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# SOFTWARE STARTUP GROWTH: THE ROLE OF DYNAMIC CAPABILITIES, IT INNOVATION AND CUSTOMER INVOLVEMENT

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# SOFTWARE STARTUP GROWTH: THE ROLE OF DYNAMIC CAPABILITIES, IT INNOVATION AND CUSTOMER INVOLVEMENT

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## Abstract

*The rising trend toward entrepreneurship and rapid advances in IT are encouraging many software startups to enter the market place. Software startups contribute to the society by creating jobs and by driving innovation. Research on the business of software development, so far, had concentrated mainly on established firms. This research-in-progress paper seeks to shed light on how software startups develop. IT innovation is considered as the direct source of software startup growth. And dynamic capability, in terms of learning capability, integration capability, and responsiveness capability are posited as influencing IT innovation. Notwithstanding the importance of pursuing IT innovation, software start-ups need to be closely watching market demands and changes. The action of customer involvement is viewed as enhancing the effect of dynamic capabilities on IT innovation. This paper aims to contribute to existing literature by investigating a little-studied phenomenon - software startup and formulating a software startup growth model. Furthermore, this paper attempts to advance the understanding of the theory of dynamic capabilities by specifying three types of dynamic capabilities and by examining their effect on IT innovation. Finally, it opens up an avenue of investigating the impact of the alignment between the customer involvement and dynamic capabilities.*

*Keywords: Software Startup Growth, Dynamic capabilities, IT innovation, Customer Involvement*

# 1 INTRODUCTION

Startups are new and small businesses designed to create new products and services under conditions of extreme uncertainty, and typically they are accompanied by high innovation-driven growth (Ries 2011). The focus of this paper is software startups. With the development of information technology, such as cloud computing and open source software, the barriers to entry for software startups have decreased significantly in recent years. Many software startups poured into the market place triggering intensive competition. Moreover, startup companies often display a lack of resources and operating history. Thus, the failure rate is extremely high with nearly 80% of startup companies failing in the competitive environment within their first three years (Feinleib 2011).

It is meaningful to understand software startup growth for the following reasons. From the practical perspective, software startups contribute to the society by creating jobs and by driving innovation (Hathaway 2013). Furthermore, the software industry is influencing the transformation of various industries (Hoch 2000). From the theoretical perspective, although the literature on entrepreneurship focuses attention on explaining the phenomenon of new venture growth, it considers startups in different industries as a whole (Bradley et al. 2011). Few studies solely lay focus upon software startups and explicitly consider the impact of IT artefacts when analysing their development. Many IS studies examine the factors influencing high-performance firms or firm failure, but few specialize on startups (Kim et al. 2011; Li et al. 2010). Reasons for younger and older firm failures are different. The bankruptcy risk is high when firms are new and small, and their failures are more likely attributed to the deficiency in resources and capabilities (Thornhill & Amit 2003). The IS literature has indicated the missing link between IT and entrepreneurship (Giudice & Straub 2011).

Software startups are flexible in nature because they have limited operating history and they cannot follow certain procedures to operate business like mature companies do. Therefore, flexibility-based capabilities are beneficial for them to build up business. Moreover, the software industry is characterized by the short product lifecycle. To get the first-mover advantage, software startups need to respond in a timely manner to the market demand and quickly enable the new product. Innovation is the heart of entrepreneurial process (Timmons & Spinelli (1994), so IT innovation is always the engine of driving a software startup company to move forward. During the course of enabling and maintaining IT innovation, software startups need to contact with customers. Therefore, dynamic capabilities, IT innovation, and customer involvement are three important factors contributing to software startup growth. The objective of this research in progress (RIP) paper is to investigate how software startups develop by examining the role of dynamic capacities, IT innovation, and customer involvement.

The paper aims to contribute to the literature in three ways. First, it proposes one of the empirical studies of which we are aware that examines the phenomenon of software startup growth. Second, it advances the understanding of the theory of dynamic capabilities by investigating the effects of three types of dynamic capabilities on IT innovation. Third, it also contributes to the theory of dynamic capabilities by proposing that engagement with customers enhances the positive influence of dynamic capabilities on IT innovation.

The remainder of the paper proceeds as follows: in the following section, the research gap is identified based on the literature review and expected contributions are spelled out. In the third section, the research model is presented, and hypotheses are proposed. In the fourth section, the research methodology including initial measurements development, data collection, and data analysis is delineated. Finally, the implications and limitations are discussed.

## 2 LITERATURE REVIEW

The theory of dynamic capabilities is considered as a useful complement of the resource-based paradigm for understanding how competitive advantage is achieved (Di Stefano et al. 2014). In comparison with the resource-based view which stresses organizational rents accruing from the resource-picking mechanism, the theory of dynamic capabilities advocates competencies of firms

come from the capability-building mechanism. Capabilities are defined as a firm’s ability to deploy resources based on developing, carrying, and exchanging information within the organization (Amit & Schoemaker 1993). Capabilities are analysed from different levels in terms of “zero order” and “first order” (Teece 2014). Zero-level capabilities are ordinary capabilities by which firms can make a living. By contrast, first-order capabilities are dynamic capabilities enabling a firm to change zero-order capability to adapt with external changes.

Dynamic capabilities are specifically associated with changes. Given that innovation represents a process of changes, dynamic capabilities are necessary during the course of achieving innovation. Although existing literature confirms the impact of dynamic capabilities on innovation (Lawson & Samson 2001; Lee & Kelley 2008), few studies have focused on the effect of dynamic capabilities on IT innovation. Innovation is a broad term that includes technical innovation and non-technical innovation (e.g. organizational innovation, marketing innovation) (OECD 2005). IT innovation is a subset of technical innovation that refers to the application of digital computer and communication technologies and the enablement of the created software (Swanson 1994). The success for different types of innovation is different (Ashfold 2004). Existing research rarely examines the role of dynamic capabilities in driving IT innovation, particularly in the context of software startups. Notwithstanding the importance of pursuing IT innovation, software startups need to be aware of what is going on the market. The execution of external-oriented actions can facilitate software startups to better utilize internal capacities to enable IT innovation. However, few extant studies take the alignment of externally-oriented actions and dynamic capabilities into consideration when conducting new venture performance. This paper will shed light on these ends.

### 3 RESEARCH MODEL

In this section, the software startup growth model is presented (as shown in Figure 1), and then the constructs, hypotheses, and control variables of the model are explained accordingly. Regarding the model, IT innovation is the direct source of software startup growth, software startups equipped with high level dynamic capabilities are more likely to enable IT innovation, and the engagement with customers enhances the effect of dynamic capabilities on IT innovation.

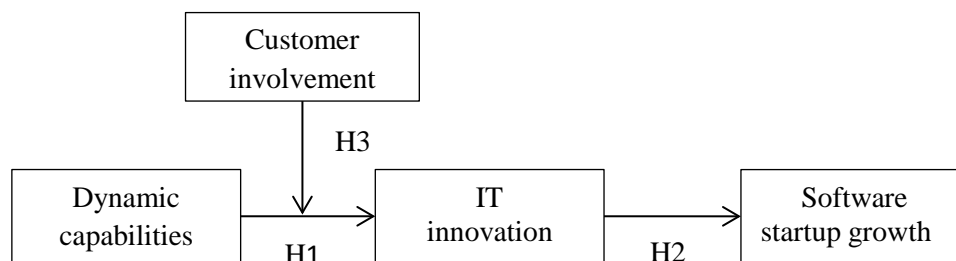


Figure 1. Software startup growth model

#### 3.1 Constructs

Definitions of software startup growth, dynamic capabilities, IT innovation, and customer involvement are introduced below.

##### 3.1.1 Software Startup Growth

According to the typical growth trajectory of small business, growth is an important milestone because it determines whether the business has the potential of growing to a mature company or not (Lewis & Churchill 1983; Scott & Bruce 1987). Following Davidsson’s (2005) viewpoint, small firm growth should be conducted from amount-change perspective (e.g. sale growth) as well as size-change perspective (e.g. market growth). Growth and high performance have different foci. Growth is the necessary stage that a firm must go through before achieving high performance. Functional organization structure, stable resource stock, and superior profitability can be utilized to indicate

whether a mature firm has the high performance or not. However, above indices cannot be used to examine a firm in the stage of growth. When achieving high growth, a startup might not be profitable, but it has demonstrated the ability of reconfiguring resources, delivering products, and keeping customers. During the course of growth, a startup experiences breakthrough changes from a simple existence to a workable entity. At the starting point, it is lack of resources and capabilities to enable new products or service. The organization is less functional and the market is highly unpredictable for the new business. To realize the high growth, software startups need to redeploy internal and external resources and to respond to external changes (Zahra et al. 2006). In the meantime, they ought to collect customers' feedback facilitating them to achieve IT innovation (Cheung et al. 2011).

### 3.1.2 *Dynamic Capabilities*

Software startups live in a hyper-competitive ecosystem, so flexibility-based capabilities are even important for them to survive. Stronger dynamic capabilities mean that firms have higher levels of flexibility to adapt with the volatile environment (Zahra et al. 2006). As claimed previously, because software startups lack operating history, they need to constantly learn and integrate the learned knowledge into existing working routines. Moreover, because the first-mover advantage is essential for software startups, they need to respond in a timely way to the market need and quickly launch the product. Thus, from perspectives of utilizing external resources and responding to the market demand, dynamic capabilities including learning capability, integration capability, and responsiveness capability are paramount for the development of software startups (Teece, 2007; Teece et al. 1997; Bowman & Ambrosini 2003). *Learning capability* is the capability by which organizational tasks can be completed better and quicker (Dodgson 1993). Within a particular company, learning capabilities stem from individual learning skills, and they generate benefits through collective learning that demands the effective knowledge transfer among individuals. Software startups always involve "learning by doing" and "learning by trying". For example, IT technical staffs need to acquire constantly new knowledge or skills, and to share the knowledge with their team members to improve software functionality. *Integration capability* is the ability to manage the business by integrating internal and external resources (Mitchell & Shaver 2003). Internal integration refers to interrelating different categories of knowledge within software startups. For instance, software startups need the alignment between the design knowledge and the marketing knowledge when launching the new product. External integration concerns the ability of connecting external knowledge with the design process. For example, software startups embed cloud computing into their software development process or integrate open source software into the development platform, which results in the low cost of working routines. Except for learning capability and integration capability, responsiveness capability is necessary for software startups to cope with the unstable environment. Software startups should be able to sense external opportunities or threats and respond in a good time. *Responsiveness capability* reveals the ability of reviewing or justifying existing activities including product performance, justifying customer need, and assessing advertising effects in a good time. The software startup ecosystem is characterized by extreme uncertainty and hyper-competition. Software startups need to be equipped with critical thinking on their designing or marketing activities, and they should have the ability to respond to costumers' need.

### 3.1.3 *IT Innovation*

The technology-driven innovation has a profound influence on new firm's survival (Giudice & Straub 2011). For software companies, the adoption of IT innovation enables them either to reduce operational cost or to pursue new opportunities. Generally, IT innovation is defined as the innovation in the organizational application of digital computer and communication technologies which can be considered as a sub-unit of the organization (Grover et al. 1997; Swanson 1994). IT innovation is interpreted as process innovation and product/service innovation. From the viewpoint of the process, IT innovation occurs when firms adopt new production methods to develop software. From the perspective of the product, IT innovation means the enablement of newly created software or service. To be specific, process innovation reflects changes of computing capabilities or improvement of the development process in software startups. For instance, to implement large scale reuse, software startups choose a particular design pattern. To adapt to changing customer needs, software startups

improve their design procedures. To reduce the operation cost, software startups use open source development tools or outsource work to the third party. Product or service innovation involves creating new software or delivering new services based on software creation. Two types of IT innovation are not isolated but interdependent with each other. The introduction of one type of IT innovation can generate the other type of IT innovation. For instance, changes of computing capability can bring about improvement of the development process, and then they can deliver a new product or new service.

#### *3.1.4 Customer Involvement*

Customer involvement is the externally-oriented action that refers to collaborating with customers for the purpose of innovation (Lusch et al. 2007). A software startup needs to remain a channel to communicate with the markets. As long as a software startup is aware of what is going on the markets, it will be in a better position to succeed. Customers, as valuable sources, can facilitate companies to have a deeper understanding of markets by contributing their ideas to a new product launch (Hanna et al. 1995). Co-creating value with customers is an important trend in relationship marketing (Lagrosen 2005) and it has shown its efficiency in the software industry (Cheung et al. 2011; Saldanha & Krishnan 2011). For software startups operating in a new marketplace, customers are the pivot sources of providing directions for them to cope with changes. The customer engagement, which is not limited to a certain format such as having a meeting with customers, can be carried out in many ways by software startups. For instance, customers can be testers of the created software. Customers may find out some problems when using the software and report them to the software startup. Then the software startup fixes these problems and follows up feedback from these customers. By continually communicating with these customers, the quality of the software is improved. In addition, during the course of co-working with customers, the software startup can identify potential customer needs and convert the needs into new products. Furthermore, for software startups producing customized software, the customer engagement is necessary. Software startups need to co-work with the enterprise customer and provide the software according to relevant requirements.

### **3.2 Hypotheses**

Based on our research model, we propose three hypotheses.

#### *3.2.1 Dynamic Capabilities and IT Innovation*

Dynamic capabilities including learning, integration, and responsiveness capability are essential for software startups to enable IT innovation. Learning capability is one of organizational factors that facilitate the organizational learning process (Alegre & Chiva 2013). Organizational learning is a dynamic process within which knowledge transferring from individual level to organizational level, and back again (Goh & Richards 1997). Innovation requires individuals acquire knowledge and share the knowledge within the organization (Jiménez-Jiménez & Sanz-Valle 2011). Therefore, learning capability is the critical antecedent of technical innovation in software startups. On the one hand, learning from experimentation is internally-focused learning that enables software startups to develop internal knowledge base (Kim et al. 1993). For instance, during the course of new product development, a software startup needs to learn from experiences of R&D activities. On the other hand, knowledge exchange with external environment is helpful for nurturing novel ideas (Cohen et al. 1990). Learning from external sources of knowledge, such as customers and competitors, facilitates software startups to generate IT innovation.

Integration capability helps software startups engage in IT innovation by smoothing internal communications across functional areas and by absorbing resources from the external environment. The success of IT innovation relies on R&D as well as marketing, so effective integration practices are quite essential. The higher the level of the integration capability is, the better the alignment of the different functional areas becomes. Moreover, during the process of new product development, software startups need to bring in constantly new resources such as new employees, new financial

support sources, and so forth. The superior integration capability indicates that the focal software startup can coordinate new resources with the existing resource stock.

Responsiveness capability enables firms to respond to the market need and the environment uncertainty (Heinrichs & Lim 2008). IT innovation is a process within which software startups need flexibly cope with changing market needs and tough technical challenges. The update of products in software industry is intensive. To maintain and improve the innovativeness of products, software startups need to be capable of responding to market demands. In addition, the feedback of the market is unpredictable when the new product being introduced into the market. Software startups need to have the ability of adapting with the uncertain market in a good time. Additionally, to outpace the competitors, the focal firm needs to react to actions of competitors in a timely way and to improve the product. Hence, we propose the first hypothesis as follows:

H1: Dynamic capabilities positively influence IT innovation in software startups.

### 3.2.2 *IT Innovation and Software Startup Growth*

Young firms are exposed to a higher risk of failure than established firms because they are short of resources and stable relationships with suppliers and customers (Cefis & Marsili 2005). Innovation enhances the chance of succeeding in the market and it plays a key role for the growth of new firms (Schumpeter 1942). Regarding software startups, IT innovation is the powerful vehicle driving them to grow rapidly. Recall, there are two types of IT innovation - product innovation and process innovation, being taken into consideration for software startups. Product innovation and process innovation are associated with the different stages of the business development (Milling & Stumpfe 2000). Most software startups enter the market on the basis of product innovation. As the firm age increases, process innovation becomes more important for software startups to maintain the product innovation. As the product is the guarantee of acquiring a stable market share, product innovation is critical for keeping and expanding the market share. Product innovation allows firms to provide differentiated products which serve a range of customer need. As a consequence, the focal software startup enhances its competitive position in the market.

Process innovation is interrelated to product innovation. The adoption of new processes brings in the high product quality and also the increased productivity. In the production process, software startups need to constantly adopt new approaches to renew the software creation. Moreover, the reengineering work brings in the low production cost and high product efficiency. Also, IT innovation is beneficial for the organizational change of software startups. Organizational change refers to the growth from the existing status to the aimed status in future (Lee 2010). Innovative software startups have the high likelihood of going through changes and growing rapidly. Hence, we propose the second hypothesis as follows:

H2 : IT innovation positively influences software startup survival in software startups.

### 3.2.3 *Complementarities between Dynamic Capabilities and Customer Involvement, and IT Innovation*

A software startup normally uses multiple channels to communicate with the market. External information facilitates them to better employ their capabilities to launch the new product, although internal capabilities are necessary for the development of software startups. Customer involvement such as collecting customers' feedback is considered one of the critical externally-oriented actions with the aim of establishing the close connection with customers (Kristensson et al 2008). Customer involvement facilitates software startups to avoid latter changes of software development. By engaging with customers in the process of the product development, software startups acquire external information which enhances the influence of learning capabilities on IT innovation. Although software startups can learn from their previous experiences of software development, customers' feedback on the product offer more valuable chances for them to utilize their learning capabilities to improve the created software. During the course of interaction with customers, software startups can more effectively use their integration capabilities to create software than without. For software

startups producing the customized software, they are typically required to have a comprehensive understanding of customers' requirements. The more frequent customer engagement, the more chances they can integrate customers' requirements to deliver the customized software. For software startups of which the customer is the individual, they face the situation of customer requirements differing from individual to individual. The greater the attention paid to customers' needs, the more likely software startups using the integration capabilities will coordinate different requirements into a product. Furthermore, the effect of responsiveness capability on IT innovation really depends on the degree of customer involvement. The closer collaboration with customers, the better software startups can respond to the market demand to maintain IT innovation. Hence, we propose the third hypothesis as follows:

H3: Customer involvement enhances the positive effect of dynamic capabilities on IT innovation in software startups.

### **3.3 Control Variables**

In the paper, we control firm age, establishment size, and industry segments which are highly related to firm growth. As suggested, the startup stage refers to the period when ventures are in their first six years (Timmons and Spinelli 1997). Establishment size refers to the initial number of employees. Large entrepreneurial team increases the venture's range of feasible strategies and the probability of effectuating a successful strategy (Aspelund et al. 2005). Moreover, as software firms in different segments face up different technology maturity and market dynamics, industry segments including infrastructure software and application software are considered as the third control variable (Bokhari 2007).

## **4 RESEARCH METHODOLOGY**

The initial measurement development, data collection, data analysis are introduced in this section.

### **4.1 Measurement Development**

For all variables, measurements will be adopted from existing literature (as shown in Table 1) and some modifications will be made according to our research context. Each item will be measured by a 7-point Likert-type scale. A number of scholars in the area will be invited to review our questions. Some modifications will be made based on their suggestions.

### **4.2 Data Collection**

After the initial measurement development, a pilot test using a small group of entrepreneurs will be conducted. The participants will be requested to make comments on the format, content, and wording of the measurements. Any ambiguous wording and any errors will be clarified based on their feedbacks.

An online survey method will be employed for collecting data. The firm age will be controlled less than six years. The establishment size will be controlled for less than 5 according to criteria of defining Australian micro-enterprises (Australian Bureau of Statistics 2001). Best practices of guaranteeing the response rate suggested by Dillman et al. (1974) will be followed. In order to avoid the threat of common method variance (CMV), as suggested by Podsakoff et al. (2003), respondents will be informed that their participation is anonymous and there is no right or wrong answer for each question, so that the evaluation apprehension will be reduced.

### **4.3 Data Analysis**

Before testing the model, SPSS will be used to examine data. The data will be cleaned for outliers, skewness, and kurtosis (Hair et al. 2010). Besides, other anomalies such as straight lining data in



which respondents give the same responses to all questions will be removed. Solutions for missing data will also be under consideration. Moreover, validation procedures for constructs will be conducted by following best practices (MacKenzie et al. 2011). Partial Least Squares-Structure Equation Modelling (PLS-SEM) is considered as an available option when constructs are multidimensional and formative (Hair et al. 2011). Therefore, PLS-SEM will be used to test the proposed model. Values of  $R^2$ , path weight, and significance will be reported.

Construct name-- type of Construct	Sub-construct --type of sub-construct	Items	Source or basis
IT Innovation (ITI) -- Formative	Process Innovation --Reflective	Number of process innovation, such as open source development, new specification techniques	Carlo et al. 2012
	Service Innovation --Reflective	Number of service innovation, such as innovation business intelligence using Internet, intranet	
Dynamic Capabilities (DC) --Formative	Learning Capability --Reflective	Managerial commitment, openness and experimentation, and knowledge transfer	Jerez-Gómez et al. 2005
	Integration Capability --Reflective	Internal integration and external integration	Johnson and Filippini 2013
	Responsiveness Capability --Reflective	Assess product performance, assess customer need, and assess promotional performance	Heinrichs and Lim 2013
Customer Involvement (CI) -- Reflective		Frequency of meetings , extent of consultation , representation of customers, and number of relevant tools used	Carbonell et al. 2009
Software Startup Growth (SSG) -- Reflective		Sales growth, employment growth, and market share growth	Davidsson et al. 2005

*Table 1. Measurement of constructs*

## 5 CONCLUSIONS

The paper seeks to contribute to IS literature in three ways. It provides a framework of investigating how software startups develop. It is one of few studies which conduct software startups by linking IS literature with entrepreneurship. Second, it advances the understanding of dynamic capabilities. From perspectives of utilizing external knowledge as well as responding to market demand, learning capability, integration capability, and responsiveness capability are deemed as important dynamic capabilities for software startups to pursue IT innovation. Furthermore, this paper opens a new avenue for future studies to consider the complementarity of externally-oriented action such as customer involvement and dynamic capabilities when conducting firm-level analysis.

As with any other research, the research has some limitations. The data will be collected from one country, Australia, which may address the limitation of generalizability. However, software startups in different segments: infrastructure and application will be selected. On the basis of results, similarities and differences in terms of segments will be compared. By doing so, the limitation of generalizability will be reduced to some extent. The data is currently planned to be collected in a cross-sectional manner. It is pointed out that cross-sectional studies are vulnerable to the inflation of common method variance (CMV) (Podsakoff & Organ 1986). As started beforehand, relevant approaches will be adopted to avoid the threat of CMV<sup>1</sup>.

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