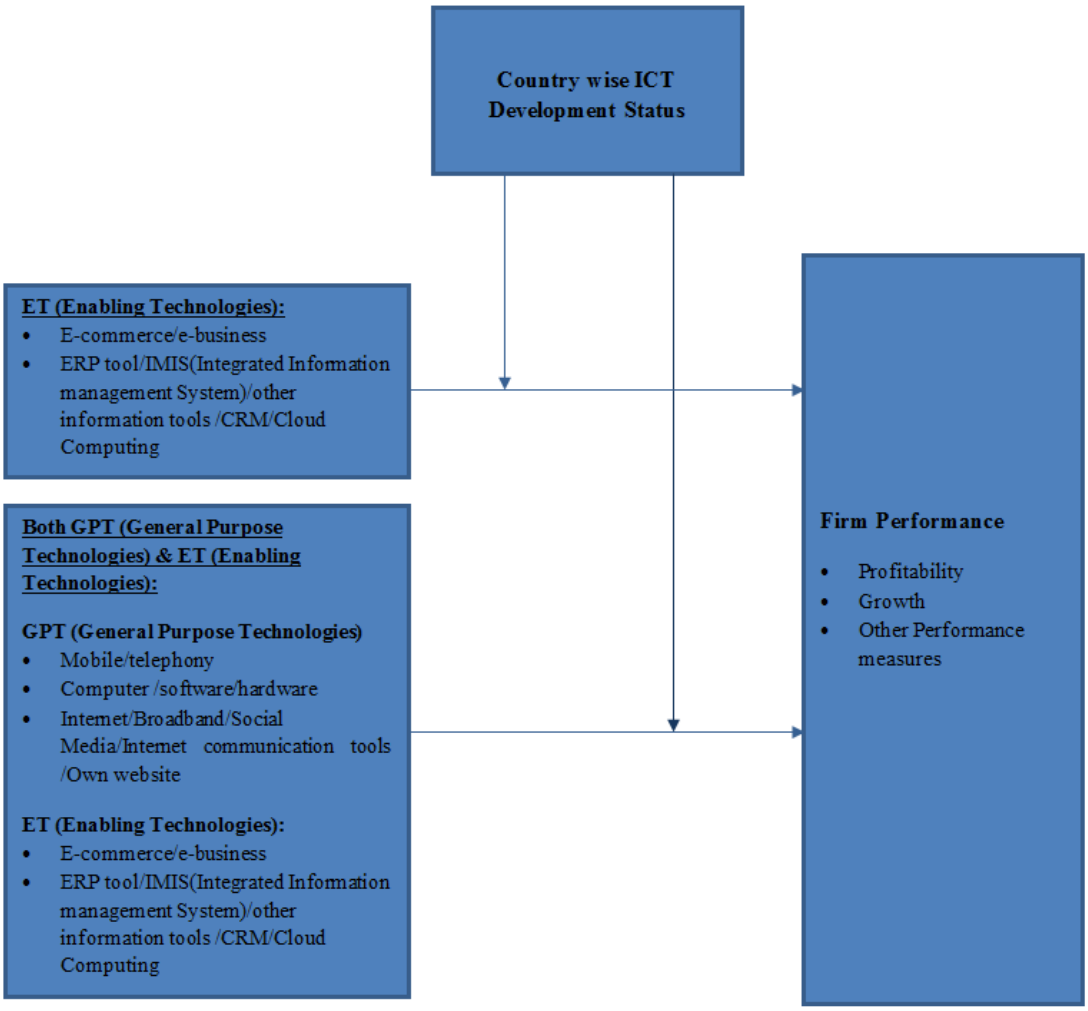

Figure 1: *Research model for Meta-Analysis*

3. RESEARCH METHODOLOGY:

We verified the proposed models and hypotheses by applying a meta-analysis approach which is techniques to investigate coefficients reported in earlier empirical studies (Sabherwal, Jeyaraj and Chowa, 2006) to conclude conclusive outcomes. Therefore, it explains the considerable variance in previous empirical papers.

We followed the following Research Methodology in our study:

3.1. Literature Search and Selection Strategy:

We comprehensively searched for primary studies on the topic published before November 2018. We searched in established databases such as EBSCO (Business Source Elite), JSTOR

Databases, ABI/INFORM, EconLit, ERIC (Expanded Academic Index), PsycINFO, Science Direct and Wilson Business Abstracts using ICT and Firm Performance related keywords.

We also conducted a manual search using relevant keywords in related journals such as Strategic Entrepreneurship Journal, Entrepreneurship Theory and Practice, Strategic Management Journal, Journal of Business Venturing, Academy of Management Journal, Journal of Applied Psychology, Journal of Small Business Management, the Entrepreneurship and Regional Development and Administrative Science Quarterly. Next, we searched the reference list of the primary studies to find more papers on the topic.

3.2. Decision rules for inclusion of studies in meta-analysis:

We considered those primary studies as part of this meta-analysis which were quantitative and explored the ICT-performance relationship by Pearson correlation coefficient.

3.3. Calculation and analysis of effect size:

After a comprehensive search process guided by the above inclusion criteria, we collected a total of 533 primary studies. After a meticulous review of those papers, we finally obtained 106 papers and a total of 271527 observations for the final analysis which indicates a solid empirical base for a meta-analysis (Brinckmann, Grichnik and Kapsa, 2010; Read, Song and Smit, 2009). The excluded papers were either qualitative or did not use person correlation coefficient in exploring ICT-performance relationship.

The Sample sizes of our empirical database ranged from 8 (Devaraj and Kohli, 2000) to 100000 (Hagsten and Kotnik, 2017), and effect sizes ranged from r = -0.81 (Bauer, Dehning and Stratopoulos, 2012) to r = .978 (Ojukwu, 2006).

Since Bivariate Meta-analysis has often faced a great deal of criticism for not being sufficient for evaluating relationships which are multivariate, we conducted both Bivariate Analysis and Meta-regression.

To validate our hypotheses, we followed the following rule:

A hypothesis is proven when both Bivariate and the Meta-regression investigations accomplish confirmation. A hypothesis is partly confirmed when either the Bivariate or Meta-Regression Analyses prove it.

We also explored the moderating effect of the different ICT development status in the countries of the primary studies in this meta-analysis. We used Firm Size, Sample Size, Control for industry vs. No control for industry, Performance scope (i. Firm profitability, ii. Firm growth, iii. Other performance measures), and Quality of Publication (5 year average of Impact Factor) as control variables.

3.4. Variable Used:

3.4.1. Independent variable: Usage of ICT:

We used the Use of different ICT tools as the independent variable. We coded the 106 studies according to the ICT tools used by the firms. We categorized Different types of ICT tools in the following manner:

a) General Purpose Technology (GPT):

- Mobile/Telephony
- Computer /Software/Hardware
- Internet/Broadband/Social Media/Internet communication tools like WhatsApp, Viber, Skype/Own website

b)Enabling technologies (ET):

- E-commerce/E-business,
- ERP tool/Integrated Information management System/other information tools /CRM/Cloud Computing

c) Both GPT and ET

- Mobile/Telephony
- Computer /Software/Hardware
- Internet/Broadband/Social Media/Internet communication tools like WhatsApp, Viber, Skype/Own website
- E-commerce/E-business,
- ERP tool/Integrated Information management System/other information tools /CRM/Cloud Computing

3.4.2. Moderator Variable: Presence of ICT development context of countries of primay studies:

We considered the status of ICT infrastructure development in the country of primary studies, separating between 'Not Present' (ICT development context not present) and 'Present' (ICT development context present) in the Bivariate analysis. In the meta-regression analysis, we used the value of each country as per the ICT development index of 2017 (latest one) prepared by the International Telecommunication Union (ITU). ITU since 2007 publishes the ICT Development Index (IDI) which evaluates the information and communication technology infrastructure and uptake of 176 countries (ITU, 2019).

3.4.3. Dependent variable – performance:

The existing empirical literature shows a variety of performance measures (Combs, Crook, and Shook, 2005; Venkatraman and Ramanujam, 1986). We sorted these measures into three general categories: Profitability (ROI, ROA, IRR, ROS etc.), Growth (Sales growth, Growth in revenue, Employment growth, Growth in cash flow, productivity growth etc.) and Other Performance Measures (Overall business performance/success, Competitiveness, Customer satisfaction, Value addition etc.).

3.4.4. Control variables:

We controlled for whether the primary study controlled for industry or not (Brinckmann, Grichnik, and Kapsa, 2010).

We also controlled for quality of the study by categorizing studies into two categories: studies without impact factor (not published) and the studies with impact factor (published). Accordingly, it was possible for us to control statistically for publication bias.

Additionally, we controlled for the Nature of firm performance measure (e.g., profitability, growth or other performance measures).

We also controlled for the sample size and Firm size (Micro, Small and Medium Size, Mixed size and Large) of the primary studies.

4. RESULTS:

H1, H2, H3, and H5 are confirmed by both bivariate, and meta-regression analyses. But H4 is partially accepted since it is accepted in bivariate analysis but rejected in meta-regression analyses (details are provided in the following table 1).

Hypothesis	**Confirmed in …**		Conclusion for hypothesis
	Bivariate analysis	Meta-regression	
H1: Use of Enabling Technologies (ET) as strategic resources affects firm performance positively.	Yes (.5484***)	Yes (0.424***)	Accepted
H2: Use of both GPT and ET together as strategic resources affect firm performance positively.	Yes (.3947***)	Yes (0.245***)	Accepted
H3: The country wise ICT development impacts the ET-firm performance relationship in such a way that the country with better ICT development impacts the ET-performance relationship more positively.	Yes (.5515***)	Yes (0.0797**)	Accepted
H4: The country wise ICT development impacts the ICT-firm performance relationship in such a way that the country with better ICT development impacts the ICT-performance relationship more positively when both GPTs & ETs are used as strategic resources.	Yes (.3947***)	No (-0.116*)	Partly accepted
H5: Use of ETs as strategic resources separately add more to firm performance when the country of the study has a better ICT development status than what both GPTs and ETs as strategic resources add to.	Yes (for ETs .5515***) & (for GPTs & ETs .3947***)	Yes (for ETs . 0.0797**) & (for GPTs & ETs (-0.116*)	Accepted

*** p<0.01, ** p<0.05, * p<0.1

Table 1: Results of Hypotheses Test

4.1. Bivariate Moderator Analysis:

Firstly, we completed a bivariate examination (details provided in table 2). We found comparatively larger effect sizes for studies with ET tools (r= .5484, k = 41) compared to studies with both GPT and ET tools (r= .3947, k = 32).

The considerable Q- measurement of ET (1553.7376, df=95; p < .001), indicates variability across the effect sizes and even more so for studies which use both GPT and ET tools (16532.0077, df=95; p < .001). Hence, the existence of theoretically relevant moderators becomes likely (Schmidt and Hunter, 2014).

Among the studies with ET tools, we found slightly larger effect sizes for studies present in the ICT Development index (r= 0.5515, k = 36) compared to those studies absent in the ICT Development index (r= .5107, k = 5). Among the studies with both GPT and ET tools, all the studies were present in the ICT Development index (r= .3947, k = 32).

We found comparatively larger effect sizes for studies with Micro sized firms (r= .6203, k = 7) compared to those studies with SME (r= .4852, k = 49), studies with Mixed Sized firms (r= .4509, k = 37) and studies with Large firms (r= .3275, k = 13).

Regarding impact factor, we found considerably larger effect sizes for studies without impact factor (r= .6212, k = 42) than for those studies impact factor (r= .3702, k = 64).

In terms of industry, we found comparatively larger effect sizes for studies with no control for industry (r= .5246, k = 52) than for those studies with control for industry (r= .4165, k = 54).

We found comparatively larger effect sizes for studies with Firm Growth (r= .5167, k = 12) compared to those studies with Other Performance Measure (r= .5014, k = 73) and studies with Firm Profitability (r= .3249, k = 21).

	Number of studies (K)	**Aggregate sample size (N)**	**Mean ES**	**95% CI**	**Q**	**P value**
			Random	**Random**		**Random**
H1: ET (Enabling Technologies)→ICT-Business performance relationship	41	125610	.5484	.4856 to .6112	1553.7376	.0000
H2: Both GPT & ET→ICT-Business performance relationship	32	55988	.3947	.1888 to .6006	16532.0077	.0002
H3: Presence in ICT Development Index→ ET-Business performance relationship	36	121692	.5515	.4916 to .6115	1026.3910	.0000
Absence in ICT Development Index→ ET-Business performance relationship	5	3918	.5107	.0850 to .9363	333.7982	.0187
H4: Presence in ICT Development Index→ Both GPT & ET-Business performance relationship	32	55988	.3947	.1888 to .6006	16532.0077	.0002
Absence in ICT Development Index→ Both GPT & ET-Business performance relationship	0	0	N/A	N/A	N/A	N/A
Controls						
Firm Size						
Micro	7	1231	.6203	.3117 to .9289	163.7668	.0001
SME	49	153347	.4852	.4277 to .5428	3189.5212	.0000
Mixed	37	40257	.4509	.3641 to .5377	2113.3915	.0000
Large	13	76692	.3275	-.0565 to .7115	12757.5406	.0946
Study quality						

Low quality	42	32209	.6212	.5283 to .7141	2083.4542	.0000
High quality	64	239318	.3702	.2815 to .4588	22234.0036	.0000
Industry						
No Control for industry	52	22516	.5246	.4262 to .6229	2411.2601	.0000
Control for industry	54	249011	.4165	.3227 to .5104	22261.3912	.0000
Performance Measure						
Firm Profitability	21	114660	.3249	-.0175 to .6673	16881.7708	.0629
Firm Growth	12	14680	.5167	.3640 to .6693	628.3887	.0000
Other Performance Measure	73	142187	.5014	.4405 to .5622	7090.6136	.0000

All values are significant at p <0.01 unless otherwise indicated.

Table 2: Results of Bivariate Analysis

4.2. Meta-Regression Outcomes:

Next, we went for the meta-regression process (details given in table 3) that allows the relative explanatory power of every contingency variable to be explored considering other variables.

The regression results indicate that the use of ET tools (β = .424, p <0.01) is positively and significantly related to ICT-Performance Relationship. Similarly, the use of both GPT and ET tools (β = .245, p <0.01) is positively and significantly related to ICT-Performance Relationship, but the effect size is smaller than that of only ET use.

Besides, the results suggest that the ICT development value of the primary studies with ET (β = 0.0797, p <0.05) is positively and significantly related to ICT-Performance Relationship. On the contrary, the ICT development value of the primary studies with both GPT & ET tools (β = -0.116, p <0.1) is significantly but negatively related to ICT-Performance Relationship.

The regression outcomes show that the ICT-performance relationship is negatively associated but statistically significant if controlled for industry (β = -.281, p <0.05).

We also found that ICT-performance relationship is negatively associated and statistically not significant if controlled for firm size (β = -.0588, n.s.).

On the other hand, Publication quality in the form of impact factors of journals (β = 0.0556, p <0.05) affected ICT-performance relationship in a positive and statistically significant way. Similarly, Sample size (β = 3.55e-06, p <0.01) affected ICT-performance relationship in a small but positive and statistically significant way.

Finally, we found that control for Performance measures like Firm profitability (β = -.364, p <0.01) has a negative but statistically significant impact on ICT-performance relationship. Conversely, Firm growth (β = 0.0267, n.s.) has a small positive but statistically not significant impact on ICT-performance relationship.

	Model 1	Model 2	Model 3	Model 4	Model 5
VARIABLES	Firm Performance	Firm Performance	Firm Performance	Firm Performance	Firm Performance

Five Years Impact Factors	0.0556**	0.0316	-0.00898	0.00783	0.0324
	(0.0219)	(0.0205)	(0.0190)	(0.0189)	(0.0205)
Industry	-0.281**	-0.228**	-0.212**	-0.0547	-0.190
	(0.120)	(0.109)	(0.0994)	(0.104)	(0.119)
Sample Size	3.55e-06***	5.51e-06***	6.64e-06***	4.14e-06***	5.13e-06***
	(1.09e-06)	(1.07e-06)	(1.36e-06)	(9.95e-07)	(1.67e-06)
Profitability Performance Measure	-0.364***	-0.397***	-0.563***	-0.534***	-0.352***
	(0.105)	(0.0957)	(0.0880)	(0.0880)	(0.102)
Growth Performance Measure	0.0267	0.0767	0.231**	0.135	-0.00131
	(0.138)	(0.125)	(0.112)	(0.112)	(0.136)
Significant Impact on ICT	0.233*	0.145	0.112	0.168*	0.105
	(0.119)	(0.109)	(0.101)	(0.0980)	(0.116)
Firm Size	-0.0588	-0.0497	-0.0156	-0.0245	-0.0283
	(0.0488)	(0.0442)	(0.0406)	(0.0413)	(0.0471)
ICT Index		-0.0923***	-0.0921***	-0.127***	-0.0776***
		(0.0197)	(0.0175)	(0.0269)	(0.0226)
Enable Technology			0.424***	-0.239	
			(0.0731)	(0.273)	
General Purpose & Enable Technology			0.245*** (0.0860)		0.857* (0.482)
Enable Technology X ICT Index				0.0797** (0.0362)	
General Purpose & Enable Technology X ICT Index					-0.116*
					(0.0678)
Constant	0.319**	0.987***	0.768***	1.035***	0.843***
	(0.126)	(0.183)	(0.163)	(0.201)	(0.202)
Observations	102	102	102	102	102
R-squared	0.232	0.379	0.548	0.532	0.400

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Result of Meta-regression

5. DISCUSSION AND CONCLUSION:

5.1. Main findings:

The absence of integration of updated results on ICT-firm performance relationship has caused ambiguity in the face of the debate whether IT matters or not. Carr (2003) initiated this debate by claiming that organizations might have overspent on IT by overstating the strategic value of it. The results of this meta-analysis discard this argument by showing that most of the ICT tools (ETs alone and GPTs and ETs together) as strategic resources have a positive impact on the performance of a firm.

These influences change according to the types of ICT tools used and some ICT tools impact firm performance more than others as strategic resources. For example, H1 which expected the use of Enabling Technologies (ET) affects firm performance positively is accepted in both the Bivariate and Meta-regression Analysis. One reason could be because of the nature of this ET tools, they need specialized knowledge and training for adoption and usage, and when embraced in the firms, they bring about a considerable positive impact on firm performance. For example, implementation and use of ET related ICT tools such as ERP, Cloud Computing, e-commerce, IMS results in enhanced organizational performance such as

increased sales and resultant profitability (Zhuang and Lederer, 2006), better communication with the stakeholders (Subramani, 2004), better information management (Li et al., 2006), streamlined supply chain management, one-stop services, less need for human labour (Falk, 2005) etc.

Similarly, H2 which expected the use of both GPT and ET as strategic resources affect firm performance positively is accepted in both the Bivariate and Meta-regression Analysis. But the effect size, in this case, is smaller in both Bivariate and Meta-regression Analysis compared to only ET use. One reason could be the very nature of GPT which makes it difficult to directly impact organizational performance without being complementary with other business functions (Liang, You and Liu, 2010). This is supported by the concepts of resource complementary (Milgrom and Roberts, 1995) and organizational capabilities (Liang, You and Liu, 2010). Accordingly, although ICT tools which fall under the category of GPT are considered valuable organizational resources which can enhance the performance of a firm, they alone might not generate sustained performance in firms (Rai et al., 2006). These tools impact the performance of a firm via complementary relationships with other resources such as ETs as well as capabilities of a firm such as human resource with technological knowledge (Alvarez-Suescun, 2007, 2010; Bharadwaj, 2000; Bhatt and Grover, 2005; Brown et al., 1995; Chan et al., 1997; Hirschheim, Heinzl and Dibbern, 2013; Karimi et al., 2007; Melville et al., 2004; Rai et al., 2006; Wade and Hulland, 2004; Zhu, 2004). Even though the RBV acknowledges the importance of resource complementarily in firms, it is not fully explained by this theory. Hence, the refinement of this component is vital to increase the relevance of the RBV to GPT related analysis.

H3 which expected that the country wise ICT development impacts the ET-firm performance relationship in such a way that the country with better ICT development impacts the ET-performance relationship more positively is proven in both the Bivariate Analysis and in the Meta-regression. Implementation and usage of ET tools are subject to considerable cost and training (Hennig and Jardim, 1977; Rotter and Portugal, 1969) which results into a more cautious use ET tools and assessment of value provided by ET tools. That is why at many organizations ET tools are more effective in providing value in firms. But the adoption of these tools depends on the ICT infrastructure of a country. This explanation is consistent with the outcomes of both bivariate and meta-regression Analysis.

H4 which expected that the country wise ICT development impacts the ICT-firm performance relationship in such a way that the country with better ICT development impacts the ICT-performance relationship more positively when both GPTs & ETs are used as strategic resources is accepted in Bivariate analysis but rejected in meta-regression. Most of the GPT related ICT tools are so widely used that other factors can dilute their attribution to business performance. Furthermore, implementation and usage of ET tools are subject to considerable cost and training (Hennig and Jardim, 1977; Rotter and Portugal, 1969) which results into a more cautious use of ET tools and assessment of value provided by ET tools. That is why at many organizations ET tools are more effective in providing value in the business than when both GPTs and ETS are used together.

H5 which expected that the use of ETs separately add more to firm performance when the country of the study has a better ICT infrastructure than what both GPTs and ETs as strategic resources add to as strategic resources, is accepted in both the Bivariate Analysis and in the Meta-regression. As mentioned earlier, because of the necessity of high investment and considerable training (Hennig and Jardim, 1977; Rotter and Portugal, 1969) for successful deployment and use of ETs, firms try to take the optimum benefits out of these tools which

result in superior value for the firms than that of other kinds of ICT tools. On the contrary, Anecdotal evidence suggests that compared to ET tools, less investment and training is required to implement GPTs at the firm level. Because of this less cost and minimal training necessities, firms most of the times do not pay too much attention to use GPTs in an optimum way. This might be a reason for GPTs rendering less value than their potential. Moreover, since GPTs are not considered a strategic resource, they are only used as cost minimization tools which hinder their optimum use. Henceforth, they render less value than their potential. It is consistent with the findings of Willcocks and Skyes (2000) who claimed that rather than using ICT resources as cost minimization tool when ICT is used as a strategic resource, it contributes to business performance in a better way. Besides, most of the GPT related ICT tools are so widely used that their attribution to business performance can be diluted by other factors. This is consistent with the argument of Feeny and Ives (1997) that only radically new resources can provide value to the business rather than overtly used existing resources. This is also consistent with Miller's theory which argues that ICT being a commodity available to everyone does not, in fact, add any value to the firm's output (Schubert and Leimstoll, 2007).

Hence, when GPT is used along with the ET tools in an organization, it reduces the overall impact on ET-performance relationship. Consequently, their joint impact on firm performance also decreases. However, all these will only happen when the firms can adopt these technologies, and the level of ICT development of a country is one of the precursors for this adoption (Sabi et al., 2016; Chan and Ngai, 2007).

Among the 106 studies, we considered in the meta-analysis, only 54 studies controlled for the industry. The regression results reveal that the ICT-performance relationship is negatively associated but statistically significant if controlled for the industry. Those studies which controlled for the industry also took into consideration industry related factors that impact the ICT and business performance relationships. According to Bain (1951), Mason (1939) and Porter (1985), the structure of industry directly influences the performance of different organizations in that industry. Nonetheless, the inclusion of industry related controls in empirical studies do not directly explain how industry related characteristics limit or stimulate organizations to utilize ICT for improving organizational performance. In other words, we do not know much about how industry related characteristics impact ICT Performance Relationship in a firm (Melville et al., 2004). Only 54 papers directly examined the relationship between ICT and firm performance across different industries. Even fewer studies attempted to render a theory-driven argument to explain the reason for the existence of such differences. One stream of such research has applied growth accounting to explore diverse multi-factor productivity (MFP) growth at the industry level. Stiroh (2001) finds that firms in the IT industry have witnessed more substantial productivity growth compared to other industries. According to Morrison (1997), the increase of IT benefit-cost ratio overtime are not uniformly distributed across different industries.

Among the 106 studies which we considered in the meta-analysis, most of the studies include SMEs (49 studies) and mixed sized firms (37 studies). The rest of the studies include large firms (13 studies) and micro-sized firms (7). The meta-regression report that ICT-performance relationship is negatively associated and statistically insignificant if controlled for the firm size. The Bivariate result shows that comparatively larger effect sizes for studies with Micro-sized firms compared to those studies with SME, Mixed Sized firms and Large firms ($r = .3275$, $k = 13$) respectively. This is not consistent with the findings of Damanpour (1992) who reported that larger firms have several advantages over small firms in ICT adoption and ICT value creation.

Finally, we found that control for Performance measure (Firm profitability versus Firm growth versus other performance measures), Publication quality in the form of 5 years impact factors of journals and sample size affected the outcome significantly.

5.2. Contributions and implications to research:

This meta-analysis contributes to the existing literature by increasing our theoretical and empirical understanding of how ICT as a strategic resource affect firm performance. As a result, it contributes to Business Performance related literature. Firm Performance or growth being a vital issue of Strategic Entrepreneurship, this meta-paper contributes to Strategic Entrepreneurship literature. Additionally, this meta-analysis is the first attempt of integrating the impact of ICT as a strategic organizational resource on firm performance since the previous meta-analyses only analysed the impact of IT on firm performance excluding the communication-related tools. Hence, this meta-analysis also contributes to technology or to be specific ICT related literature. Further, this study also digs this issue deeper by exploring the impacts of ET and both GPT& ET tools on Performance relationship. Further, this meta-analysis study remains the first one to explore the relationship between ICT and performance where the status of national ICT development of primary studies has been taken into consideration. Henceforth, it contributes to evidence-based research in the field of the entrepreneurial ecosystem. Conversely, as the whole analysis has been based on RBV, GPT and ET this study also contributes to theory-driven research.

In fact, the majority of the existing ICT-firm performance studies seem to answer the question of ‘what is the impact of ICT on firm performance.' But this meta-analysis additionally tries to explore the associated set of questions of ‘when, where and how does ICT impact the firm performance?’ by exploring the moderating role of the status of ICT development at country level in the ICT and firm performance relationship. As a result, this study also enhances the existing ICT-firm performance related literature and provides suggestions for meaningful research in the future. Therefore, the findings of this meta-analysis are pertinent for practitioners including educators, policymakers, and researchers.

5.3. Limitations and Avenues for Further Research:

Being one of the first meta-analyses that examine the moderating role of national ICT development context in the ICT and business relationship, this meta-analysis provides a building block for more comprehensive empirical research on the topic in the future. But like any research, our meta-analysis also includes a few limitations which offer the potential for exploring it further in future studies. To start with, meta-analysis has some potential limitations like scope, publication bias, observation bias, the impact of confounding variables etc.

The outcome of this meta-analysis is dependent on different past research extracted from diverse sources at different times. Accordingly, these data vary due to diverse industries (Byrd and Davidson, 2003; Straub, Rai and Klein, 2004), economic environments (Liang, You and Liu, 2010) and national conditions (Zhu, Kraemer and Dedrick, 2004; Tanriverdi, 2005; Wang, Tai and Wei, 2006). As a result, there is a possibility of observation biases.

We adopted a few measures to prevent abovementioned potential issues. For instance, the considerable size of the total observations of this meta-analysis enhances the robustness of the outcomes which can minimize observation biases to some extent. Moreover, by taking into consideration the national ICT development context, we tried to tackle the heterogeneity

issue to a certain extent. Further, we included non-published outcomes along with the published outcomes to avert a publication bias.

We likewise observed that cross-sectional research dictates quantitative ICT-Firm Performance research. Nonetheless, longitudinal investigations could uncover that ICT holds positive long-term impacts in a better way. Hence, the cross-sectional primary studies that dictated this meta-analysis might have underestimated performance related impacts.

By and large, this paper distinguished various critical contextual factors that affect the relationship between ICT as a strategic resource and firm Performance. In this process, we expected to catalyse a more contextual understanding of the phenomena of Strategic Entrepreneurship. The identified variables are indicators of various salient contextual aspects; yet, we would prefer not to propose that the distinguishing factors are the only ones. Additional research can be conducted to reveal the precise mechanism of how diverse moderators and mediators influence ICT-Performance link.

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REFERENCES:

Alvarez-Suescun, E. (2007). Testing resource-based propositions about IS sourcing decisions. *Industrial Management & Data Systems*, *107*(6), 762-779.

Alvarez-Suescun, E. (2010). Combining transaction cost and resource-based insights to explain IT implementation outsourcing. *Information Systems Frontiers*, *12*(5), 631-645.

Amit, R., & Schoemaker, P. J. (1993). Strategic assets and organizational rent. *Strategic management journal*, *14*(1), 33-46.

Arvanitis, S., & Loukis, E. N. (2009). Information and communication technologies, human capital, workplace organization and labour productivity: A comparative study based on firm-level data for Greece and Switzerland. *Information Economics and Policy*, *21*(1), 43-61.

Bain, J. S. (1951). Relation of profit rate to industry concentration: American manufacturing, 1936–1940. *The Quarterly Journal of Economics*, *65*(3), 293-324.

Barney, J. B. (1986). Strategic factor markets: Expectations, luck, and business strategy. *Management science*, *32*(10), 1231-1241.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, *17*(1), 99-120.

Barney, J. B., & Arikan, A. M. (2001). The resource-based view: Origins and implications. *Handbook of strategic management*, *124188*.

Bauer, T. D., Dehning, B., & Stratopoulos, T. C. (2012). The financial performance of global information and communication technology companies. *Journal of Information Systems*, *26*(2), 119-152.

Bharadwaj, A. S., Bharadwaj, S. G., & Konsynski, B. R. (1999). Information technology effects on firm performance as measured by Tobin's q. *Management science*, *45*(7), 1008-1024.

Bharadwaj, A. S. (2000). A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS quarterly*, 169-196.

Bhatt, G. D., & Grover, V. (2005). Types of information technology capabilities and their role in competitive advantage: An empirical study. *Journal of management information systems*, *22*(2), 253-277.

Biagi, F. (2013). ICT and Productivity: A Review of the Literature. *JRC Institute for Prospective Technological Studies, Digital Economy Working Paper*, *9*.

Bresnahan, T. (2010). General purpose technologies. In *Handbook of the Economics of Innovation* (Vol. 2, pp. 761-791). North-Holland.

Bresnahan, T. F., & Trajtenberg, M. (1995). General purpose technologies 'Engines of growth'?. *Journal of econometrics*, *65*(1), 83-108.

Brinckmann, J., Grichnik, D., & Kapsa, D. (2010). Should entrepreneurs plan or just storm the castle? A meta-analysis on contextual factors impacting the business planning–performance relationship in small firms. *Journal of business Venturing*, *25*(1), 24-40.

Brown, R. M., Gatian, A. W., & Hicks Jr, J. O. (1995). Strategic information systems and financial performance. *Journal of Management Information Systems*, *11*(4), 215-248.

Byrd, T. A., & Davidson, N. W. (2003). Examining possible antecedents of IT impact on the supply chain and its effect on firm performance. *Information & Management*, *41*(2), 243-255.

Carr, N.G. (2003). IT doesn't matter. *Havard Business Review*, *305*.

Chandrasekar Subramaniam, M. J. S. (2002). A study of the value and impact of B2B e-commerce: the case of web-based procurement. *International Journal of Electronic Commerce*, *6*(4), 19-40.

Chan, Y. E., Huff, S. L., Barclay, D. W., & Copeland, D. G. (1997). Business strategic orientation, information systems strategic orientation, and strategic alignment. *Information systems research*, *8*(2), 125-150.

Chan, S. C., & Ngai, E. W. (2007). A qualitative study of information technology adoption: how ten organizations adopted Web-based training. *Information Systems Journal*, *17*(3), 289-315.

Chari, M. D., Devaraj, S., & David, P. (2007). International diversification and firm performance: Role of information technology investments. *Journal of World Business*, *42*(2), 184-197.

Chen, Y. Y. K., Jaw, Y. L., & Wu, B. L. (2016). Effect of digital transformation on organisational performance of SMEs: Evidence from the Taiwanese textile industry's web portal. *Internet Research*, *26*(1), 186-212.

Çilan, Ç. A., Bolat, B. A., & Coşkun, E. (2009). Analyzing digital divide within and between member and candidate countries of European Union. *Government Information Quarterly*, *26*(1), 98-105.

Collis, D. J., & Montgomery, C. A. (1995). Competing on Resources: Strategy in the 1990s. *Knowledge and strategy*, 25-40.

Combs, J. G., Russell Crook, T., & Shook, C. L. (2005). The dimensionality of organizational performance and its implications for strategic management research. In *Research methodology in strategy and management* (pp. 259-286). Emerald Group Publishing Limited.

Corrado, C., Haskel, J., & Jona-Lasinio, C. (2017). Knowledge spillovers, ICT and productivity growth. *Oxford Bulletin of Economics and Statistics*, *79*(4), 592-618.

Crook, T. R., Ketchen Jr, D. J., Combs, J. G., & Todd, S. Y. (2008). Strategic resources and performance: a meta-analysis. *Strategic management journal*, *29*(11), 1141-1154.

Dai, Q., & Kauffman, R. J. (2002). B2B e-commerce revisited: Leading perspectives on the key issues and research directions. *Electronic Markets*, *12*(2), 67-83.

Devaraj, S., & Kohli, R. (2000). Information technology payoff in the health-care industry: a longitudinal study. *Journal of Management Information Systems*, *16*(4), 41-67.

Devaraj, S., & Kohli, R. (2003). Performance impacts of information technology: Is actual usage the missing link?. *Management science*, *49*(3), 273-289.

Damanpour, F. (1992). Organizational size and innovation. *Organization studies*, *13*(3), 375-402.

Deloitte (2017). *Global mobile consumer trends, 2nd edition.*
Available at: https://www2.deloitte.com/content/dam/Deloitte/us/Documents/technology-media-telecommunications/us-global-mobile-consumer-survey-second-edition.pdf
Accessed at: February 2, 2019.

Dierickx, I., & Cool, K. (1989). Asset stock accumulation and sustainability of competitive advantage. *Management science*, *35*(12), 1504-1511.

Falk, M. (2005). ICT-linked firm reorganisation and productivity gains. *Technovation*, *25*(11), 1229-1250.

Falk, M., & Hagsten, E. (2015). E-commerce trends and impacts across Europe. *International Journal of Production Economics*, *170*, 357-369.

Feeny, D., & Ives, B. (1997). IT as a basis for sustainable competitive advantage. *Managing IT as a Strategic Resource, ed. L. Willcocks, D. Feeny, and G. IsleiMcGraw-Hill, Maidenhead*.

Fuchs, M., Höpken, W., Föger, A., & Kunz, M. (2010). E-business readiness, intensity, and impact: An Austrian destination management organization study. *Journal of Travel Research*, *49*(2), 165-178.

Gibson, I., Rosen, D., & Stucker, B. (2015). Business Opportunities and Future Directions. In *Additive Manufacturing Technologies* (pp. 475-486). Springer, New York, NY.

GSMA (2017). *GSMA Intelligence Q4.*
Available at: https://www.gsmaintelligence.com/research/2017/09/global-mobile-trends-2017/639/
Accessed at: February 2, 2019.

Guerrieri, P., & Padoan, P. C. (2007). Modelling ICT as a General Purpose Technology, College of Europe.

Hagsten, E., & Kotnik, P. (2017). ICT as facilitator of internationalisation in small-and medium-sized firms. *Small Business Economics*, *48*(2), 431-446.
Hawari, A. A., & Heeks, R. (2010). Explaining ERP failure in a developing country: a Jordanian case study. *Journal of Enterprise Information Management*, *23*(2), 135-160.

Hennig, M., & Jardim, A. (1977). *Managerial woman*. Anchor Press/Doubleday.

Higón, D. A. (2012). The impact of ICT on innovation activities: Evidence for UK SMEs. *International Small Business Journal*, *30*(6), 684-699.

Hirschheim, R., Heinzl, A., & Dibbern, J. (Eds.). (2013). *Information Systems Outsourcing: enduring themes, emergent patterns and future directions*. Springer Science & Business Media.

Hitt, M. A., Ireland, R. D., Camp, S. M., & Sexton, D. L. (2001). Strategic entrepreneurship: Entrepreneurial strategies for wealth creation. *Strategic management journal*, *22*(6-7), 479-491.

Hoopes, D. G., Madsen, T. L., & Walker, G. (2003). Guest editors' introduction to the special issue: why is there a resource-based view? Toward a theory of competitive heterogeneity. *Strategic Management Journal*, *24*(10), 889-902.

Huang, Z., & Palvia, P. (2001). ERP implementation issues in advanced and developing countries. *Business process management journal*, *7*(3), 276-284.

E. Hunter, J., L. Schmidt, F., & B. Jackson, G. (1986). Meta-Analysis: Cumulating Research Findings Across Studies Sage Publications: Beverly Hills, 1982, 176 pp. *Educational Researcher*, *15*(8), 20-21.

Hunter, J. E., & Schmidt, F. L. (1995). *Methods of meta-analysis: Correcting error and bias in research findings*. Sage.

ITU UNCTAD (2007). *World information society report 2007: Beyond WSIS.*
Available at:
http://www.itu.int/osg/spu/publications/worldinformationsociety/2007/index.html
Accessed at: November, 30, 2018.

ITU (2013). *Measuring the Information Society*. Retrieved from:
http://www.itu.int/en/ITU-D/Statistics/Documents/publications/mis2013/MIS2013_without_Annex_4.pdf.
Accessed at: November 30, 2018.

ITU (2019). *International Telecommunications Union.*
Retrieved from: https://www.itu.int/en/about/Pages/default.aspx
Accessed at: November 30, 2018.

James, J. (2007). From origins to implications: Key aspects in the debate over the digital divide. *Journal of Information Technology*, *22*(3), 284-295.

James, J. (2012). The ICT Development Index and the digital divide: How are they related?. *Technological Forecasting and Social Change*, *79*(3), 587-594.

Jovanovic, B., & Rousseau, P. L. (2005). General purpose technologies. In *Handbook of economic growth* (Vol. 1, pp. 1181-1224). Elsevier.

Karimi, J., Somers, T. M., & Bhattacherjee, A. (2007). The role of information systems resources in ERP capability building and business process outcomes. *Journal of Management Information Systems*, *24*(2), 221-260.

Ketchen Jr, D. J., Hult, G. T. M., & Slater, S. F. (2007). Toward greater understanding of market orientation and the resource-based view. *Strategic management journal*, *28*(9), 961-964.

Kraemer, K. L., Ganley, D., & Dewan, S. (2005). Across the digital divide: A cross-country multi-technology analysis of the determinants of IT penetration. *Journal of the Association for Information Systems*, *6*(12), 10.

Kuratko, D. F., Ireland, R. D., Covin, J. G., & Hornsby, J. S. (2005). A model of middle–level managers' entrepreneurial behavior. *Entrepreneurship theory and practice*, *29*(6), 699-716.

Leff, N. H. (1984). Externalities, information costs, and social benefit-cost analysis for economic development: An example from telecommunications. *Economic Development and Cultural Change*, *32*(2), 255-276.

Li, J., Sikora, R., Shaw, M. J., & Tan, G. W. (2006). A strategic analysis of inter organizational information sharing. *Decision support systems*, *42*(1), 251-266.

Liang, T. P., You, J. J., & Liu, C. C. (2010). A resource-based perspective on information technology and firm performance: a meta analysis. *Industrial Management & Data Systems*, *110*(8), 1138-1158.

Lippman, S. A., & Rumelt, R. P. (1982). Uncertain imitability: An analysis of interfirm differences in efficiency under competition. *The bell journal of Economics*, 418-438.

Lightfoot, H. W., Baines, T., & Smart, P. (2011). Examining the information and communication technologies enabling servitized manufacture. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, *225*(10), 1964-1968.

Lockett, A., Thompson, S., & Morgenstern, U. (2009). The development of the resource-based view of the firm: A critical appraisal. *International journal of management reviews*, *11*(1), 9-28.

Lopez-Nicolas, C., & Soto-Acosta, P. (2010). Analyzing ICT adoption and use effects on knowledge creation: An empirical investigation in SMEs. *International Journal of Information Management*, *30*(6), 521-528.

Luftman, J., Lyytinen, K., & Zvi, T. B. (2017). Enhancing the measurement of information technology (IT) business alignment and its influence on company performance. *Journal of Information Technology*, *32*(1), 26-46.

Madon, S., & Krishna, S. (2018). *The Digital Challenge: Information Technology in the Development Context: Information Technology in the Development Context*. Routledge.

Maine, E., & Garnsey, E. (2006). Commercializing generic technology: The case of advanced materials ventures. *Research Policy*, *35*(3), pp.375-393.

Majumdar, S. K., Carare, O., & Chang, H. (2009). Broadband adoption and firm productivity: evaluating the benefits of general purpose technology. *Industrial and Corporate Change*, *19*(3), 641-674.

Malhotra, A., Gosain, S., & El Sawy, O. A. (2005). Absorptive capacity configurations in supply chains: Gearing for partner-enabled market knowledge creation. *MIS quarterly*, *29*(1).

Markus, M. L., & Robey, D. (1988). Information technology and organizational change: causal structure in theory and research. *Management science*, *34*(5), 583-598.

Mason, E. S. (1939). Price and production policies of large-scale enterprise. *The American Economic Review*, *29*(1), 61-74.

Matthews, P. (2007). ICT assimilation and SME expansion. *Journal of International Development: The Journal of the Development Studies Association*, *19*(6), 817-827.

Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Information technology and organizational performance: An integrative model of IT business value. *MIS quarterly*, *28*(2), 283-322.

Milgrom, P., & Roberts, J. (1995). Complementarities and fit strategy, structure, and organizational change in manufacturing. *Journal of accounting and economics*, *19*(2-3), 179-208.

Mithas, S., Ramasubbu, N., & Sambamurthy, V. (2011). How information management capability influences firm performance. *MIS quarterly*, *35*(1), 237.

Mody, A., & Dahlman, C. (1992). Performance and potential of information technology: An international perspective. *World Development*, *20*(12), 1703-1719.

Morrison, C. J. (1997). Assessing the productivity of information technology equipment in US manufacturing industries. *Review of Economics and Statistics*, *79*(3), 471-481.

Norton, S. W. (1992). Transaction costs, telecommunications, and the microeconomics of macroeconomic growth. *Economic Development and Cultural Change*, *41*(1), 175-196.

Ojukwu, D. (2006). Achieving sustainable growth through the adoption of integrated business and information solutions: A case study of Nigerian small & medium sized enterprises. *Journal of Information Technology Impact*, *6*(1), 47-60.

Park, S. R., Choi, D. Y., & Hong, P. (2015). Club convergence and factors of digital divide across countries. *Technological Forecasting and Social Change*, *96*, 92-100.

Penrose, E. T. (1959).The Theory of the Growth of the Firm. *NY: Oxford University Press*.

Peteraf, M. A. (1993). The cornerstones of competitive advantage: a resource-based view. *Strategic management journal*, *14*(3), 179-191.

Peteraf, M. A., & Barney, J. B. (2003). Unraveling the resource-based tangle. *Managerial and decision economics*, *24*(4), 309-323.

Popa, S., Soto-Acosta, P., & Perez-Gonzalez, D. (2018). An investigation of the effect of electronic business on financial performance of Spanish manufacturing SMEs. *Technological Forecasting and Social Change*, *136*, 355-362.

Porter, M. E., & Advantage, C. (1985). Creating and sustaining superior performance. *Competitive advantage*, *167*.

Posada, J., Toro, C., Barandiaran, I., Oyarzun, D., Stricker, D., de Amicis, R., ... & Vallarino, I. (2015). Visual computing as a key enabling technology for industrie 4.0 and industrial internet. *IEEE computer graphics and applications*, *35*(2), 26-40.

Rai, A., Patnayakuni, R., & Seth, N. (2006). Firm performance impacts of digitally enabled supply chain integration capabilities. *MIS quarterly*, 225-246.

Ram, J., Corkindale, D., & Wu, M. L. (2015). Examining the role of organizational readiness in ERP project delivery. *Journal of Computer Information Systems*, *55*(2), 29-39.

Ray, G., Muhanna, W. A., & Barney, J. B. (2005). Information technology and the performance of the customer service process: A resource-based analysis. *MIS quarterly*, 625-652.

Rochet, J. C., & Tirole, J. (2006). Two-sided markets: a progress report. *The RAND journal of economics*, *37*(3), 645-667.

Rogers, E. M. (2001). The Digital Divide. Convergence: The International Journal of Research into New Media Technologies, 7, 96-111.

Roller, L. H., & Waverman, L. (2001). Telecommunications infrastructure and economic development: A simultaneous approach. *American economic review*, *91*(4), 909-923.

Ross, J. W., Beath, C. M., & Goodhue, D. L. (1996). Develop long-term competitiveness through IT assets. *Sloan management review*, *38*(1), 31-42.

Rotter, G. S., & Portugal, S. M. (1969). Group and individual effects in problem solving. *Journal of Applied Psychology*, *53*(4), 338.

Ruivo, P., Oliveira, T., & Neto, M. (2012). ERP use and value: Portuguese and Spanish SMEs. *Industrial Management & Data Systems*, *112*(7), 1008-1025.

Rumelt, R. P., & Lamb, R. (1984). Competitive strategic management. *Toward a Strategic Theory of the Firm*, 556-570.

Sabherwal, R., Jeyaraj, A., & Chowa, C. (2006). Information system success: individual and organizational determinants. *Management science*, *52*(12), 1849-1864.

Sabi, H. M., Uzoka, F. M. E., Langmia, K., & Njeh, F. N. (2016). Conceptualizing a model for adoption of cloud computing in education. *International Journal of Information Management*, *36*(2), 183-191.

Santhanam, R., & Hartono, E. (2003). Issues in linking information technology capability to firm performance. *MIS quarterly*, 125-153.

Schubert, P., & Leimstoll, U. (2007). Importance and use of information technology in small and medium-sized companies. *Electronic Markets*, *17*(1), 38-55.

Sin Tan, K., Choy Chong, S., Lin, B., & Cyril Eze, U. (2009). Internet-based ICT adoption: evidence from Malaysian SMEs. *Industrial Management & Data Systems*, *109*(2), 224-244.

Stiroh, K. J. (2002). Information technology and the US productivity revival: what do the industry data say?. *American Economic Review*, *92*(5), 1559-1576.

Straub, D., Rai, A., & Klein, R. (2004). Measuring firm performance at the network level: A nomology of the business impact of digital supply networks. *Journal of Management Information Systems*, *21*(1), 83-114.

Subramani, M. (2004). How do suppliers benefit from information technology use in supply chain relationships?. *MIS quarterly*, 45-73.

Tanriverdi, H. (2005). Information technology relatedness, knowledge management capability, and performance of multibusiness firms. *MIS quarterly*, 311-334.

Teece, D. J. (2018). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. *Research Policy*, *47*(8), 1367-1387.

Tippins, M. J., & Sohi, R. S. (2003). IT competency and firm performance: is organizational learning a missing link?. *Strategic management journal*, *24*(8), 745-761.

Venkatraman, N., & Ramanujam, V. (1986). Measurement of business performance in strategy research: A comparison of approaches. *Academy of management review*, *11*(4), 801-814.

Venkatraman, N., & Zaheer, A. (1990). Electronic integration and strategic advantage: a quasi-experimental study in the insurance industry. *Information Systems Research*, *1*(4), 377-393.

Wade, M., & Hulland, J. (2004). The resource-based view and information systems research: Review, extension, and suggestions for future research. *MIS quarterly*, *28*(1), 107-142.

Wang, E. T., Tai, J. C., & Wei, H. L. (2006). A virtual integration theory of improved supply-chain performance. *Journal of Management Information Systems*, *23*(2), 41-64.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic management journal*, *5*(2), 171-180.

Willcocks, L. P., & Sykes, R. (2000). The role of the CIO and IT function in ERP. *Communications of the ACM*, *43*(4), 32-32.

Wong, P. K. (2002). ICT production and diffusion in Asia Digital dividends or digital divide?. *Information Economics and Policy*, *14*(2), 167-187.

Wu, F., Yeniyurt, S., Kim, D., & Cavusgil, S. T. (2006). The impact of information technology on supply chain capabilities and firm performance: A resource-based view. *Industrial Marketing Management*, *35*(4), 493-504.

Zhu, K. (2004). The complementarity of information technology infrastructure and e-commerce capability: A resource-based assessment of their business value. *Journal of management information systems*, *21*(1), 167-202.

Zhu, K., Kraemer, K. L., & Dedrick, J. (2004). Information technology payoff in e-business environments: An international perspective on value creation of e-business in the financial services industry. *Journal of management information systems*, *21*(1), 17-54.

Zhuang, Y., & Lederer, A. L. (2006). A resource-based view of electronic commerce. *Information & Management*, *43*(2), 251-261.