

# A Study of the Relationship between Dynamic Capabilities and Firm's Dynamic Growth – A Case in Taiwan

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**Abstract**—Despite the many studies discussing dynamic capabilities and firm growth, there is still limited empirical evidence for the combination of the two. This paper aims to understand how firms build dynamic capabilities to respond to the dynamics of firm growth. The contributions of this study are as follows: In the different stages of firm growth, a) the way a firm builds its dynamic capabilities within five stages of firm development is similar to the ideas suggested in the product life cycle, such as incubation, birth, growth, stabilization, and re-creation; b) a firm's dynamic capabilities play different roles and are used to enhance product quality and solve key problems; c) managers should try to develop adequate dynamic capabilities without overlooking the mediating role of total quality management in the relationship of firm strategy and performance and needs to fully understand that the promotive determinant of dynamic capabilities also changes over time.

**Keywords**—Dynamic Capabilities; Firm Growth; Promotive Determinant; Product Life Cycle.

**Abbreviations**—AU Optronics Corporation (AUO); Chi-Mei Optoelectronics Corporation (CMO); Electronic Engineering (EE); Industry and Technology Intelligence Services (ITIS); Market Intelligence and Consulting Institute (MIC); Photonics Industry and Technology Development Association (PIDA); Radiant Opto-Electronics Corp. (Radiant); Thin Film Transistor-Liquid Crystal Display (TFT-LCD); Total Quality Management (TQM).

## I. INTRODUCTION

THE fundamental question in the field of strategic management is how firms achieve and sustain competitive advantage [Porter, 21; Rumelt et al., 22; Teece et al., 24]. This is a very important question but is difficult to answer. The literature on dynamic capabilities frameworks shows that the concepts or essentials of dynamic capabilities in the resource-based view of the firm are potential sources for achieving and sustaining competitive advantage [Ethiraj et al., 7; Teece et al., 24; Teece, 25; Eisenhardt & Martin, 30; Helfat et al., 31]. According to Teece et al., [24], dynamic capabilities are defined as the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments. Dynamic capabilities also demonstrate the capacity possessed by an organization to purposefully create, extend, or modify its resource base [Helfat et al., 31].

Dynamic capabilities must be built, maintained, and developed by the firms that possess them. It is necessary for the firms to make long-term inputs and commitments on this issue. Through the ways of coordinating and combining, a firm's competitive advantage depends on the distinctive processes shaped by the firm's specific asset positions, such as the firm's portfolio of difficult-to-trade knowledge assets and complementary assets, and the evolutionary path(s) that it follows or inherits [Teece et al., 24]. There is no single path of development for dynamic capabilities. Instead, different paths are effective for different types of dynamic capabilities and in different contexts [Teece et al., 24; McKnight, 2012]. In order to keep pace or stay ahead of the environmental dynamism, firms also build dynamic capabilities in response to ongoing environmental change by building and deploying dynamic capabilities faster than their competitors [Eisenhardt & Martin, 30].

Recent research has addressed how firms build and develop dynamic capabilities. For example, King & Tucci [14] found that prior experience plays a significant role in how a firm develops its capabilities. Danneels [6] argued that many organizational antecedents of dynamic capabilities are within managerial control. In fact, issues like slack resources, environmental scanning, willingness to cannibalize and constructive conflicts are factors that positively influence the development of dynamic capabilities. Akwei et al., [1] found the process for the creation of dynamic capabilities in the case of Rolls Royce and Sage PLC. Their findings reveal that dynamic capabilities are developed and renewed through continuous internal activities, such as in-house innovations, human resource activities, learning activities and external activities with partners, using collaborations and acquisitions. Hung et al., [11] also used dynamic capability approach to examine the adeptness of organizations in managing core processes related to organizational process alignment.

The dynamics of firm growth is also an important issue. Because many growth models fail to capture the important early stages in a firm's origin and growth, this paper adopts a framework established by Churchill & Lewis [5] to address the issue of small business growth. This framework for small business growth is divided into five stages: Existence (Stage 1), Survival (Stage 2), Success (Stage 3), Take off (Stage 4), and Resource maturity (Stage 5).

Despite the many studies in the field of dynamic capabilities and firm growth, there is still limited empirical evidence for a combination of the two. Therefore, this paper aims to study how firms build, maintain, and develop dynamic capabilities, in order to adapt their manufacturing operations in response to the dynamics of firm growth and to determine the role that dynamic capabilities play in their various growth stages. There is also a discussion of the variation in the development of dynamic capabilities, particularly in the different stages of small business growth.

The identification of these relationships advances the empirical understanding of the dynamics of firm growth and the development of dynamic capabilities. In order to achieve this objective, this paper adopted the case study method analyzing the longitudinal historical data of Radiant (Radiant Opto-Electronics Corp.), which is the first firm to specialize in backlight module R&D and manufacturing in Taiwan and recently became the world's largest backlight module firm. The backlight module is one of the key upstream components in the TFT-LCD (Thin Film Transistor-Liquid Crystal Display) panel industry.

## II. LITERATURE REVIEW

### 2.1. The Origins, Development, and Evolution of Dynamic Capabilities

Teece et al., [24] argued that because of imperfect factor markets or more precisely the non-tradability of "soft" assets such as values, culture and organizational experience, dynamic capabilities must be built and requires a firm to

make long-term commitments. Distinctive competences and capabilities generally cannot be acquired directly. It sometimes takes years or even decades to be built. Teece et al., [24] also identified several classes of factors that determine a firm's distinctive dynamic capabilities. They are organized in three categories: organizational and managerial processes (e.g., coordination/integration, learning and reconfiguration), positions (e.g. technological assets, complementary assets, financial assets, reputational assets, structural assets, market assets, and organizational boundaries), and path dependencies (e.g. technological opportunities and assessment).

Many studies have found that some factors play a significant role in how a firm develops its dynamic capabilities or facilitates the creation of dynamic capabilities by enabling the development of dynamic capabilities. Instances of these factors are sensing capabilities [Teece et al., 24], prior experience [King & Tucci, 14], experiential learning [Eisenhardt & Martin, 30], environmental scanning, willingness to cannibalize, constructive conflict [Danneels, 6], organizational learning [Zollo & Winter, 32], learning capabilities from original equipment manufacturer operations [Yung & Lai, 27], the role of a firm's history, learning, managerial capabilities [Bruni & Verona, 4; Kuuluvainen, 15], and quality management capabilities [Fening, 9; Lobo et al., 17].

Therefore, the common assumption that underlies the logic of dynamic capabilities is that a firm's evolution and change are non-random and depend on the firm's prior history. Consequently, a change is constrained and guided by past and present actions and by the organization's resource base [Kuuluvainen, 15]. According to this logic, a firm's competitive advantage or performance, in relation to growth, is expected to persist over time [Teece et al., 24; Helfat et al., 31].

### 2.2. Dynamic Capabilities and the Dynamics of Firm Growth

Many studies have analyzed the growth of firms. For instance, Learned et al., [16] argued that the real key to a firm's success, or even to its future growth, lies in its ability to find or create a competence that is truly distinctive. In order to explain the growth of a firm, Penrose [20] developed a resource creation perspective based on a dynamic between productive capabilities and market opportunities. Ijiri & Simon [12] found that a firm acquires an impetus for growth, perhaps by innovating in production or marketing processes or perhaps as an effect of new management staff or techniques. Erik & Karl [8] found that R&D efforts enable the exploitation of external knowledge because R&D plays several roles during the early life course of high-tech as well as high growth firms.

Teece [23] and Wernerfelt [26] also proposed that firm growth and competitive advantage requires the exploitation of existing internal and external specific capabilities of a company. Proponents of the resource-based view argue that valuable, rare, inimitable, and non-substitutable resources can

be a source of superior performance and may enable the firm to achieve sustainable competitive advantage [Barney, 3; Wernerfelt, 26; Yung et al., 28].

Teece et al., [24] took resource-based view to further advocate a dynamic capabilities framework. As previously mentioned, they defined dynamic capabilities as the firm's ability to integrate, build, and reconfigure internal and external competences, to address rapidly changing environments. In other words, dynamic capabilities affect a firm's resource base, which in turn is the source of the firm's competitive advantage [Ambrosini & Bowman, 29].

Prior studies have identified that a firm's growth or competitive advantage depends on distinctive competence, productive capabilities, inimitable and non-substitutable resources, or dynamic capabilities. Teece [25] further emphasized that if an enterprise possesses resources/competences without dynamic capabilities, it has a chance to make a competitive return for a short period but cannot sustain extremely competitive returns for the long term, except by chance.

### III. METHODOLOGY

#### 3.1. Case Study Approach

This study focuses on a historical analysis, rather than the contemporary period, because it seeks to understand the role of dynamic capabilities in the different stages of small business growth and the processes for developing dynamic capabilities over long periods of time. It selects the backlight module industry with a focus on Radiant, founded in July 1995, as the case to study such issues. There are two main reasons for selecting the backlight module industry. The first is that Taiwanese companies have been involved in backlight modules for less than 20 years and therefore it is an emerging industry with rapid development. Secondly, because of the increasing global demand for LCD panels (e.g. Notebook PC, LCD-TV and LCD-Monitor), Taiwanese companies have been undergoing a rapid development in the international backlight module market.

In addition, the principal reason for using the backlight module manufacturer, Radiant, as the single case for the study is that the company performs better than its competitors in the industry. When Radiant started in 1995, Japanese and Korean manufacturers had almost mastered the key technology, materials, and customers of the backlight module industry. However, despite the strong competitive pressure, Radiant survives and grows rapidly and has become the world's largest backlight module firm.

#### 3.2. Data

This study uses qualitative data, between 1995 and 2011, from the backlight module industry in Taiwan. Data sources include the backlight module firms' Annual Reports, the Information Industry Yearbook, the EE (Electronic Engineering) Times, the MIC (Market Intelligence & Consulting Institute), the ITIS (Industry & Technology Intelligence Services), and the PIDA (Photonics Industry

and Technology Development Association). Interviews were also conducted with some senior managers on the subject of the research question. Cross analysis of the data from these diverse sources offers different and valuable information describing the development of dynamic capabilities in the different stages of Radiant's growth.

## IV. ANALYSIS

#### 4.1. The Case: Radiant

Radiant was founded in July 1995 with a head office established in the Kaohsiung Export Processing Zone. It is Taiwan's first professional R&D center and manufacturing facility for backlight modules with specific focus on the design, manufacture, assembly, and marketing of the backlight modules.

Radiant has always devoted itself to upgrading production technologies and quality assurance systems. It was awarded the ISO 9001 in 1998 and has been importing advanced testing equipment and educating its subcontractors to enhance the quality and stability of its products.

Recently, the world's principal backlight module manufacturers in Taiwan and South Korea have been divided into two categories, as listed in Table 1: the TFT-LCD group-type and non TFT-LCD group-type. For example, the non TFT-LCD group-type, such as Radiant, Coretronics, or Kenmos, does not belong to any TFT-LCD panel manufacturers. Therefore, in order to sell their products to Samsung, LG Display, CMO (Chi-Mei Optoelectronics Corporation), or AUO (AU Optronics Corporation), they must possess higher capabilities than their TFT-LCD group-type rivals, such as Digital Innovation Display, Heesung, or Forehouse.

Table 1: The World's Major Large-Size Backlight Module Manufacturers and the Top 4 TFT-LCD Panel Manufacturers

TFT-LCD Panel Manufacturers	Backlight Module Manufacturers	The Main Application of the Product
<b>Samsung</b>	Digital Innovation Display (DID) Hansol Technics DS LCD Taesan LCD	NB(Notebook PC)  TV(LCD TV) MNT(Monitor), TV TV
<b>LG Display</b>	Heesung New Optics	NB, MNT, TV NB, MNT, TV
<b>AUO</b>	Forehouse Darwin	NB, MNT, TV TV
<b>CMO</b>	Chilin	MNT, TV
<b>Non TFT-LCD group-type</b>	Radiant Coretronics Kenmos	NB, MNT, TV NB, MNT, TV NB, MNT, TV

Source: MIC, January 2011

#### 4.2. The Dynamics of Radiant's Growth

This paper uses an established framework for small business growth proposed by Churchill & Lewis [5] for the study. There are five stages included in the framework: Existence

(Stage 1), Survival (Stage 2), Success (Stage 3), Take Off (Stage 4), and Resource Maturity (Stage 5). This study identified key factors in the different stages of Radiant's growth using the framework of these five stages.

Firstly, in Stage 1 (Existence), the main problems of the business are obtaining customers and delivering products and services to the customers with which it has contracted. Radiant devoted itself to the development and assembly of products during the start-up phase. For example, Radiant sold products not only to the company (e.g., Nan Ya) in Taiwan, but also to the company (e.g., Tai Shan) in South Korea, and to the company (e.g., Hitachi) in Japan. These actions seen in Radiant between 1995 and 1997 were applied to Stage 1.

Secondly, in Stage 2 (Survival), the main goal shifts from mere existence to a focus on the relationship between revenues and expenses. Radiant focused on the short-term generation of enough cash to break even and to cover the repair or replacement of capital assets as they worn out. In order to improve its capital assets, Radiant has injected an increased amount of cash capital every year, with total paid-in capital accumulating to USD 20 million until 1999. Meanwhile, Radiant also continued to develop new customers and finally achieved a profitable operation in 2000. These actions taken by Radiant during this time were applied to Stage 2 (1998-2000).

Thirdly, in Stage 3 (Success), the important task is to ensure that the basic business remains profitable, so that Radiant does not exhaust its source of cash and to develop managers to meet the needs of the growing business. Along with Radiant's customers (TFT-LCD panel manufacturers, such as Samsung, LG Display, AUO and CMO), Radiant also shifted its factories to China, in order to provide quick service to save transportation costs and to seize new opportunities. Radiant also invested in China constructing factories that gave fast mass-production capabilities. For example, Radiant constructed a factory in Wujiang in 2002 and a factory in Nanjing in 2003. These actions were applied to Stage 3 (2001-2003) of Radiant's growth.

In Stage 4 (Take Off), there are five key issues: financing of rapid growth, delegating responsibilities from the owner to others, improving the managerial effectiveness of a fast growing and increasingly complex enterprise, enhancing quality management capabilities, and ensuring enough cash to satisfy these demands. Along with any expansion of the production capacity, the organizational structure of Radiant was simplified from seven major departments in the early stages to four major departments (including R&D,

manufacturing, marketing, and general administration) in 2004. This re-construction effort provided more flexibility for the organization and avoided large-scale organizational bureaucracy and meanwhile improved its capabilities of conducting total quality management. From 2004 to 2007, Radiant's total paid-in capital amounted to USD 128 million after a seven-fold increase in overseas convertible bonds, a five-fold increase in transfer surplus capital and an increase in cash capital. The consolidated operating income of Radiant reached a new high in 2007, surpassing USD one billion with previous year growth of more than 30%. It was the best operating performance in the industry.

Furthermore, in this stage, other than expanding its production capacity, Radiant also made efforts to enhance its quality management capabilities to maintain the quality standard established over time and even exceed customers' expectations. Radiant meliorated their managers' commitments to quality management, conducted a more effective quality planning, and emphasized more on the issue of organizational learning. All of these tasks apparently were important for this stage of development and were found being applied by Radiant in Stage 4 (2004 – 2007). These actions helped improve the organizational climate and were parts of systematic improvement of organizational performance [Milan et al., 18].

Finally, the greatest concerns of Radiant entering Stage 5 (Resource Maturity) are to consolidate and control the financial gains resulting from rapid growth and to retain the advantages of being a small company, including having the flexibility of response and the entrepreneurial spirit. The business environment suddenly changed in 2008 because of the U.S. financial crisis, the continuing rise in Chinese wages, and the debt crisis in Europe. The decline in the LCD industry slowed the growth of the associated backlight module industry. However, Radiant rose to the challenges of the environment by developing a complete line of products, seizing technological or market opportunities, and building manufacturing flexibility to rapidly satisfy various customer's needs. Therefore, during this difficult time, Radiant not only set a new business performance record (e.g., sales revenue, net income ratio), but also became the premier Taiwanese backlight module manufacture. These actions taken by Radiant were applied to Stage 5 (2008-2011).

In sum, these different actions by Radiant occurred in response to various issues or problems during its growth. The performance of Radiant in various growth stages is described in Table 2.

Table 2: The Performance of Radiant in Various Growth Stage\* [Unit: USD Million]

	Stage1		Stage2		Stage3		Stage4		Stage5	
	1995	1997	1998	2000	2001	2003	2004	2007	2008	2011
<b>Sales Revenue</b>	----	2.63	5.57	34.06	81.97	251.05	460.96	1049.13	1127.80	2114.37
<b>Net Income (%)</b>	-0.82	-2.07	-1.32	3.33	10.54	25.58	68.28	64.35	41.85	146.25

\*From 2004 to 2011, sales revenue included the parts from overseas factories (Source: The Radiant Annual Report)

### 4.3. How Radiant Built, Maintained, and Further Developed Dynamic Capabilities in its Various Growth Stages

This paper uses a longitudinal case study method selecting Radiant as the case to understand how a firm builds, maintains, and develops dynamic capabilities in order to adapt its manufacturing operations in response to the dynamics of the firm's growth and to determine the role that dynamic capabilities play in their various growth stages.

Firstly, in Stage 1 (Existence), Radiant was established in 1995 and, in order to obtain customers, it had to accrue assembly know-how or experience through technology transfer and organizational learning. For instance, Radiant invited some backlight module managers from Japan to serve as top managers and technology advisors. At the same time, Radiant was granted backlight board technology license by the Chatani Industrial Company in Japan. During this Stage 1, dynamic capabilities may not have been seen because they had to be built with the requirement of the firm making long-term commitments. Teece et al., [24] identified several classes of factors that help determine or facilitate a firm's distinctive dynamic capabilities, which are termed promotive determinants in this paper. It was found in this study that organizational and managerial processes, especially organizational learning, such as learning capabilities, help determine or facilitate Radiant's dynamic capabilities during the incubation period. It has been claimed that because of the shortened product life-cycles and increasingly imitable technologies, organizational knowledge emerges as a major source of competitive advantage [Hsu, 10]. Therefore, this study obtained the following proposition.

*Proposition 1: A firm builds its dynamic capabilities, such as learning capabilities, by accumulating production know-how or experience in the first stage of firm growth.*

Secondly, in Stage 2 (Survival), in order to generate enough cash, Radiant had to develop diversified sources of cash streams and new customers. Radiant sought major shareholders, such as Delta Electronics, Quanta, and TECO Electric & Machinery, to raise funds. These major shareholders had been continuing to invest in Radiant, even when it was not yet profitable. During 1995-1999, the paid-in capital rose from USD 6.5 million to 20 million making the accumulated cash investment was USD 13.5 million in total. Evidence shows that Radiant did not suffer from a shortage of funds. This occurred because Radiant developed its core technology, non-printing LGP technology, making the backlight module thinner in the early stages. Therefore, the potential capacity for future development was quite high in

Radiant and it was worthy of investment. During this stage, Radiant's dynamic capabilities had to reach a break-even point to depart from the survival stage. This paper found that the promotive determinant of Radiant's dynamic capabilities is its distinctive positions, especially its financial assets (e.g., fund raising capabilities) and technological assets (e.g., core technology development capabilities). These capabilities help determine Radiant's dynamic capabilities in its birth period. Thus, this study suggests the following:

*Proposition 2: A firm builds its dynamic capabilities, such as fund raising capabilities and core technology development capabilities, by constructing diversified sources of cash and new customers in the second stage of firm growth.*

In Stage 3 (Success), Radiant had to build fast mass-production capabilities to ensure that its basic business remains profitable. In addition, Radiant needed to construct factories in China to enhance its customer service and local procurement. Radiant also recruited professional sales personnel to improve its marketing capabilities and to win more bulk orders from large international companies and form a long-term strategic partnership with these companies. During this stage, Radiant's dynamic capabilities had to provide fast service to meet customer needs quickly. It was found from the data that the promotive determinant of Radiant's dynamic capabilities was also its distinctive positions, especially its reputational assets (e.g., becoming a strategic partner) and its market assets (e.g., recruiting professional marketing staff) in the growth period. Hence, a proposition was derived from the data:

*Proposition 3: A firm maintains its dynamic capabilities, such as the capabilities of becoming a strategic partner and recruiting professional marketing staff, by establishing a long-term relationship and customer reputation in the third stage of firm growth.*

In Stage 4 (Take Off), Radiant had to cultivate and realize top management's strategic goals in order to finance the firm's rapid growth and delegate the responsibility of management and development to the right people. The goal of Radiant was changed from being the world's largest backlight module enterprise to become the world's most competitive backlight module enterprise with better product quality. Therefore, one of the most important efforts made by the company was to enhance the product quality and operating performance of the Chinese factories. Radiant developed a quality assurance system (Figure 1) to improve its total quality management (TQM) further. During this stage, it was found that Radiant's layout of factories operating in China has been stable.

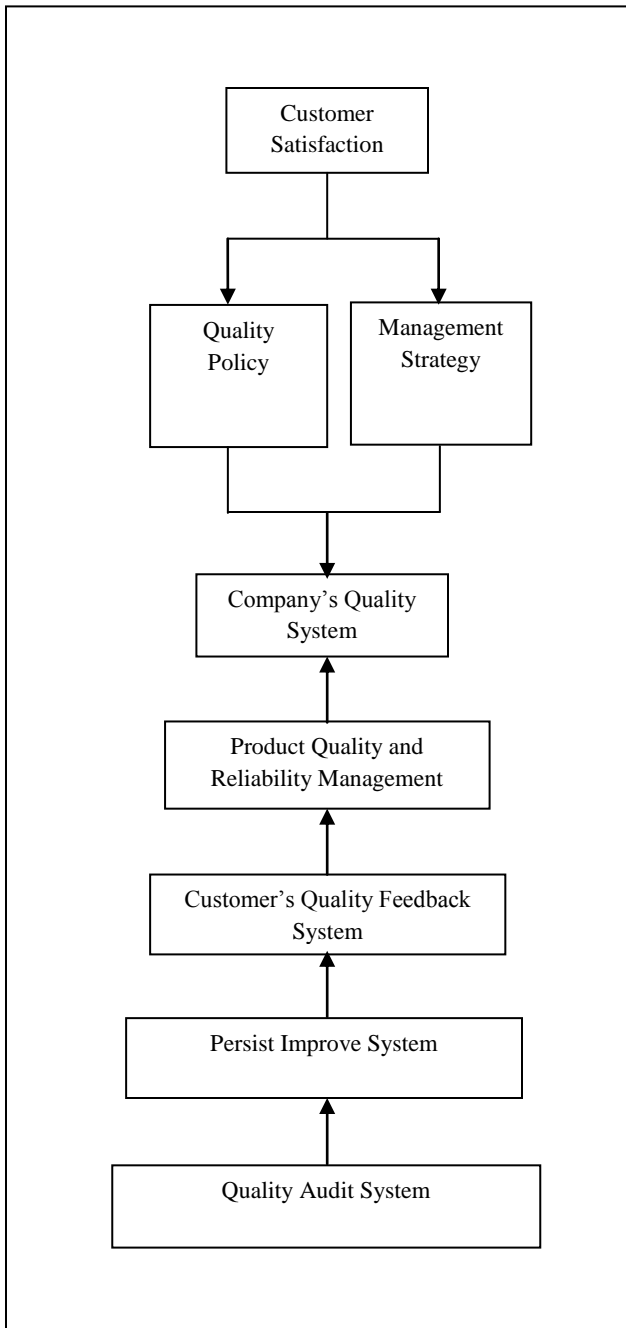


Figure 1: Quality Assurance System of Radiant  
(Source: The Radiant Company Website)

Starting with customer's inquiries, Radiant's management watched closely at each step of the selling-production process – from contract signing, sample development, pilot run, and mass production to product delivery. This quality audit system indeed strengthened Radiant's capabilities of conducting TQM, insured the quality of products against deterioration, and enhanced customer satisfaction. In addition, Radiant also coordinated each factory and integrated their information and production processes to ensure the maximization of the organizational efficiency and product quality. To Radiant, it was necessary to improve the integrative and coordinative processes in order

to run the quality assurance system aforementioned. This action provides evidence supporting Annika & Sverker's [2] work suggesting that, while a firm is growing rapidly, performing TQM is still imperative and even needs to be heightened to support the continuous innovation of the organization. It also illustrates the important role of TQM being a mediator in the relationship of organization strategy and organization performance [Prajogo & Sohail, 19].

Therefore, it was found that in the growth period, achieving stabilization with the same or better product quality is important to a firm. The promotive determinant of Radiant's dynamic capabilities is its organizational and managerial processes, especially the coordination and integration efforts, such as coordinating and integrating information and quality management programs of all factories. Hence, this study suggests the following proposition:

*Proposition 4: A firm maintains its dynamic capabilities, such as the capabilities of integrating information and of enhancing TQM, by realizing the top management's strategic intentions and concerns for product quality in the fourth stage of firm growth.*

Finally, in Stage 5 (Resource Maturity), Radiant had to re-create entrepreneurial management to control the financial gains and to retain the advantages of being a small company. During this stage, because the external environment continued to deteriorate (e.g., the U.S. financial crisis, the rise in the Chinese basic wage, the debt crisis in Europe, the rising cost of raw materials, etc.), the environment for backlight module manufacturers became more difficult. Some less competitive firm were being acquired by other firms. Radiant, however, rose to the challenges and was committed to strengthening its manufacturing flexibility and to taking advantage of the innovations in the thin Tablet PC's to identify new opportunities for LED backlight modules.

In 2011, the consolidated sales revenue and net income of Radiant reached a new record and the company became the leader in the backlight module industry in Taiwan. This paper found that the promotive determinant of Radiant's dynamic capabilities is its path dependencies, especially in sensing technological and market opportunities, such as seizing markets and the development of manufacturing flexibility capabilities in the re-creation period. Therefore, this study proposed the following statement:

*Proposition 5: A firm further develops its dynamic capabilities, such as the capabilities of grasping opportunities and of developing manufacturing flexibility by re-creating entrepreneurial management in the final stage of firm growth.*

In short, Table 3 illustrates the relationship between the dynamics of firm growth and the development of firm's dynamic capabilities.

Table 3: The Relationship between the Dynamics of Firm Growth and the Development of Dynamic Capabilities

Growth Stage	Key Problem	How Radiant Develops Dynamic Capabilities	The Role of Dynamic Capabilities	The Factor that Determines Radiant's Dynamic Capabilities (Promotive Determinant)
Stage 1: Existence (1995-97)	Obtain customers	By accumulating production know-how or experience	Nothing	Organizational and managerial processes (Organizational learning)
Stage 2: Survival (1998-2000)	Generate enough cash	By constructing diversified sources of cash and new customers	To reach break-even point	Positions (technological assets and financial assets)
Stage 3: Success (2001-03)	Ensure that the basic business remains profitable	By establishing a long-term relationship and customer reputation	To provide express service and meet customer needs quickly	Positions (reputational assets and market assets)
Stage 4: Take off (2004-07)	Make sure the financing of rapid growth and the delegation of responsibility	By realizing top management's strategic intentions	To improve the integrative processes, change organizational climate, and develop a quality assurance system	Organizational and managerial processes (coordination and integration)
Stage 5: Resource maturity (2008-11)	Control the financial gains and retain the advantages of small size	By re-creating entrepreneurial management	To grasp or sense new technological opportunities and develop manufacturing flexibility	Path dependencies (sense technological opportunities)

## V. CONCLUSION

This study aims to understand how firms build, maintain, and develop dynamic capabilities in order to adapt their manufacturing operations in response to the dynamics of firm growth, and to determine the role of the dynamic capabilities play in the firm's different growth stages. It used a longitudinal case study method selecting Radiant as the case to discuss the research question. The contribution and implications of this study are as follows.

Firstly, it offers an empirical understanding of the role played by the dynamics of firm growth in the development of dynamic capabilities. While most of the past research commonly determines that firm growth requires the exploitation of both internal and external firm-specific capabilities, productive capabilities, or market opportunities [Erik & Karl, 8; Penrose, 20; Teece, 23; Wernerfelt, 26], this study further clarifies how a firm develops dynamic capabilities in its different growth stages in which different key problems are encountered. For example, this paper finds that a firm builds dynamic capabilities by accumulating production know-how in Stage 1, by finding sources of funding and customers in Stage 2, by establishing a long-term relationship and customer reputation in Stage 3, by realizing top management's strategic intentions in Stage 4, and by re-creating entrepreneurial management in the final stage. Therefore, this study identifies an important relationship between the dynamics of firm growth and a firm's dynamic capabilities.

The second contribution of this paper is the finding that a firm develops its dynamic capabilities in different growth stages and the promotive determinant of dynamic capabilities changes over time. It was found that the promotive determinant of Radiant's dynamic capabilities begins with learning capabilities obtained in the incubation period. Fund raising capabilities and the development of core technology

capabilities are developed in the birth period. Capabilities to form strategic partnership and to cultivate professional marketing staff are identified in the growth period. The capabilities of integrating information and enhancing TQM are seen in the take-off period for stabilization. Finally, the capabilities of seizing opportunities and of manufacturing flexibility are found in the re-creation period. This empirical finding not only identifies that different paths are effective for different types of dynamic capabilities in different contexts [Teece et al., 24; McKnight, 2012], but also determines that the concrete promotive determinant of dynamic capabilities changes over time.

The third contribution of this paper is the finding that new factors play a significant role in how a firm develops its dynamic capabilities. These new factors, such as capabilities of fund raising, of forming strategic partnership, of integrating information, and of enhancing TQM are different from the findings in the previous studies suggesting sensing capabilities [Teece et al., 24], prior experience [King & Tucci, 14], organizational learning [Zollo & Winter, 32], and managerial capabilities [Bruni & Verona, 4; Kuuluvainen, 15]. In addition, it is important not to overlook TQM's mediating role in the relationship of organization strategy and organization performance in the context of firm growth.

The fourth contribution of this paper is the finding that a firm's dynamic capabilities play different roles and are required to solve key problems in the different stages of firm growth. As mentioned previously, firms also need to build dynamic capabilities in response to ongoing environmental change in order to keep pace with or stay ahead of the dynamic change of the environment. By building and then deploying dynamic capabilities faster than competitors, a firm can deal with the rapid environmental change effectively [Eisenhardt & Martin, 30]. This paper finds that in order to achieve a smooth transition to the next growth stage, a firm should develop sufficient and adequate capabilities to

improve the environmental suitability of its dynamic capability. This can also help a firm solve diverse problems by taking account of the rapid changes in the environment.

The first implication of this paper is that industrial managers must understand that it is required for a firm to develop sufficient and adequate dynamic capabilities for the different stages of firm growth and that the promotive determinant of dynamic capabilities including the capabilities of performing TQM, also changes over time.

The second implication of the findings is that a firm may need to extend its production line overseas (in this case, to China) aggressively to reduce its cost for production and pursue market growth. However, such a rapid expansion of the production capacity should not be undertaken at the expense of deteriorating the quality of product. The way Radiant builds its dynamic capabilities provides evidence that while an organization is undergoing rapid growing process (the take-off stage), adopting something like quality assurance system to enhance a firm's capabilities for TQM is very important. This finding is consistent with the findings of Javier & Nieves [13] in which the researchers suggested that the way a firm uses its TQM capacity to generate wealth is not uniform in all firms but is contingent on variables such as the size and subsector of the firm.

Finally, the main limitation of this paper is that using one case may be too narrow in its scope for general application – a common limitation seen in the studies adopting single case study method. Perhaps, using multiple cases to study the issue is necessary in the future.

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