

**"MANAGING CORE COMPETENCY FOR CORPORATE
RENEWAL: TOWARDS A MANAGERIAL
THEORY OF CORE COMPETENCIES"**

by

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Towards a Managerial Theory of Core Competencies

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Abstract

Competence cultivation, competence diffusion, competence aggregation, competence leverage, and competence renewal, constitute the key processes in the management of core competencies. This paper seeks to define the key managerial issues and the tasks involved in the successful performance of these five processes. In that sense it constitutes a modest attempt to move in the direction of a managerial theory of core competencies.

Managing Core Competency for Corporate Renewal

Towards a Managerial Theory of Core Competencies

Introduction

Partly as a reaction to the implicit bias in favour of the analysis of the external environment in much of the strategy literature of the 1970s, best exemplified by Porter's work (1980), many strands of research have recently converged to give more importance to the analysis of the firm's own resources and competencies. Building on seminal works by Penrose (1959) and Selznick (1957) considerable efforts have been deployed to build a theory of the firm's resources and competencies (Rumelt, 1984, Wernerfelt, 1984, Lippman and Rumelt, 1982, Itami, 1987, Barney, 1986, Dierickx and Cool, 1989, Teece, Pisano and Shuen, 1990), and to demonstrate to managers its value (Prahalad and Hamel, 1990). While this emerging theory does make a compelling case for the importance of resources and competencies to firm success, while it is intuitively appealing to managers, and while it presents business policy and organisational process researchers with a good opportunity not to let their fields of enquiry be reduced to a minor branch of economics, it lacks both a solid empirical base and a microtheoretical foundation. Competencies and resources are difficult to identify, isolate and measure (because they are often tacit, inimitable, collective, deeply embedded and interactive and integrative). Their performance effects are hard to isolate from others, thus making resource and competence based theories hard to test in the conventional I/O paradigm. This has led empirical researchers to be few, and to take radically different approaches. At one extreme one gets to competencies almost entirely by default, i.e., if nothing else explains performance differences between firms, firm- or business unit-specific factors must play a role (Rumelt, 1991). At the other extreme, painstakingly detailed small sample industry or corporate studies may shed light on the competencies of specific firms and on their use towards competitive advantage (Collis, 1991). Mid-range approaches, for example tracking the development of core technologies in specific industries (e. g., Miyazaki, 1991) or the development and exploitation of competencies by individual firms in industries (Cool and Dierickx, forthcoming 1994, Quinn, Doorley and Paquette, 1990) or focusing on the role of core competencies in new product development (Leonard Barton, 1992) start to be increasingly adopted by researchers. Another approach has been to rely on simulations of organisational learning and competence development processes (e.g.,

March, 1991; Marengo, 1992). At the same time a managerial theory of resources, capabilities and competencies is still not developed.*

Research on core competencies has so far been largely externally oriented and driven by theory building, and theory refutation. Theory has developed more in reaction to the economics-driven industry and environment analysis evolution of the business strategy field, and as a follow up on the seminal work of Nelson and Winter (1982). This has led more towards an economic theory rather than a managerial theory of core competencies. The difficulty, and resulting dearth, of empirical studies, whether large sample statistical or process-based, further contributed to an economic rather than managerial theory. Further, a managerial, or organisational process theory of core competencies quickly meets the relatively fragmented nature of the field of organisational learning, where proposed models and theories operate at very different levels and with very different priorities (e. g., intervention and action vs. conceptualisation and modelisation) (Huber, 1991). This did not help in the development of a managerial theory of core competencies either.

Without attempting to develop a managerial theory, this paper presents and analyses the major managerial challenges raised by core competence management. The paper starts with a broad discussion of the issues faced in managing core competencies, and draws a series of dilemmas from this discussion. Subsequent sections analyse each dilemma in turn, and provide a tentative set of observations on managerial approaches which can help address these dilemmas.

Issues and Dilemmas in the Management of Core Competencies

Competencies are not easy to manage. Competencies are not very tangible, nor measurable, and the more valuable competencies may well be the least manageable. Competencies are fragile. Unpractised, they wither away; stretched too thinly they lose their cut, explicated too fully they no longer improve, aggregated too widely they lose substance and reality, cultivated too long and too tightly they turn into rigidities, and breed incompetence in responding to new circumstances.

This section explores these issues, leading to the identification of a few managerial dilemmas that are at the heart of competence management.

* Further, this emerging field suffers from the use of a few different terms in different ways, by different researchers. For useful attempts to clarify the language system being used, see Teece, Pisano and Shuen, 1990, and Nanda, 1992.

Competencies develop in different ways in the context of an organisation. Rather than at the level of a whole organisation, or even at that of a small group, competence is most easily understood at the individual level, and most organisational competencies start with the individual. Individuals have skills and knowledge, benefit from intuition, and can develop expertise. Collective competencies start to develop with individual and small group learning by doing, rather than with top management-engineered grand designs. Competence develops partly as an individual action learning process, through reflective learning between practice and cognition (Schon, 1983). Learning also results from small group interaction involving know how development and exchange in communities of practice (Lave and Wenger, 1990). This allows the development and refining of procedural knowledge. Some such learning is shared informally in professional interactions (akin to the traditional apprenticeship processes), some may also be made easier to share through the reciprocal processes of knowledge articulation (making tacit knowledge and know how explicit) and knowledge internalisation (bringing explicit knowledge to become in-action know how) in situation (Nonaka, 1991, Hedlund and Nonaka, 1993).

Beyond individual and small group learning, competencies in organisations are rooted in the interaction of distinctive skills, technical and management systems, dedicated processes and assets, and, finally, cultural attitudes and values which define competence and excellence in specific domains as valued goals (Leonard Barton, 1992). Organisational competencies are the underlying process routines that allow to combine skills, systems, assets, and values, to result in predictable high-level performance of specific tasks, which yield advantage over competitors, and provide valued functionalities for customers. Competencies are thus integrative task performance routines that combine resources (skills and knowledge, assets and processes, tangible and intangible) to result in superior competitive positions.

Competencies do not develop automatically. While individuals and small groups develop know-how informally, more formal methodologies may be used to accelerate learning, or to trigger competence development. A number of management tools can be used to accelerate learning in organisations, some very structured and programmatic, such as total quality management, others more open-ended, such as the "dialogue" methodologies which aim to improve content-free communication in the organisation. Yet, competencies develop and evolve in partly unplanned creative ways, and structured methods can lead to an excessively deterministic approach.

One first issue for top management thus is to decide to what extent to leave competency development an unstructured emergent process, or to what extent to structure and drive the process through a series of methods, programmes and tools.

Once developed, competencies are not communicated and shared easily. Deepening competencies requires ongoing cultivation, and most often growing specialisation on the part of individuals and small groups. Competence deepening and competence sharing may conflict. Deepening competencies may require undivided focus and attention, and may also make communication and sharing more difficult. More tightly honed competencies may also be more difficult to share and communicate whatever the effort. Advanced tacit practices are not easily reproducible, and the learning process, for others, is slower and more difficult, except through a slow apprenticeship.

Moving know how from the individual to the collective level faster than through apprenticeship requires several processes, among which the articulation of the know how and its extension to other units (Hedlund and Nonaka, 1993). Yet, the articulation of competencies is unlikely to ever be fully feasible, because competencies cannot be entirely captured in explicit procedural knowledge. A tolerance for some tacitness and ambiguity is thus essential to the move from individual skills to collective competencies, unless one transfers procedures blindly with no room for learning. Indeed, less than fully specified rules foster learning, as they help learning, but one has to interpret and improve them, whereas fully explicit rules may block learning, or be ignored (Brown and Duguid, 1991). Either procedures are blindly adhered to, and learning stops, or procedures are increasingly ignored, and informal "communities of practice" develop, often fostering significant collective "learning by doing", within the local "community", but making results from that learning increasingly difficult to share with other subunits which have developed other practices, following different learning paths.

One second key issue for management, therefore, is to create a "tight-loose" process for competence diffusion, leaving enough variation and freedom to practices for learning to take place, and imposing enough commonality for sharing to remain possible. Large corporations, with multiple units performing comparable tasks, but each left with enough autonomy to experiment with new methods of task performance, and to develop different perspectives, may best take advantage of such "tight-loose" processes. This may also involve a reliance on normative control, shared values, and common intents to provide organisational unity, rather than on detailed procedures and

strict rules. Receptivity to practice sharing is fostered by shared attitudes, yet procedures and rules are flexible enough to encourage learning.

A third issue arises from the different levels of aggregation in competence management, from elemental skills, affecting a particular sub-task in what members of the organisation do, to broad integration competencies that bring together these elemental competencies into an effective whole. Highly specialised elemental competencies are not easily integrated and combined. The firm may be good in parts, but ineffective in whole! Yet, poorly integrated disaggregated competencies are of little practical value. Conversely, though, integrating competencies that are not at the leading edge in their own right may also be of little practical value. Highly specialised elemental competencies are not easily integrated and combined.

One of the key tasks of management, therefore, is to facilitate competence aggregation. Again, a duality arises: honing leading edge competencies leads to increasing specialisation, and makes the aggregation of competencies more difficult, just like their diffusion to the rest of the organisation. Aggregation cannot be achieved at the cost of a substantial decay in the underlying competencies.

A fourth issue is rooted in the need to leverage competencies as widely and effectively as possible. Leveraging competencies across as wide a scope as is economically profitable may bring various types of benefits. First, leveraging maximises the return on the competency. Second, leveraging accelerates the competence development process, by providing more opportunities to practice the competency. Third, by providing different but related application opportunities, leveraging allows not just the repetitive honing of the competence, but its enrichment and aggregation with other competencies in response to new needs or problems.

The major difficulty stems from the fact that the scope of competence leverage opportunities is difficult to establish precisely and leveraging faces three difficulties: the discovery of appropriate leveraging opportunities, the mobilisation of competencies towards them, and the validation of the opportunity/competency match. Leveraging may run out of opportunities, or the identified opportunities may provide only a partial match for the firm's competencies. Conversely, opportunities may call for the development of additional competencies, which may be more or less feasible. The quality of the match between opportunities and competencies is thus important to competence enrichment and deepening, and to their widening, as well as to the achievement of competitive advantage in the new opportunities being sought. Striking

a creative balance between focusing too much on existing opportunities, and mastered competencies, and discovering new opportunities, where the leverage potential may be uncertain, and for which new competencies will need to be developed, is a fourth difficult trade-off in core competence management.

Finally, top management needs to be concerned with the renewal of core competencies. To talk of renewal competencies is almost an oxymoron. Competencies are the result of continuity, whereas renewal creates discontinuity. Competencies arise mainly from learning by doing and from reflection on action. Yet, competencies narrowly honed in the context of a procedurally defined process, or of a dominant paradigm (be it technological or about market or customer behaviour), may evolve into core rigidities (Leonard Barton, 1992) and turn into core liabilities or core incompetence if and when a new paradigm takes hold. Developing renewal competencies is likely to decrease the short to medium term efficiency of the organisation (March, 1991), but may allow the organisation to be less path dependent, and thus less vulnerable to changes in technology or market linkages (Henderson and Clark, 1990, Leonard Barton, 1992).

We have so far identified five facets to the management of competencies, each constituted by a process of organisational learning. Each of these processes gives rise to a managerial dilemma between letting the cultivation of competencies follow its "natural" track (the left hand column in Table 1 below) and a more active management process (the right hand column in Table 1). We will discuss each of these processes and dilemmas in the next sections.

Table 1
Dilemmas in Core Competence Management

Key Processes	Natural Path		Managed Effort
1. Competence Development	Emergent	vs	Programmatic
2. Competence Diffusion	Apprenticeship	vs	Explicitation
3. Competence Integration	Specificity	vs	Aggregation
4. Competence Leverage	Exploitation	vs	Exploration
5. Competence Renewal	Incrementalism	vs	Discontinuity

Competence Development: Emergent vs. Programmatic

In striving for survival, organisations will naturally develop some competencies, or die. In competitive environments, incompetent organisations are unlikely to survive for long. A competence is most often know how in action, i.e., it results from the "learning by doing" that takes place in organisations. As such it is highly conservative: a competence does not arise without repetition, in particular for the more tacit collective types of know how. Competence grows with the repeated interactions between individual skills, systems and processes, and tangible and intangible resources of the organisation. Honing skills and processes leads to better definition and increasing quality of the competence.

Yet, as the scope of competition widens, companies may face intense competitive challenges by firms with greater competencies. Concerned with the risks of such challenges, and in particular with the struggle of many western industries fighting for survival against East Asian rivals, many firms have turned to programmatic managed approaches to accelerate the development of their competencies. Rather than allow the development of competencies to rely on an emergent repetitive tacit process, these companies have increasingly resorted to learning tools to foster faster core competence cultivation. Most such tools have their origin in the US, where they were developed to manage effectively and efficiently the huge industrial build up during World War II, and have been diligently applied, and perfected in Japan after the war (Cole, 1989, Garvin, 1988, Imai, 1986), and "rediscovered" in the West more recently.

Quality improvement and quality deployment methods in particular, have become key tools for the cultivation of a kernel of competencies. They offer a framework, a language, a systematic approach, and a set of procedures for the explicitation and the improvement of know how. Root cause analysis and other such tools provide a way to evolve from rough "heuristics" in process design to much more accurate "scripts" which reflect a deeper and more detailed understanding of cause and effect relationships. This allows the company to constantly refine, test, and validate its competence cultivation scripts and to confidently turn them into organisational routines (Chakravarthy and Kwun, 1990). Short of such a process, the competence kernel of the organisation remains vulnerable and underdefined.

Competence development tools, such as the problem solving methodologies provided by TQM, have played a key role in the competitive responses of companies such as

Ford, Motorola or Xerox to Japanese challenges. In some companies, Motorola and Xerox for example, these tools have become the backbone of a complete mobilisation and transformation process. Similarly, Rover has learned a great deal from Honda in the use of these methods, and they played a key role in Rover's turnaround in the late 1980s, and are now applied to British Aerospace, Rover's parent company.

Yet, one should not underestimate the difficulties of accelerating competence development, in particular when the relative importance, and/or pace of improvement of various types of competencies is shifting. Competencies display great inertia. Competence development is intrinsically conservative, not just because of its cumulative and repetitive nature. Beyond task performance, a growing competence in some specific field usually leads to strong emotional and organisational commitment. First, successful learning by doing requires continuity of tasks and of performance criteria. This is typically achieved through a dominant process logic being applied to a dominant product design. As cumulative learning is achieved, and cumulative excellence develops, a growing commitment to the existing skill set and vested interest in its continued value develop. More rewards accrue from the successful use of the competence. Second, competence results from, and reinforces specific mindsets. Successful procedures, and what they deliver, are sources of satisfaction, which cannot be questioned without questioning the worth of the individuals and communities which breed them. How people think and how they perceive their environment is shaped by their skills and tools (cf. the famous hammer holder looking for nails metaphor). This shaping leads to strong value judgements and orthodoxies. Third, organisational routines are the result of a satisfactory compromise between stakeholders in an organisation (of an "organisational truce" as March puts it) and they implicitly reflect the relative credibility and relative power of various categories of stakeholders (Leonard Barton, 1992). A shift in the relative criticality of competencies may threaten the balance of power in the organisation, and question the continued validity of existing arrangements between different groups of stakeholders. Fourth, existing competencies provide the basis for deciding on future commitments and bias them. Commitments, both to investments and to product and markets, are made as a function of existing competencies by the dominant groups in the organisation, in a way most likely to perpetuate their relative dominance.

Efforts to increase quality at Xerox faced difficulties largely because they challenged the power base of strong groups. For example, more reliable copiers challenged the position, and the skills, of the large maintenance and service field force that Xerox had built over the years. Yet, inputs from that field force on the specifics of machine

breakdowns and on maintenance issues were essential to improve machine quality. Similarly, engineering groups may be more concerned with engineering processes than with designing products for manufacturability.

Thus the use of various integration tools, such as the "dialogue" processes and the business process reengineering approaches currently much in vogue, also have a key role to play to foster the development of transversal competencies, in particular where the efforts and the benefits of competency development may not be shared equally across functions, specialists, or subunits of the organisation.

Beyond the tools, processes that favour the identification of individuals to the success of the organisation may also contribute considerably to the development of collective competencies, in particular when the balance of costs and benefits to individuals is uneven across individuals and their subunits. One approach is to even costs and benefits. While this has long been seen as a cornerstone of Japanese management, it has also been practised by professional service firms confronted with the impossibility of forecasting accurately the future value of the skills of their members (Gilson & Mnookin, 1985) and, more generally, has been seen as an important contributor to the successful functioning of complex organisations (Prahalad & Doz, 1987, ch12). This approach collectivises costs and benefits, and risks and returns, to the development of organisational competencies.

Stretching the collective ambition of the members of the organisation, and imposing a sense of competitive urgency to accelerating and deepening of competence development are some of the key merits of setting an ambitious strategic intent (Hamel & Prahalad, 1989). This is largely what external benchmarking, and the very hard pressure of Japanese competition did to Motorola and Xerox, two of the more successful "systematisers" of competence development. Articulating a sequence of competence development milestones, some measurable (e. g, Motorola's six standard deviations ["6 σ "] approach to quality or its current ten times [10 \times] reduction goal for product development cycle times) quantum improvement goals, the achievement of which depends on massive competence development acceleration, provides important goalposts to target the effort. Finally, in-depth training of everyone involved, to foster the individuals' ability to contribute is essential. Interestingly, the competence deepening and acceleration tools, the evening out of risks and returns in the face of uncertainty about the future value of specific competencies, and the setting of an ambitious strategic intent, also facilitate the ability and the willingness to diffuse and

share competencies in the organisation. Competence diffusion, though, raises some specific additional issues.

Competence Diffusion: Apprenticeship vs. Explication

Sharing and diffusing competencies do not come easily. While full articulation seems like the simplest approach, it applies really only to the diffusion of fully packaged stabilised know-how*. This may work well when the competence is tightly honed, and well known, e. g., McDonald's fast food operations, or the retail operations of a highly standardised bank, such as BCP's "Nova Rede" network in Portugal or BancOne in the United States. A fully articulated approach is also most effective when creativity is not sought (e.g., routine operations, where safety may be important) and when fast deployment of a competence in multiple new branches developed quickly with new untested personnel, is more important than evolutionary learning. This premium on speed was the case both of McDonald, at least internationally, and of BCP, after the liberalisation of the Portuguese banking market provided the opportunity to cover the country quickly with new banking branches.

Most corporate competencies are not quite so articulated and well packaged as McDonald's or BCP's. They may not be so mature either. Management priority, therefore, may be more slanted towards further learning, and the deepening of competencies, rather than their full codification for easier transfer. Indeed, it has been observed that tight procedural articulation conflicts with deepening (Brown & Duguid, 1991). The current vogue for "best practice" transfers reflects this difficulty: how to leave enough room for practices to improve, without making them so different from unit to unit that their transfer and sharing is made impossible. A careful differentiation, on the part of management, between what is left to evolve and what is made uniform is essential. Uniformity of format allows easier connections between various parts of an organisation, while freedom of content, and differentiation of culture, allow innovation and selective evolution. Best practice exchanges act as a selection mechanism between evolutive and innovative practice improvement efforts, and retention is facilitated by diffusion mechanisms, more or less formalised depending on the nature of the competence and on its ownership within the organisation.

For less packaged competencies, and more constantly and unpredictably evolving ones, the full articulation and codification, and deliberate transfer may be even more difficult.

* Leaving aside here the communication of scientific knowledge, for which full rigorous explication is essential, but which relates only indirectly to the development of know-how and of corporate competencies.

For example, most innovative strategy consulting companies, such as McKinsey or Arthur D. Little, struggle with this issue. Competencies evolve with the learning of consultants, who then need to share their learning. Yet, what there is to share, and how to share it are not clear. To find out requires a substantial effort, leading to a tendency to undershare competencies. The same is true of R&D competencies, where what is to be shared is constantly evolving and being enriched (De Meyer, 1993). In such situations, informal emergent networking processes may be key, rather than explicit formal transfers. Networks need to be supported by processes that encourage communication, awareness of the learning taking place in various parts of the organisation, documentation, and incentives to collaborate. Nestlé, for example, has a very rich set of procedures to facilitate learning processes within its network of technical centres and "research companies". These range from the opportunities to develop face-to-face acquaintance via periodic internal conferences and frequent visits to the long-term mobility of key people between centres, fostering better deeper informal diffusion of competencies.

How competencies are held in the organisation provides a second dimension along which to differentiate their diffusion. At one extreme, a competence can be totally individual, a unique know-how possessed by one individual, alone. An orchestra's conductor might fit this case: although the conductor's and the orchestra's level of performance are both improved by mutual interaction, the performance of the orchestra is dependent on that of the conductor. A gifted software development engineer may have similar relationships with a development team to the conductor's relationship to the orchestra. At the other extreme, competence in a professional service organisation may be everyone's property (Meister, 1982). Most often competence is lodged at some intermediate level: it is not the property of single individuals nor does it permeate the whole organisation. Typically, it belongs to a small team, or a subunit in a large corporation. Perhaps competencies will emerge around a core process of the organisation, or around a specific practice unit. Competence may thus reside more or less narrowly with individuals, small groups, teams, organisational subunits, specific functions (or groups of people involved in core processes) or the whole organisation.

Processes that can be used to diffuse competencies depend both on the nature of the competence - or of its stage of evolution - and on the more or less collective or individual nature of its ownership. An individual formalised explicit competence is perhaps best diffused via formal training, tested by a period of apprenticeship or co-practice, and monitored via professional norms. Sharing the competencies of

experienced chartered accountants, lawyers, or medical doctors probably comes closest to this type of process. A collective formalised competence can be transferred by a mix of formal training and informal teamwork and team integration. Arthur Andersen's famous CAPS programmes, at its St. Charles campus, provide an off-line training experience, but are designed to mimic client assignments, thus blending learning and action. An individual tacit competence is probably most difficult to share, except in a "master-disciple" relationship, providing a monitoring and apprenticeship process not unlike that of the old guilds of the Middle Ages. Collective tacit competences cannot be fully articulated, but a mix of articulation and apprenticeship provides a vehicle for transfer.

It is important to note that, within the same organisation, various types of competencies need to be diffused differently, and the success of their diffusion also assessed differently. For example, Andersen Consulting has very different ways to transfer competencies at the junior associate level, at the senior partner level and at levels in between. How competencies are assessed also varies between a systematic, frequent, quantitative evaluation process at junior levels, and participation to a bonus pool, where each partner allocates "points" to all other partners at senior levels.

Although we have so far differentiated and compared various approaches to competence diffusion these various approaches can also be blended to provide a balance between the acceleration of the development of competencies and the need to diffuse them quickly. IKEA, for example, resorted to an interesting dynamic approach to spearhead its rapid international expansion. New stores would be started by a specialised headquarters' team, who would plan the building, supervise its construction, launch the store (advertising, merchandising, layout, etc...), operate it for its first year, and then hand over its management to a more permanent and more local team, and move on to the next store opening project. The store start-up teams were drawn from a small cadre of personnel, many of whom had been informally selected as high potential individuals in the IKEA culture. The approach had the advantage to concentrate and accelerate the deepening of store development and management competencies within a small group, and to diffuse these competencies to local teams in an apprenticeship process during the first year following the opening of each store. The management of each store could still decide to make adaptations to local circumstances, or to try innovative approaches once the start-up team had moved on, but as IKEA accumulated learning, the approaches followed by the various stores tended to converge and the differences between them to decrease. As the IKEA formula matured - at least in Europe - it became more important to diffuse existing

competencies easily than to experiment to foster the development of competencies. In organisational learning terms, heuristics had been transformed into scripts, and the retention and diffusion of existing scripts became more important than the variation that would foster the development of new ones.

As for the acceleration of competence development, the commitment of the involved members of the organisation is essential. Competence diffusion and institutionalisation work only insofar as individuals who have skills are willing to share them, and those who benefit from the learning stay with the company, and continue cultivating these skills jointly. In other words, collective corporate goods are developed (Hogarth et al., 1991). Corporate rather than individual appropriation of newly developed competencies is facilitated by skill specialisation, where complementarity and co-specialisation are achieved only by the firm (a usual practice of consulting companies, and an implicit practice of many "secretive" industrial companies such as Michelin as well as of classified programmes, such as the B2 project at Northrop). The existence of internal labour markets, rather than external ones, also facilitates competence diffusion, an argument often used to explain the greater emphasis put by Japanese companies on the development of their employees, in comparison to US companies. The lower the risk that an employee who has developed broad competencies, or gained an understanding for a wide range of competencies, will leave, the easier it is for the firm to allow the development of broad integrative competencies, rather than fragment competence development.

Competence Integration: Specificity vs. Aggregation

The heart of core competence management is the ability to integrate specific elements of know how, rooted in skills, technical systems and specific assets into wider value-creating competencies, through management systems and processes. Competitively valuable core competencies are rooted in integration between skills to create value for customers in ways that are not imitable by competitors. Fragmented narrow competencies are of little use. As stressed by researchers and practitioners alike, it is the constant striving for combination and blending of discrete elements of competencies that provide for opportunity creation and competitive advantage. Sony's miniaturisation competence, for example, results from the integration of many different skills. AT&T's successful entry into the credit card business similarly results from the combination of many discrete competencies developed and cultivated over a long period of time in the telephone service business.

Customers value integrated competencies, yet integration is not valuable unless the elemental competencies are themselves outstanding. Top management is again caught in a dilemma between stressing elemental competencies and fostering the aggregation of competencies. Obviously, both are required, but where to put the priority may not be fully clear. British Aerospace, for example, is outstanding in wing aerodynamics, and keeps honing this competence via a whole series of partnerships (Airbus, Panavia, EFA, specific alliances like BAe's participation in the Swedish Gripen programme...). To be outstanding at wing aerodynamics already requires a level of competence aggregation. In BAe's case, this is helped by advanced computer-based engineering systems, by a large on-line library of wing aerofoils test results, and by powerful simulation tools. These provide the basis for the aggregation of very specific competencies held by individuals or small teams of engineers. Indeed, effective aggregation starts at the individual level, with what Honda calls "T-shaped" engineers, i.e., a lot of depth in a narrow field, to bring some valuable specific skills, but also some breadth across adjacent fields to allow "connection" with specialists from other domains. Team processes also help integrate specific competencies, for example in product development, but in other areas as well. Focusing on business processes, rather than functional departments, also fosters core competence aggregation through joint learning, in addition to the customer responsiveness and cost reduction advantages that business process re-engineering usually brings.

The quality of programme and project management tools is another key determinant of aggregation competencies, at least in engineering-based firms, such as aerospace contractors. The ability to be a system and mission integrator, for example, hinges on the programme and project management competencies. Lockheed, for example, has won several major contracts with the US Department of Defence more on the basis of its programme management skills than on any specific technologies or elemental competencies. Similarly, it seems that its takeover of major competitors, such as General Dynamics' fighter aircraft division, is based on the expectation that Lockheed will bring superior programme management skills to improve the performance of the acquired units.

Competence integration itself may become a key competence of a firm. Indeed, beyond its aerospace equipment business, Lockheed has entered the airport operations business (where local authorities "outsource" the operation of their airports to Lockheed) quite successfully, it seems, on the back of its integration competencies.

For most companies, however, integration competencies are difficult to dissociate from actual elements of competencies. Patterns and processes of competence integration are dependent on the tasks which led to their emergence. Communication channels, information filters, decision rules, and problem solving approaches are a reflection of the needs they emerged to address (Henderson & Clark, 1990). As such they are not domain-independent. To disentangle the integration competencies embedded in these channels, filters, rules and approaches is not what most firms succeed in doing. Quite to the contrary, most become prisoners of set patterns, and are not able to reaggregate their competencies in a different pattern from that in which they emerged. This makes redeploying competencies to explore new opportunities more difficult.

Competence Leverage: Exploitation vs. Exploration

Competencies develop and grow through practice. The more frequently and intensely a competence is practised, the more finely honed it becomes. Variations in the application of the same competency to new but related contexts, rather than repetitive practice, contribute to the development of that competency. Efficiency learning takes place through experience, effectiveness learning through enriching the repertoire of causal "scripts" used in solving related but different problems (Brown and Duguid, 1991). This raises an additional dilemma for top management: to emphasise efficiency learning and the exploitation of mastered competencies in the existing business domain of the firm, or to emphasise effectiveness learning by stretching competencies to explore business domain extensions.

While efficiency learning takes place naturally, in following the natural inertia of the firm's competencies and product markets, effectiveness learning calls for an active management process. The first hurdle in that process is to discover new leveraging opportunities for the firm's competencies.

Opportunity discovery usually requires both creativity in identifying unmet needs and unserved market segments and/or flexibility in reconfiguring existing competencies. For example, while the credit card business was perhaps an obvious opportunity for AT&T, the reconfiguration of competencies from phone services to credit card markets was not just a straightforward transposition. Conversely, AT&T may have in hand all the competencies for a simultaneous translation phone service, worldwide, but to identify and assess the need for and price elasticity of such a service may not be easy. Core competence leveraging, thus, is an exercise both in external imagination and in internal flexibility.

External imagination does not come easily, most companies are prisoners of existing definitions of customers and markets (Levitt, 1975; Hamel and Prahalad, 1991). Imagination borders on corporate creativity. While the elements and sources of corporate creativity are known (Woodman, Sawyer and Griffin, 1993) their application to the discovery of new applications remains difficult.

There are no "sure fire" solutions, but, it seems, practices which can improve the odds. First, the diffusion and sharing of competencies between businesses, in itself, seems to improve the likelihood of discovering new opportunities by exposing personnel to one another's competencies, and allowing to match competencies and possible opportunities. Applying the business logic of one product, or one industry to another may also help. Some observers would argue that Canon did not transform the photocopier industry through strategic brilliance but rather merely by applying to photocopiers the approaches, and implicit logic it first developed in the camera business. Third, moving from the fixation on product-markets, to grasp underlying needs and functionalities, and the ways in which actual users assess value may also facilitate the discovery of new opportunities by identifying unmet or poorly served needs. This, in turn, is facilitated by direct linkages between technological product designers and users, allowing for a visceral sense of product integrity (Von Hippel, 1988; Hamel and Prahalad, 1991; Dougherty, 1992). More generally, metaphors and analogous reasoning may help unshackle the mindset of developers (Nonaka, 1991). Finally, fear of failure makes a learning approach to opportunity discovery and exploitation difficult. The cost of failure can be reduced both by reducing the cost of trials (e.g., through core platforms and variations, modularity, faster and less costly product development, more flexible manufacturing, decreasing economies of scale, and faster production ramp ups). For products or systems not amenable to this "trial and error" learning approach (e.g., nuclear reactors or aircraft rather than walkmen or laptop computers) better simulation methods may offer similar advantages and allow to explore many engineering options at an affordable cost. Molecular modelling may come to play a similar role in the development of new pharmaceutical substances.

Beyond these technical approaches, organisational processes and cultural attitudes that depersonalise failure in discovery and exploration may also play a key role (Chakravarthy, 1990). Failure is seen as a collective tuition cost for finding new applications, not as the fault of a specific individual.

The second hurdle is to mobilise competencies in a new configuration. Internal flexibility to leverage competencies is equally difficult to achieve as the discovery of new opportunities towards which to mobilise them. New opportunities are likely to draw on a series of competencies which have been cultivated in various parts of the organisation, and need to be combined in new ways. Accessing these competencies and getting the various subunits where they are located to contribute to the new opportunity may not be easy. Issues of subunit boundaries and possible misappreciation of the nature of the required competencies are likely to stifle the exploitation of new opportunities. For example, when VCRs were first introduced by Philips, their manufacturing was assigned to a video product group plant, (because VCRs were to be part of the video division marketwise), which lacked the required competencies, where an audio group plant, with the experience of audiotape decks, and the micromechanics competencies needed for VCRs, would have been a much better 'choice'. Some companies, such as Sharp and Canon, in Japan, establish "corporate priority" projects drawing personnel from many subunits to attempt to overcome subunit parochialism. Others, such as 3M in the US try to build cultures and processes of sharing and opportunity developing.

Further, as we argued earlier, the pattern of competence aggregation may reflect the particular needs of its emergence, and not be easy to restructure and redirect towards new opportunities. The plasticity of competence deployment patterns is low. The quality of the match between competence and opportunity may be a third barrier to effective leverage. First, the company itself may define its served markets, or its strategic intent narrowly, thus ruling out a number of opportunities, or inadequately, hence missing more rewarding opportunities. For example, it has been argued that IBM's focus on mainframes and its concept of being a proprietary hardware company led it to define excessively narrowly, and for too long, the scope of opportunities available to the company (Ferguson and Morris, 1993). Similarly, Apple's concept of its business may have led the company to take less advantage of its operating system know-how than it might, leaving an open opportunity to Microsoft (Rappaport and Halevi, 1991). Second, a company may push its reliance on core competencies too far. For example, the evidence is mixed on whether Minebea could effectively leverage the competencies developed in the manufacturing of miniature bearings to the production of semiconductor memories (Collis, 1991). The issue, in that particular case, is that although the high level of aggregation competencies (e.g., clean room operations) were similar, the disaggregated competencies were quite process-and material-specific, and steel is quite different from silicon.

Conversely, though, the match between competencies and opportunities may also be too conservative. It is not just an issue of narrow market definition but also one of not using new opportunities to challenge the company to develop and test new competencies. Constantly exploiting the same set of competencies may lead to both complacency and vulnerability. The learning of existing competencies plateaus at a high, very acceptable level, but the organisation members no longer feel a pressure for improvement. The set of competencies may become obsolete and not be renewed.

Competence Renewal: Incrementalism vs. Discontinuity

Exploration competencies, discovering new opportunities and creating the need to develop new know how is essential to the long term success of most firms (Hogarth et al., 1991) since the competitive value of any given competency is likely to decay over time (Dierickx and Cool, 1989) and/or to be curtailed by transilient or architectural innovations (Henderson and Clark, 1990). Elsewhere (Hogarth et al., 1991) we have argued that unbounded goals, simultaneous managerial attention to long term and short term, and the ability to acknowledge and manage the tensions created by a series of paradoxes are key to renewal competencies. It is also important, though, to recognise that the learning processes required for renewal competencies are quite different from those useful in cultivating existing competencies (Chakravarthy and Kwun, 1990). Unlearning existing competence "enhancing" routines - or at least exempting the competence renewal processes from the discipline of these routines - so as to challenge dominant logics and bring new perspectives (Nonaka, 1991, Henderson, 1991). Internal variety is an enabling condition for renewal.

A few firms seem to develop a capability to manage both continuity and renewal. The constant practice of combining and recombining core technologies into new applications, and hence not to be locked into any particular set pattern of interaction between technologies, seems to have allowed Canon to master the transition from one product architecture to another, where other firms faltered (Henderson, forthcoming 1994). Similarly, Canon's recent shift from laser printers to bubble printers may denote the same competence to master the transition between products and technologies which are deeply different.

Yet, renewal competencies are even more difficult to pin down, for analytical and managerial purposes, than performance competencies. Whereas the measurement of performance competencies can be quantitative - from "learning curves" to "time to 50% improvement" thresholds - the measurement of renewal competencies is much

more difficult. Exploring also takes place mostly in a "satisficing" mode, where performance expectations and thresholds play a key role, hence the importance of discrepancy creating strategic "intents" which establish higher performance expectations. Further, "learning by exploring" is not easily amenable to simple methods. Search and learning rules are not clear.

The development of renewal competencies in many organisations is also stifled by organisational processes. First, reasons for success may not be understood, and their continued validity not well assessed. Reasons for success may be missed*, or successful approaches may not be replicable. Uncertain imitability prevails, even within the firm. This makes renewal threatening: what needs to change and what needs to be protected is not clear, and the feasibility of change is uncertain. Second, renewal threatens established businesses and individuals. Few companies willingly make obsolete the competencies of their own core businesses. More importantly, the "unlearning" of past recipes is painful and generates anxiety (Schein, 1993). Third, top management, perhaps frustrated by the first two factors, often marginalises renewal efforts into new ventures and "skunkworks" the legitimacy of which remains vulnerable to corporate politics and financial fortunes. Acceptable performance may lead to risk avoidance (Bowman, 1980) and to an atrophy of renewal competencies, a "failure of success" process. Fourth, which renewal competencies to cultivate is difficult to decide upon, in particular when the development of new competencies coincides with a deep change in business focus (e. g., Corning's repositioning into higher technology applications in the 1980s, such as optical fibres, or Intel's metamorphosis from memories to processors, or the current shift in mobile telephony towards consumer products).

Finally, renewal may not be possible. The aggregated competencies that would allow the redeployment of skills may not be possible. In the absence of high level aggregated competencies changes may not be addressed successfully. Henderson, for example, stresses that only Canon, among incumbent firms in the photolithographic equipment sector, was able to master the product architecture consequences of significant innovations in subsystems. Only Canon would master the systemic consequences of these changes.

* It is striking, for example, to see how IBM masterfully achieved "architectural" control over mainframes in the 1960s and 1970s, and let Microsoft, and to an extent Intel, take such control away from IBM in personal computers in the 1980s.

Conclusion

Our argument so far has stressed the need for balance between inertial development and programmatic management of five key processes in the management of corporate competencies: competence development, competence diffusion, competence integration, competence leverage, and competence renewal. Although balance is the sought outcome, management efforts need to be devoted to pushing out, i.e., accelerating and deepening development, encouraging and facilitating diffusion, fostering integration, discovering and exploring opportunities for leverage, and complementing competence cultivation with competence renewal. The most important task for top management is to operationalise these efforts. Table 2, below, summarises briefly the tools and approaches that top management can use to manage actively all five processes discussed above.

[Table 2 about here]

Although our sequential treatment of each process may not highlight the point, it is also obvious that the various processes are not independent. To some extent they do conflict and balance must also be achieved between processes. The key difficulty here is that not all processes are equally measurable. Competence development can be quite tangible, at least in some dimensions, such as quality, or cost and speed of operations. Competence diffusion is easy to measure, at least for some competencies, in particular the ones that can be routinised. Competence integration raises difficult issues, in particular that of disconnecting the capability to integrate competencies from the historical context in which they happened to have developed, and thus to reconfigure and redeploy competencies towards new opportunities, particularly when these new opportunities are not just to be served by existing subsystems of competencies and business processes, but need the recombination and reconfiguration of elemental competencies.* Measuring the success of leveraging is often an issue of opportunity cost, hence hard to assess. Finally, renewal competencies are even more difficult to assess. There may therefore be a natural tendency to pay attention to what is most easily measurable, i.e., progress along the development and diffusion dimensions, thus reinforcing the intrinsically conservative and inertial nature of core competencies.

* It is more difficult for Canon to redeploy itself from generation to generation of photolithographic equipment than for AT&T to redeploy its transaction processing and billing subsystems towards the credit card market. Lockheed's success in airport management is probably an intermediate reconfiguration, which draws mostly on its integration skills (e.g., programme management and system integration) rather than on the elemental competencies of military systems and aircraft development and production.

Our brief inventory of management tools, on Table 2, also suggests that tools for development, diffusion, and leverage are both more numerous, more specified, and better routinised than tools for aggregation and renewal. These differences may in turn contribute to the observed inertial nature of competencies. It is easier to accelerate movement on the existing competence trajectory of the firm than to reconfigure or re-invent and re-develop competencies.

The key management challenge, as the firm grows and matures, may therefore well be not to become prisoner of one's own competencies. While for relatively new and young firms the development and diffusion of unique competencies may be the key priority, priorities may shift towards leverage, and later towards aggregation and renewal, as the firm, and its existing business domain mature. The nature of the top management priorities, therefore, may have to shift over time from developing to diffusing, to aggregating and leveraging, and finally towards challenging and renewing.

Table 2
Management Tools and Approaches for Core Competence Management

Development	Diffusion	Integration	Leverage	Renewal
<ul style="list-style-type: none"> • Quality Management • Quality deployment • "Dialogue" processes • Business process reengineering • Collectivisation of risks and returns within the firm • <i>Strategic intent</i> • Competence development campaigns • Professional training 	<ul style="list-style-type: none"> • Articulation and transfer of procedures • Best practice exchange • Selective uniformity, selective differentiation • Networking processes (Emergent and structured) • Professional norms and observability of performance • <i>Apprenticeships and co-practice</i> • Specialised, mobile accelerated competence development teams • Collectivisation of risks and return • Internal labour markets 	<ul style="list-style-type: none"> • "T-shaped individual skill bases • Programme and project management skills • Reconfiguration capabilities • "Architectural" competencies 	<ul style="list-style-type: none"> • Marketing imagination • Transfer of business logics, analogous reasoning • Focus on underlying functionality, and "value to cost" measures • Direct linkages between technologists and customers • Modularity and flexibility in product design • <i>Simulation tools</i> • Collectivisation of risk of failure • Internal flexibility • Transferability bases (?) of competencies 	<ul style="list-style-type: none"> • Unbounded goals • Multiple time frames • "Exploring" skills • Unlearning

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