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# The effect of dynamic capability to technology adoption and its determinant factors for improving firm's performance; toward a conceptual model

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## Abstract

Based on TOE framework this paper analyze the influence of the Dynamic capabilities (DCs) associated with technology adoption for improving firm's performance. This study proposed technology adoption as a functional competence/ capability which mediate relationship between DC with firm's performance. It is focusing on the determinant factors of technology adoption at firm level and showing a conceptual model of the indirect effects of DCs at firm level, which can be key predictors of firm performance in dynamic environment. The four determinant factors has been identified are externalities, entrepreneurial leadership, slack resources, and absorptive capability. The results of this research is mostly relevant to top corporate executives (BOD) or top management team (TMT) who seek to provide some supporting "hardware" content, and to improve firm's "software" ability, in order to achieve a successful technology adoption in their organization. A further research for showing its empirical results is highly recommended.

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*Keywords:* Technology Adoption, TOE framework, Dynamic Capability.

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## 1. Introduction

Recently it is widely accepted on strategic management literatures that technological change and innovation are fundamental sources of productivity and sustainable growth (Woodward, 1965; Thompson, 1969; Perrow, 1970; Stevenson, 1983; Markides, 1997; Morris, 1998; Johnson and Scholes, 2002; Acevedo, 2002; O'Mahony and Ark, 2003), technology adoption is a form of strategic innovation which is a fundamentally different way of competing in an existing business (Schumpeter, 1934; Hitt et. al., 2006;. Ireland and Webb, 2007; W. Riddell and Song, 2012) and the successful adoption technology in firms is significantly affect their competitive advantages especially firm's

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performance (Porter, 1985, 1990; Barney, 1991; D'Aveni, 1994; Hitt and Brynjolfsson, 1996; Cornford and Smithson, 2003; Rayport and Jaworski, 2004; Hatch, 2005; Kotler and Keller, 2006; Majundar et al., 2013).

Concerning to this issue then some research examining the use of technology in the production process to increase firm's productivity has been conducted in the 19th and 20th centuries (Abramovitz, 1956; Solow, 1957; Stephen and Prescott, 1994; Saloner and Shepard, 1995 etc). Then a range of studies have linked technology to firm performance, as measured through wages, firm productivity, growth, and other factors (Acevedo, 2002). Many researches argue that technology adoption brings down the operational costs (Amado et al., 2010), contributes 6 to 81% marginal increase in output (Brynjolfsson and Hitt, 2000; Adewoje et al., 2012), not only improve the efficiency (cost reduction) but also increases the effectiveness (improve performance and make the organization more flexible and better accountability) (Sabbaghi and Vaidyanathan, 2008; Rusli, 2012), reduce environmental impact instead of lowering energy costs (Bressler et al.; 2011), and also leads to significant reduction in firm mortality (Sinha and Noble, 2008).

However, the impact of technology adoption especially on information and communication technologies (IT/ICT) remains uncertain. The relationship between technology and productivity has long been debated over the last few decades. Some empirical studies in the 1980s and in the early 1990s did not find relevant productivity improvements associated with IT investments (Becchetti et al., 2003). Additionally Berndt and Morrison (1995) also found a negative relationship between profitability and investment in computer equipment. In this context, the notion of productivity paradox of IT was created and has been one of the main issues in IT research areas (Brynjolfsson and Hitt, 1996; Rai et al., 1997). While Shu and Stressmann (2005) noticed that even though Information and communication technologies have been one of the most essential dynamic factors relating all efforts, it cannot improve banks' earnings in terms of return on assets. Eventually a quantitative research by Jawabreh et al. (2012) found that there is a negative correlation between IT adoption with a profit rate of the airlines firm.

This paradox requires further research to examine what are initially the determinant factors of technology adoption? Is its context and content affect the influence to the firm's performance?

## 2. Literature Review

Recognizing the determinant factors of technology adoption will be highly useful for its successful implementation to achieve the organization objectives (Tornatzky and Fleischer, 1990; Ireland and Webb, 2007). Strategically, the successful adoption technology in firms is significantly affect their competitive advantages especially firm's performance (Porter M., 1985, 1990; Erickson et al., 1990; Barney, 1991; Hitt and Brynjolfsson, 1996; Cornford and Smithson, 2003; Lasry and Callahan, 2004; Rayport and Jaworski, 2004; Kotler and Keller, 2006; Majundar et al., 2013).

Practically using a strategic management cases approach (Wit and Weyer, 2010) technology adoption can be classified into two major emerging contents; IT (Information Technology) or ICT (Information and Communication Technology) and Non-IT adoption. IT/ICT is commonly a general technology which is applicable to all users at many level organization (e.g. internet, computer/laptop, mobile phone, SMS, smart phone, GPS etc) and a specific technology for solving particular industrial problems such as SCM (Supply Chain Management), RFID (Radio Frequency Identification), the Enterprise Resource Planning (ERP) and Electronic Data Interchange (EDI) etc. Otherwise Non-IT is mostly a company specific technology to meet some special need of firms or industry such as: CNC (Computer Numerical Control), CFD (Computerized Fluid Dynamic), 3D scanner, Automation Manufacturing equipments etc. Nevertheless some Non-IT can be classified as system specific technology such as Fuzzy logic, Solar thermal, Artificial intelligence, Photo voltaic, Synthetic fuel and so on.

Then contextually, the study of technology adoption can be approached from several levels (Taylor and Tod, 1995). Some researchers investigated the adoption from a macro-view within social context or at country level (Kiiski and Pohjola, 2002; Ferle et al., 2002). Others have examined this issue at an organizational or intra-firm level (Harrison et al, 1997; Plouffe et al., 2001). Some other research focused to investigate technology adoption by the individual determinants (Mathieson 1991; Davis 1989, Vinkatesh et al., 2003 etc).

Extending Taylor and Todd's (1995) classification, the research on the determinants of technology adoption can be distinguished into three stream; first, those based on intention-based models relying on how users accept or not accept and further use or reject technology; second, diffusion innovation focusing to why and how a new technology spread around organization or community; and third, how the new technology affect the goal, objective and performance of

organization. The first stream is exemplified by such theories as the Technology Acceptance Model or TAM (Davis 1986, 1989; Davis et al., 1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). The second major is primarily represented by Diffusion of Innovation or DOI theory (Rogers, 1963; 1983; 1995), and Technology Adoption Life Cycle or TALC model (Rogers et al., 1957; Moore, 1991). Then the last one is dominantly explained by organizational theory such as Technology Organization and Environment or “TOE” framework (Tornatzky and Fleischer, 1990).

Considering the content and context of research and exploring all those main related theories, this paper propose TOE framework as the most relevant theory for searching the determinant factors of technology adoption at firm level using their three elements which present both constraints and opportunities for technological innovation (Tornatzky and Fleisher, 1990). These elements influence the way a firm sees the need for, searches for, and adopts new technology. Indeed, as the TOE framework includes the environment context (not included in the DOI theory), some researches consider this model to be more complete, comprehensive and becomes better able to explain technology adoption in intra-firm level generally (Oliveira and Martins, 2011).

Meanwhile considering the technology adoption is a process to manage some resources relating to use and utilize technology, it also can be analyzed and determined by RBV (Resource Based View) theory. So in order to develop that competitive advantage the firm must have resources and capabilities that are superior to those of its competitors (Barney, 1991). Yet RBV is essentially a static theory since it does not explain how the firm resources and capabilities evolve over time to be the basis of competitive advantage (Priem and Butler, 2001). RBV research doesn't essentially examine about these effects of a firm's external environment on managing resources (Bettis and Hitt, 1995). Hence there is a need of theory which should not just view a firm as a bundle of resources, but note also the mechanisms by which the firms learn and accumulate new skills and capabilities, and the forces that limit the ratio and direction of this process' (Teece et al., 1990). From there comes the concept of "dynamic capability" that refer to the firm's ability to alter the resource base by creating, integrating, recombining and releasing resources in turbulence and quick changing environment (Eisenhardt and Martin, 2000).

However empirical study of dynamic capabilities remains relatively rare (Pablo et al., 2007). Indeed, the most important relationship in this field is the one between dynamic capabilities and performance (Barreto, 2010). The literatures are divided about the links between dynamic capabilities and competitive advantage or firm performance (Cepeda and Vera, 2007). Some explain that there is a direct relationship between firms' dynamic capabilities and their performance or competitive advantage (Teece et al., 1997; Makadok, 2001; Zollo and Winter, 2002). Others have also linked dynamic capabilities to competitive advantage but have asserted that this link was indirect (Eisenhardt and Martin, 2000; Zott, 2003; Helfat and Peteraf, 2003; Bowman and Ambrosini, 2003; Wang and Ahmed, 2007). Then contrary with those, after examined the dynamic capabilities' notion and firm performance, Helfat et al. (2007) argue that dynamic capabilities do not necessarily lead to competitive advantages.

These existing various relationship requires further research to examine what are the determinant factors of dynamic capability's effect? What is relationship with technology adoption?

### 3. Proposition

In firm context, TOE framework was commonly developed to identify the three dominant aspects or latent variables influencing the process of a technology adoption and implementation (Tornatzky and Fleischer, 1990). The TOE suggests that adoption is influenced by technology development (Kauffman and Walden, 2001), organizational conditions, business and organizational reconfiguration (Chatterjee et al., 2002), and industry environment (Kuan and Chau, 2001).

#### 3.1. *Slack Resources*

Both technological context and organizational context describes that technology adoption depends on the pool of resources exceeding of the minimum necessary to produce a given level of organizational output or Slack resources which is ready to use (Zhu and Kraemer, 2005; Lin, 2006). It is raw material input to technology adoption process includes tangible and intangible assets (Prakash et al., 2008). In addition technological context describes that adoption depends on the pool of technologies inside and outside the firm (availability), compatibility (both technical and organizational), complexity (learning curve) and maturity (application level) (Tornatzky and Fleischer, 1990; Zhu and Kraemer, 2005; Lin, 2006; Venkatesh and Bala, 2012).

Instead of technology, some TOE -focused researches present that slack sources for technology adoption are financial (Kuan and Chau, 2001; Franquesa and Brandyberry, 2009), knowledge (Jeyaraj, Rottman, and Lacity, 2006; Sabherwal, Jeyaraj, and Chowa, 2006; Lin, 2013, Wang et al., 2013), and employee or human capital (Wang et al., 2013; Vanacker et al., 2013). In conclusion, slack resources have a positive effect on a firm's flexibility, and innovation in a dynamic environment (Damanpour, 1996; Judge et al, 2001) and provide organizations with the ability to be proactive as well as defensive in adopting new technologies or designing new lines of services (Nohria and Gulati, 1996; Levinthal, 1990; Lawson, 2001; Voss et al, 2008).

*Proposition 1; Slack resources is positively affecting the adoption of technology.*

### 3.2. Entrepreneurial Leadership

Many studies are considering one of the most important features of entrepreneurial leadership is known as creating value by discovering new opportunities in order to gain competitive advantages (Schulz and Hofer, 1999), the value of slack resources to create firm's flexibility, and thus innovation is highly important referring to the entrepreneurial leadership. Indeed slack resources do not exist by itself in an organization. It is created by an internal process decision within the company driven by the perception of the organizational leader. Then resources readiness both tangible and intangible will be mostly available and ready in organization within higher entrepreneurial leadership (Katz and Gartner, 1988; Sykes and Block, 1989; Hornsby et al., 1993). In addition Sharfman et al (1998) found that antecedent of firm's resource is closely related to the entrepreneurial leadership; elements in the firm's environment, firm characteristics and value and belief of the firm (McGrath and MacMillan, 2000).

*Proposition 2; the entrepreneurial leadership is positively affecting the slack resources.*

Following TOE framework, there are some relevant environmental factors influencing firm's technology adoption are the influence of partners (Kuan and Chau, 2001; Al-Qirim, 2006; Jeyaraj et al., 2006; Scupola, 2009), competitive pressure (Porter and Millar, 1985; Abrahamson, 1991; Iacovau et al., 1995; Kuan and Chau, 2001; Zhu et al., 2004), regulatory compliance (Lyytinen and King, 2006; Lai, 2008; Lin, 2013). While in line with the growing of public awareness, the social issues also been recognized as a critical factor that can impact technology adoption (Helper, 1995; Hubbard, 1998).

### 3.3. Externalities

Other some researches clearly find that the influence of partners commonly as "network effects" are likely to significantly impact technology adoption since they affect the expected benefit from a new technology that exist with other firm assets (Katz and Saphiro, 1986; Chari and Hopenhayn, 1991; Rogers, 1995). Some empirical researches found evidence for the role of network effect in their study of technology adoption in various industry; banks (Saloner and Shepard, 1995), telecommunication firms (Majumdar and Vankataraman, 1998), supply chain (Lee et al., 2001) and RFID (Amlaku et al., 2012).

*Proposition 3; the externalities is positively affecting the adoption of technology.*

Instead of its effect to technology adoption, externalities also have influence to the leader's perceive in how to manage the organization more efficiently and effectively. Effect of externalities is mostly related to the character and behavior management in the organization interacts with its environment dynamics; organizational leadership. When the industry environment is more competitive, turbulence and unpredictable then consequently it brought severe pressures to bear on the type of analytical approaches to management that were the cornerstone of competition then no longer feasible to think that analytical planning will lead to competitive success (Bettis and Hitt, 1995; Gupta and MacMillan, 2004). At this turbulence and chaos environment where the power of analytical leadership is diminished, the need the entrepreneurial leadership by organization is higher (McGrath, 1997; Brown and Eisenhardt; 1998).

Then in recent circumstance which is dynamic, turbulence, uncertainty and unpredictable, the organization context mostly refers to "the entrepreneurial leadership" (McGrath and MacMillan, 2000; Tarabishy et al., 2005). In the dynamic, complex, and uncertain competitive environment, a type of entrepreneurial leader who is distinct from the behavioral form of leader is highly needed (Cohen, 2004; Tarabishy et al., 2005). However, considering the need and emergence of entrepreneurial leadership caused basically by recent circumstance which is dynamic, turbulence, uncertainty and unpredictable, so entrepreneurial leadership clearly was affected by externalities (McGrath and MacMillan, 2000; Cohen, 2004; Tarabishy et al., 2005).

*Proposition 4; the externalities is positively affecting the entrepreneurial leadership.*

Another issue addressed by this research is lacking any studies that show a correlation between the particular models in relationship to firm's performance in dynamic circumstances. Using RBV logic, most previous research of technology adoption - as one of resource management processes - is mostly connected to firm's competitive advantages (Sirmon et al., 2007). Therefore RBV's main focus is the company's ability to maintain its resource combination that cannot be duplicated or manipulated by competitors (Barney, 1991). Whereas achieving long-term success requires that firms possess not only the operational capabilities and competencies to compete in existing markets by VRIN resources, but also the ability to recombine and reconfigure assets and organizational structures for adapting to emerging markets and technologies (Teece et al., 1997; Makadok, 2001; Helfat et al, 2007).

#### *2.4. Dynamic Capability*

Many previous studies investigating deeper and extend the technology adoption by RBV logic then lead them to be static processes. Meanwhile, to sustain their competitive advantage, firms need to renew their stock of valuable resources as their external environment changes by their Dynamic capabilities processes (Teece, Pisano, and Sharen, 1997; Makadok, 2001; Helfat et al, 2007; etc.). Then this study wants to examine relationship the determinant factors of technology adoption and the Dynamic capabilities (DCs) components in form of absorptive capability (Wang, and Ahmed, 2007; Cabral, 2010).

Absorptive capacity has been widely researched at the level of firms, sectors, regions and nations, based on a wide consensus (Abreu et al., 2007). Then consequently it has undergone major refinement, and today a firm's absorptive capacity is mostly conceptualized as a dynamic capability. It is the ability of the organization to recognize the values of novelty in the external form then assimilate and apply it for commercial purposes or the company's ability to evaluate and utilize external knowledge as the primary purposes of the level of prior/previous knowledge (Cohen and Levinthal, 1990). Specifically, absorptive capability measures a firm's ability to absorb, assimilate, and exploit an innovation throughout a firm (Link and Siegel, 2002). The higher a firm demonstrates its absorptive capability, the more it exhibits dynamic capabilities. Firms with a high level of absorptive capacity likely harness new knowledge to enhance their innovative activities (Zaheer and Bell, 2005).

Regardless there is different views of DC's effects to firm's advantages, recently there are emerging researches arguing that dynamic capabilities build and reconfigure resource positions (Eisenhardt and Martin, 2000), zero-order capabilities (Winter, 2003), operational routines (Zollo and Winter, 2002) or operational capabilities (Helfat and Peteraf, 2003) and, through them, affect performance. This chain of causality designates an indirect link between dynamic capabilities and performance. The indirect relationship results from the idea that dynamic capabilities originate and define the firm's individual resource configuration including functional capability processes, which shapes the firm's competitiveness and therefore performance (Porter, 1994; Galunic and Eisenhardt, 2001; Zott, 2003).

Then some recent literatures show that the indirect effect of dynamic capabilities to firm performance is mediated by three interrelated functional capabilities - coordination capability, learning capability and strategic competitive response capability (Protogerou et al., 2008; 2011), the human ability to reconfigure, combine and integrate knowledge (Teece et al, 1997; Gómez and Vargas, 2012), capability development (Brady and Davies 2004; Woiceshyn and Daellenbach 2005; Athreye 2005), the repeatable processes - structures and routines (Harrell, O'Reilly and Tushman, 2007), and other more general actions that foster coordination and organizational learning (Gulati et al., 2002).

Therefore this paper argues that technology adoption is one of functional capabilities/ competence which mediates relationship between absorptive capability to firm's performance.

*Proposition 6; the absorptive capability is positively affecting the adoption of technology.*

While considering that one of the DC practices is "vicarious learning" or learning from the actions of other firms (Levinthal and March, 1993; Haunschild and Miner, 1997), some scholars have long observed that the learning plays an essential role in complementing and sometimes substituting for an organization's own experience, especially in the scenario of adopting new practices, technologies, and strategic positions (Li, and Usher, 2000; Beckman and Haunschild, 2002; Srinivasan et al., 2007). Therefore absorptive capability also depends on prior knowledge and facilitates cumulative learning of new related knowledge, efficient and effective coordination or integration of activities internal to the firm, as well as external coordination of activities and technologies, via strategic alliances,

outsourcing, technological collaborations, formal or informal networks between industries, and between industry and university laboratories (Lewin and Massini, 2003).

It means firm need much resource to achieve effective absorptive capability development. Within sufficient slack resources firm will be able to have higher absorptive capability demonstrating stronger ability of learning from partners, integrating external information and transforming it into firm-embedded knowledge (Cohen and Levinthal, 1990).

*Proposition 7; the resources readiness is positively affecting the absorptive capability*

Meanwhile Thong and Yap's (1995) used two main categories of factors influencing firm capabilities configuration which are individual characteristics (CEO innovativeness, attitude towards adoption, and technology knowledge), and organizational characteristics (business size, competitiveness of environment, information intensity). Then Sarker and Valacich (2010) using data analysis showed that intrapreneurship culture is a valuable key capability that predicts firm market performance dynamically; both technological and managerial resources have a positive effect on the development of an intrapreneurship culture in the firm. They also suggested that investment in both technological and managerial capabilities influences firm performance positively by means of the capability of intrapreneurship culture. In line with those view, Zahra et al. (2006) developed a conceptual model of how DCs are developed in entrepreneurship culture. Then using a similar international context and RBV-based study, empirically Lu et al. (2010) showed that the resources of institutional capital and managerial effects on firm's international performance are channeled through each firm's dynamic capability.

In addition Ambrosini and Bowman (2009) argued that dynamic capabilities are shaped by enabling and inhibiting variables within and outside the firm, including the perceptions (mindset) and motivations (vision) of managers (or leader). Within its function for creating and constructing the entrepreneurial culture and also building the learning organization, entrepreneurial leadership is highly correlated to the dynamic capability (Gibb, 1993; Burns, 2005).

*Proposition 8; the entrepreneurial leadership is positively affecting the absorptive capability.*

However absorptive capability also highly depends on technological collaborations, formal or informal networks between firms with its external such as industries and professional group, and between industry and university laboratories (Lewin and Massini, 2003). Furthermore, this relationship will increases the effectiveness of knowledge absorption capability as it enhances the complementary of experience inside the firm (Cohen and Levinthal, 1990). While the external pressure in form of highly intensive competition and mandatory regulation push organization and employees to learn quickly and build strategic assets such as technology and customer feedback to adapt well with the rapidly changing circumstance. Then collaboration and partnerships can be a learning resource for an organization that helps companies to recognize dysfunctional routines and to avoid hidden strategic constraints (Teece and David, 2007).

Hence DC's central focus is on the degree of 'fit' over time between an organization's changing external environment and its changing portfolio of activities and capabilities (Porter, 1996). In addition Helfat et al.'s study (2007) stated that all dynamic capability processes by adapting, integrating and reconfiguring internal and external organizational skills, resources and functional competences in order to match the requirements of a changing environment. It is emphasized later by Rindova and Kotha (2001) explaining how dynamic market and turbulence industry push firms enter tough competition through their continuous organizational morphing and dynamic capabilities.

*Proposition 8; the externalities is positively affecting the absorptive capability.*

Then considering some previous researches focusing on technology adoption as one of strategic corporate issue, the study want to investigate the effect of technology adoption to firm's performance. Although there is still debatable result of technology adoption's effect to firm's performance, most literatures show that use of new technology in the production increase firm's productivity (Abramovitz, 1956; Solow, 1957; Stephen and Prescott's, 1994; Saloner and Shepard, 1995 etc). Technology adoption brings down the operational costs (Saloner and Shepard, 1995; Rebb, 2004; Chandrasekhar et al., 2008; Amado et al., 2010), contributes up to marginal increase in output (Brynjolfsson and Hitt, 2000; Adewoje et al., 2012), increases the effectiveness of firm (Milne, 2006; Sabbaghi and Vaidyanathan, 2008;

Rusli, 2012), reduce environmental impact and energy costs (Bressler et al.; 2011), and also leads to significant reduction in firm mortality (Sinha and Noble, 2008).

*Proposition 9; the adoption technology is positively affecting the firm's performance.*

The all above proposition suggest that there are five paths of technology adoption process in firm level. A conceptual theoretical model will be constructed by connecting all propositions together. Putting the externalities as an antecedent, it drive all scenarios within three determinant factors; entrepreneurial leadership, absorptive capability and slack resources. In summary, the relationship between propositions can be seen as the following figure:

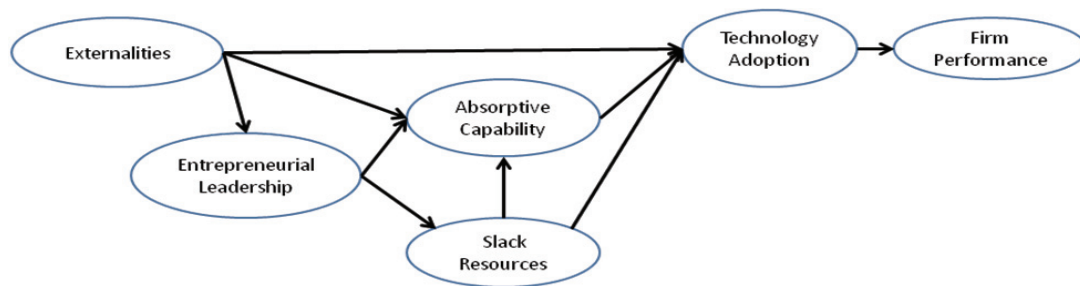


Figure 1. The proposed conceptual model

#### 4. Discussion

By focusing on the determinant factors of technology adoption at firm level, this study would like to contribute to the broader study of RBV and dynamic capability. Toward hypothetical model, this paper highly suggest further study to find and test the correlation of technology adoption's antecedents - in form of TOE factors - on firm performance and then connect them to the firm's DCs. Many studies using TOE framework has proven to show that the determinants factors as antecedents has significant relationship with technology adoption for enhancing firm's performance (Williamson, 1983; Porter and Millar, 1985; Abrahamson, 1991; Kuan and Chau, 2001; Zhu et al., 2004; Al-Qirim, 2006; Jeyaraj et al., 2006; Scupola, 2009; Lai, 2008; Lin, 2013). However, again, there is no study connecting directly the TOE factors to the DC's especially to show the technology adoption as a functional competence/capability both theoretically and empirically. In addition there is also a lack of studies using the DC's approach in technology adoption, to see the influence of DC's to the technology adoption and its determinant factors, and further firm's performance.

On the hand it should be noticed that there is no single view of the proposed conceptual model and its main variables. For example, externalities and slack resources mostly have ambiguity perceived. Although many studies support the need resources for technology adoption but there is also the opposite view of it. There are basically two divergent views of the value of slack resources (Zinn and Flood, 2009). One approach sees slack resources as a sign of inefficiency, that is, either too much money is spent to produce the output or the output exceeds what is needed or desirable. The other view focuses on the potential of slack resources to permit managers to act strategically to exploit opportunities, such as to expand hospital services or to increase demand by partnering with insurers. It means the resource positions are perceived, relative, transient and multidimensional; that is, they reflect the entrepreneur's perception of available resources relative to demand (Dolmans, 2014). However selection the measured variables which represent the proposition for further empirical test should be validated comprehensively.

Theoretically this paper is expected for contributing to the current corpora of knowledge on dynamic capability, and strategic management, as well as on RBV and diffusion of innovation/technology adoption. Its specific contribution is the conceptual demonstration of the indirect effects of DC's at firm level, which can be key predictors of firm performance in dynamic environment. In conclusion, this study:

1. Will enrich the relationship between Technology Adoption (TA) and firm's performance in dynamic process and rapid changing environment.
2. Will expand the previous studies which propose TA as a functional capability mediating DCs to enhance Firm's performance (Wang and Ahmed, 2007; Ambrossini et al., 2009).

3. Will explore the previous TA study (Oliveira et.al, 2011) that TOE is more comprehensive and better to explain TA in firm level, then connecting the TOE factors with DCs (Dynamic Capabilities). Several studies have established the link between technology adoption and firm performance using TOE perspectives, but none has examined the relationship with DCs.
4. Will show that TA is not static processes, it will be also depended on the dynamic of human capital and capability to cope with the business environment changes.
5. Will investigate effect of DCs to technology adoption and its determinant factors and inter correlated among them to achieve a better firm performance.

To achieve a robust hypothetical model, this study will be limited and bounded into several conditions. First, the technology adoption in this study is defined as “output”; it is an outcome of the process of search and selection; technology options are selected by the organization; detailed understanding is gained; and the new technology is used in new products/services (Mirvis et al., 1991; Hall and Kahn, 2002; Taylor, 2010). Second, it should be noticed that in this research, technology adoption notion in organization context rather than personal/individual. This research does not examine individuals’ technology adoption processes which are mainly closed to the psychological and individual behaviour study. Third, this study will be conducted at intra-firm level (business unit) with its content can be both IT and Non IT in accordance with the type of firm. Fourth, time of span of study can be longitudinal or non series. If it will be longitudinal, this study should provide any longitudinal or time series data which examine the past, present, and future of the relationships.

In practical, management should realize that technology adoption is not static process. It is not only about relationship between some resources both inside and outside organization but also the ability of the organization to recognize the values of novelty in the external form then assimilate and apply it for commercial purposes or the company's ability to evaluate and utilize external knowledge as the primary purposes of the level of prior/previous knowledge. Without capability - at next higher order - for managing the resource, the core competence (VRIN resources) of firm will not occur, thus it means no competitive advantages emerge. In addition, managers should utilize “vicarious learning” or learning from the actions of other firms because technology adoption dynamic processes can be emerged by inter-related firm responds.

Then considering that the externalities is antecedent of technology adoption, managers must be more responsive to all its variables such as regulation, social issues, networking and so on. Practically to achieve a successful technology adoption managers must be acknowledge that the influence of partners commonly as “network effects” are likely to significantly impact technology adoption since they affect the expected benefit from a new technology that exist with other firm assets. Therefore the successful adoption is not only depends on prior knowledge and facilitates cumulative learning of new related knowledge but also to the managerial capability; how efficient and effective coordination or integration of activities internal to the firm, as well as external coordination of activities and technologies, via strategic alliances, outsourcing, technological collaborations, formal or informal networks between industries, and between industry and university laboratories. Company like Walmart has proven how they successfully adopt RFID technology for boosting the firm’s performance with involvement their all supply chain form manufacturers or vendors to end-user customers. As well as Dell's success with their logistics and supply chain technology adoption.

## 5. Conclusion

This paper has identified four determinant factors of technology adoption; externalities, slack resources, entrepreneurial leadership and absorptive capability. Absorptive capability has close relationship with the technology adoption and firm’s performance. The conceptual model of this paper is mostly relevant to top corporate executives (BOD) or top management team (TMT) who seek to provide some supporting “hardware” content such as technological factors, organizational factors, environmental factors, and to improve firm’s “software” ability such as absorptive capability in order to achieve a successful technology adoption in their organization. Firms should to provide “hardware content” and create such condition (TOE) then align them to “software” competency (DCs) for enhancing their performance by technology adoption. The technology adoption is not internal static process, it also depends on prior knowledge and facilitates cumulative learning of new related knowledge, efficient and effective coordination or integration of activities internal to the firm, as well as external coordination of activities and technologies, via strategic alliances, outsourcing, technological collaborations, formal or informal networks between industries, and between industry and university laboratories. Based on strong grounded theory and previous



researches, a robust conceptual model has been proposed. In deed to test this model a further empirical research is highly recommended.

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