

Firm Competence from Taiwanese Flat Panel Display: Perspectives on RBT and OLT

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Abstract. Traditionally, scholars suggest firm shall sequential to develop technology-oriented competence to enter other markets (Technology Promote Market, TPM). However, in practice, we observe contradiction that the international enterprises adopt the market-oriented perspective so as to first reflect on market, and then transfer external firm's technologies and experiences to firms (Market Promote Technology, MPT). It is an interesting phenomenon that motive to resolve the gap between the theoretical argument and practice. Thus, we explore the sequence between prioritize to develop technology and market competence, and characteristics, mechanism, and routes of interaction of small-sized firm competence. This research using the extended case method (ECM) compared two Taiwan FPD (Flat Panel Display) enterprises that produce TFT-LCD (Thin Film Transistor-Liquid Crystal Display) manufacturing equipment. We found that firms possessing the characteristics of improvement resources (CIR), develop technology competence first, and apply intra-organizational learning (intra-OL) mechanism and inside-out routes (IOR) to promote market competence. Conversely, firms having the characteristics of social resources (CSR), develop market competence first, and utilize inter-organizational learning (inter-OL) mechanism and outside-in routes (OIR) to promote technology competence.

Introduction

Past research explored the development of firm competence mostly stressed on large organizations (Nonaka et al., 2014; Wernerfelt, 2014). However, they do not give enough attention to small-sized firms constrained on the situation of limited resources, not to develop several competences simultaneously, and think how small-sized firms use previously competence to facilitate follow-up competence. Which competence shall prioritize to develop so as to build another competence for small-sized firm, accordingly, needs further study. Particularly, few empirical studies have focused on small-sized firms prioritize to develop necessary competence, promote another competence, and consider the strategic thinking over the characteristics, mechanism, and routes of interaction of small-sized firm.

The purpose of this study was to explore how small-sized firms utilize firm's limited resources, learning mechanism, routes, and prioritize to develop necessary competence for firm's survival. In the paper, small-sized firms are facing two different strategy of competence development, what criteria should be used for firms to choice of the fitness development plan is the key of this study.

This research using the extended case method (ECM) compared two Taiwan FPD enterprises possessing dichotic successful path of competence development. We found that Neda (disguised name) possessing the characteristics of improvement resources (CIR), develop technology competence first, and apply intra-organizational learning (intra-OL) mechanism and inside-out routes (IOR) to promote market competence (Technology Promote Market, TPM). Conversely, ARET (disguised name) has the characteristics of social resources (CSR) (Alcacer and Oxley, 2014; Chittoor, Kale and Puranam, 2014), develop market competence first, and execute inter-organizational learning (inter-OL) mechanism and outside-in routes (OIR) to promote

technology competence (Market Promote Technology, MPT). The article concludes with noting the academic and practical application. Research limit and future research direction is offered as well.

Literature Review

The conceptual framework is based on field research and an integration of the scholarly literature regarding resource-based theory and organizational learning theory. Wernerfelt (1984, 2014) argued firm's resources leads to different immediate insights than the traditional product perspective. Further, firm builds resource position barriers as firm's competitive advantages by exploiting existing resources and exploring new resources in within firm and across firm. Priem and Butler (2001) suggested studying the accumulation of resources from the view of RBV. Danneels (2002) extends resource-based view by examining not only how resources are used in product development, but how resources are utilized as well in competence development. Danneels (2007) argues applying technological competence to develop new productions that serves to new customer and examines how one resources can be used to build another. Thus, applying resource-based theory to investigate the priority of resource development, resource characteristics of interaction of firm competence.

March's (1991), drawing on organizational learning concepts, shows how resource characteristic impacts the firm's learning route by applying exploitative and explorative modes of learning. In addition to offering the application of March's distinction to organizational learning, scholars (Kogut and Zander, 1992; Henderson and Cockburn, 1994) also present an additional classification: the notion of basic competence, composite competence, and architectural competence. Composite competence and architectural competence are more significant because they are helpful for firms to escape from the trap laid by their current competences. Therefore, it is important to add new competences to the firm's repertoire for firm's continued prosperity in a dynamic environment (McGrath, 2001). Klerk and Havenga (2004) argues the firm growth that pursued by transferring of external resource and extending of internal resource. These scholars refer firm mix in new competences by both exploiting within firm's resources and exploring across firm's resources.

Slater et al. (2014) and Baker and Sinkula (2015) argued market-driven OL is a function of a three-step process: Information acquisition is the process by which knowledge is obtained; Information dissemination is the process by which information from different sources is shared and thereby leads to new information or understanding; Information shared interpretation is the process by which distributed information is given one or more commonly understood interpretations.

This article examines small-sized firm shall prioritize to develop a necessary competence, and then promote follow-up competence. Danneels (2002) suggests firm shall develop technological competence first to support customer competence, to serve certain customers, and to enter other markets. We adopt and extend Danneels (2002) "technological competence" into "technology competence" consisting by techlogical-related resources as manufacturing know-how (Wu et al., 2014; Danneels, 2002), research and design (Walsh and Ungson, 1991), and manufacturing and material radical innovation (Obloj and Zemsky, 2014) help to provide tangible and intangible goods and services.

The market competence literature in this study adopts and extends Danneels (2002) concept of "customer competence" and Narver and Slater (1990) "market orientation". According to Danneels (2002) "customer competence" gives the firm the ability to serve certain customers. It is constituted by such market-related resources as knowledge of customer needs, distribution and sales access to customers, reputation of the firm and its brands, and communication between the firm and customers. We synthesize both the notion of Danneels (2002) and narver and Slater (1990) to a new definition of market competence consisting by the resource at firm's existing market-related resources (Alcacer et al., 2015) as relationship with customer (Engerman, and Rosenberg, 2014), relationship with competitor (Park et al., 2014; Kleinbaum and Stuart, 2014), and relationship with employees (Eggers, 2012, 2014) helps to provide tangible and intangible goods and services.

Methodology

This article conducts a field study using in-depth interviews, observations, and documents as data sources from two Taiwan FPD industry, TFT-LCD manufacturing equipment providers, varied in terms of age, size, and the historical progress of resource. Research sites were selected to achieve a dichotic sample that provides many possibilities for comparison, which enables richer theory development (Glaser and Strauss, 1967; Strauss and Corbin, 1990; Corbin and Strauss, 2014; Walsh et al., 2015). This study intended to contrast firms that were different in terms of their variety of resource characteristics, learning mechanism, routes of choice, and that were at different interaction of firm competence. Rouse and Daellenbach (1999) called for a rich, detailed investigation of the nature of firm resources through comparative case studies.

Neda is a company that offers machine automation and maintenance for IC (Integrated Circuit), Semiconductor (SC), FPD, chemical, parts materials, and solar cell industries. Its automation equipments, especially those clean room robot and control system application have been adopted extensively by leading optoelectronics and SC firms for material moving and manufacturing. Mainly, its customers are widespread in high-tech industries that manufacture technology-based products that apply manufacturing automation for efficient production.

ARET is a company that offers machine automation and maintenance for Cathode Ray Tube (CRT), Semiconductor (SC), TFT-LCD, and solar cell industries. Its automation equipments, especially those micro-drill the entire factory equipment and pack/unpacking system have been adopted extensively by leading optoelectronics firms for material moving and manufacturing. Mainly, its customers are widespread in both high-tech industries that manufacture technology-based products and traditional industries that apply manufacturing automation for efficient production (Lin, 2014).

The study used the extended case method (Burawoy, 1991, 2014) as a guide to data analysis. The goal of the extended case method is to build new theory, integrate and synthesize existing concepts and theory (Burawoy, 2014). The article examines the literature relevant to research problem area, and employs the empirical data to fill in its gaps. Burawoy (2014) suggests going through many cycles of confrontation between data and theory to direct the analyst to additional data and draw on additional concepts and theories.

This article used various types and sources of data to provide a rich and solid foundation for the theory development. This study conducted 47 interviews involved in the resource characteristics, learning mechanism, choice route of interaction of small-sized firm competence. Some of the reports by interviewees were retrospective (Miller et al., 1997), other reports were contemporary with the activities they described. Interviewees were drawn from multiple functional areas (e.g., manufacturing, R&D, marketing, and management) in various organizational levels and were compared and integrated across informants and two cases. All interviews were conducted by following a semi-structured approach included some or all of the questions. Interviews commonly lasted from 45 minutes to two hours, and were tape-recorded. This article had regular contact with informants at the sites from 3th, Mar, 2006 to 30th, Apr, 2014.

Findings

In accordance with the research purpose, the research findings were classified into four parts: (a) technology competence and market competence, (b) characteristics and priority of competence development, (c) mechanisms and direction of competence development, and (d) routes and exploiting and exploring another competence. Each is discussed below.

Technology Competence And Market Competence

Technology competence refers to basic competencies, composite competencies, and architectural competencies (Kogut and Zander, 1992; Henderson and Cockburn, 1994). Based on the interview

results, basic competencies involve using existing endogenous resources and competencies. It includes two types of competence that incrementally improve production processes and manufacturing know-how (Wu et al., 2014; Danneels, 2002). Composite competencies combine existing endogenous resources and competencies with new firm competence. It comprises research and design (Walsh and Ungson, 1991) of existing and new products and processes. Architectural competencies create new competence among firms that have obtained exogenous resources and competencies. It is composed of radical material innovation and radical manufacturing innovation (Obloj and Zemsky, 2014).

Market competence can help firms anticipate more accurately the response to actions designed to retain or attract customers, improve channel relationships or thwart competitors, and act on market information in a timely and coherent manner, which has significant implications for the attainment and sustainability of competitive advantage (Möller and Anttila, 1987; Slater and Narver, 1995). According to interview, market competence is constituted by existing and new market-related resources and assets, such as relationship with employees (Eggers, 2012, 2014), relationship with competitor (Park et al., 2014; Kleinbaum and Stuart, 2014), and relationship with customers (Engerman, and Rosenberg, 2014). The distinction between technology competence and market competence is listed in Table 1.

Table 1 Technology competence and market competence

patterns	Technology competence	Market competence
Architectural competence	Manufacturing and material radical innovation(T_3)	Relationship with customers(M_3)
Composite competence	Research and Design(T_2)	Relationship with competitor(M_2)
Basic competence	Manufacturing know-how(T_1)	Relationship with employees(M_1)

Characteristics And Priority Of Competence Development

This section demonstrates the interplay of resource characteristic impacts on firm's competence development, as well as the historical progress of the critical resource development. Based on the interview and the historical progress of Neda's existing resource, we found that Neda has the characteristics of improvement resources (CIR) and exploitation resource (March, 1991). They obtain advanced knowledge from intra-firm interaction by continuing to improve their existing resources (Ittner and Larcker, 1997; Serel et al., 2001). In other words, small-sized firms have historically progressed by exploiting improvement resources, and tend to prioritize developing technology competence, and then to promote market competence (Nyberg et al., 2014).

Conversely, based on the interview and the historical progress of ARET's existing resource, we found that ARET has the characteristics of social resources (CSR) and exploration resource (March, 1991; Alcacer et al., 2014). They obtain enhanced experience from external-firm connections by linking newly and social resources. In other words, small-sized firms have historically progressed by exploring social resources, and tend to prioritize developing market competence, and then to promote technology competence.

Mechanisms And Direction Of Competence Development

Based on the historical progress of Neda's existing resource development, we found the various departments, supervisors, and members are fully informed and participate in the mechanism of the firm's intra-OL with three stages of "information acquisition → information dissemination → shared interpretation" to upgrade technology-oriented resources (Sinkula, 1994; Slater and Narver, 1995). More important, this mechanism of intra-OL requires being built a corporate institution (Lee and Saxenian, 2007; Engerman and Rosenberg, 2014) and executes the direction of bottom-up "employees → departments → organization" to develop technology competence.

Based on the historical progress of ARET's existing resource development, we found the various departments, supervisors, and members are fully informed and participate in the mechanism of the

firm's inter-OL with three stages of "information acquisition → information dissemination → shared interpretation" to upgrade market-oriented resources (Sinkula, 1994; Slater and Narver, 1995). More important, these mechanisms of inter-OL require collaborative coordination (Lee and Saxenian, 2007; Engerman and Rosenberg, 2014) and executes the direction of top-down "organization → departments → employees" to develop market competence.

Routes And Exploiting And Exploring Another Competence

Applying intra-OL interactions (Harvey et al., 1998) in within and across departments, and organization has upgraded Neda's technical knowledge and shaped technological barriers (Hsu and Chiang, 2001). Further, using inside-out route (IOR) and taking technology to serve new customers and the external markets by exploiting technical-resources to upgrade their technical knowledge and experience, and further promote market competence (Technology Promote Market, TPM).

Using inter-OL interconnections with contractors and the embedded network (Hobday, 1995) has elevated ARET's marketable knowledge and shaped marketability synergies and agglomerations (Yeung, 1994; Amin and Cohendet, 1999). Further, using outside-in route (OIR) and taking market to strengthen new experiences and technologies (Mathews, 2002) by exploring marketable-resources to hoist their marketable knowledge (Lin, 2014), and further promote technology competence (Market Promote Technology, MPT).

Academic Application

We applied resource-based theory and organizational learning theory to explore the characteristics, mechanism, routes of interaction of small-sized firm competence. Several contributions are described as follows.

First, this study identified resource characteristics that are necessary for the direction of firm competence development, particularly regarding prioritize to develop necessary competence and to promote follow-up competence. We found that firms possessing the characteristics of improvement resources (CIR), develop technology competence first, and apply intra-OL mechanism and inside-out routes (IOR) to promote market competence (Technology Promote Market, TPM). Conversely, firms that have the characteristics of social resources (CSR), develop market competence first, and utilize inter-OL mechanism and outside-in routes (OIR) to promote technology competence (Market Promote Technology, MPT).

Second, the processes of exploiting and exploring must occur simultaneously and are equally important. The findings of this study show that together both exploiting and exploring the existing and newly resources are activities that can expand the resource base of the firm, which in turn enables further new competences.

Third, a small-sized firm requires not only the characteristics of specific resources, but also the mechanisms of intra- and inter-OL with three stages of "information acquisition → information dissemination → shared interpretation" (Sinkula, 1994; Slater and Narver, 1995; Slater et al., 2014; Baker and Sinkula, 2015) and the route of inside-out and outside-in, which actuate and complete a firm's competence development.

Fourth, the findings of this study are consistent with the views of scholars (Wernerfelt, 1984, 2014; Danneels, 2002, 2007) who have stated that a firm's development is necessary for considering sequential resource development. Furthermore, we emphasize that the crucial choice for small-sized firms in the development process is the continual exploitation of existing resources, thus saving the firm financial costs and time. This view is consistent with that by March (1991) "exploiting learning".

Finally, we found that small-sized firms are devoted to prioritizing the development of the most valuable competence, and then utilize the first competence to promote follow-up competence.

Limitations And Future Research

The findings in this study are based on an in-depth study of two firms. Obviously, we could not establish whether the findings are generalizable to all small-sized firms not belong to high technology firm in newly industrialized economies, or whether they generalize to possessing abundant resources. The researched firms could have idiosyncratic characteristics that impacted their competence development, learning mechanism, and routes. However, the findings presented above have a strong intuitive and conceptual appeal, and are amenable to quantitative verification.

Future research may be directed toward quantitative approaches or extended to the alliance partners (Lane and Lubatkin, 1998; Shipilov et al., 2014), mergers and acquisitions (Eisenhardt and Martin, 2000; Karim and Mitchell, 2000), and accumulate resources and competencies (Priem and Butler 2001).

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