

Leapfrogging the Competition: the Dynamics of Resource Metamorphosis

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Abstract. Companies commonly come to dominate an industry through a product advantage that they then build into a superior resource system. With an endowment of superior resources they hold competitors at bay, sometimes for decades. Much less common is a dominant competitor that has leapfrogged to the lead starting from a seemingly inferior resource position.

Even a subtle change in industry environment can create the opportunity to leapfrog; and strategic foresight (or luck) can result in a new resource combination better suited to the new environment. If a weaker competitor seizes such an opportunity it can dominate an industry. A dominant incumbent will be overtaken unless it can find ways to match the new resource combination or check its growth.

Leapfrogging is a dynamic process. It requires that one or more competitors transform their endowment of resources. When the transformation is consciously managed we call the process 'managing metamorphosis'.

This paper describes the metamorphosis of a segment of the speciality chemicals industry. The leading producer creates a competitive advantage that is sustained for 20 years; but a change in industry competitive forces creates conditions favourable for leapfrogging. A dynamic resource based analysis supported by selected simulations shows how the resource positions of three competitors evolve over history from 1986 to 1996. An investigation of the leader's policy logic reveals why the company was initially slow to respond to the threat of leapfrogging. Structural analysis of the resource system and simulations out to the year 2010 show the concepts and tools available to management to redesign policies (for pricing, R&D, and service staff) to leapfrog a market leader or 'jump' in time to fend off a rival.

Using the lessons learned from the resource based analysis we outline some new strategic frameworks which have proven effective in practical application with management.

Birth of Competitive Advantage - Product Innovation Begets Service Reputation. In the 1970s Wideflux, a speciality chemicals company, patented 'flexamax', a compound that revolutionised fine china production. Flexamax allowed ceramics factories to use raw materials of variable quality to produce an end product of consistently high quality; resulting in dramatic reductions in raw materials costs, inventories, factory downtime and scrappage.

Flexamax was so valuable to ceramics factories that (despite the misgivings of some skeptics in the management team) it was priced at 10 times Wideflux's fully allocated costs per kilogram. Nevertheless, and to the surprise of the skeptics, the company rapidly built sales, thereby creating a phenomenally profitable business. WideFlux went on to enjoy almost two decades of dominance in the Ceramic Thermal Compatibility Additive (CTCA) market. Over time the company developed many variations on the basic flexamax compound. Moreover, by working with a variety of factories, WideFlux's sales engineers built a reputation for deep knowledge of their customer's technical challenges. WideFlux sales engineers were able to apply the solutions for one customer to other customers.

Inevitably, WideFlux's rivals became aware of just how profitable the CTCA business was. Over the years several competing compounds were introduced, but none of the rival companies were successful in taking a significant number of customers from WideFlux, even when the basic patent expired. One of the rivals, CostChem, actually invented an arguably technically superior product and offered it at a 30% discount to flexamax, but still failed to attract much interest. Wideflux firmly believed that the flexamax product remained attractive because the company knew how to solve customers' problems with a state-of-the-art product applied by skilled sales engineers who could be deployed throughout Europe.

Changing Industry Forces, Rivals and Wideflux's Response to Change. In the early 1990s the political climate in Europe changed. Throughout the 1980s many of the Western European fine china producers were operating in relatively protected markets. However in the 90s, with barriers to trade falling and long dormant producers emerging as real competitive threats from Eastern Europe, there was significant overcapacity and cost pressure building up. Moreover, with rising cost pressure Wideflux's sales engineers were no longer pitching their offering to like-minded ceramic engineers. Instead purchasing departments were increasingly influential. Imperceptibly (at first) but steadily the nature of the buyer changed from technically aware to cost conscious. In this new climate one particular competitor KeenChem began to enjoy some success with its thermalease product range which was chemically similar to Wideflux's flexamax range. In an effort to keep business, Wideflux's sales engineers began to offer selected price concessions to key customer accounts.

Meanwhile Wideflux management strove to meet the annual profit growth target set by its parent, DivCong. Historically WideFlux had been meeting this profit target year after year, so there was limited pressure to run the business as a lean operation. Consequently, WideFlux sales engineers were amongst the highest compensated in the industry, and WideFlux always had a wide ranging R&D program backed by high levels of R&D spending critical to maintaining the flow of new product variations.

Corporate pressure on Wideflux to maintain profits led to a search for cost savings. Management was contemplating a reduction in the number of sales engineers as a means to fund R&D. Management reasoned that if Wideflux failed to innovate, customers would no longer regard the Wideflux relationship as critical and would be easy prey for competitors such as KeenChem. However sales engineers experienced conflicting signals from customers concerning KeenChem's success. In some countries Wideflux was sustaining a dominant position; but in others the damage was heavy. Wideflux was faring worst where KeenChem had seconded engineers to help customers optimise their consumption of thermalease. This tactic was especially effective where WideFlux had limited geographic representation and with customers producing products for the low

end of the fine china market. Several high end customers had also been tempted; but nearly all of these remained with Wideflux. However in some regions KeenChem was gradually building a reputation for reliable proactive service that might eventually appeal to high end customers. After 20 years of success the question facing Wideflux management was how best to adapt to the new industry conditions. One member of the management team had worked with system dynamics in the past and felt that it would be the right framework for unraveling the structural reasons for Wideflux's faltering business. The following sections discuss the insights resulting from a dynamic resource based analysis.

Resource endowments at the outset of the story. Reading the WideFlux case according to a resource-based template [Barney, 1986, 1991; Dierickx and Cool, 1989; Morecroft, 1997; Warren, 1997], a number of resource-stocks drive competition in the industry. The first resource-stock is the effective value of the accumulated expenditures in R&D (or technology base). In 1986 WideFlux had a technology base *resource-stock* valued at 120 billion Italian lira; more than twice the size of its competitors' technology bases. This advantage allowed WideFlux to build its reputation for technological leadership. By leveraging the technology base, WideFlux developed the second resource-stock: a large customer base; its 1986 share of the base was 80%. WideFlux's dominant share contributed to ongoing superior accumulation of experience and knowledge of the product's use. Superior technology and knowledge led to the development of the third superior resource-stock: a high price. In 1986 WideFlux's price was 6,700 Italian lira per kilogram (Lit./Kg.), whereas KeenChem and CostChem's prices were respectively 5,700 Lit./Kg. and 5,400 Lit./Kg.. These three resource-stocks combine to create the historical basis for sustainable competitive advantage: a self-reinforcing loop through technology base> customer share> product's use knowledge> price>sales and profits> R&D spend>technology base. A fourth but historically non-critical resource-stock is service. A proxy for this resource is the number of researchers/field engineers who help to solve clients' technical problems. In 1986 WideFlux had 40 service staff or about double the competition in absolute terms but less than 50% of the competition on a market share equivalent basis. This apparent gap was more than compensated for by Wideflux's service skills.

Resource metamorphosis from 1986 to 1996. As the European fine china industry faced intensifying cost pressure in the early 1990s, the CTCA industry was ultimately impacted. This 'slow burn' shock moulded the resource endowment evolution of the three competitors, and explains a superficially puzzling picture. WideFlux lost 30% of its market share in a period of ten years, leaving it with 56% in 1996; whereas KeenChem increased its' share from 2% to 23% and CostChem grew from 15% to 20%.

Figure 1, 2 and 3 illustrate the values of the fundamental resource-stocks for the three competitors at the outset of the story (1986) and at the end of the analysed ten year period (1996). Three considerations flow from the pictures. First, the prices of the three competitors converged to a lower level. Second, the difference between leader's and competitors' technology base remained unchanged; suggesting that competitors increased their market shares despite the fact that WideFlux was still a technological leader. Third, the level of the service staff of all three competitors increased, converging to approximately 60 people per company. However, while the growth in service staff at WideFlux was 37%, the increases at KeenChem and CostChem were respectively 500% and 600%. Figure 4 illustrates the dynamic behaviour of the resource endowments of the three competitors between 1986 and 1996. The graph for technology base shows that the differences in accumulated investments in R&D among competitors remained constant during the ten year period. The graph for service shows the remarkable increase in service staff of KeenChem starting in 1990. The aggressiveness of such a policy is confirmed in the graph representing the number of new service staff added per year to the overall level of service staff. The rate of service staff accumulation at KeenChem increased rapidly beginning in 1990, and in 1993 overtook the rate of service accumulation at WideFlux.

KeenChem accumulates its staff resource much quicker than WideFlux, and at some level is able to do so because the skill requirements are much lower. Indeed, both KeenChem and CostChem are hiring service engineers who are able to deal with cost-conscious commercial buyers whereas WideFlux maintains its policy of building a service function that performs well solving complex formulation problems and prefers to deal with scientists at customer sites. Furthermore, the graph for price emphasises a degree of reluctance of WideFlux to cut its price. Until 1990 WideFlux maintains a very significant price premium and only in 1993-1994 was the premium eliminated. The considerable cost advantage of competitors' products attracted cost-sensitive buyers who found it convenient to trade-off the problem-solving reputation of WideFlux with both close-to-the-buyers service and lower prices of competitors. This evolution of resource endowments drove the dynamic behaviour of the customer base resource-stock. As illustrated in the graph for the share of customer in figure 4, WideFlux market eroded gradually beginning from 1990 with a sharp reduction between 1992 and 1994.

The resource dynamics are puzzling in many respects. Why did the leader fail to manage a resource metamorphosis thereby losing 30% of its market share? Why did WideFlux both delay price cutting and overlook the need for a new kind of service?

Figure 2 - Resource Metamorphosis of KeenChem

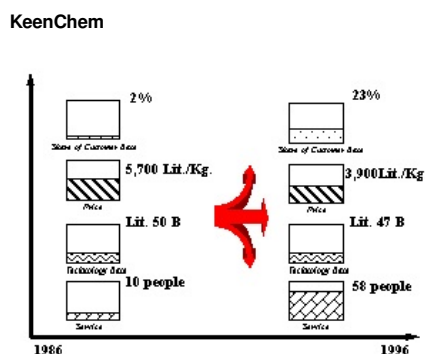


Figure 1 - Resource Metamorphosis of WideFlux

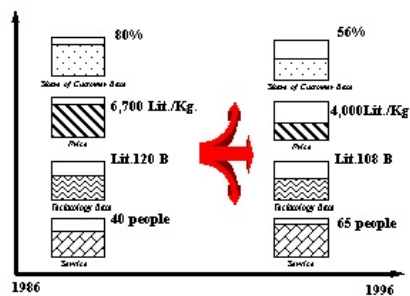


Figure 3 - Resource Metamorphosis of CostChem

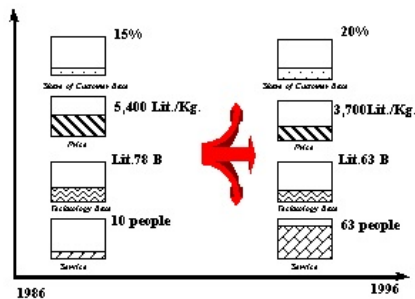


Figure 4 - Time charts of main resource-stocks evolution for the three competitors



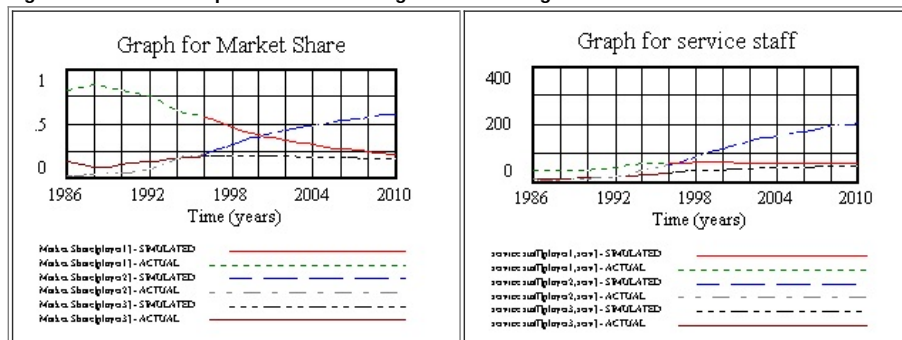
Dominant Logic of WideFlux. An analysis of the dominant policy logic [Pralhad and Bettis, 1986; Morecroft, 1985] at WideFlux helps to explore the rationale underpinning the observed resource dynamics. In particular, such an analysis helps to explain why WideFlux did not aggressively cut price and why the company did not shift to a different, less technically oriented, kind of service.

Pricing inertia at WideFlux was created in two ways: by short term profit expectations at DivCong; and by the knowledge that price cuts for one customer would ultimately undermine revenues at all other customers.

The apparent inertia of service style is more subtle. Embedded in the corporate culture was the idea that R&D people were top scientists in their fields and that the service offered had a high scientific content. The switching to a more intensive support oriented service translated to a loss of prestige and status at Wideflux; whereas the competitors were not burdened with the same historical bias. For example, headcount alone does not reveal at a first glance the increasing gap between the leader's and competitors' service effectiveness. However, a closer look would reveal a growing mismatch between the service capabilities of Wideflux and the requirements of the customers.

Need for a shift in mind. Figure 5 explores the implications of the delays in implementing a resource metamorphosis. Simulating a scenario in which WideFlux's dominant logic does not vary, the graph for service staff shows a dramatic increase in service level achieved by KeenChem and the graph for share of customers elucidates the market consequences.

Figure 5 - Simulated implications of unchanged dominant logic

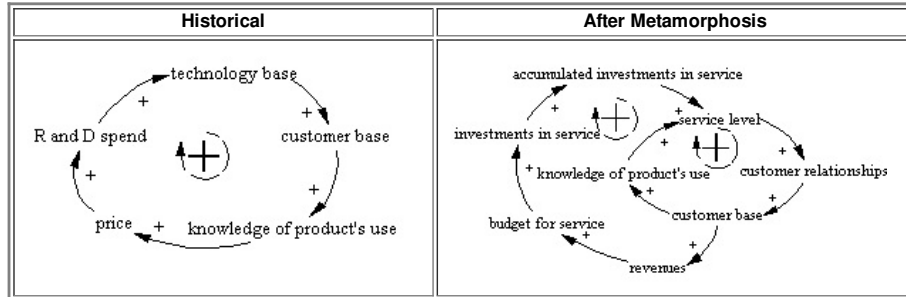


The rival's bold growth in service leverages an emergent positive feedback loop that replaces the old source of competitive

advantage (diagram in figure 6). Such a feedback is emergent in the sense that it does not originate from a conscious enactment of a policy. WideFlux's slow price cuts allow competitors to accumulate a greater share of customer base and to build customer relationships. As service level increases, share of base grows. Increased share leads to the accumulation of experience in customer's use of the product and allows for further enhancement of service. On the other hand, larger customer share generates revenues that enhance the budget for service. A greater service budget produces higher investments in service improvements. In turn, further improvements in service reinforce the accumulation of customers.

The WideFlux case provides evidence for the crucial role played by the interplay of corporate and business dominant logic in stimulating or hindering firm adaptation and survival in the face of environmental shocks. For WideFlux rigid dominant logic in both pricing and service translated to inertia which was preventing WideFlux's management from recognising the need for a rapid resource metamorphosis.

Figure 6 - Positive feedback loops driving sustainable competitive advantage



Summary of Generic Resource Transformation Framework. The notion of transforming resources to meet market needs is not a new one. Darwin [1859] saw that species who found a way to adapt to the environment succeeded, and those that did not became extinct. Darwin described the process as driven by natural random mutations; and these mutations led to a taxonomy of species occupying environmental niches. The most adaptable species, became the most successful.

By the same token, companies that find a way to proactively adapt to their future environment - or even shape their environment, are by definition more likely to thrive. So how can companies proactively adapt to and/or shape their environment?

We believe that the success formula for any company can be described as a collection of co-dependent resources that may or may not be directly controlled, and that certain of the resources are truly critical at any time. The critical resources are determined by a clear understanding of how a company can build and sustain a competitive advantage. Moreover, the critical co-dependent resources are largely determined by the operating environment. It is not enough to know how to optimise the resources you've got in today's environment; to be truly proactive, you must mutate your company ahead of time. Managers are faced with resource transitions all the time. Whenever the market environment or industry structure changes, the capabilities best suited to competing in the market shift. If management has a clear unified vision of what the key resources are and how to get them, this can be a powerful management device.

The following seven step resource metamorphosis framework has demonstrated its value as a powerful and practical management tool in helping managers proactively mutate their companies:

1. Identify the key resources that have driven historical performance.
2. Develop a view on the nature of the discontinuity
3. Determine the likely nature of the required resources going forward
4. Identify the coordinating mechanisms required to assure that transitional resources are developed, unneeded resources retired and new resources are developed
5. Identify the required transitional resources
6. Build-up new resources
7. Eliminate redundant resources

Implications For Management

The dynamic resource based view is a powerful strategic framework and change agent. Its impact is derived from clear expression of complexity. In this example the resource based view makes it abundantly clear which resources have contributed to a potential leapfrogging scenario. The simulation model provides foresight into which resources are likely to be critical; and, almost by inspection, it is possible to determine which resources are or could be deficient. Armed with this knowledge, clear priorities emerge for proactive actions to sustain threatened resources or rebuild deficiencies. Sustaining or rebuilding resources is, in our experience, a very easy concept for most managers to grasp - which makes it that much easier to effect positive co-ordinated change. This is especially important where it takes a simple idea to galvanise a management team to action. Because the resource based framework is at its essence simple, it is compelling, and has succeeded where other approaches have failed to galvanise a management team around a new management approach. We believe the dynamic resource based view of companies represents a real advance in helping managers understand how to proactively raise business performance by identifying high potency management actions.

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