Micro foundations of strategic capability development: a case study within auto industry

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The importance of firms' adaptation processes is prominent in today's business environment which is characterised by ever changing customers, technologies, and competition. Ever since Schumpeter's (1942) classic work strategic renewal has been found crucial for firms' adaptation to environmental change. The role of strategic renewal in firms' adaptation processes includes development of capabilities for the purpose of sustainability of competitive advantage against environmental changes.

Based on the resource-based view (Barney, 1991), distinctiveness of resources and capabilities of close competitors explains competitive heterogeneity. However, such distinctiveness also influences competitive advantage and disadvantage. Within this view, however, there is not a clear conceptual model to explain how this distinctiveness is achieved. The dynamic resource-based view (Helfat & Peteraf, 2003) argues that competitive advantage and disadvantage emerges over a period of time and can also shift over time based on changes in the environment. Due to the lack of understanding about how, basically, competitive heterogeneity arises we may not be able to provide a comprehensive explanation, or make prescriptive recommendations to managers, for how firms create (or recreate) competitive advantage based on manipulation of resources and capabilities in accordance with environmental change. Therefore, in order to explain the dynamics of competitive advantage, the resource-based view must incorporate the dynamics of how of the resources and capabilities (that form the basis of competitive advantage) develop over time against environmental changes. In this regard, it can be argued that when firms' capabilities lose their strategic value due to environmental dynamics (like rivals' imitation of other firms' capabilities), they may pursue strategic renewal and develop new capabilities which have strategic value (strategic capabilities) in the new environment.

Although many attempts are made for conceptualisation of capability development, still there is not a clear conceptualisation about development and renewal of strategic capabilities. This study shows that such failure is an oversight in the literature because it leaves the underlying phenomenon of capability development partially explained and, hence, may have caused the current deficiency in empirical research (Ambrosini & Bowman, 2009).

On the other hand, the emerging micro perspective in strategy formation research (Johnson et al, 2003) points to the role of organisational micro processes in creation of competitive advantage. Accordingly, applying the micro perspective to study capability development may enable us to identify micro processes and describe their roles in unfoldment of capabilities which are sources of competitive advantage. Therefor this study intends to conceptualise strategic capability development by investigating its micro foundations and the underlying mechanism. In this regard, knowledge integration has been suggested as the most important organisational micro processes which can be aligned with environmental requirements (Grant, 1996) and, across multiple periods of time, can develop organisational capabilities (Zollo and Winter, 2002). In addition, product innovation has been described as an "engine" for firms' capability development (Danneels, 2002) where processes and factors involved with capability development are observable.

Accordingly, this study is aimed at re-examining the role of the dynamics of knowledge integration within the product innovation context in development and renewal of strategic capabilities. In particular, this research intends to provide an in-depth study of strategic capability development processes during economic transformation in emerging economies by looking at Auto Industry evolution in Iran.

METHODS

The present research might best be described as theory elaboration (Lee, 1999; Lee, Mitchell & Sablynski, 1999) in that it elaborates theoretical links not previously addressed in the literature. For, example, previous studies on capability development have emphasised either on institutional environment influences or firms'

specific processes, resulting in apparent contradictions described earlier. Thus, this research attempts to "simplify, reconnect and redirect theory" (Lee et al, 1999:p. 166) on capability development, in a way that integrate macro-micro processes of capability development.

Research setting

For the purpose of studying the co-evolution of knowledge integration with capability development, this study needs to focus on product innovation projects across which a firm has developed innovative capability. Then, the linkages between knowledge integration and capability development and knowledge exploration and exploitation can be examined over the course of such product innovation projects. Based on such findings new knowledge may be gained regarding the role of knowledge integration in firms' adaptation with environment through establishment of open innovation processes (including both In-bound and Out-bound open innovation).

This study adopts a critical realist approach for studying the impact of managing knowledge integration across different product innovation projects on competitive capability development within firms. A case study method is used here for theory elaboration. To encompass both organisational and project levels of analysis, an embedded case study design is adopted to undertake, a longitudinal comparative case study of product innovation projects in the Iran Khodro Company (IKCO). This firm is an exemplar of capability development within the Iranian Auto industry. Iranian government (as an emerging economy) has encouraged capability development within firms to provide the required basis for economic transformation from centrally planned to market-based economy. Due to strategic value of Auto industry, specific attention is paid to development of this industry. IKCO has been the key player of this industry development and has transformed from a car assembler into a leading car maker in the Middle East, North Africa and Central Asia. Over a period of 18 years, this company developed capability within global value chain of Auto industry and now stands as 14th in the world wide ranking. Therefore, this firm is an excellent case for elaboration of capability development where the phenomenon under study is "closer to the surface" and easier to observe (Eisenhardt, 1989; Pettigrew, 1990).

Studies so far about the role of knowledge integration and product innovation has emphasised institutional environment influences (based on ambidexterity perspective) or firms specific processes (based on dynamic capability perspective). Therefore they are mainly "theory-oriented" or "descriptive". However, to integrate these views of capability development, this study position a middle ground between these two polar types. Accordingly, based on "critical realism" position, this study looks for "analytic generalisability". Analytic generalisation, refers to the study of a phenomenon in its real context to support, contest, refine, or elaborate a theory, model, or concept (Schwandt, 1997).

Since IKCO's capability matured over the course of the four product innovation projects, aligned with this view and following the "replication logic" (Yin, 1994), these projects are selected as embedded cases through which dynamics of knowledge integration has led to capability development. These product innovation projects represent "most likely" cases (Flyvbjerg, 2006) within the case company for capability development across different product innovation projects. Sanchez and Mahoney (1996), generally, classified all product innovation projects into four cells including incremental, modular, architectural and radical learning. These cells contain different knowledge integration contents and serve to different modes of capability development. Accordingly, selecting product innovation projects from all cells of this classification encompass the dynamics of knowledge integration across different modes of capability development. The review of the product innovation projects in the case company within pilot study of this research showed that four product innovation projects have been the base projects upon which IKCO has developed capability. Characteristics of these projects including Pars, Samand, Soren and Dena, matches with archetypes product innovation projects suggested by Sanchez and Mahoney (1996).

Data sources

To investigate the interaction between knowledge integration and capability development in IKCO over the course of the four product innovation projects, semi-structured interviews conducted with informants from the projects who had the required information at both project level and organisational level. The interviews included interviewing 37 key informants who were mostly people with more than 10 years of experience in the case company. The interviewees were selected based on information gained through the pilot study. The interviews were conducted during 22 site visits and within a four-week time frame. The training department of IKCO as the official channel for administrative arrangements developed a mutually convenient schedule of interviews for researcher and interviewees. The interviews were mostly conducted at interviewees' workplace.

RESEARCH FINDINGS

Findings of this study demonstrates that across the different projects, industry architecture, innovation strategy, knowledge integration, absorptive capacity and dynamic capability have been developed from part level up to architectural levels of product architecture. More specifically, these variables developed at part level in Pars project, at component level in Samand project, at subsystem level in Soren project and finally at architectural level in Dena project. Table 1 summarises findings of this study.

DISCUSSION

As mentioned earlier, co-evolutionary relationship between knowledge integration and capability development consists of two influences: the impact of capability development on knowledge integration and the impact of knowledge integration on capability development. Based on the findings of this study Industry Architecture co-varies with Innovation Strategy and Knowledge Integration across different levels of product architecture. Based on ….theory such co-variations implies that, at each level of product architecture, changes in Industry Architecture informs Innovation Strategy which affects Knowledge Integration at that level of product architecture. These relationships may be due to the impact of capability development on knowledge integration. On the other hand, there are co-relationships among Knowledge Integration, Absorptive Capacity and Dynamic Capability. These co-relationships show that, at each level of product architecture, Knowledge Integration affects both Absorptive Capacity and Dynamic Capability at that level of product architecture. Since Absorptive Capacity (Zahra & George, 2002) and Dynamic Capability (Zollo & Winter, 2002), basically, change organisational capability base, as suggested by Jacobides and Winter (2005), they may cause further changes within the Industry Architecture in form of increased complementarities and factor mobility (increased modularisation in industry structure) at higher level of product architecture. Consequently by changes within the Industry Architecture at higher level of product architecture, as discussed above, innovation strategy changes leading to a change in Knowledge Integration at the same level of product architecture. Furthermore, at the same level of product architecture, changes in knowledge integration informs formation of Absorptive Capacity and Dynamic Capability at that level which eventually leads to another change in the Industry Architecture at higher level. These inter-connected influences across different levels of product architecture, as illustrated in Figure 4, form interconnected cycles at different levels of product architecture. These cycles may altogether shape the co-evolutionary relationship between knowledge integration and capability development. Such co-evolutionary relationships, indeed, represent the “generative mechanisms” (Pettigrew, 1990; Simon, 2009) upon which competitive advantage of firms are achieved based on dynamics of organisational micro processes such as knowledge integration, which are also connected to macro changes with the industry.

As illustrated in Figure 1, inter-relationships among the shown cycles across different levels of product architecture and different product innovation projects forms two patterns of co-evolution between industry architecture and knowledge integration, across different product innovation projects. One pattern of co-evolution is consistent of the impact of complementarities of IKCO’s knowledge at each level on differentiation of knowledge based at that level followed by knowledge integration based on “knowledge personalisation” leading to developing absorptive capacity at the same level. Such development of absorptive capacity at that level has affected complementarities of IKCO’s knowledge at next level of product architecture starting a new cycle for the next product innovation project. This pattern of relationships represent co-evolution of complementarities of IKCO’s knowledge (with knowledge of suppliers) and knowledge integration based on knowledge personalisation approaches.

The second pattern consists of the impact of factor mobility of IKCO’s strategic assets at each level of product architecture on differentiation between functions followed by “coordination by mutual adjustment” at that level leading to development of routines constituting dynamic capability at the same level. This development of dynamic capability at that level has influenced factor mobility of IKCO’s assets at next level of product architecture starting a new cycle for the next product innovation project. Such relationships suggest co-evolution of factor mobility of IKCO’s strategic assets (against its suppliers) and knowledge integration based on “coordination by mutual adjustment”.

In brief, as a result of such co-evolutionary cycles, knowledge has been integrated from part level up to architectural level of product architecture in accordance with the specialisation being emerged within the industry architecture. On the other hand, based on the arguments put forward by Grant (1996), knowledge integration represents organisational capability. Accordingly, knowledge integration at different levels of product architecture includes capability development at those levels of product architecture. Considering that the

relationships between different levels of product architecture is defined based on the structural conception of hierarchy in complex systems (Simon, 1962; Sanchez & Mahoney, 1996), knowledge integration from part level up to architectural level shows that by integrating the products elements at lower levels firms develop the ability of integrating elements at higher levels of product architecture. Accordingly, knowledge integration from part level up to architectural levels includes step by step development of the combinative ability starting from the ability of integrating parts and then extending to the ability of integrating components and then subsystems towards the ability of reconfiguring the whole system (addressing knowledge reconfiguration). This process of extending the combinative ability from part level up to architectural level indicates the gradual unfolding of the central phenomenon (Van de ven 1990) which is the emergence of new strategic capability in the firms. Indeed, as the islands of specialised knowledge and capability have been emerging at different levels of product architecture, the old strategic capability has started to fade and the new strategic capability has been arisen gradually from part level of product architecture up to architectural level of product architecture. The new strategic capability which is formed at higher levels of product architecture compared to the old strategic capability, enables the firm for
achieving a new knowledge reconfiguration for the firms which is distinctive along the value chain of the industry architecture. Based on such distinctive knowledge configuration, the firms may develop new products which cover a wider range of market sections compared to the old knowledge configuration. Therefore, the new products raised out of such knowledge configuration may be new source of competitive advantage and superior profit in the new environmental situation.

CONCLUSION

Heterogeneity of capabilities and resources in a population of firms is one of the cornerstones of resource-based theory (Peteraf, 1993; Hoopes, Madsen, and Walker, 2003). Within the resource based view, however, we lack a clear conceptual model that includes an explanation of how this heterogeneity arises (Helfat & Peteraf, 2003). Absent an understanding of where heterogeneity in resources and capabilities comes from, it is difficult for researchers to fully explain how firms use resources and capabilities to create competitive advantage. This gap in our understanding makes it more difficult to offer prescriptive advice to managers as well. As one of its contributions, this study helps to explain the fundamental sources of firm heterogeneity.

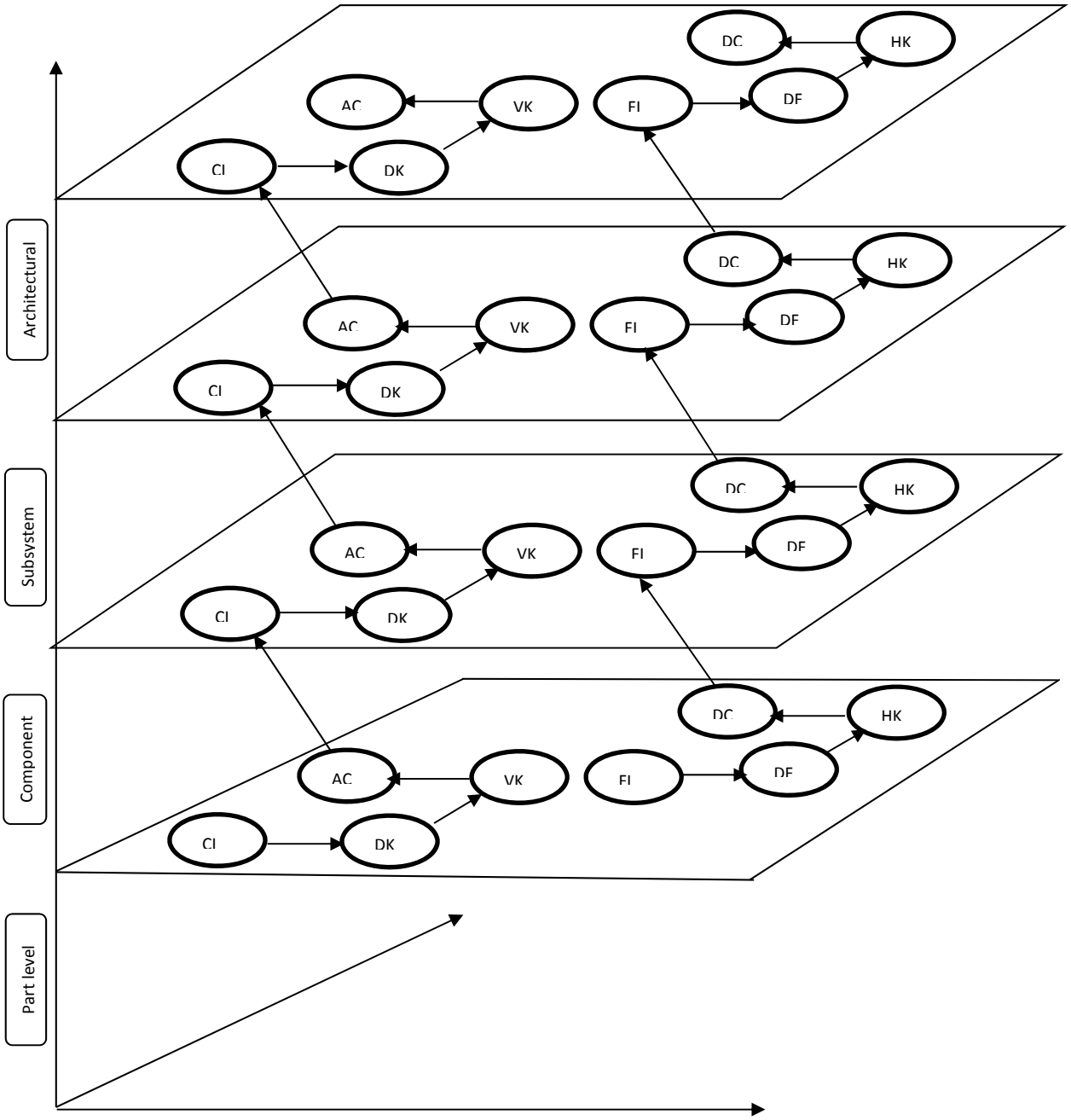
Considering the importance of organisational micro processes as micro foundations of building and regaining competitive advantage, this study focused on the role of knowledge integration within product innovation projects in development of strategic capabilities. Particularly, managing knowledge integration consistently across the sequence of product innovation projects was found quite important to renew strategic capabilities once they have been eroded due to competitor's imitations. In this regard, this study shows that successful firms may manage their knowledge integration activities dynamically and in accordance with the level of changes occurred within the industry architecture. To do this, managers can manipulate the capability development process via effective organisational design. They may pursue organisational differentiation across different levels of product architecture and in accordance with the changes in the industry architecture at those levels and the progress in the level of specialisation achieved by the industry participants along the value chain. As the knowledge and capability get gradually specialised within the industry[1], from part level of product architecture up to the architectural level of it[2], organisations tend to differentiate at the same levels accordingly. Then, to integrate the differentiated organisational units at different levels of product architecture, knowledge would be integrated at those levels of product architecture. On the other hand, by integrating knowledge from part level up to architectural level and across a sequence of product innovation projects, firms may gradually contribute to step by step emergence of new strategic capability at organisational level. These findings add to capability development literature by revealing the underlying mechanism of strategic capability development and, consequently, clearly identifying the different stages of it. By shedding some lights on the micro foundations of strategic capability development in firms, this paper contributes to a question of "how" capabilities which are sources of competitive advantage are developed and renewed at organisational level by managing knowledge integration processes at project level and across product innovation projects.

References:

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of management*, 17(1), 99.
Brown, S., & Eisenhardt, K. (1998). *Competing on the edge: Strategy as structured chaos*: Harvard Business Press.

[1] as indicated by the increase in factor mobility and complementarities of strategic assets
[2] which represents diffusion of new capability and knowledge within the local industry

Eisenhardt, K., and Martin, J. (2000). Dynamic capabilities: what are they? *Strategic management journal, 21*(10), 1105-1121.
Danneels, E. (2002). The dynamics of product innovation and firm competences. *Strategic Management Journal, 23*(12), 1095-1121.
Dess, G. G., Ireland, R. D., Zahra, S. A., Floyd, S. W., Janney, J. J., and Lane, P. J.
(2003). Emerging issues in corporate entrepreneurship. *Journal of Management*, 29(3), 351-378.
Dosi, G., Nelson, R., & Winter, S. (2000). *The nature and dynamics of organizational capabilities*: Oxford University Press.
Floyd S, and Wooldridge B. 1999. Knowledge creation and social networks in corporate entrepreneurship: the renewal of organizational capability. *Entrepreneurship Theory and Practice* 23(3): 123–143.
Floyd, S., and Lane, P. (2000). Strategizing throughout the organization: Managing role conflict in strategic renewal. *Academy of management review, 25*(1), 154-177.
Giddens, A. (1979). *Central Problems in Social Theory: Action, Structure and Contradiction in Social Analysis*. Basingstoke: Macmillan
Grant, R. (1996). Prospering in dynamically-competitive environments: Organizational capability as knowledge integration. *Organization Science*, 375-387.
Helfat, C., and Peteraf, M. (2003). The dynamic resource-based view: capability lifecycles. *Strategic management journal, 24*(10), 997-1010.
Jarzabkowski, P., Balogun, J. and Seidl, D. (2007). Strategizing: the challenges of a practice perspective. *Human Relations*, 60, 5–27.
Johnson, G. (1987). *Strategic Change and the Management Process*. Oxford: Basil Blackwell
Johnson, G., Melin, L. and Whittington, R. (2003). Guest editors' introduction: micro strategy and strategizing: towards an activity-based view. *Journal of Management Studies*, 40, 3–22
Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic management journal, 13*(S1), 111-125.
O'Reilly, C., and Tushman, M. (2008). Ambidexterity as a dynamic capability: Resolving the innovator's dilemma. *Research in organizational behavior, 28*, 185-206.
Pettigrew, A.M. (1990). Longitudinal field research on change: theory and practice. *Organization Science*, 1, 267–292.
Regnér, P. (2008). Strategy-as-Practice and Dynamic Capabilities: Steps Towards a Dynamic View of Strategy. *Human Relations*, forthcoming
Sanchez, R., and Mahoney, J. (1996a). Modularity, Flexibility, and Knowledge Management in Product and Organisation Design. *Strategic management journal, 17*, 63-76.
Simon, H.A. (1962). The architecture of complexity, *proceedings of American Philosophical Society*,109, 467-482.
Simsek, Z. (2009). Organizational ambidexterity: Towards a multilevel understanding. *Journal of Management Studies, 46*(4), 597-624.
Sminia, Harry. 2009. Process research in strategy formation: Theory, methodology and relevance. *International Journal of Management Reviews*, 11: 97-125
Spender, J. (1996). Making knowledge the basis of a dynamic theory of the firm. *Strategic Management Journal, 17*(2), 45-62.
Teece, D., Pisano, G., and Shuen, A. (1997a). Dynamic capabilities and strategic management. *Strategic management journal*, 18(7), 509-533.
Tripsas, M., and Gavetti, G. (2000a). Capabilities, cognition, and inertia. *Strategic management journal, 21*(10 – 11), 1147-1161.
Van den Bosch, F., Volberda, H. and deBoer, M. 1999: Coevolution of firm absorptive capacity and knowledge environment: organizational forms and combinative capabilities. *Organizational Science*, 10(5), 551–68.
Winter, S. (2003). Understanding dynamic capabilities. *Strategic Management Journal*, 991-995.
Zollo, M., and Winter, S. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organization Science*, 339-351. A micro perspective analysis of capability renewal through knowledge integration within product innovation project.



CI: complementarities within industry architecture
DK: differentiation of knowledge bases
VK: vertical knowledge integration
AC: absorptive capacity routines
FI: factor mobility in industry architecture
DF: differentiation among functions
HK: horizontal knowledge integration
DC: dynamic capability routines

Figure 4: The “generative mechanisms”

Constructs	**Industry Architecture**		**Innovation strategy**		**Knowledge integration**		**Absorptive capacity**	**Dynamic capability**
Emerging themes	Complementarities	Factor mobility	Knowledge outsourcing	Capability outsourcing	Vertical KI	Horizontal KI	Prior knowledge	Combinative capability
Pars project	IKCO changed parts for new product development and local suppliers developed function-specific knowledge of part design for delivering new parts	IKCO changed parts for new product development and local suppliers developed function-specific capabilities for performing part design tasks	IKCO outsourced knowledge of designing parts specific to functional performance and focused on knowledge of designing parts specific to product performance	The tasks within functions were differentiated to function-specific tasks (contributing to functional performance) for designing parts and product-specific (contributing to product performance) tasks for designing parts	Using people–to-people approaches at the part level for knowledge integration between knowledge bases within functions	Using coordination by mutual adjustment at the component level for knowledge integration among the functions	IKCO learned to develop parts of a new product based on new knowledge	IKCO could reflect market requirements on desired (potential) product specifying architectural requirements
Samand project	IKCO changed components for new product development and local suppliers developed function-specific knowledge of component design for delivering new components	IKCO changed components for new product development and local suppliers developed function-specific capabilities for performing component design tasks	IKCO outsourced knowledge of designing components specific to functional performance and focused on knowledge of designing components specific to product performance	The tasks within functions were differentiated to function-specific tasks (contributing to functional performance) for designing components and product-specific (contributing to product performance) tasks for designing components	Vertical knowledge integration based on people-to-people approaches at the part level between knowledge bases within functions	Coordination by mutual adjustment for knowledge integration at the part level among functions	New knowledge was introduced to IKCO	Idea for innovation was created
Soren project	IKCO changed subsystems for new product development and local suppliers developed function-specific knowledge of subsystem design for delivering new subsystems.	IKCO changed subsystems for new product development and local suppliers developed function-specific capabilities for performing subsystem design tasks	IKCO outsourced knowledge of designing subsystems specific to functional performance and focused on knowledge of designing subsystems specific to product performance	The tasks within functions were differentiated to function-specific tasks (contributing to functional performance) for designing components and product-specific (contributing to product performance) tasks for designing subsystems.	Vertical knowledge integration based on people-to-people approaches at the component level between knowledge bases within functions	Coordination by mutual adjustment for knowledge integration at the component level among functions	IKCO learned to develop components of a new product based on new knowledge	IKCO could reflect architectural requirements on desired (potential) subsystems specifying subsystems requirements
Dena project	IKCO changed subsystems' configuration for new product development and local suppliers developed function-specific knowledge of subsystems reconfiguration for delivering new configuration of subsystems	IKCO changed configuration of subsystems for new product development and local suppliers developed function-specific capabilities for performing architectural design tasks	Differentiation between IKCO's knowledge of design and local suppliers' knowledge of design within functions at the component level of product architecture	The tasks within functions were differentiated to function-specific tasks (contributing to functional performance) for designing product architecture and product-specific (contributing to product performance) tasks for designing product architecture.	Using people-to-people approaches at the architectural level for knowledge integration between knowledge bases within functions	Horizontal knowledge integration based on coordination by mutual adjustment at the subsystem level between knowledge bases within functions of the company	The new knowledge was shared among different functions	IKCO could meet subsystem requirements and realize the desired (potential) subsystems