Implications of Internal Organization Structure for Firm Boundaries

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ABSTRACT

The knowledge-based view (KBV) argues that organization structure forms the basis of a firm’s ability to integrate and apply knowledge. While the KBV has foremost focused on aligning tasks of different knowledge types with their most suitable organizational form, the question of how a firm’s internal structure may condition its boundary choice for tasks of different complexity has not yet been examined. This paper studies the role that internal structure such as decentralized accountability, incentive intensity, and lateral coordination plays in firm boundary decisions, and argues that internal structure moderates the relationship between task complexity and vertical integration. The findings show that decentralized accountability, incentive intensity, and lateral coordination affect firm boundary decisions, and that decentralized task accountability and high incentive intensity lead to higher vertical integration than corporate accountability and low incentive intensity. Further, a firm’s internal structure strongly influences the relationship between task complexity and firm boundaries. The empirical setting is the firm boundary decision of 109 U.S. banks regarding Internet banking services. The data is from a survey conducted during winter of 2001/2002.

Keywords: Knowledge-based view, organization structure, task complexity, firm boundaries
Theories of the firm explain the conditions under which a firm should internalize rather than organize tasks in the market. Since Coase (1937), research on vertical integration has highlighted the limitations of markets for the exchange of knowledge. One problem is that knowledge cannot be valued prior to it being shared (Arrow, 1974), thereby creating the possibility for opportunism in exchange relationships. Apart from Arrow’s information paradox and opportunism, cooperative effort also entails costs of knowledge transfer because people do not always agree on the best way of action (Conner & Prahalad, 1996). In the knowledge-based view of the firm (KBV), firms are “repositories of specialized knowledge” (Demsetz, 1988: 157) and exist for the integration and application of knowledge that is costly to generate, maintain, and utilize (Demsetz, 1988; Grant, 1996; Kogut & Zander, 1992). Firms possess advantages when it comes to knowledge exchange: their members can rely on common, shared language and experiences that facilitate knowledge transfer and provide norms for the use and application of knowledge (Arrow, 1974; Kogut & Zander, 1992). Further, firms can rely on direction in the form of rules and instructions to coordinate tasks based on specialized knowledge (Demsetz, 1988; Conner & Prahalad, 1996). Thus, the KBV argues that activities extensively relying on knowledge exchange are better organized internally than through the market. However, work in the KBV has not investigated how internal organization structure influences a firm’s ability to economize on the costs of knowledge exchange, thereby affecting firm boundary decisions for tasks of different complexity.

Work in organization theory hints at the suitability of different internal organization structures for the execution of different tasks. More complex environments present organizations with more complex tasks, which are more efficiently handled by differentiation and integration of subunits rather than by centralized processing (Lawrence & Lorsch, 1967). Similarly, Cyert
and March (1963) note that the benefits of assigning decision rights to someone with specialized knowledge about coordination increases with increases in task complexity. Recent work building on ideas of the KBV has also made initial strides to better understand the role of internal organization structure for knowledge exchange and proposed an alignment between governance forms and different types of tasks (Grant, 1996; Macher, 2006; Nickerson & Zenger, 2004). Nickerson and Zenger (2004) argue that different hierarchical forms, namely authority-based versus consensus-based hierarchy, vary in their support for knowledge transfer, motivation for search efforts, and therefore are suitable for different tasks. For example, although incentive structures are lower-powered in hierarchies than in markets, they are not identical across organizations (Nickerson & Zenger, 2004). Hence, firm boundary decisions need to take a more nuanced view of organizations and their internal structure which impacts incentives and communication channels within firms, and thus knowledge exchange. Despite recent forays into better understanding the role of internal structure for knowledge exchange in tasks of different complexity (Grant, 1996; Macher, 2006; Nickerson & Zenger, 2004), hierarchical governance in boundary decisions is often still treated as a black box, largely neglecting internal structural differences among firms and their influence on firm boundaries.

In this paper, we primarily build on arguments of the KBV and related literatures to better understand the role of internal organization structure relative to task complexity for firm boundary decisions. Specifically, we argue that the conduciveness of internal structure for efficient knowledge exchange, where internal structure is captured as variance in decentralization of accountability, incentive intensity, and lateral coordination, influences the extent of vertical integration for tasks of different complexity. Hence, we propose that internal organization structure functions as a shift parameter for the link between task complexity and firm boundary.
This paper makes several contributions. First, although the KBV points to the role of organizing principles as important mechanism for integrating knowledge efficiently across units within a firm (Grant, 1996; Kogut & Zander, 1992; Nickerson & Zenger, 2004), empirical testing of internal organization structure and its role for firm boundary decisions has been scarce. This paper provides new insights into the role that variance in organizing principles among firms such as decentralization of accountability, incentive intensity, and lateral coordination plays for firm boundaries. We thus provide a more fine-grained view of internal organization and suggest that internal structures influence firm boundaries by impacting the costs of internal organization.

Second, by studying the moderating effect of internal organization structure on the link between task complexity and firm boundaries, we propose that the choice of how to organize tasks is more complex than hitherto presented. The extent to which increasing task complexity leads to task integration may depend on a firm’s internal structure and its ability to manage knowledge exchange for complex tasks. Hence, when making boundary decisions we need to not only compare markets to hierarchies, but also pay attention to heterogeneity in internal structures.

We proceed by discussing the implications of the KBV and related theories of the firm for the link between task complexity and vertical integration. Then, we discuss how internal organization structures vary in their ability to access and use knowledge, and explain how different internal structures moderate the link between task complexity and vertical integration through their effect on the internal cost of organizing. Finally, we present our data and analysis and conclude with a discussion of our findings and implications for theory and future research.

**THEORY AND HYPOTHESES**

Research on firm boundaries has focused on how firms should best organize their tasks to minimize the sum of production and transaction costs. Building on the work by Barnard (1938)
and Galbraith (1977) which notes the superior information-processing capacity of organizations, the KBV sees the role of firms as creating, storing, sharing, and applying knowledge. Similar to other capabilities-based approaches, such as the resource-based view (Barney, 1991) or evolutionary economics (Nelson & Winter, 1982), the KBV emphasizes firm heterogeneity in production costs. While Transaction Cost Economics (TCE) (e.g., Williamson, 1975; 1985) has been the dominant approach for evaluating transaction costs in the vertical integration literature, there are other theories of the firm that relate directly to transaction costs that arise in knowledge-intensive tasks: incentive-systems theory (Holmstrom & Milgrom, 1991; 1994) and adaptation theory (Williamson, 1975; Wernerfelt, 1997).

In the KBV, knowledge is “the most strategically important of the firm’s resources” (Grant, 1996: 110). Organizations have advantages over markets for knowledge exchange (Conner & Prahalad, 1996; Demsetz, 1988; Grant, 1996; Kogut & Zander 1992), especially when knowledge is tacit, and thus difficult to transfer among individuals and separate entities. On the one hand, the advantage of organizations in knowledge exchange derives from their ability to avoid knowledge transfer across firm boundaries, thereby reducing potentially lengthy efforts to convince third parties of the superiority of a specific course of action (Conner & Prahalad, 1996; Demsetz, 1988). That is, in organizations planning processes, rules, and direction through lines of authority substitute for educating and convincing actors of the appropriateness of a course of action (Demsetz, 1988). Thus, by applying fiat and direction firms avoid potentially lengthy and costly negotiations, and thereby economize on knowledge exchange (Arrow, 1974; Conner & Prahalad, 1996). On the other hand, researchers have argued that the benefits of organizations lie in facilitating knowledge transfer through shared experience, language, and culture among organizational members (Arrow, 1974; Kogut & Zander, 1992;
Weick, 1995). Members develop over time a shared understanding by “learning the information channels within a firm and the codes for transmitting information through them” (Arrow, 1974: 56). Such shared understanding facilitates communication and knowledge exchange by, for example, raising awareness of how one’s own tasks are interdependent with those of others (Thompson, 1967) or by increasing actors’ willingness to cooperate toward common goals (Barnard, 1938). Taken together, both lenses of the KBV argue that organizations provide a better mechanism for knowledge exchange and coordination than markets. Thus, production costs of knowledge-intensive tasks, such as professional services, product design, technology development, or certain kinds of sales, are generally lower within the firm.

Within the Coasian view of transaction costs (Coase, 1937), distinct theories of the firm try to explain the drivers of firm boundaries (Gibbons, 2005; Kim & Mahoney, 2005): incentive-systems theory (Holmstrom & Milgrom, 1991; 1994), property rights theory (PRT) (Grossman & Hart, 1986), rent-seeking theory (Williamson, 1975; Klein, Crawford, & Alchian, 1978), and adaptation theory (Williamson, 1975; Wernerfelt, 1997). For example, incentive-systems theory is a principal-agent approach that examines how ownership of productive assets affects the agent’s alignment of incentives with tasks. Similarly, PRT argues that firm boundaries depend on where the greatest effort for task completion occurs proposing that ownership of productive assets should be given to the person whose up-front effort matters most for success, thereby reducing the need for ex-post negotiation. In contrast, transaction cost economics as developed by Williamson¹ (1975, 1985; 1991) emphasizes the inefficiency of ex-post renegotiation. Here, the presence of asset specificity leads to vertical integration in order to avoid the frittering away of profits through opportunistic haggling over quasi-rents. As Gibbons (2005) points out,

¹ Given the predominance of TCE in the strategy literature, it makes sense to investigate how asset specificity relates to knowledge (e.g., Poppo & Zenger, 1998; Mayer & Salomon, 2006). However, this is not the only way to integrate knowledge-based issues into a theory of the firm.
Williamson occasionally references Simon’s (1951) theory of the employment relationship to describe a type of transaction cost that occurs even when opportunism is controlled by reputation effects or effective monitoring. For highly complex tasks, (which we define below), the cost of negotiating a contract up-front to cover every possible scenario is prohibitive. Furthermore, the sequence of actions by the employee or supplier must occur in rapid succession, in response to varying demands, and may need to be coordinated with the work of other people. For example, a registered nurse is trained to provide numerous services in response to patient needs. In hospital settings, nurses are not paid for each IV or medication, but are salaried, with the understanding that they will do whatever is required under the supervision of a physician who bears overall responsibility for the patient’s care. In the adaptation or “adjustment-cost” theory of the firm (to use Wernerfelt’s (1997) terminology), parties recognize that writing a complete contract is not possible and therefore commit to a relationship in which one party can tell the other which specific duties to perform as a result of changes in the environment. Recognizing that hierarchy facilitates coordination of highly complex tasks, the parties integrate to improve adaptation.2

Rather than emphasizing opportunism and physical assets, the knowledge-based view sets boundaries to economize on knowledge exchange related to task complexity (Grant, 1996; Kogut & Zander, 1992; Nickerson & Zenger, 2004). These assumptions match well with adaptation theories (e.g., Wernerfelt, 1997; Tadelis, 2002), which explain how complexity leads to transaction costs, and incentive-systems theories (e.g., Holmstrom & Milgrom, 1991; Milgrom & Roberts, 1992) which recognize the challenge of motivating agents to choose appropriately between alternatives. Building on these ideas, we study how different internal organization

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2 Gibbons (2005) stresses that adaptation theory can go beyond Simon’s (1951) explanation of the employment contract because it is possible to consider all parties as having specific decision rights under different scenarios and combinations of sources of uncertainty, rather than one party as the “employer” and the other as an “employee.” Tadelis (2002) applies similar arguments to the integration of any supplier.
structures influence the relationship between task complexity and firm boundary decisions, thereby providing a more holistic picture of the factors influencing firm boundaries. We particularly emphasize governance of the production of services by teams of knowledge workers, a situation in which agents often have different expertise, the value of physical assets employed is minimal, monitoring of effort is difficult, and yet opportunistic behavior is diminished because future employment relies on reputation.

**Task Complexity and Firm Boundaries**

Recent work related to the KBV argues that the knowledge transfer advantages of firms are particularly beneficial for the execution of complex tasks (Macher, 2006; Nickerson & Zenger, 2004). Task complexity affects the need for ongoing communication, knowledge transfer, and joint decision-making among parties completing different aspects of a task as well as the ease with which tasks can be subdivided into independent subtasks that draw on different knowledge sets (Nickerson & Zenger, 2004). In the realm of information processing, Schroder, Driver, and Steufert (1967) define complexity as the number of dimensions of information involved, the number of alternatives for each dimension, and the degree of uncertainty along each dimension. Integrating these ideas with the broader literature on complexity, Campbell (1988) creates a typology based on the presence of four sources of complexity: multiple paths to an end-state, multiple desired end-states, conflicting interdependence among paths, and uncertainty about links between paths and between paths and ends. The question of integration—whether to conduct an activity within the boundaries of the firm—can involve all four sources of complexity. For example, the decision to vertically integrate manufacturing can involve choices about alternative production methods, requirements for products to meet standards set by

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3 This definition is paralleled in research related to the KBV that argues that tasks can be ill-structured in the sense that there exists little consensus on their problem solving approaches and interdependencies that may occur among knowledge sets during task execution (Fernandes & Simon, 1999; Macher, 2006).
marketing, accounting, and regulators, a tradeoff between economies of scale and flexibility, and uncertainty about these issues. High complexity arises from tasks being very high on some dimensions or from being moderately high on multiple dimensions.

Building on this definition of complexity in information processing and Simon’s work (1962: 486) where a complex system is “a large number of parts that interact in a non-simple way,” economic models of firm boundary decisions generally condense complexity into two parameters: the number of things that can change, and the cost of changing those things (Tadelis, 2002; Wernerfelt, 1997). For example, to measure complexity in his adjustment cost theory of the firm, Wernerfelt (1997) includes parameters for the “number of possible sequences of actions” and “the frequency with which [the buyer] communicates with [the seller]” (495). Similarly, Bajari and Tadelis (2001) define a project as more complex if it involves a longer list of items that can change or if there is greater uncertainty about whether a design is appropriate.

Similar to these conceptualizations of complexity, we define task complexity along two dimensions: the difficulty to complete a specific task and the number of task dimensions. For example, in the context of service implementation, our definition of task complexity captures the range of different services being implemented and the extent to which the implementation of these services has well-understood processes for problem solving. Task complexity is the higher the greater the number of services and the more difficult these services are to implement.

Differences in task complexity and their associated needs for knowledge exchange affect the suitability of different firm boundaries for the execution of a specific task. Nickerson and Zenger (2004) argue that market arrangements are more suitable for simple and well-structured tasks, while internalization is preferred for complex, ill-structured tasks. Tasks that are highly complex and therefore require constant mutual adjustment, coordination, and information
processing among agents are better organized internally (Galbraith, 1977; Gulati & Singh, 1998). In contrast, simple, well-structured tasks that can be easily decomposed and subsequently completed with minimal ongoing knowledge exchange are suitable for outsourcing where agents can independently perform tasks relying on their own specialized knowledge.

Further, work in economics highlights advantages of hierarchy for the organization of complex tasks. Studying the integration of salespeople (Wernerfelt, 1997) and supply chains (Wernerfelt, 2005), Wernerfelt theorizes and finds that greater complexity in interactions, or both diversity and frequency of adaptation in task execution, render hierarchy the more efficient governance form because it substitutes haggling with direction and simplifies coordination. Similar to Wernerfelt’s approach, Tadelis and colleagues (Bajari & Tadelis, 2001; Levin & Tadelis, 2005; Tadelis, 2002) examine complexity by developing formal economic models of contracting decisions for procurement of one-time projects (e.g., building construction) and ongoing services (e.g., municipal waste disposal). For example, Tadelis (2002) shows that incentives vary inversely with complexity and that integration in terms of both asset ownership and an employment-like wage incentive are choices driven by task complexity. In sum, prior research indicates that more complex tasks are more efficiently governed within the firm.

_Hypothesis 1: Higher task complexity is positively related to vertical integration._

**Task Complexity, Internal Organization Structure, and Firm Boundaries**

Boundary decisions may, however, not only be affected by task complexity, but also by internal organization structures that affect internal organizational costs by impacting incentive alignment and intensity (Grossman & Hart, 1986; Milgrom & Roberts, 1992), and hence knowledge exchange, use, and application within the firm (Kogut & Zander, 1992). For example, Conner and Prahalad (1996: 477) argue that “the organizational mode through which individuals
cooperate affects the knowledge they apply to business activity.” Internal organization structures, such as decentralization of accountability, incentive intensity, and lateral coordination influence the extent and direction into which knowledge travels within a firm. Further, the effectiveness of different internal structures to process information largely depends on the type of knowledge involved and the task’s complexity (Kogut & Zander, 1992; Nickerson & Zenger, 2004). In that regard, Grant (1996: 120) mentions that “when different types of knowledge vary considerably in their potential for transfer and aggregation, the implications for organizational structure and the location of decision-making authority are profound”. Thus, internal organization structure and task complexity may jointly influence firm boundary decisions. Moreover, internal organization structures, such as incentive intensity (Grossman & Hart, 1986) and centralization, may affect influence costs within organizations (Milgrom & Roberts, 1992) and thereby propel decision makers toward a specific boundary choice. Hence, an organization’s internal structure may greatly influence whether a firm can take advantage of the knowledge transfer benefits often attributed to hierarchy (Kogut & Zander, 1992; Grant, 1996), and thus may lead to situations where a firm opts to internalize regardless of task complexity. In the following sections we discuss in detail the link between different internal organization structures, task complexity, and the degree of vertical integration.

Centralized Versus Decentralized Accountability and Degree of Vertical Integration

Centralized versus decentralized accountability captures the hierarchical level held accountable for a task’s outcome. If task accountability is centralized, corporate is likely to use rules and directives to integrate knowledge, and thus less autonomy remains at the business level (Argyres, 1996; Galbraith, 1973). To the contrary, if task accountability is decentralized, business-level managers are accountable for task outcomes. Whether task accountability is at the
corporate level or decentralized is likely to influence the degree to which a task is internalized.

Firms that decentralize task accountability tend to vertically integrate more because decentralization reduces production costs relative to centralization. Knowledge and task expertise vary between the corporate and business-level because business unit managers have greater involvement in day-to-day activities than corporate level managers do. Therefore, managers at the business level tend to be better informed about product requirements and the marketplace than corporate level managers, and therefore they have greater task-specific knowledge (Argyres & Silverman, 2004; Argyres, 1996). For example, when launching new services, business-level managers are often close to the actual users (customers or employees) of new services and therefore are likely to have a refined knowledge of the needs and expectations that a new service has to meet. Thus, knowledge expertise regarding a task is higher at the business level. Higher knowledge expertise reflects a higher capability for task execution, which, in turn, is likely to raise the degree of integration (Leiblein & Miller, 2003).

**Hypothesis 2:** Decentralized task accountability is related to higher degrees of vertical integration than centralized (corporate) task accountability.

A firm’s organization structure is likely to affect the link between task complexity and vertical integration. As task complexity increases, centralized task accountability is likely to lead to increased problems with knowledge transfer, which makes the transaction cost savings offered by the benefits of hierarchy even more important. Within the firm, problems between the corporate level and the operational unit worsen as task complexity increases; however, these problems in knowledge transfer are even worse across firm boundaries.

Centralized accountability is likely associated with lower integration for simpler tasks. Centralization distorts incentives faced by business level managers to invest efforts in task execution (Argyres, 1995; Williamson, 1985) because they are not held accountable for task
outcome. Additionally, the corporate level may encounter task monitoring difficulties, if the business level holds private and tacit information regarding its task performance (Argyres, 1995). In that case, contracting with market agents for simple tasks that are well-structured and easily decomposed into subtasks may yield lower transaction costs than organizing internally. As task complexity increases, however, centralized task accountability is likely to lead to increased problems with knowledge transfer across boundaries, which may raise costs of market transaction above those of hierarchy. Complex tasks have interdependencies among knowledge sets, ill-structured problem solving approaches, and rely heavily on tacit knowledge (Fernandes & Simon, 1999; Macher, 2006; Nickerson & Zenger, 2004), and therefore they require frequent adjustments as feedback and new information become available rendering one-time negotiations with market agents inefficient. Consistent with adaptation theory, more complex tasks require more adjustments, so negotiating a one-time price ex ante with an external supplier is inefficient. Ex post negotiations may be further hampered by differing knowledge sets and language between corporate and market agents (Grant, 1996; Kogut & Zander, 1992). Hence, as task complexity increases, corporate is likely to increase vertical integration. Even though corporate may also encounter difficulties internally organizing these tasks, internal transaction costs may be lower due to the benefits of hierarchy (Simon, 1951; Williamson, 1985) and the reliance on a common language and employment contract (Grant, 1996; Wernerfelt, 1997).

On the other hand, decentralized task accountability creates incentives at the business level to invest effort into task performance regardless of task complexity, because quality of task execution is directly linked to rewards (Alchian & Demsetz, 1972). Since the task is executed at

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4 These difficulties may arise because as task complexity increases, the corporate level may encounter increasing problems with applying rules and directives to integrate knowledge. As Grant (1996: 379) observes “direction involves codifying tacit knowledge into explicit rules and instructions” to communicate knowledge at low cost between specialists and non-specialists (Demsetz, 1988).
the business level, learning at that level tends to entail tacit and context-specific knowledge that is difficult to communicate and transfer (Fernandes & Simon, 1999; Nickerson & Zenger, 2004), but highly applicable to complex tasks and also useful with performing simple tasks. Being held accountable for task outcome and possessing tacit, context-specific knowledge for task execution, the business unit has incentives to control the process leading to task outcome, and therefore is likely to prefer integration to outsourcing regardless of task complexity. Therefore,

*Hypothesis 3: Decentralized task accountability weakens the positive effect of task complexity on vertical integration.*

**Incentive Intensity and Degree of Vertical Integration**

Although incentives are less powerful within firms than in markets (Williamson, 1975), incentive intensity is likely to vary across firms. Incentive intensity reflects the strength of the link between reward and performance (Alchian & Demsetz, 1972) and “can be thought of as varying directly with the levels of managers’ decision making authority and responsibility for decision consequences” (Argyres, 1996: 397). That is, in a multidivisional firm, incentive intensity is high if the same unit both makes funding decisions for a task and is held accountable for task outcome (Williamson, 1991). Incentive intensity is low if funding authority and accountability rest in different units.

We argue that high incentive intensity is related to higher degrees of integration than low incentive intensity because strong incentives increase internal productivity and reduce production costs, helping internal production compare more favorably to external production. Lower incentive intensity requires more substantial knowledge transfer between the unit making funding decisions and the unit with task accountability. This separation of funding authority and task accountability is likely to result in divergent goals between units (Jensen & Meckling, 1976). For example, funding authority at the corporate level may result in the pursuit of short-
term financial goals in funding decisions, while business units with task accountability may face resource constraints that interfere with the quality of task execution. Therefore, if incentive intensity is low, the unit with task accountability has strong incentives to engage in opportunistic activities to influence decisions made by the unit with funding authority. These influence activities can take the form of haggling over resource allocation, distorting information transfer, or failing to make sufficient specialized asset investment (Meyer, Milgrom, & Roberts, 1992). These influence activities raise the costs of organizing internally (Milgrom & Roberts, 1990) and can ultimately surpass the costs of market transactions (Poppo, 1995). Influence activities raise costs of internal organization as managers consume resources lobbying for favorable outcomes instead of pursuing more productive activities, as lobbying leads to distorted resource allocation, and as firms implement less efficient systems to limit influence costs (Milgrom & Roberts, 1990). Thus, influence activities lead to the pursuit of local optima instead of organization-wide maximums (Eccles & White, 1988). To avoid these internal costs of organizing firms may pursue lower vertical integration when faced with internal organization structures of low incentive intensity. In contrast, if incentive intensity is high, consequences are tightly linked to actions (Williamson, 1991). That is, if held accountable for task outcomes, managers have high incentives to make funding decisions that maximize task performance and to control the task completion process. Influence activities are less likely since funding authority and task accountability rest with the same area. This link between actions and outcomes is the stronger, the higher the degree of task internalization. Therefore, internal organization structures of high incentive intensity are likely associated with higher vertical integration.

Hypothesis 4: High incentive intensity within the firm is positively related to vertical integration.

When funding authority and task accountability reside in the same unit (high incentive
intensity), adaptation is relatively inexpensive, regardless of task complexity. Therefore, high incentive intensity is likely associated with integration, even for lower task complexity. In contrast, the link between task complexity and vertical integration is likely to be stronger for low incentive intensity. At lower task complexity where tasks can be easily partitioned into subtasks and transferred to market agents, outsourcing may enable firms with low incentive intensity to avoid internal costs of influence activities. As task complexity increases, however, knowledge exchange becomes increasingly tacit and context-specific, and task execution is more ad hoc and ill-structured (Nickerson & Zenger, 2004; Macher, 2006). Even though greater task complexity is likely to increase influence costs of internal organization and the monitoring of task-related activities of another unit (Poppo, 1995), it also increases knowledge transfer across firm boundaries (Nickerson & Zenger, 2004). Adding concerns of knowledge appropriation to the increased difficulty of organizing interdependent and complex tasks with market agents, costs of organizing in markets are likely to outweigh internal costs of organization. Therefore, as task complexity increases, firms with low incentive intensity are likely to vertically integrate.

*Hypothesis 5: High incentive intensity weakens the positive effect of task complexity on vertical integration.*

**Lateral Coordination and Degree of Vertical Integration**

Lateral coordination captures the extent to which a firm integrates activities related to a task across different business units and channels. Lateral coordination affects the extent to which a firm creates a common language and routines across units and thus the conduciveness of a firm’s internal structure for knowledge exchange. The KBV emphasizes that firms are superior to markets in transferring knowledge because of their common language and shared experience among organizational members (Arrow, 1974; Weick, 1995; Kogut & Zander, 1992), or what Monteverde (1995: 1629) calls “one single organization-specific dialect”, that has evolved
through continuity of association of organizational members. The extent to which this common, organization-specific dialect is applied to develop a shared task understanding may depend on the extent to which information and knowledge about task-related activities is coordinated laterally. The more lateral coordination occurs regarding a task, the more likely is the firm to develop routines as mechanisms of communication (Grant, 1996) and a common knowledge base around a task. These routines and common knowledge bases help different units share and integrate knowledge aspects of a task that become available as the task is executed (Grant, 1996). Hence, a firm’s lateral coordination enhances the knowledge sharing advantages of organizations relative to markets, and therefore is likely related to greater vertical integration. Furthermore, by fostering a common language, lateral coordination is likely to enhance task understanding across units with different knowledge sets. As common understanding among units increases, costs and efforts to negotiate a course of action may decline (Conner & Prahalad, 1996) and thereby facilitate task execution within the firm, which, in turn, is likely to increase vertical integration.

*Hypothesis 6: Greater lateral coordination is positively related to greater vertical integration.*

By facilitating knowledge transfer, lateral coordination is likely to promote vertical integration regardless of task complexity. The shared understanding and common language fostered by lateral coordination is likely to increase the efficiency of internal organization relative to markets for even simple tasks by easing knowledge exchange related to the execution of task components. In contrast, firms with low lateral coordination are likely to prefer the market for the execution of simpler tasks. The lack of a strong shared understanding across units reduces the advantages of internal organization relative to market contracting, especially for tasks that are rather simple and easily broken into subtasks that rely on different knowledge components for their completion (Nickerson & Zenger, 2004; Macher, 2006). By using the
market for simpler tasks, these firms can take advantage of the market’s higher-powered incentives. They are likely to prefer the market to vertical integration up to the point where increasing task complexity makes knowledge exchange through the market less efficient than through hierarchy. Therefore, we propose that the effect of task complexity on vertical integration is the more pronounced the lower a firm’s lateral coordination, and vice versa.

**Hypothesis 7: Greater lateral coordination weakens the positive effect of task complexity on vertical integration.**

**METHODS**

Our empirical setting is the U.S. banking industry and the firm boundary decisions that banks made to implement Internet banking services. The Internet provides banks with an electronic, interactive communication channel for the distribution of their financial services. Internet banking solutions represent a front-end system that relies on a programming link to transfer data entered by customers using online financial services to a bank’s core processing systems (FFIEC, 2003). Thus, Internet banking technology provides banks with an electronic platform on which to offer a range of financial services. This setting is well-suited for our study: First, banks varied widely in the range of financial services they initially offered online, with services ranging from account inquiry, funds transfer, and loan services to electronic bill payment, account aggregation, and website hosting (Berger, 2003; OCC, 2002). This variance in extent and type of services offered reflects variance among banks in terms of the complexity faced when first implementing Internet banking solutions. Second, banks varied widely in the extent to which they relied on third party technology vendors, such as Edify, Digital Insight, or Fiserv, versus their own internal IT staff to implement Internet banking services. Implementation typically comprises the installation and customization of an electronic front end that hosts the financial services as well as establishing ties between a bank’s front end and its core processing...
systems. Third, with few exceptions (e.g., Banc One and Wingspan), most of the efforts to implement Internet banking were spearheaded from inside the traditional organization where the sourcing decision regarding Internet banking implementation was made (BAI, 1999). However, banks varied in their internal organization for Internet banking. For example, Internet banking initiatives sprung up in different units across banks, funding authority varied across lines of business and IT unit, some Internet efforts were highly centralized and coordinated across lines of business while others were decentralized, and the unit championing Internet banking ranged from marketing and operations to IT across banks (BAI, 1999; Boston Consulting Group, 2000).

**Data**

The data is from two surveys conducted during winter of 2001/2002 and archival yearly Reports on Condition and Income that banks file with regulators. We conducted a mail survey among senior executives responsible for their bank’s Internet initiatives to obtain information on bank’s outsourcing activities and internal organization structure for Internet banking. We also conducted a telephone survey among senior executives of Internet technology vendors to gather information on the complexity associated with implementing different Internet Banking services.

From a list of 2512 FDIC-insured bank holding companies (BHCs) larger than $100 million in assets we randomly sampled 800 BHCs. As of December 2000, there existed 5065 FDIC-insured BHCs. We contacted each bank by phone to gather the name and contact information of the most senior executive in charge of the bank’s Internet banking initiatives. We obtained contact information for 768 both privately and publicly held banks.

We sent the survey to senior executives in charge of their bank’s Internet activities during winter 2001/2002 and conducted two follow-up postcard mailings and follow-up phone calls during spring 2002. The survey was based on prior interviews with bank executives and industry
experts as well as reviews of bank websites, press releases, and market research studies. We also piloted the survey with eight experts who were either senior banking executives or banking industry analysts. We obtained responses from 224 banks. Accounting for 21 acquired banks among the 768 banks in the sample the response rate rose to 30%. We examined the data for potential non-respondent bias by conducting t-tests between respondents and non-respondents and between earlier and later respondents for size, financial condition (loans/deposits), and number of banks in a BHC’s structure. The t-tests were not significant indicating absence of a non-respondent bias between respondents and non-respondents (size: $t = -0.18$; BHC’s structure: $t = 1.15$; financial condition: $t= 1.07$) and between earlier and later respondents (size: $t = -1.03$; BHC’s structure: $t = -0.71$; financial condition: $t= -1.08$).

We included global and specific measures to assess informants’ knowledge of their bank’s Internet activities (Kumar, Stern, & Anderson, 1993) and to reduce concerns of rater reliability (Gerhart, Wright, McMahan, & Snell, 2000). Due to the small size of most banks’ area responsible for Internet banking (71% of e-business units of banks in the sample had no more than five employees) we only used a single informant. Further, utilizing multiple informants from a single firm when a single informant is most knowledgeable often creates problems (Glick, Huber, Miller, Doty, & Sutcliffe, 1990). About 70% of informants had titles at the VP-level or higher. Informants had titles in e-commerce (37%), operations (25%), IT (16%), marketing (9%), sales (6%), finance (2%), CEO (2%), and other not specified (4%), reflecting earlier observations that the area initially championing Internet banking varied across banks (BAI, 1999). Informants had, on average, a job tenure of 3.8 years and a bank tenure of 8.3 years, reflecting experience in Internet banking that had existed for only six years at the time of the survey. To assess informants’ competence we also asked them to rate their personal involvement in (1) their bank’s
online initiatives, (2) adding new online functionality, and (3) Internet supplier/partner selection on a 7-point Likert-type scale. The three items were reliable ($\alpha = 0.88$) and informants seemed very involved (mean = 6.03; S.D. = 1.23). Further, Gerhart, Wright, and McMahan (2000) note that single raters are more reliable in smaller than larger firms due to substantial within-company variation in larger firms, e.g. different policies across business units can present a major source of rater reliability at the firm level (865). We believe that rater reliability bias is not a concern in this study given the small size of most banks’ e-business units and given that informants were only asked to report on activities directly related to Internet banking, their area of responsibility.

Also, during winter 2001/2002 we conducted a telephone survey with senior executives of ten Internet banking technology vendors. We sampled ten of the largest technology vendors because we were interested in obtaining information on the average difficulty for a bank to implement Internet services, and therefore sought vendors with experience across a large set of banks. We asked the ten informants to rate each of the 36 Internet banking services (see Appendix 1) on a scale of 1-7 based on how difficult it is for an average bank to implement (e.g. demand imposed on back-end systems, extent of synchronization required between the Internet channel and core processing systems). The list of 36 Internet banking services was compiled from reviews of bank websites, press releases, and market research reports as well as from interviews with bank executives and industry experts. Experts in the industry confirmed this list as containing all Internet banking service areas offered by banks at the time of the survey. We discussed the task with each senior executive over the phone to avoid any misunderstandings and then e-mailed a list of the 36 services to the senior executives for their rating. Averages for the service ratings by the ten senior executives are reported in Appendix 1. Across the ten senior executives the average job tenure was 4.6 years and their average involvement in installing
Internet banking systems was 5.4 (1-7 scale). The ten senior executives’ inter-rater reliability (James, Demaree, & Wolf, 1993; Lindell & Brandt, 1999) was $\alpha=0.95$ for retail services, $\alpha=0.72$ for investment services, $\alpha=0.87$ for small business services, and $\alpha=0.84$ for non-traditional services yielding an overall inter-rater reliability of $\alpha=0.85$.

A potential shortcoming of survey-based research that collects dependent and independent measures from the same informant is common method variance (Podsakoff & Organ, 1986). However, we believe that the validity of our results is not subject to common method bias. First, our independent variable ‘task complexity’ was collected in a separate survey with informants different from those in the survey collecting data on the dependent variable ‘degree of vertical integration’ and the independent variables ‘internal organization structure’. This is likely to decrease correlation among dependent and independent variables potentially attributable to common method bias (McEvily & Chakravarthy, 2002). Second, several of our findings are based on interactions between variables from different surveys which are unlikely to be distorted by common method bias (Brockner, Siegel, & Martin, 1997).

**Variable Measurements**

**Dependent Variable:** The dependent variable is *degree of vertical integration* and captures a firm’s overall reliance on internal talent versus external third party links to implement new services, i.e. Internet banking services. It assesses the extent to which a firm organizes internally versus through market-based arrangements for the task of service implementation. The variable measures a firm’s intensity of vertical integration across a set of eight service categories that comprise a total of 36 Internet banking services offered at the time of data collection in 2002 (see Appendix 1). That is, degree of vertical integration is based on the number of service categories that a firm integrates, and on the extent to which it vertically integrates within each of
the eight service categories (Gilley & Rasheed, 2000). For each of the eight service categories, survey informants indicated the percentage of service implementation that their bank completed through reliance on internal talent versus external third party arrangements. Thus, similar to Pisano (1990) and Poppo and Zenger (1998) we measure degree of vertical integration as a continuous variable ranging from zero for all external to 100% for all internal. We calculated degree of vertical integration by summing the percentages of service implementation internalized by service category (see Appendix 2) and then dividing the sum by the total number of service categories the bank implemented to obtain a measure of average degree of vertical integration across the eight service categories. Thereby, this measure considers that vertical integration may vary across service categories, and that some service categories may be fully-outsourced.

To ensure robustness of our findings we also calculated a measure of degree of vertical integration at the level of each of the eight service categories. In other words, we did not average degree of vertical integration across the eight service categories, but rather estimated our analysis at the service category level where each service category had its own observation for degree of vertical integration per bank. The results were consistent with the findings reported here.

**Independent Variables:** The four independent variables are: task complexity, decentralized accountability, incentive intensity, and lateral coordination. *Task complexity* captures the difficulty of implementing a set of Internet banking services. The measure consists of two components that capture complexity as the number of services implemented and as their difficulty of implementation which varies by service: First, from a list of 36 Internet banking services (see Appendix 1) informants (senior banking executives) checked off the services that their bank offered. This list of 36 services spans account balance inquiry and funds transfer services, bill payment services, bill presentment services, credit/loan/mortgage services,
investment and insurance services, and non-traditional services such as account aggregation (the eight service categories for which we also measured degree of vertical integration). The task of implementing Internet banking services is likely to be the more complex, the more services a firm implements due to interdependencies among services that need to be resolved in order to present the customer with a coherent set of services. Second, the difficulty of implementing services varies by service. Difficulty of implementation in our context refers to how difficult it is for an average bank to adapt its organization, for example, the demand imposed on back-end systems and the synchronization required between a bank’s core processing systems and its Internet banking platform. Since we are interested in the general difficulty of implementing each of the 36 services rather than in the difficulty a specific bank may experience, we asked ten senior executives of technology vendors, such as EDS or Fiserv, that have extensive experience with implementing Internet banking services to rate each of the 36 services on a scale of 1-7 for their difficulty of implementation (these ratings are provided in Appendix 1). The raters’ overall inter-rater reliability was $\alpha = 0.85$. We used these ratings and the survey responses from the senior bank executives to calculate a variable of task complexity that weighs each of the services that a bank implemented out of these 36 services by its difficulty. That is, $\Sigma x_i s_i$, where $x_i$ reflects the services that a bank implemented and is 1 if bank $j$ implemented service $i$ and 0 otherwise, and $s_i$ reflects the difficulty rating for service $i$. We take the log of this variable.

To ensure robustness of our results we also calculated task complexity separately for each of the eight service categories for which we also measured degree of vertical integration. We then estimated our analysis at the service category level where each service category had its own observation for task complexity and degree of vertical integration per bank to ensure that our results were not due to only bundling effects among services or driven by the joint deployment of
services. The results of this analysis were consistent with the findings reported here.

*Decentralized accountability* assesses whether corporate is accountable for e-business success or whether accountability is decentralized. The variable is a dummy with the reference category centralized (corporate) accountability. Survey informants indicated the area head that was ultimately accountable for e-business success at the time when the firm chose to implement Internet banking (see Appendix 2). Decentralized accountability (N=78) comprises structures where the business unit (head of operations or retail banking) or IT unit is held accountable, or where the heads of two areas (corporate, business unit, or IT unit) share accountability for e-business success. Centralized (corporate) accountability (N=31) comprises structures where the CEO, CFO, head of marketing, or head of strategic planning are accountable. The corporate accountability measure takes into consideration that marketing and strategic planning positions are frequently centralized staff functions in retail banks. The measure separates sole corporate accountability from arrangements where accountability is fully or partially decentralized.

*Incentive intensity* is a dummy variable that assesses the strength of the link between reward and performance (Alchian & Demsetz, 1972). The variable is 1 if the same unit, or head, is accountable for e-business success while holding control over e-business funding allocation (N=59). The variable is zero if the unit accountable for e-business success is different from the unit that makes the e-business funding allocation (N=50). Informants indicated in the survey (a) the area head that was ultimately accountable for e-business success and (b) the area head that controlled e-business funding at the time of Internet banking implementation (see Appendix 2). We then compared the answers to both questions and coded the variable as 1 if both accountability and funding control were held by the same area head and as zero otherwise.

*Lateral coordination* consists of two items measured on a 1-7 scale. Informants indicated
the extent to which their bank had mechanisms in place to coordinate e-business activities (a) with existing channels and (b) across business units.

**Control Variables:** We control for firm-specific variables that may affect a firm’s degree of vertical integration. *Size* is measured as the log of assets a bank held at the time when implementing Internet banking (Dos Santos & Pfeffer, 1995) and was obtained from archival annual reports on condition and income that banks file with regulatory agencies. Larger firms may be resource richer and therefore more likely to vertically integrate and benefit from scale and scope economies that make internalization less costly. *Time of adoption* is measured as the months since year-end 1995 (the time when the first established bank, Wells Fargo, began to offer Internet banking) that passed until a bank started to adopt Internet banking. This variable controls for market learning effects due to the diffusion of Internet services which affects the amount of knowledge available about individual services (Schoenecker & Cooper, 1998) and hence their difficulty of implementation. As experience of technology vendors and information available in the market about services increases, outsourcing may become more attractive.

We also control for firm capabilities and experience that is likely to affect a firm’s propensity to engage in vertical integration (Leiblein & Miller, 2003). *PC banking experience* denotes a bank’s exposure to an earlier, related technology where 1 refers to banks with PC banking experience and zero to banks without PC banking experience. PC banking required customers to install the bank’s software on their computer and dial into the bank’s network in order to conduct banking transactions. Thus, PC banking was less technologically sophisticated than Internet banking that allows customers to conduct their banking business from any PC with Internet access and to pay, transfer, and aggregate funds involving accounts hosted by third parties. However, PC banking provided banks with valuable information about the intricacies of
remote banking and its links with traditional back-end systems and thereby may influence a bank’s expertise for implementing new technology services by relying on internal talent.

*Technical capabilities* capture a firm’s overall technology/IT knowledge and resources relative to peers at the time when deciding to adopt Internet banking. Technical capabilities are a two item measure on a 1-7 scale. Informants indicated the extent to which their bank had (a) overall technology/IT knowledge and (b) invested in IT. The variable controls for a bank’s technical knowledge which may affect its ability to implement Internet banking services through reliance on internal talent. *Marketing capabilities* are a composite measure of two items: (a) an archival measure of a bank’s advertising and marketing expenses divided by its revenues to correct for firm-size effects, and (b) an archival measure of a bank’s experience with different banking products measured as the percentage of income derived from nontraditional sources such as insurance and investment services (Furst, Lang, & Nolle, 2000). We used z-transformations of both measures to create the marketing capability measure that controls for a firm’s knowledge of its customer markets, which is likely to be helpful when implementing new services that operate at the bank-customer interface and are used by bank customers.

**Statistical analysis**

To test the influence of task complexity and internal organization structure on degree of vertical integration we estimated a two-sided Tobit regression at the level of the firm for a sample of 109 banks. Tobit regression is appropriate when the dependent variable has an upper and/or lower limit bound (Greene, 2000), which in the case of degree of vertical integration are 100 and zero, and the dependent variable has several values clustered at a limit bound, generally zero (Greene, 2000). Since our dependent variable has 53% of its observations at zero reflecting complete outsourcing of service implementation, Tobit regression is an appropriate estimation
technique because it uses, in contrast to other estimation techniques, all observations, those at the
limit and those above, to estimate the regression line. Tobit regression estimates both the
likelihood that the dependent variable exceeds the limit bound (in our case complete
outsourcing) and its value if it does, using a maximum likelihood estimator (Greene, 2000).\(^5\)

A potential issue that requires attention relates to Chandler’s (1962) thesis that “structure
follows strategy”, which implies that our organization structure variables may not be truly
exogenous, but rather that strategy choices may influence structural decisions. On the other hand,
researchers have also argued and shown that organization structures are rather rigid in the short-
term constraining strategic choice, are path-dependent and limited by prior structural decisions
and commitment, and that therefore strategy follows structure in the short-term (North, 1990;
Argyres, 1995; 1996). We adopt this view that argues that pre-existing organization structures
drive how strategies are implemented in the short term, while over the long-run managerial
actions can reduce structural constraints thereby supporting Chandler’s (1962) thesis “structure
follows strategy” (Argyres, 1996: 401). Given that our study focuses on the early stage of a new
technology’s adoption, and hence on the short-term, it is more reasonable to argue that structural
characteristics inside the organization preceded the sourcing decision than vice versa, and that
structural decisions regarding Internet banking are influenced by a bank’s pre-existing internal
structures. Further, our hypotheses predict relationships rather than causal directions.

We also tested our model for endogeneity of the organization structure variables using

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\(^5\) To ensure robustness of our findings we conducted two additional analyses. First, we estimated our models using
OLS and the results were consistent. Second, we tested our hypotheses arranging the data at the service level where
each bank had individual observations for each service category’s task complexity and degree of vertical integration
to ensure that our findings were not due to interdependencies among the bundle of services implemented. This
analysis contrasts to the analysis at the firm level where each bank has one observation for task complexity and
degree of vertical integration averaged across all its services. We used a random-effects Tobit model to estimate the
data at the service level and to account for individual firms having multiple observations in the data set: i.e., one for
each service category offered. We used a random-effects model since there does not exist a sufficient statistic to
condition a fixed-effects Tobit model. The results were consistent with those presented in the paper.
the Davidson-Hausman-Wu test of endogeneity (Wooldridge, 2003). Davidson and MacKinnon (1993: 236-242) propose an augmented regression test where \( y_1 \) represents degree of vertical integration and \( y_2 \) represents the organization structure variables, respectively.

\[
y_1 = \alpha_1 y_2 + \alpha_2 x_1 + \alpha_3 x_2 + \ldots + \epsilon
\]

\[
y_2 = \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots + \mu
\]

where \( x \) reflects different exogenous variables. We test for endogeneity of \( y_2 \) in the first equation by estimating \( y_2 \) as a function of all exogenous variables in the model to obtain fitted residuals \( \mu \) for a respective structure variable (\( y_2 \)) that we then insert into the first equation predicting \( y_1 \).

\[
y_1 = \alpha_1 y_2 + \alpha_2 x_1 + \alpha_3 x_2 + \alpha_4 \mu + \ldots + \epsilon
\]

We conduct this analysis for each of the three organization structure variables: incentive intensity, decentralized accountability, and lateral coordination. A variable is endogenous, if the t-test for the coefficient \( \alpha_4 \) of the fitted residual \( \mu \) is significant. The test involves instrumental variables in the model predicting each of the structure variables (\( y_2 \)) that correlate with \( y_2 \), but not with \( \epsilon \). We used three variables\(^6\) that capture organizational and environmental factors that may influence a firm’s structural decisions: geographic diversification, industry concentration (Lawrence & Lorsch, 1967), and customer characteristics, and estimated the models predicting the structural variables with all three or subsets of the three in the equation. Conducting these tests we found no evidence of endogeneity. The estimate \( \alpha_4 \) was not significant (\( p = 0.267 \) for lateral coordination, \( p = 0.581 \) for incentive intensity, and \( p = 0.519 \) for decentralized accountability) in any of the equations, implying that it is reasonable to treat the organization structure variables as exogenous in our data set.

\(^6\) Geographic diversification is measured as a dummy variable that captures whether or not a bank has offices outside the state in which it is headquartered. Customer characteristics are captured as customer affluence, i.e. the percentage of deposit accounts greater than $100K divided by all deposit accounts. Industry concentration is the four-firm concentration ratio of deposits in a bank’s market defined by its number of states of operation.
RESULTS

Table 1 presents means, standard deviations, and correlations. The three internal structure variables decentralized accountability, incentive intensity, and lateral coordination correlate positively with degree of vertical integration ($r = 0.21$, $r = 0.13$, and $r = 0.13$, respectively).

Table 2 presents the results for the Tobit regression models testing the link between task complexity, internal organization structure, and vertical integration. Model 1 presents the control variables. Firm size is positive and significant ($\beta = 7.549$; $p < 0.05$) showing that larger firms tend to have higher vertical integration. Similarly, firms with greater marketing ($\beta = 17.197$; $p < 0.05$) and technical capabilities ($\beta = 9.799$; $p < 0.05$) tend to have higher vertical integration.

Model 2 introduces the task complexity and internal organization structure variables to test H1, H2, H4, and H6, while Models 3 through 6 test H3, H5, and H7 that propose interactions between task complexity and internal organization structure. H1 states that higher task complexity is positively related to vertical integration. In Model 2 the coefficient for task complexity is positive and significant ($\beta = 15.523$; $p < 0.05$), supporting H1 and prior arguments on the positive link of task complexity with vertical integration (Nickerson & Zenger, 2004).

All of the internal organization structure variables, namely lateral coordination ($\beta = 7.094$; $p < 0.05$), incentive intensity ($\beta = 19.241$; $p < 0.10$), and decentralized accountability ($\beta = 27.957$; $p < 0.05$) were significant and positive in Model 2. Decentralized accountability is related to higher vertical integration than centralized (corporate) accountability, supporting H2. Further, the positive coefficient for incentive intensity supports H4 proposing that incentive intensity is positively related to vertical integration. Finally, the positive coefficient for lateral coordination supports H6. Thus, a firm’s internal structure significantly affects its boundary choice.
Models 3 through 6 test H3, H5, and H7 that propose that a firm’s internal organization structure moderates the relationship between task complexity and vertical integration. H3 proposes that decentralized accountability weakens the positive effect of task complexity on vertical integration. In Model 3 the interaction between decentralized accountability and task complexity is negative and significant ($\beta = -49.767; p < 0.05$). We assess the nature of the interaction by graphing the total marginal effect of task complexity on vertical integration for decentralized accountability and centralized (corporate) accountability. The total marginal effect is the sum of the direct effect of task complexity on vertical integration and the interaction effect. Calculating the total marginal effect at the two different levels of the variable decentralized accountability (dummy moderator) shows how the link between task complexity and vertical integration changes depending on whether the structure is more or less decentralized for task accountability. Figure 1 shows the interaction graph. The slope for centralized (corporate) accountability is steeper than that for decentralized accountability. In fact, the slope for decentralized accountability is almost horizontal indicating that degree of vertical integration does only incrementally change as task complexity increases. In contrast, if corporate is accountable for task outcome, degree of vertical integration increases significantly as task complexity increases. Further, the figure shows that decentralized and corporate accountability differ significantly in their relationship to vertical integration, if task complexity is low, however, this gap closes as task complexity increases. Finally, the figure implies that firms with decentralized accountability tend to vertically integrate more than firms with corporate accountability at low to medium levels of task complexity. Thus, H3 is supported.

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INSERT FIGURE 1 ABOUT HERE
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H5 proposes that high incentive intensity weakens the positive effect of task complexity
on vertical integration. Model 4 introduces the interaction that is significant and negative (β = -42.673; p < 0.05). To gain further insight into the moderating effect of incentive intensity we graph the total marginal effect of task complexity on vertical integration at high and low incentive intensity in Figure 1. The figure shows that the slope for low incentive intensity is steeper than that for high incentive intensity. The almost horizontal slope for high incentive intensity shows that vertical integration does not greatly vary as task complexity increases for firms with high incentive intensity, i.e. the same area head is accountable for task outcome and holds funding authority. In contrast, when incentive intensity is low, vertical integration varies greatly depending on task complexity. Further, at low task complexity firms with high and low incentive intensity differ significantly in their vertical integration, this difference, however, dissipates as task complexity increases. Overall, firms with high incentive intensity have a greater tendency to vertically integrate at low and medium task complexity, supporting H5.

H7 proposes that greater lateral coordination weakens the positive effect of task complexity on vertical integration. Model 5 tests this interaction which was not significant. Thus, H7 is rejected. The link between task complexity and vertical integration does not seem to vary by a firm’s lateral coordination, although lateral coordination has a direct, significant effect on vertical integration. Finally, Model 6 presents all three interactions proposed in H3, H5, and H7. While the interaction for incentive intensity is two-tailed significant (p < 0.10) when included in the same model as that for decentralized accountability, the interaction for latter turns only one-tailed significant.

Overall, the results show that both task complexity and internal organization structure relate to vertical integration, and that internal organization structure (decentralized accountability and incentive intensity) moderates the task complexity – vertical integration link.
DISCUSSION AND CONCLUSION

This paper contributes to the literature on firm boundaries by providing a more fine-grained look at how internal organization structure influences knowledge exchange and incentive alignment within firms and thus the advantages of hierarchy relative to market. By showing that firm boundaries vary depending on a firm’s internal structure this paper emphasizes the need for research to move from a simple comparison of hierarchy with markets toward a comparison of markets with the internal structures of hierarchy. Thus, new insights can be gained for firm boundary decisions as research lifts the veil of hierarchy to consider how firms actually operate.

Firms vary in their decentralization, their assignment of decision rights, and along other internal structural dimensions that affect how organization members interact with each other (Cyert & March, 1963), the ease with which they exchange knowledge (Grant, 1996), and the incentives they face for knowledge exchange (Grossman & Hart, 1986; Milgrom & Roberts, 1992). We discuss the individual findings of this paper and their implications next.

First, we find that internal organization structure is positively associated with a firm’s degree of vertical integration. Specifically, decentralized task accountability where business-level managers are held accountable for task outcomes is associated with higher vertical integration than centralized (corporate) task accountability. A reason for this may be that knowledge expertise for task completion resides at the business level where the task is executed, thereby providing the business unit with the absorptive capacity to internalize the task. In contrast, if task accountability is centralized, corporate relies on the use of rules and directives to integrate its own knowledge with that of the business unit and knowledge transfer may be hampered by private and tacit knowledge at the business level (Kogut & Zander, 1992). Faced with the need for knowledge transfer under conditions of both hierarchy and market, advantages
of hierarchy over market may decline for firms with corporate task accountability. Further, high incentive intensity (same area is accountable for task outcome and has funding authority) is positively related to higher vertical integration. Areas that have funding authority and are held accountable for task outcomes face tight links between actions and consequences in the case of vertical integration where the process of task execution is conducted in-house, and thus a strong incentive to internalize. In contrast, low incentive intensity is likely to result in divergent goals between units with funding authority and units held accountable for task outcome. These divergent goals can raise influence costs (Milgrom & Roberts, 1990) that wither away the advantages of hierarchy relative to markets. Moreover, lateral coordination is positively related to vertical integration. By facilitating a common language and shared experience across units, lateral coordination is likely to raise the advantages of hierarchy for knowledge exchange.

Second, consistent with prior work in both the KBV and economic literatures (Macher, 2006; Nickerson & Zenger, 2004; Tadelis 2002; Wernerfelt, 1997), we find that task complexity is positively associated with vertical integration. Thus, as a task’s need for knowledge exchange and interaction among knowledge components increases, firms are more likely to integrate.

Third, we find that internal organization structure moderates the link between task complexity and vertical integration. The findings show that firms with decentralized task accountability tend to vertically integrate regardless of task complexity; whereas task complexity matters greatly for the decision of how much to integrate when task accountability is centralized. Similarly, the findings for incentive intensity show that firms with high incentive intensity tend to vertically integrate regardless of task complexity, whereas task complexity strongly affects the decision of vertical integration for firms with low incentive intensity. Hence, task characteristics play a major role in vertical integration decisions for firms with centralized task accountability.
and/or low incentive intensity. In contrast, task complexity plays only a minor role in boundary decisions of firms with decentralized task accountability and/or high incentive intensity. These findings imply that sometimes internal structure weighs greater on firm boundary decisions than the characteristics of the task or transaction, and vice versa. How a firm is organized and who holds decision rights affects whether hierarchy becomes the superior form of organizing regardless of task complexity or only the preferred form for complex tasks.

The findings have theoretical implications. The interaction findings point to the need for research on firm boundaries to look beyond the characteristics of tasks or transactions to other factors explaining firm boundaries. By simply matching task characteristics with appropriate organization forms, we may have overlooked other important drivers of transaction and production costs and hence of firm boundaries, such as internal organization structures that under some circumstances, e.g. decentralization, may outweigh the importance of task characteristics as drivers of firm boundary decisions. While prior work has extended the dichotomous distinction between market and hierarchy, i.e. the traditional make-vs.-buy decisions, to include hybrid forms, alliances, and equity partnerships (e.g., Kogut, 1988) or tapered integration (Harrigan, 1984), little empirical work has been devoted to developing a better understanding of how differences among firms in terms of their hierarchy relate to firm boundary decisions. Consistent with work in the resource-based view on heterogeneity in production costs among firms based on differential resource endowments as driver of firm boundaries (Argyres, 1996; Leiblein & Miller, 2003), this paper’s findings imply that heterogeneity in internal organization structure affects firms’ internal production costs, which, in turn, affect efficient firm boundaries.

This paper’s findings also have important managerial implications. Characteristics of a transaction or task should not be the only deciding factor in a firm’s boundary decision.
Managers need to look beyond task complexity to how their organization is structured, how decision rights are assigned, and thus how capable their firm is to execute tasks of different complexity internally. Also, when deciding whether their firm is prepared to conduct a task in-house, managers should not only judge their resources and core competencies, manufacturing skills or technological capabilities, but also the organization of their resources, that is how is their firm internally structured. Internal structure affects knowledge exchange among and within units, incentives, and thus how well the firm will be able to mobilize its internal resources.

This study’s limitations are potential starting points for future research. First, in this paper we study how internal organization structure moderates the link between task complexity and vertical integration. Hence, our study allows the conclusion that internal structure sometimes dominates task complexity as driver of vertical integration, but it does not allow any conclusions regarding how internal structure interacts with asset-specificity, frequency, or uncertainty of a transaction. This is an important limitation of our study given the dominance of TCE in research on firm boundaries. Furthermore, we do not evaluate the role of physical asset ownership as a part of internal structure, as suggested by Property Rights Theory. We view the alternative theories of the firm as potential complements to one another, rather than competitors, emphasizing different sources of transaction costs.

However, there are several benefits to building a knowledge-based theory of transaction costs on complexity, as emphasized by adaptation theory and incentive-systems theories of the firm. First, complexity may be easier to understand and measure than asset specificity for certain transactions (Tadelis, 2002). Second, there is no fundamental disagreement in the behavioral assumptions for why transaction costs arise and what motivates actors(i.e., opportunism is not a necessary assumption: Conner & Prahalad, 1996; Kogut & Zander, 1992). Third, existing theory
about knowledge management within the firm explains how organizational structure deals with complexity, and structure varies across firms. Thus, we can move from a theory of the firm that primarily addresses firm boundaries (i.e., the make-or-buy decision) toward the conception of a theory of the firm (Cyert & March, 1963)—a description of how firms operate. A key insight gained by the integration of adaptation theory with the KBV is that costs can arise from locating decision-making authority at a level distant from where the knowledge resides. Rather than a unidirectional principal-agent view, firm organization is an intricate allotment of decision rights among a group of individuals with specialized knowledge.

Another limitation of our study is that we do not have repeated measures for multiple years and thus cannot test Chandler’s (1962) thesis that structure follows strategy in the long-term. Future research could study how firm’s internal structures not only affect firm boundary decisions in the short-term, but how firm boundary decisions may alter internal structures in the long run, as firm boundaries affect firms’ internal capability bases. Jacobides and Winter (2005) provide some theoretical ideas for this area of future research. Finally, future research could study different aspects of internal structure than the ones studied here, and study the impact of internal structure on firm boundary decisions in different industries.
REFERENCES


Wernerfelt, B. 2005. Product development resources and the scope of the firm. *Journal of
Marketing*, 69: 15-23.
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</tr>
<tr>
<td>4 Task complexity</td>
<td>3.36</td>
<td>0.77</td>
<td>0</td>
<td>4.37</td>
<td>-0.01</td>
<td>0.47</td>
<td>-0.19</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Marketing capabilities</td>
<td>0.04</td>
<td>0.73</td>
<td>-1.29</td>
<td>2.12</td>
<td>0.19</td>
<td>-0.34</td>
<td>0.28</td>
<td>-0.16</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 PC banking experience</td>
<td>0.32</td>
<td>0.47</td>
<td>0</td>
<td>7</td>
<td>0.10</td>
<td>-0.30</td>
<td>0.27</td>
<td>-0.04</td>
<td>0.31</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Technical capabilities</td>
<td>4.06</td>
<td>1.29</td>
<td>1</td>
<td>7</td>
<td>0.26</td>
<td>-0.14</td>
<td>-0.04</td>
<td>-0.06</td>
<td>-0.03</td>
<td>-0.04</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Lateral coordination</td>
<td>4.04</td>
<td>1.94</td>
<td>1</td>
<td>7</td>
<td>0.21</td>
<td>0.27</td>
<td>0.02</td>
<td>0.06</td>
<td>-0.07</td>
<td>-0.12</td>
<td>0.32</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Incentive intensity</td>
<td>0.55</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
<td>0.13</td>
<td>-0.15</td>
<td>0.00</td>
<td>-0.11</td>
<td>0.04</td>
<td>0.00</td>
<td>-0.09</td>
<td>-0.04</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>10 Decentralized accountability</td>
<td>0.72</td>
<td>0.45</td>
<td>0</td>
<td>1</td>
<td>0.13</td>
<td>0.10</td>
<td>0.14</td>
<td>0.05</td>
<td>-0.03</td>
<td>-0.05</td>
<td>0.02</td>
<td>-0.10</td>
<td>0.04</td>
<td></td>
</tr>
</tbody>
</table>

N= 109; Correlations greater than r=0.25 are significant at p<0.01, and greater than r=0.19 are significant at p<0.05
Table 2:
Tobit Analysis of the Effect of Task Complexity and Internal Organization Structure on Degree of Vertical Integration

Greater coefficients imply a greater degree of vertical integration

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-130.899**</td>
<td>-90.994</td>
<td>-109.413*</td>
<td>-101.283</td>
<td>-94.214</td>
<td>-112.884*</td>
</tr>
<tr>
<td></td>
<td>(61.411)</td>
<td>(62.931)</td>
<td>(61.987)</td>
<td>(62.992)</td>
<td>(61.907)</td>
<td></td>
</tr>
<tr>
<td>Time of adoption</td>
<td>-0.459</td>
<td>-1.124***</td>
<td>-1.051**</td>
<td>-1.160***</td>
<td>-1.157***</td>
<td>-1.118***</td>
</tr>
<tr>
<td></td>
<td>(0.363)</td>
<td>(0.418)</td>
<td>(0.406)</td>
<td>(0.410)</td>
<td>(0.421)</td>
<td>(0.406)</td>
</tr>
<tr>
<td>Firm size</td>
<td>7.549**</td>
<td>4.951</td>
<td>6.248*</td>
<td>5.744*</td>
<td>4.991</td>
<td>6.455**</td>
</tr>
<tr>
<td></td>
<td>(3.468)</td>
<td>(3.293)</td>
<td>(3.276)</td>
<td>(3.250)</td>
<td>(3.286)</td>
<td>(3.249)</td>
</tr>
<tr>
<td>Marketing capabilities</td>
<td>17.197**</td>
<td>19.176**</td>
<td>17.703**</td>
<td>15.328*</td>
<td>19.567**</td>
<td>15.011*</td>
</tr>
<tr>
<td></td>
<td>(8.504)</td>
<td>(7.984)</td>
<td>(7.698)</td>
<td>(7.877)</td>
<td>(8.015)</td>
<td>(7.785)</td>
</tr>
<tr>
<td>Task complexity</td>
<td>15.523**</td>
<td>56.395**</td>
<td>48.356***</td>
<td>16.526*</td>
<td>76.053***</td>
<td>76.053***</td>
</tr>
<tr>
<td></td>
<td>(7.725)</td>
<td>(21.647)</td>
<td>(17.349)</td>
<td>(7.765)</td>
<td>(26.950)</td>
<td></td>
</tr>
<tr>
<td>Lateral coordination</td>
<td>7.094**</td>
<td>7.613**</td>
<td>7.906**</td>
<td>7.434**</td>
<td>8.229***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.121)</td>
<td>(3.053)</td>
<td>(3.119)</td>
<td>(3.157)</td>
<td>(3.085)</td>
<td></td>
</tr>
<tr>
<td>Incentive intensity</td>
<td>19.241*</td>
<td>17.338</td>
<td>25.178**</td>
<td>18.789*</td>
<td>23.188**</td>
<td></td>
</tr>
<tr>
<td>Decentralized accountability</td>
<td>27.957**</td>
<td>31.844**</td>
<td>24.544*</td>
<td>28.149**</td>
<td>29.791**</td>
<td></td>
</tr>
<tr>
<td>Decentralized accountability x Task complexity</td>
<td>-49.767**</td>
<td></td>
<td></td>
<td></td>
<td>-39.697</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(23.154)</td>
<td></td>
<td></td>
<td></td>
<td>(24.794)</td>
<td></td>
</tr>
<tr>
<td>Incentive intensity x Task complexity</td>
<td>-42.673**</td>
<td></td>
<td></td>
<td></td>
<td>-34.357*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(18.846)</td>
<td></td>
<td></td>
<td></td>
<td>(19.921)</td>
<td></td>
</tr>
<tr>
<td>Lateral coordination x Task complexity</td>
<td>3.164</td>
<td>1.508</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.804)</td>
<td></td>
<td></td>
<td></td>
<td>(3.917)</td>
<td></td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-280.9***</td>
<td>-267.4***</td>
<td>-264.6***</td>
<td>-264.4***</td>
<td>-267.0***</td>
<td>-262.9***</td>
</tr>
<tr>
<td>Change in Log likelihood</td>
<td>27.0***</td>
<td>5.6**</td>
<td>6.0**</td>
<td>0.8</td>
<td>9.0**</td>
<td></td>
</tr>
</tbody>
</table>

Standard errors are in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1% (two-tailed)
Figure 1
Interaction Effects between Task Complexity and Internal Organization Structure

Interaction between Task Complexity and Decentralized vs. Centralized (Corporate) Accountability

Interaction between Task Complexity and Incentive Intensity
## Appendix 1: Internet Banking Services and their Difficulty Ratings

<table>
<thead>
<tr>
<th>Type of Internet Banking Service</th>
<th>Service Ratings Difficulty of Implementation (1=least, 7=most)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Account balance inquiry and funds transfer services</strong></td>
<td></td>
</tr>
<tr>
<td>Account balance inquiry</td>
<td>2.22</td>
</tr>
<tr>
<td>Funds transfer between existing accounts at the same bank</td>
<td>2.78</td>
</tr>
<tr>
<td>Open a new deposit account online as existing customer</td>
<td>3.89</td>
</tr>
<tr>
<td>Integrate banking information with financial software (e.g., Quicken)</td>
<td>4.33</td>
</tr>
<tr>
<td>Open a new deposit account online as new customer (no prior banking relationship)</td>
<td>4.89</td>
</tr>
<tr>
<td>Checking and savings accounts for small business</td>
<td>3.13</td>
</tr>
<tr>
<td>Payroll direct deposit for small business</td>
<td>3.75</td>
</tr>
<tr>
<td>Cash transfer for small business</td>
<td>4.25</td>
</tr>
<tr>
<td>Integration of banking information with accounting software (e.g., Quick Books)</td>
<td>4.75</td>
</tr>
<tr>
<td>Cash management services for small business</td>
<td>4.75</td>
</tr>
<tr>
<td>Merchant services for small business</td>
<td>4.75</td>
</tr>
<tr>
<td><strong>Bill payment services</strong></td>
<td></td>
</tr>
<tr>
<td>Schedule and pay bills online</td>
<td>4.33</td>
</tr>
<tr>
<td>Pay “ANYONE” or “ANY BILL” online</td>
<td>4.89</td>
</tr>
<tr>
<td>Bill payment for small business</td>
<td>4.50</td>
</tr>
<tr>
<td><strong>Bill presentment services</strong></td>
<td></td>
</tr>
<tr>
<td>Bill Presentment (i.e. view bill data from outside billers on the bank’s web site)</td>
<td>5.89</td>
</tr>
<tr>
<td><strong>Credit/loan/mortgage services</strong></td>
<td></td>
</tr>
<tr>
<td>View credit card balances</td>
<td>2.67</td>
</tr>
<tr>
<td>View existing consumer loan/mortgage balances</td>
<td>2.78</td>
</tr>
<tr>
<td>Apply for a credit card online</td>
<td>3.33</td>
</tr>
<tr>
<td>Apply for consumer loan/mortgage products online</td>
<td>3.56</td>
</tr>
<tr>
<td>Receive real-time approval or rejection for consumer loan/mortgage application online</td>
<td>4.78</td>
</tr>
<tr>
<td>Credit products for small business</td>
<td>4.25</td>
</tr>
<tr>
<td><strong>Investment (non-FDIC insured) services</strong></td>
<td></td>
</tr>
<tr>
<td>View information on investments (e.g., mutual funds) offered by the bank online</td>
<td>3.44</td>
</tr>
<tr>
<td>View balances of investment accounts online</td>
<td>3.44</td>
</tr>
<tr>
<td>Open an investment account online</td>
<td>4.56</td>
</tr>
<tr>
<td>Purchase investments online (e.g., mutual funds, stocks, bonds, and other securities)</td>
<td>5.67</td>
</tr>
<tr>
<td><strong>Insurance services</strong></td>
<td></td>
</tr>
<tr>
<td>View information on insurance products offered through the bank online</td>
<td>3.22</td>
</tr>
<tr>
<td>Apply for insurance online (i.e. submit an application form online)</td>
<td>4.00</td>
</tr>
<tr>
<td>Receive quotes from multiple insurance companies for comparison</td>
<td>5.33</td>
</tr>
<tr>
<td><strong>Non-traditional services</strong></td>
<td></td>
</tr>
<tr>
<td>Web site hosting services</td>
<td>3.89</td>
</tr>
<tr>
<td>Account aggregation across accounts at the same bank</td>
<td>4.11</td>
</tr>
<tr>
<td>Virtual mall</td>
<td>4.67</td>
</tr>
<tr>
<td>e-marketplaces</td>
<td>4.67</td>
</tr>
<tr>
<td>Account aggregation across unaffiliated institutions</td>
<td>5.78</td>
</tr>
<tr>
<td>Wireless access</td>
<td>5.00</td>
</tr>
<tr>
<td><strong>CRM (customer relationship management) services</strong></td>
<td></td>
</tr>
<tr>
<td>Single sign-on</td>
<td>5.56</td>
</tr>
<tr>
<td>Web site customization (one-to-one customer relationship)</td>
<td>5.22</td>
</tr>
</tbody>
</table>
Appendix 2: Survey Measures

Degree of vertical integration of service implementation: percentage
At the time when your bank first adopted each of the following online services, what was the percentage of in-house development versus external arrangements (third party/vendor relationships) that your bank used to implement each service?

<table>
<thead>
<tr>
<th>Service</th>
<th>In House</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>Account balance inquiry &amp; funds transfer services</td>
<td></td>
<td>=100%</td>
</tr>
<tr>
<td>Bill payment services</td>
<td></td>
<td>=100%</td>
</tr>
<tr>
<td>Bill presentment services</td>
<td></td>
<td>=100%</td>
</tr>
<tr>
<td>Credit/loan/mortgage services</td>
<td></td>
<td>=100%</td>
</tr>
<tr>
<td>Investment (non-FDIC insured) services</td>
<td></td>
<td>=100%</td>
</tr>
<tr>
<td>Insurance services</td>
<td></td>
<td>=100%</td>
</tr>
<tr>
<td>Non-traditional services (e.g. website hosting, account aggregation, virtual mall)</td>
<td></td>
<td>=100%</td>
</tr>
<tr>
<td>CRM* (customer relationship management) services in general</td>
<td></td>
<td>=100%</td>
</tr>
</tbody>
</table>

- CRM is defined as enabling your bank to provide customers with a one-to-one relationship (e.g., reflected in website customization, customized e-mails, or customized online advertising)

Centralized vs. decentralized accountability and incentive intensity:
At the time when your bank decided to implement e-banking services, who was accountable for e-business success and who controlled e-business funding?

<table>
<thead>
<tr>
<th>Position</th>
<th>Who is ultimately accountable for e-business success?</th>
<th>Who controls e-business funding?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head of Marketing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head of Strategic Planning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head of Retail Banking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head of Operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head of e-Commerce/e-business</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other, please specify (write in each box)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Lateral coordination:
Rate the degree to which the following organizational characteristics applied to your bank at the time when your bank decided to implement e-banking services.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Low</th>
<th>High</th>
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</thead>
<tbody>
<tr>
<td>Coordination of e-business activities with existing channels</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Coordination of e-business activities across business units</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>