

**The role of project capability in strategic change: towards a
resource-based perspective**

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Introduction

This paper draws upon resource-based theories of the firm (Penrose 1959; Nelson and Winter 1982; Teece and Pisano 1994) to develop a framework for analysing how firms use projects to achieve their strategic objectives.¹ Penrose (1959) argued that a firm's resources and knowledge related to the use of certain technologies or exploitation of markets creates a 'base' from which to move into new technology or market positions. Subsequent research using a resource-based approach has emphasised that 'organisational capabilities' are critical to a firm's ability to use resources to grow and compete successfully in rapidly changing technologies and markets (Richardson 1972; Wernerfelt 1984; Chandler 1990; Teece and Pisano 1994; Teece et al. 1997; Grant 1991).

Although a few studies have identified the role of 'project execution capability' in late industrialising countries (Amsden and Hikino 1994), 'multi-project management capabilities' in new product development (Cusumano and Nobeoka 1998), and 'project capability' in capital goods (Davies and Brady 2000), the growing body of literature on the resource-based view of the firm has largely ignored the project as an organisational capability and source of competitive advantage. In contrast to the traditional emphasis on resources and capabilities inside the firm, the concept of project capability draws attention to temporary forms of organisation that make use of resources that are both internal and external to the firm. Projects are established as internal organisations to meet a firm's strategic objectives, such as technology research, new product development and process improvements. But they are often set up as collaborative forms of organisations with suppliers and customers that cut across the traditional boundary between the firm and its external environment.

This paper suggests that the concept of project capability helps us to analyse how firms use projects to (1) perform a growing range of research, development and implementation activities in their traditional base business, and (2) as a vehicle to explore moves into new technology or market positions. It argues that 'base-moving' projects can be a successful way of investigating or responding to new technological imperatives or market opportunities. The paper is divided into three main parts. Part 1 discusses Penrose's analysis of the resource-

¹ The paper is based on chapter 3 'Firm strategy and project capability' in Davies and Hobday (2005).

based view of the firm and identifies the role of organisational capabilities as a source of competitive advantage for the firm. Part 2 argues that the additional concept of project capability is required to identify a growing proportion of the activities undertaken by firms. Part 3 considers how project capabilities are used by firms to support their strategies to move into new technology or market bases.

Part 1: The organisational capabilities of the firm

In *The Theory of the Growth of the Firm* (1959), Penrose laid the foundations for the modern analysis of the resource-based view of firm strategy and organisation. Penrose defined the firm as an administrative organisation and a pool of productive resources. Her analysis depends on the distinction between resources and services (Penrose 1959: 25). Firms use of two types of resources to produce and sell products and services: physical resources (tangible assets such as raw materials, plant and equipment) and human resources (intangible assets such as financial, managerial or technical knowledge and skills). Resources are a bundle of 'potential services' that are defined independently of their use. Services refer to the productive 'activities' or 'functions' involved in making use of firm-specific resources. However, the products and services produced by a firm at a given time are merely one among several ways in which a firm could use its resources. The internal resources of a firm are rarely fully utilised in the process of production. They consist of a bundle of potential services that can be used in a variety of different ways.

The existence of this pool of 'unused productive services' provides a powerful inducement for a firm to search for ways of using its existing resources more fully. Therefore, a firm's unused services are a challenge to innovate and an opportunity to expand into new technology or markets. A firm is able to innovate by introducing 'new combinations' of resources and productive services, such as the development of new products, new production processes, and new forms of organisation (Penrose 1959: 85-6).

1.1 The resource base: technologies and markets

Penrose's central argument is that the long-term competitiveness of the firm does not depend so much on the efficiency with which it can use its resources to produce a diversified range of

products in large volumes at low unit costs, but on its ability to use its resources to grow and diversify into new technology and market bases. By developing a strong 'base' of resources in the use of certain technologies and exploitation of different types of markets, a firm can 'adapt and extend its operations in an uncertain, changing and competitive world' (Penrose 1959: 137). The growth and diversification of the firm is fuelled by the dynamic interaction between its technological and market bases.

A firm develops its 'technology base' by specialising in certain fields of technology. Penrose used the term 'productive base' interchangeably with technology base because a firm must develop the resources and knowledge to perform complementary activities related to a particular technology as it flows from research, through product development to physical production. When a firm moves into a new technology base, it must develop resources and knowledge in a different and often rapidly changing area of technology.

A firm develops its 'market base' by exploiting certain types of markets. A range of market-base activities are undertaken, such as sales and marketing, developing proposals, and organising the installation and maintenance of equipment. Markets are classified into the different groups or types of customers served. Resources and knowledge are developed over time to meet the needs of different groups of customers or to provide existing customers with new combinations of products and services. Movement into a new market position requires the allocation of resources 'to the development of a new type of selling programme and a competence in meeting a different type of competitive pressure' (Penrose 1959: 110).

1.2 Organisational capabilities

In the large body of literature informed by a resourced-based view of the firm, the term 'capability' is now used to refer to the knowledge and experience of a firm's management and personnel. Acknowledging the importance of Penrose's contribution, Richardson (1972) was among the first to argue that firms gain competitive advantage by developing the 'distinctive capabilities' – knowledge, experience, skills and organisation – to perform specialised productive activities, such as research, development, production or marketing. A firm's capability is distinctive or 'core' when it provides a unique source of competitive advantage, which is not widely available to other firms in an industry (Kay 1993; Prahalad

1993; Hamel and Prahalad 1994; Iansiti and Clark 1994; Leonard-Barton 1992; Leonard 1995).² A core capability is difficult to imitate and uses scarce resources that cannot simultaneously be implemented by large numbers of firms (Barney 1991).

Because resources alone do not create value, a firm must develop the 'organisational capabilities' required to leverage a firm's pool of resources and perform activities that create competitive advantage (Grant 2002: 139). For example, a firm's designers, engineers, labs and manufacturing plant are of little use on their own. It is how they are combined or organised – such as in strategic units, functional departments and cross-functional teams – to provide the capability required to produce new generations of products and perform processes that create added value.

The development of a firm's internal capabilities is closely related to changes in its external technological and market environment and assumptions about this relationship between a firm's internal capabilities and the environment have influenced the progress of research in this field (Nelson 1991). The greater the rate of change in a firm's external environment, the more important its internal resources and breadth of capabilities are to the long term success of a firm (Grant 2002: 135). In Penrose's (1959) original study, the influence of the environment was 'put on one side in order to permit concentration on the internal resources of the firm' (Penrose 1995: xiii).³ Research on the resource base of the firm undertaken since the 1980s and 1990s has focused explicitly on the dynamic interplay between the firm's internal capabilities and changing external conditions, recognising that learning is the main way in which organisations interact with, and are changed by, their environment (Teece and Pisano 1994).

However, firms can develop the capabilities to perform successfully in existing technology and market bases without developing the capabilities to gain and maintain their competitive advantage in a changing environment. Nelson and Winter (1982) argue that a firm's knowledge and experience resides in its memory, which is located in its routines.

² Some competitive advantages, however, are based not on a firm's distinctive capabilities, but on their market dominance, which Kay calls 'strategic assets' such as natural monopoly, sunk costs, government protection or network externalities (Kay, pp113-124, 1993).

³ In her defence, Penrose (1995) writes that the 'relevant environment...is different for every firm and depends on its specific collection of human and other resources. Moreover, the environment is not something "out there", fixed and immutable, but can itself be manipulated by the firm to serve its own purposes' (Penrose, xiii, 1995).

Organisational routines, which refer to the repetitive and predictable patterns of activities involved in productive activities, form the basis of a firm's organisational capability (Grant 2002: 148). A reliance on routines is a strength for companies operating in traditional technologies and markets under stable conditions. However, difficulties occur when organisations continue to follow established routines in a changed environment. During the growth of a firm, capabilities which are effective for existing technologies and market bases may be experienced as 'core rigidities' (Leonard-Barton 1992; Leonard 1995) or 'organisational inertia' (Iansiti 1998), as a firm expands to meet new opportunities.

The ability of a firm to adapt to a changing environment depends in part on a capability called 'absorptive capacity'. Largely a function of a firm's prior knowledge and experience, absorptive capacity refers to the ability to recognise the value of new, external knowledge and information, assimilate it and apply it to meet new market objectives (Cohen and Levinthal 1990). Because the development of absorptive capacity is path dependent and cumulative, lack of investment early on in a new area of knowledge and expertise may foreclose the future development of capabilities in that area. Several authors have emphasised the need for managers to identify, sustain and build their capabilities so that a firm is able to adapt to and shape its technology or market environment. The concept of a firm's 'core' competence is used to refer to a firm's primary technology or market base and to show how a firm may have over-stretched itself in terms of efficient and profitable management and should re-focus on its core (Hamel and Prahalad 1994). Radical changes in the environment can force a firm into totally renewing its capabilities. Many new forms of competitive advantage in fast changing environments stem from 'dynamic capabilities' (Teece and Pisano 1994; Teece et al. 1997). The term 'dynamic' refers to the firm's ability to adapt, reconfigure and renew its capabilities, to create innovative responses to a changing technology or market environment, and to grow into new technology or market positions along paths shaped by their traditional resources and capabilities.

1.3 Strategic, functional and cross-functional capabilities

In recent resource-based literature, capabilities are treated as vital assets that permeate all levels and all functions in an organisation. Chandler (1990) identifies the strategic and functional capabilities required to compete successfully in all types of industries. Strategic

capabilities refer to a firm's ability to move into new technologies or markets more quickly, and out of declining ones more rapidly and effectively, than its competitors. Strategic management is responsible for allocating resources and implementing long-term plans to maintain, renew and expand a firm's organisational capabilities (Chandler 1990: 594). The task of top management is to create flexibility for action by effectively monitoring internal operations and adjusting strategies to a changing environment. Functional capabilities are required to improve a firm's R&D, product design, production, distribution, purchasing, finance and general management. Middle managers develop and apply functional-specific and product-specific managerial skills, and co-ordinate, integrate and evaluate the work of the functional departments. Functional departments represent silos of knowledge – in areas such as design, engineering, logistics, procurement and manufacturing – which are essential for the preservation and perpetuation of a firm's functional skills and expertise.

Strategic and functional capabilities provide the internal dynamic for the continuing growth and competitiveness of the firm. Once a firm has established a basic position by developing its knowledge of new technologies or markets, Chandler shows that its subsequent growth, profitability and survival depends on its ability to produce a variety of products in increasingly large volumes. His framework explains how companies grow by: (1) obtaining economies of scale and scope in the production of a variety of products; (2) creating a marketing and distribution network so that the volume of sales matches the volume of production; and (3) establishing a management structure to co-ordinate functional activities and to strategically plan and allocate resources for future production (Chandler 1990: 8). Firms that produce new or improved products and use new or improved processes gain 'first-mover' competitive advantages (Chandler 1990: 34-35). First movers are leaders in exploiting cost advantages of scale and scope economies and have a head start in developing functional capabilities. First movers are able to move down the learning curve in each of the functional activities before the challengers go into operation.

Unlike Chandler, however, the a firm's capability is often defined at the strategic level only.⁴ From this top-down perspective, it is difficult to identify the growth, adaptation and learning

⁴ For example, while recognising that competence is embedded at all levels and in all functions in an organisation, Prahalad (1993) stresses that it is the top-down responsibility of strategic management to build shared values at all levels in an organisation, to manage linkages across business units, and to develop strategies for acquiring capabilities.

that takes place at lower levels in organisations. Leonard-Barton (1992: 17) argues if a capability is defined as one that provides competitive advantage then such capabilities may reside at the divisional, functional or other levels, such as temporary project organisations.⁵ Carlsson and Eliasson (1994) attempt to extend Chandler's approach to examine the hierarchy of capabilities within a divisionalised firm, including the 'technical functions' at the bottom of the pyramid which have to be co-ordinated by middle managers.

In the 1990s, many firms began to develop the cross-functional capabilities required to compete successfully in rapidly changing environments by leveraging resources located in the firm's separate functional organisations, including departments, units and divisions (Prahalad 1993; Leonard 1995). In cross-functional product development teams, for example, designers, engineers, managers and other personnel have to working across functional unit boundaries are responsible for integrating strategic planning, R&D, marketing, manufacture and finance capabilities.

Part 2: Project capability and the base of the firm

The literature on organisational capabilities provides the foundation of the modern analysis of the competitive advantage of the firm (Grant 2002). With few exceptions (Amsden and Hikino 1994; Cusumano and Nobeoka 1998; Davies and Brady 2000), however, an important capability ignored by much of the previous research using a resource-based analysis is the managerial and organisational knowledge and experience required to win bids and to successfully execute projects. Building on Penrose's research, we now argue that 'project capability' is increasingly important source of competitive advantage for the firm. In this part we examine the nature and scope of project activities that firms perform in their existing technology and market bases.

In contrast to the emphasis the resource-based literature on capabilities and resources that are internal to the firm, project capabilities draw attention to temporary forms of collaboration that cut across the traditional boundary between the firm and its external environment (DeFillippi and Arthur 1998; Gann and Salter 2000; Grabher 2002). This temporary and

⁵ While not specifically concerned with capabilities, Mintzberg (1983) was among the first scholars to stress the importance of top-down, middle and bottom-up management within organisations.

flexible organisation provides a highly effective way integrating resources from inside and outside the firm for a finite duration. In this way, firms can exercise control through the networks of external relationships they have with subcontractors, customers and other suppliers, as much as through traditional forms of internal managerial coordination, ownership and vertical integration. Figure 1 illustrates the position of project capabilities within the overall set of organisational capabilities that contribute to competitive advantage.

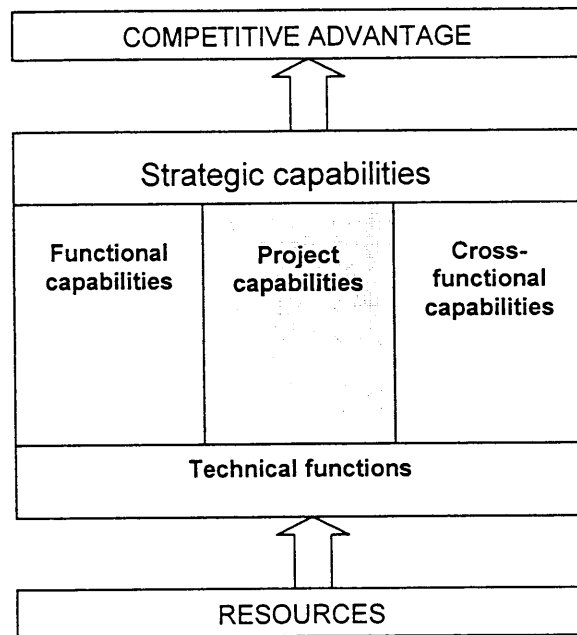


Figure 1: Resources and organisational capabilities

2.1 Project activities

Project capabilities create value for external customers and internal clients by performing activities through the life cycle of a project, from initial customer engagement or request, through the bid and proposal phase to project implementation. A project is an organisational unit established to attain a specific goal by completing a project (often a product and service) on time, within budget, and in conformance with predetermined performance specifications (Gaddis 1960: 89). These project activities include: (1) engaging with external customers, preparing proposals or bids, and developing offers for strategic partners or internal clients; and (2) setting up a project organisation and managing the life cycle of activities involved in project execution, hand-over to the customer, and ongoing support (see Table 1).

Bid activities	Project activities
<ul style="list-style-type: none"> • setting up and managing a bid team or programme of bids • requirements gathering (extracted from customer documents) after receiving an invitation to tender from a customer • conceptual design specifying components in the proposed system • estimation of costs, taking into account many factors (e.g. the quality, reliability and cost of components sourced internally and externally) • defining levels of service • risk management • scheduling of project activities • selection of subcontractors • preparing the bid document (including contractual agreements) by integrating information determined in the previous steps 	<ul style="list-style-type: none"> • setting up and managing a project or programme of projects • integrating functional and project resources • purchasing resources inside and outside the firm • managing and reallocating resources through the project life cycle using milestones and deadlines • working on a team basis • using a number of project management tools, computerised techniques and concepts - e.g. concurrent engineering, Milestone scheduling and PERT (Program Evaluation and Review Technique)

Table 1: Project capabilities

Bid managers are responsible for managing the bid team and preparing a successful proposal. Productivity improvements in the bid phase can be obtained by shorter bid-preparation times and an improved quality of submitted bids, which help to increase a firm's market share. However, if the customer is a strategic partner, the proposal team make an 'offer' rather than a bid, thus avoiding the necessity of engaging in costly and time-consuming competitive bids. Project managers are responsible for managing the completion of projects within cost, on schedule and to specific technical standards. Effective management of the front end of a project leads to better overall designs and improved productivity during later stages of implementation (Morris 1994). Members of bid or project teams can participate in more than one project by dividing their time among different bids or projects.

2.2 Types of projects: research, development and implementation

Projects undertaken by firms can be related to the distinct phases of the innovation process: research, development and production (see Figure 2). Three different types of projects are set up to conduct research in existing and new fields of technology; to develop technologies into

products; and to produce complex capital goods and services as one-offs or in small batches to meet the specific requirements of internal or external customers.

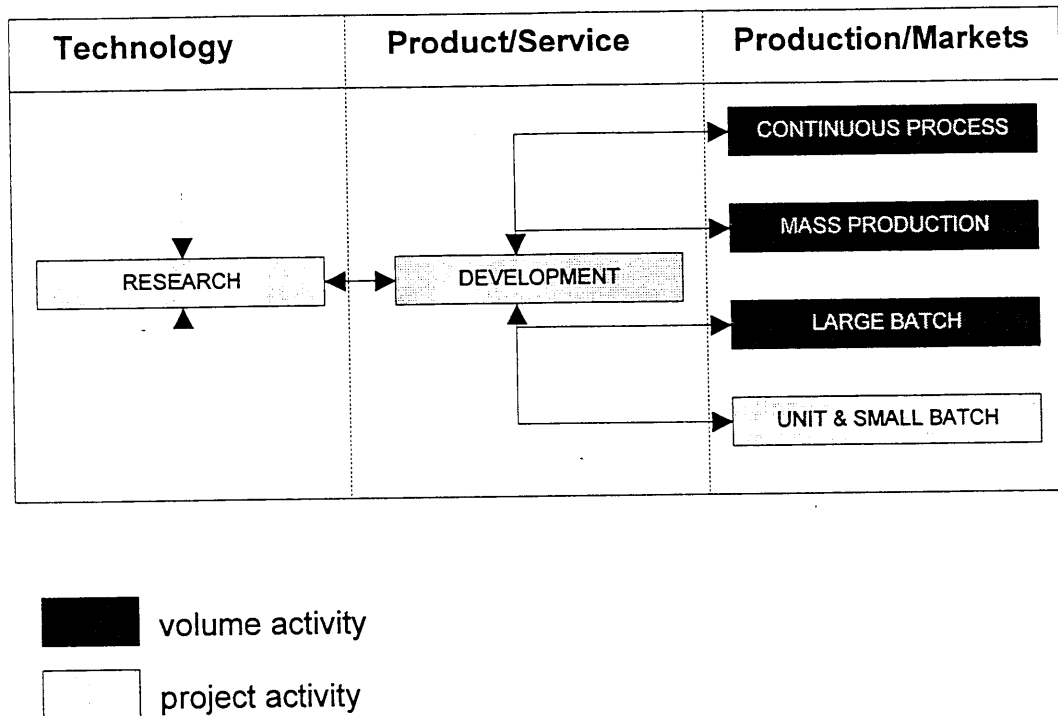


Figure 2: Projects and the innovation process

Research projects explore the possibilities of existing or new fields of technology. Development projects adapt a stable technology (the output of research) to the requirements of the market by creating products and services that can be produced profitably (e.g. Iansiti 1995 & 1998; Kusunoki et al.1998). Development activities concentrate on achieving ‘design freeze’ prior to production and market introduction. New product development (NPD) projects are responsible for the redesign of components and product architectures to improve existing products or develop new generations of products.

Improvements in the performance of development projects has been linked to the use of project-based organisations to coordinate interdependent tasks and to promote cross-functional interactions (Clark and Fujimoto 1991; Iansiti 1998: 14). In a shift away from the development of isolated products, ‘multi-project management capabilities’ enable firms to leverage core common components and design knowledge across a coordinated stream of new products, permitting reductions in development and production costs (Cusumano and

Nobeoka 1998). Nokia's new product design process, for example, requires people with different skills (e.g. handset design, wireless engineering, multimedia applications, manufacturing and finance) to work together on each new mobile handset design project. When a new handset model is designed and goes into production, the project is finished and the team is disbanded, its members move on to participate in other development projects. This circulation of people from project-to-project fosters cross-functional learning and knowledge transfer between different parts of the firm.

In most industries, the output of R&D, such as a product prototype, is the input to a production process undertaken in high volumes – large batch, mass production or continuous process – for the market. As shown in the Figure 2, the capital goods sector is the only industry in Woodward's (1965) classification of production systems to carry out its primary productive activities as well as R&D on a project basis.⁶ What we call 'implementation projects' refer to the activities involved from obtaining a customer's order to the design and integration of components and subsystems in the finished product or system.⁷

The innovation process in capital goods can be partitioned into distinct phases of a linear process flowing from research, through product development to implementation activities. Ericsson, for example, undertakes three distinct types of project including: (1) research projects to develop and improve each generation of mobile communications systems technology; (2) development projects with lead customers to create new and modified products (e.g. radio base stations and mobile switches) for each generation of mobile system; and (3) implementation projects using mature product technology to design, integrate and build mobile networks for its customers throughout the world.

The partitioning of innovation into distinct phases is, however, difficult to apply in capital goods projects at the one-off or very-low-volume end of the productive spectrum, which involve the creation or first use of new technology. To meet a customer's requirements for such technologically advanced products, research, development and implementation activities

⁶ Some firms involved in production on a one-off basis supply technically 'simple' products such as bespoke suits. Other firms provide 'complex' products such as radio transmitting stations (Woodward 1965, p.37).

⁷ High-volume producers, such as car manufacturers, may also meet their internal requirements for capital goods by undertaking one-off productive projects to install equipment (e.g. IT, telecoms and factory automation systems).

