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# *The Softer Side of Strategy Dynamics*

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***Intangible resources like the feelings of staff, customers and investors have an indirect but powerful impact on firms' performance. They grow or decline alongside the more tangible resources in the firm's armoury. Capabilities too must be accumulated and retained, and may be reinforced by learning mechanisms within the business. This third and last article on the dynamics of strategy discusses how dynamic resource system view (DRSV) techniques can be applied to these intangibles to improve the firm's performance. (The first two articles on DRSV were published in the Autumn and Winter 1999 issues of Business Strategy Review.)***

The resource-based view of strategy (RBV) has shifted the search for sustained competitive advantage away from firms' choice of industry position or segment towards its ability to accumulate and sustain resources (Collis and Montgomery 1995, Wernerfelt 1984). Exactly where the distinction lies between hard, tangible resources and their softer, intangible counterparts is debatable. However, organisations clearly own or have access not only to relatively tangible assets (people, products, plant, cash) but also to other less tangible items (skills, reputation, technologies and so on). Intangible resources can be categorised in various ways, for example by isolating those that arise in different functional parts of the business (human capital *versus* technological) (see eg Grant 1995). To help in our search for fact-based understanding of the dynamic impact arising from soft factors, we here divide intangible resources into two broad categories:

- ***Characteristics or 'attributes' associated with tangible resources***. Many tangible resources have a corresponding intangible – plant capacity/plant cost efficiency, customer numbers/customer account size, staff number/staff skill level. These intangible attributes are often as important to performance as the quantity of the tangible resource.
- ***'Indirect' resources, usually reflecting people's feelings or expectations about issues that concern them***. Examples include staff morale, reputation amongst customers, or support from investors.

'Capabilities' have to be considered separately. They are things the firm is good at doing rather than resources – ie things it has.

## Measuring Intangible Resources

Strategic plans and strategy consultants often ignore intangibles because they are felt to be undetectable, unmeasurable and/or unmanageable.

- ***Undetectable?*** Attribute-resources like product reliability, staff skills and customer profitability are clearly detectable. So too are indirect resources like

morale and reputation. The atmosphere and energy in a company where people are motivated feels quite different from one where staff are under pressure. Any sales person can describe the difference in a customer's reaction to products with bad and strong reputations, and directors can certainly detect the hostility of investors who have lost confidence in the Board.

- ***Unmeasurable?*** Firms increasingly try to measure intangible factors. Product quality, plant efficiency and delivery performance feature in routine reporting systems. But softer issues are also measured – via staff surveys and customer research for example. Even the fund management industry, characterised by a focus on 'objective' measures such as investment performance, surveys investors' confidence in their advisors and the perceived quality of service. Although a clear link between changes to these critical variables and the substantive performance of the business can seldom be precisely defined, managers know they are influential. What they need are better tools to understand and influence them.
- ***Unmanageable?*** The achievements of exemplary managers in difficult situations show that intangibles are not unmanageable. Strong new factory managers up-rate product quality and plant yield, inspirational sales managers improve sales force morale and confidence, and capable chief executives reassure anxious investors. One newly-appointed manager in a factoring firm we examined found morale at a very low level, and correspondingly poor business performance. Within three months, he had turned the business round by instituting regular, detailed enquiries into staff feelings and responding with rapid management action to correct problems.

Of course, there is less precision in assessing and managing intangible resources and capabilities than more tangible assets. Why not just leave it to individual managers? There are two reasons for a structured approach:

- Soft factors clearly matter, so without some attempt at building a fact-based assessment of their impact, the only remaining option is guesswork.
- Where the impact of soft factors is poorly understood, then the approach that follows makes it possible to start learning.

## Direct Changes to Intangible Resources

Like tangibles, intangible resources are susceptible to in-flows and out-flows, and management can usually act to accelerate in-flows and slow out-flows. Table 1 illustrates for three common intangible resources the measurement method and some forces that may drive increases and decreases in their level over time.

Table1
**Examples of intangible resources, with measures and drivers of in-flow and out-flow**

| | Morale | Reputation | Product functionality |
|---|---|---|---|
| **Measure** | By survey | By survey | Fraction of user-needs met |
| **Scale** | 0 to 1.0 | 0 to 1.0 | 0 to 1.0 |
| **Inflow drivers** | Firm performance<br>Rewards | Marketing | Product development |
| **Outflow drivers** | Work pressure | Service quality | Obsolescence |

Figure 1 portrays the dynamics of a further common example. (Warren 1999a explains the nomenclature). The average staff skill, as measured for example by a skills-audit, is represented by the level in the 'tank'. Additional skill is added each month through the in-flow 'pipe' entering from the left. Here, the only cause of increased skill is the time given to training each person. Initially, the rating of average skill level is 70%, or 0.7. (In DRSV, fractions are easier to work with than percentages.) There is significant scope to improve skill levels, as the shortfall is 30% below the ideal level. It is estimated that one hour of training closes this shortfall by 10%, so the two hours per person initially raises their skill-rating by 0.06, or 6% per month. As training efforts push staff skills higher, the shortfall is reduced and the impact of further training diminishes.

If the quantitative assessment of skill level described in Figure 1 seems artificial, consider Case A (see box). Similar efforts can be made to increase directly the level of many intangible and indirect resources. To support their share price, CEOs devote a lot of time to winning the support of stock analysts. Companies spend huge sums to build up public perception that they are responsible corporate citizens.

As with tangible resources, it may be just as important to choke off out-flows as it is to boost in-flows. Staff

Figure 1
**Limits to growth of staff skills**

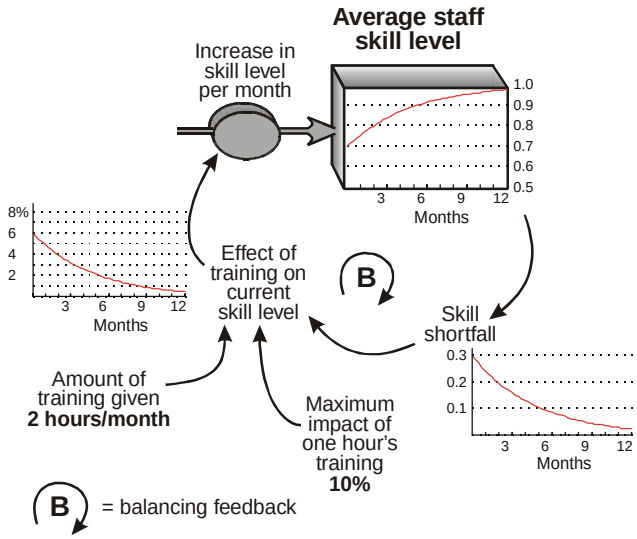
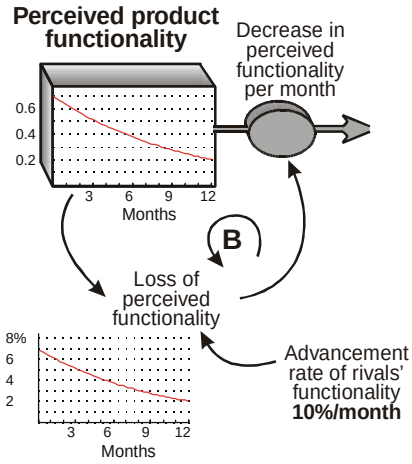



Figure 2
**Depletion of perceived product functionality**




who leave take their skills with them, and skills may be forgotten if not reinforced.

Even when there is no actual reduction in the intangible factor, it may effectively be depleted because the reference-level changes. When first introduced, products as diverse as video recorders, mobile phones, office software, restaurant meals and legal services are largely perceived to meet customers' expectations. However, whilst the product's actual functionality (tasks it will fulfil) remains unchanged, rivals provide increasingly sophisticated offerings. What was once seen to be an exemplary product becomes merely average, and then obsolete. Whilst it may be necessary in some cases to capture the dynamics of perception-change itself, it is often sufficient to portray this obsolescence simply, as in figure 2. (This mechanism explains why consumers are subjected to ever more complex products, well beyond the point where most of us lose our ability to use them.)

Figure 2 illustrates important features of the depletion process for intangible resources. First, higher levels of resources tend to deplete faster: the most sophisticated products suffer the fastest decline in users' adulation; the most publicly righteous companies suffer the sharpest criticism when they fail to live up to these standards; the stocks of companies that have enjoyed the strongest support fall faster when performance fails to meet expectations.

Combining the accumulation and depletion of intangible resources in Figures 1 and 2 offers an initial means of explaining and managing intangible resource levels over time. Reputations of consumer brands, for example, must be built and sustained by advertising. Brands relying on fashion-status amongst the young must work hard to counter an extremely rapid 'forgetting rate'. The manager of one such brand in the beer sector estimates this rate at 80% pa – of 100 consumers admiring the brand at the start of the year,

**Case A – Claims Department**
The newly appointed manager of an insurance claims unit asked his department of nearly 100 claims processors to spend half an hour assessing their own skills on four types of task. By deploying individuals against tasks that matched their skill-profile the team eliminated a serious backlog in just a few days, and raised the processing rate from a low of four claims per person per day to 16. While the measurement of skills was not exact for any individual, across this group as a whole simple measures were estimated with sufficient accuracy to be useful. Having built a picture of the initial skills-profile for the department, this manager was able to target training at closing the skill shortfall, monitoring progress towards his target by repeating the simple assessment exercise.

Table 2
**Examples of intangible 'attribute' resources associated with illustrative tangibles**

| Sectors | Tangible resource | Associated intangible attribute resource | Useful measure |
|---|---|---|---|
| **Many** | Staff | Staff experience | Years |
| **Many** | Customers | Profit-contribution | £'000 per year |
| **Many** | Products | Product functionality | Fraction of customer needs fulfilled |
| | | Product profitability | £'000 per year |
| **Telecoms** | Subscribers | Subscriber quality | Call volume: minutes/month |
| **Manufacturing** | Production facilities | Scale | Annual output: units |
| | | Cost efficiency | £/unit |
| **Retailing** | Site locations | Site quality | Passing pedestrian traffic |
| **Banking** | Loans | Size of loans | Value £'000 |
| | | Risk rating | Probability of default |

only 20 would remain after 12 months without constant, high rates of advertising spend. Conversely, brands such as Coca-Cola or Guinness might stop advertising with, at first, little detectable depletion of reputation. What matters here is the *competitive* importance of sustaining this intangible resource, together with the need to win each emerging generation of consumers.

The cost of sustaining intangible resources can be considerable. McDonald's must constantly invest in staff training. Although it should be possible in principle to train up all staff to a high level, then stop, the constant churn amongst staff requires continued intensive rates of training.

## Working with 'Attribute' Resources

Tangible resources carry with them one or more intangible 'attributes', which are themselves valuable resources. Attribute resources are susceptible to direct influence and also altered by the flow of the associated tangible (table 2). As with all elements of DRSV, these must be carefully selected, defined, and measured with units that reflect their impact on the rest of the system.

The state of attribute resources influences the performance of the system – product functionality determines the rate of customer-acquisition and purchase, customer-profitability determines cash flow, staff experience determines productivity, and so on. DRSV must therefore be extended to capture this intimate relationship between tangible resources and their attributes. The system dynamics method (Forrester 1958, High Performance Systems 1991) offers a rigorous means to operationalise this link, known as the 'co-flow' structure (short for co-incident flow).

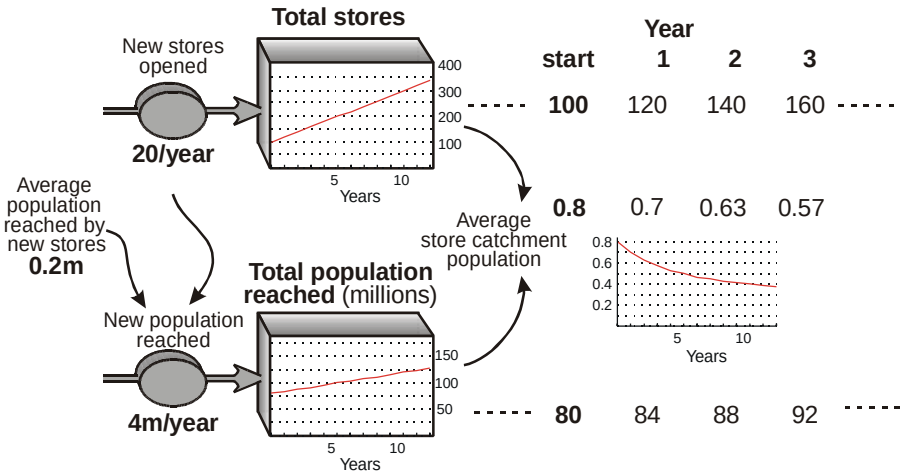
## Understanding Resource Attributes

A useful analogy here is a bath-tub. If the water in the bath represents the resource, then its temperature is an important resource attribute. This attribute can be altered directly – a heater in the bath raises temperature without changing the quantity (training raises staff skills, production engineering increases plant yield etc). The bath may cool down with no change to the quantity of water (skill levels deplete as staff forget, plant yield declines as equipment wears out). In addition, water flowing in brings with it whatever temperature the tap delivers, and water flowing out takes its temperature with it (new staff bring their skill with them, new plant brings its productive capacity – staff leaving take their skills with them, plant closures remove capacity from the system).

Resource attributes possess one useful characteristic, though, that is somewhat different from water temperature – resources can be removed selectively (unskilled staff can be laid off, the lowest-yield plant can be closed). If your bath is too cold, you have three options – add a heater to the bath, add hotter water, or (if you could!) selectively remove colder water.

Figure 3 concerns multiple retailers. Each outlet brings a certain population of potential consumers. For some chains (eg IKEA or Toys-R-Us) this catchment is geographically extensive, whilst for others

Figure 3
**Diluting the quality of a store-chain's outlets**




(McDonald's, Starbucks), it is more local. Growth for such chains ultimately creates a problem: the next new location brings a lower catchment population than the established stores. Assume that a chain's market splits into 100 large towns of average 800,000 people and now has to open up in towns of average 200,000.

Figure 3 shows the impact of this dynamic on the store-chain's site quality, with new stores – and their catchment population – flowing in from the left. The three rows of numbers on the right show how the chain size, total population served, and average store catchment are calculated. In year one, 20 stores are added (top row), but bring access to only four million new consumers (20 x 0.2m, bottom row), so the average store catchment falls from 0.8m to 0.7m (84m ÷ 120 stores, middle row). The time-chart next to 'Average store catchment population' shows how these calculations play out over 12 years. The chain finishes with 340 stores with an average of under 400,000 consumers each.

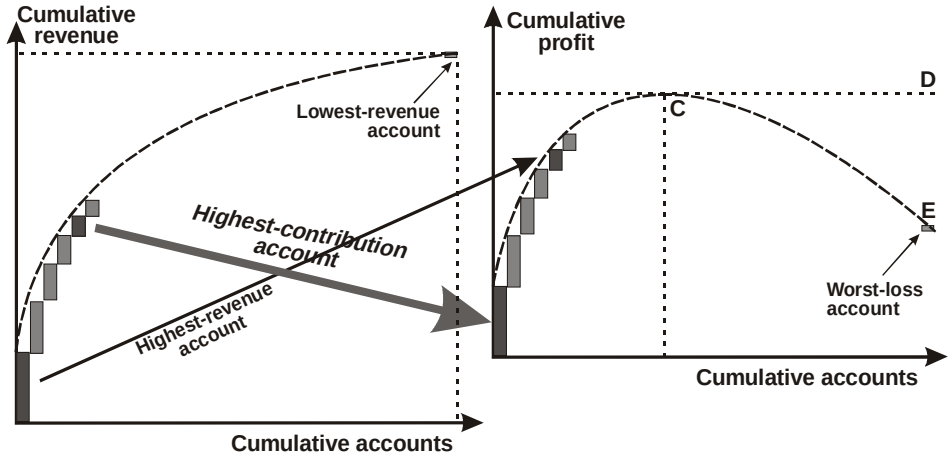
This framework can be used to assess other factors, eg to capture a qualitative assessment of stores' location-appeal. The faster the firm tries to grow, the poorer the quality of its new locations since it cannot wait for the best site to become available. Poor site quality will cause slower exploitation of each town's potential population. Both town-size and location quality will have consequences for stores' revenues and profitability, so these key financial outcomes will be a direct, arithmetic consequence of how these co-dependent intangible resources change over time. A similar process can be used to work out the effect of losing tangible resources. This firm might discover that the lower-catchment stores are not economic, and set about closing the ones in smaller towns. Both the stores themselves and their catchment populations would be represented by out-flows from the two resource-stocks.

Figure 3 raises an important methodological issue. Notice that the number in the intangible attribute stock is for the total population served, rather than the average – that average is calculated from total population divided by total stores. This can create odd situations. For example, if the skill-base of an important staff group were to be assessed, the attribute-resource stock would be measured in total 'person-skill' units (eg 120 people with skill levels of 0.7 of the ideal level, notionally equivalent to 84 fully skilled individuals). This may seem an odd approach to such issues, but is the only practical way to carry out the arithmetic.

## The 'Quality Profile' of Tangible Resources

It is a great simplification to assume, as in Figure 3, that one tranche of resource (sites in large towns) has a constant, high quality level and another (sites in small towns) a constant, lower level. Resources usually exhibit a 'quality profile', ranging from the best to worst. Figure 4 shows how to lay out the quality-profile for both the revenue and profit contribution of a firm's portfolio of customer accounts. At the far left of each chart is the best account on each measure, to which are added the contributions of the 2nd, 3rd, and 4th accounts, and so on. On the far right is the incremental contribution of the worst account. For

Figure 4
**The quality spectrum of a company's customer accounts**




profit contribution, this is negative – there is a 'tail' of loss-making accounts.

Unlike all other charts in the DRSV framework described so far, these are not time-charts, but pictures of the relationship between two variables at an instant in time. Note, too, that the co-flow picture of this situation would portray a stock of 'accounts' and a parallel stock of 'total revenue' or 'total profitability'. This may seem to break a rule in identifying strategic resource-stocks – that they should not include P&L account items, since these are all instantaneous measures of financial flows (even if averaged or totalled over an accounting period). However, total revenue and profitability are being used here to represent the quality attribute of the account-base, so are best thought of as 'revenue-generative capacity' or 'profit-generative capacity'.

Having laid out the status quo as in Figure 4, management can embark on a precisely-targeted plan to improve the quality-profile of its business. It can discuss how far to push back along this curve, and consider further questions, such as:

- What reduction in support costs should parallel this rationalisation?
- Could rivals exploit the firm's disloyalty and capture valuable accounts from the left-hand part of the curve?
- What is the scope for replacing smaller accounts with larger ones (ie more like those towards the left)?

It may be unwise simply to rationalise the business by eliminating all accounts to the right of point 'C':

- The overhead burden may not be fully variable with the number of accounts. Eliminating all accounts between C and E raises the overhead burden on those that remain. The curve becomes 'squashed' to the left, but with the profit peak lower than D.
- 'Bad' accounts may be linked to 'good' accounts. Many banks are careful to treat young, low-value account-holders well, if their parents are valuable customers.
- Accounts move over time. In banking again, young and unprofitable account holders become wealthier and valued customers over time, and move from right to left in figure 4.

Such caution should not be overdone. Some unattractive accounts are interdependent, or have great 'potential', but not all. Objectivity is essential in assessing the true quality profile and potential of accounts, product range, staff skills, and any other resource-attribute.

Applied with care and a sound fact-base, the attribute quality profile and co-flow structure offer three vital contributions:

- They alert management to the often inevitable dilution of business quality as the firm grows – poorer customers must be served, less-skilled staff must be accepted, new items with less incremental appeal have to be added to the product range, and

so on. A healthy focus can be given to how the firm might avoid, reverse or cope with this dilutive effect.

- The co-flow idea offers an integrated approach to the process of improving the firm's quality across its entire range of resources. This is much more important than the simple financial benefits of dropping marginal business. Since the rate of development for each resource depends on the health of others, improving the quality profile has dramatic effects on the system's 'gain' or ability to grow. The most extreme cases concern rejuvenation and turn-round, where management must remove negatively contributing resource to enable the firm to switch from decline to growth (Baden-Fuller and Stopford 1993, Slatter and Lovett 1999).
- Finally, the attribute-profile can be used in aggressive rivalry. If the firm can assess a rival's attribute profile as shown in figure 4, it can selectively attack key accounts (or sales staff, products etc) that underpin that competitor's resource-system. A blatant assault on the best accounts can be unwise, triggering mutually destructive retaliation. However, careful and subtle choice of attacks and timing can inflict serious damage without being noticed. In the most elegant example I have come across, a retail chain defeated a competitor by a series of small, but persistent and timely tactics that undermined the local performance of a key fraction of the rival's more profitable stores. An executive hired from the losing firm by the victor was amazed that its demise had been deliberately orchestrated, and the battle so simply won.

## Indirect Resources

Firm performance is also dependent upon intangible resources that may be termed 'indirect', since they capture a perception or attitude of key players in the system that is not directly amenable to management influence. Examples include *perceived* delivery performance (versus average delivery lead-time), customer-*perceived* quality (versus measured product quality), staff *satisfaction* with their employment conditions (versus the objective rating of those terms compared to rivals). 'The Loyalty Effect' (Reicheld 1996) explains the critical importance of building and sustaining the loyalties of three key groups – customers, employees and investors. The loyalties of other players may be also important. The 'customers' category may include dealers, agents and other channel partners who enable access to end-users. In today's increasingly networked business environment, loyalty must also be built and sustained amongst alliance partners and others with whom the firm is mutually dependent (Hagel 1996).

As noted previously, firm performance is directly explained by just a few, largely tangible factors, so the strong influence of these attitudinal factors *must* be manifest in the firm's ability to accumulate tangible resources (table 3).

Table 3
**Indirect resources and their drivers and consequences**

| Indirect resource | Changes driven by (for example) ... | Other resources flows affected by this indirect resource |
|---|---|---|
| Staff morale | Work pressure<br>Reward systems | Staff attrition |
| Reputation with customers | Product reliability<br>Service support | Customer acquisition |
| Investor support | Financial performance vs. expectation | Investment rate |

In addition to affecting the accumulation of tangible resources, indirect resources have other effects. Poor staff morale increases errors as well as staff attrition, and poor reputation with customers reduces purchases as well as making it hard to acquire new customers.

A quantitative understanding of the performance dynamics arising from the attitudes of important groups requires clear definitions of 'loyalty'. In most cases, the clearest loyalty measure is simply the fractional retention rate. If 80 employees out of every 100 remain with the firm after 12 months, the annual loyalty rate is 80%. A second form of loyalty arises where firms seek share-of-business with customers, suppliers or other partners. For example, shoppers who choose a brand once in every five purchases may be said to have a 20% loyalty to the product. The important issue here is to choose a clear measure that can be tracked through time, rather than treating 'loyalty' as an abstract, emotional concept. Adopting this precision makes it possible to evaluate properly the impact of efforts to increase loyalty.

Figure 5
**Adjustment structure for indirect resources**

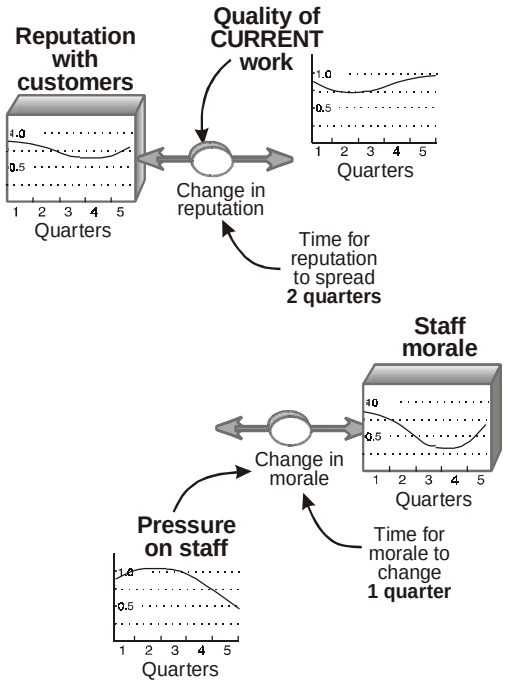



Figure 5 illustrates how DRSV captures change in two indirect resources, staff morale and customer reputation. (There is, strictly, more detail within this structure, but managers can usually estimate directly how indirect resources respond to their principal drivers, without having to go through this detail.)

Figure 5 assumes a particular driver for each indirect resource. 'Pressure on staff' is driving changes in morale, and 'quality of current work' is driving changes in reputation. These are common drivers, but not necessarily appropriate in every case. For any particular situation, it is important to identify those factors that are truly causing the feelings of staff, customers or other parties to change over time. Early attempts to understand such dynamics will be inaccurate, but improved understanding will build up over time.

## Quality and Reputation: Special Cases

Measures of product or service quality feature in many practical cases, so it is important to capture how quality behaves in different circumstances. In certain cases 'quality' is a true resource, accumulating slowly over time. In manufacturing, for example, improvements in yield, failure-fractions, and product performance (versus specification) may all take months or years to respond to sustained efforts by production engineers.

In other cases, though, no accumulation of quality occurs. Instead, quality reflects an *immediate* imbalance between other factors, notably demand and capacity. Error rates in many business processes rise and fall as the pressure on staff reflects the balance between work and their ability to cope – errors immediately increase if work rises, and fall if work slackens off.

Since quality levels often determine the rate of change in other resources (notably loss of customers), it is important to identify in each case whether the quality measure of interest is of the type that accumulates or not. If it is an accumulating resource stock, then it should be treated as such, and the drivers of its accumulation and decay must be carefully managed. Whilst quality is often assumed to affect the rate of customer-acquisition, non-customers can rely only on the *reputation* of the product or service. Current quality does, however, affect customer loss rates, since existing customers experience this directly (Case B).

## Capabilities

Capabilities are a quite distinct category of soft factors that play an important role in enabling the firm's resource-system to develop. DRSV requires a clear definition of 'capabilities' if their important contribution to the firm's resource-system is to be rigorously captured.

Both resources and capabilities are examples of 'strategic assets' – 'anything tangible or intangible the firm can use ...' (Sanchez et al 1996). However, as applied in DRSV, the term 'resources' excludes both competences and capabilities. Definitions by Amit and Schoemaker (1993) describe strategic resources as '... stocks of available factors that are owned or controlled by the firm ... converted into final products or services by using a wide range of other firm assets and bonding mechanisms ...' Work with DRSV, however, suggests that ownership or control are often not necessary, merely reliable access.

Organisational capabilities on the other hand are defined as 'a firm's capacity to deploy resources, usually in combination, using organisational processes ... that are firm-specific and are developed over time ...' The term 'competence' should not be used

**Case B – SoftCo.** A successful producer of bespoke business software had been providing good solutions for its clients with a strong staff of experienced programmers. Its management tried to increase growth, leveraging their reputation for good performance. The plan at first went well – new customers, impressed by the company's reputation, gave the firm new software projects. However, over the following two years, quality problems arose, once-loyal clients left the company, and key staff resigned. The hoped-for growth turned into a sustained period of lost business.

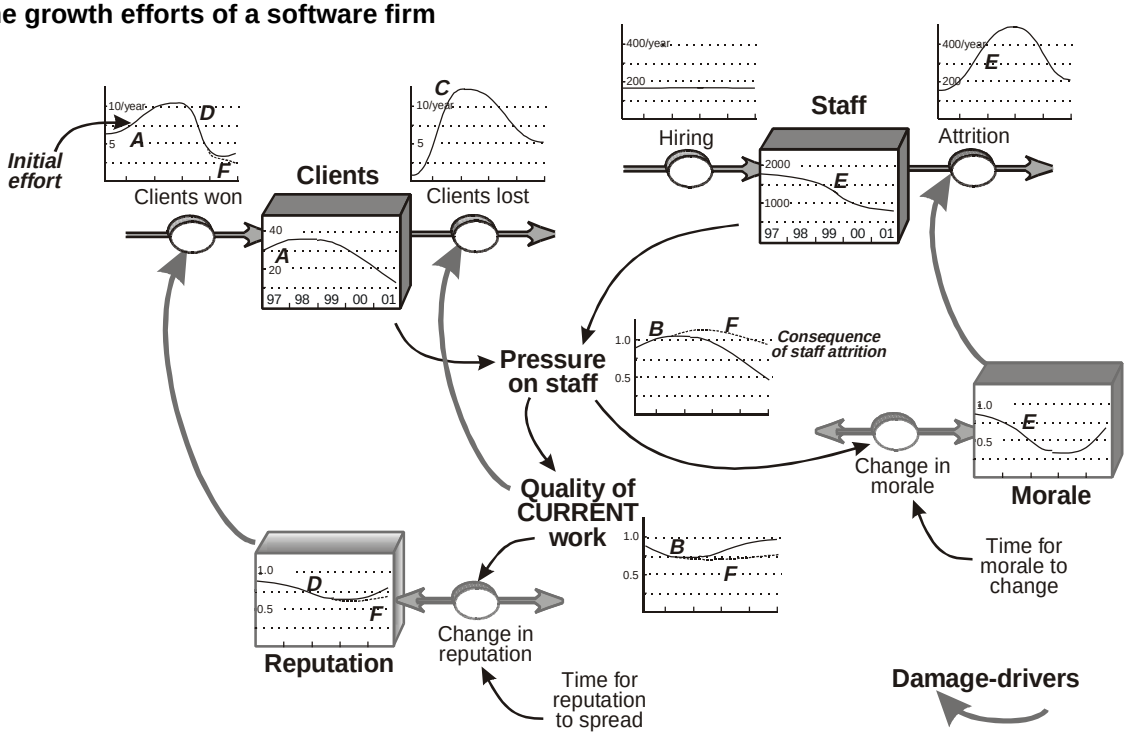
The management team estimated the history of intangible factors, based on its recollection of the feelings and reactions of staff and customers. These estimates were supported by hard evidence of staff attrition, and client gains and losses (figure 6).

The trouble all started with the successful efforts to win new clients ('A' at top left of figure 6). The increased workload was too much for even experienced staff to cope with (B), and quality fell. This did not slow the winning of new clients, who still saw a strong base of apparently satisfied clients. The staff too were excited by growth and tolerated the initial pressure. However, errors and missed deadlines disappointed existing clients, who started to move business to competitors (C). Word spread about the firm's poor performance, and its reputation fell, making it hard to win new customers (D).

Meanwhile, the pressure on staff was damaging morale, leading to staff losses, especially amongst the best software developers (E). Consequently, although the loss of business should have brought the workload back into balance, the reduced staff capacity meant that even this reduced workload could not be sustained and quality continued to suffer (F).

Management's assessment of how it might have avoided their error was remarkably simple: hiring just 100 extra staff in advance of the growth plan would have prevented the overload that led to the subsequent quality problems and damage to reputation and morale. Management felt it would have been feasible to train these new people in just six months, without imposing an excessive coaching burden on existing staff.

Figure 6
**Damage caused to intangible resources by the growth efforts of a software firm**



interchangeably with 'capability' in DRSV, being reserved (consistently with Sanchez et al 1996) for the higher-level expertise of senior management to design and operate an effective strategy.

One of the continuing puzzles in strategic management is how resource-poor firms can emerge to challenge dominant, resource-rich rivals. Whilst differences in strategic architecture may partly explain such dynamics, there remains the question as to how one firm is able to build any key resource more quickly than rivals when it appears to have no more (or even less) of the other resources needed for the task. A plausible explanation is that the firm is simply more capable than rivals at building the resource.

This observation exposes a limitation in common definitions of 'capability'. Since firms cannot operate at all without resources (ie asset-stocks other than capabilities), capability must somehow contribute to resource-accumulation and maintenance. This implies that capabilities have no meaning in isolation from the strategic resources of the firm, so their definition must be extended :

> *'Capability – the relative rate at which the firm is able to build a specific strategic resource, for any given availability of the other resources needed for that task'*

The word 'relative' in this definition recognises that the firm's ability to build a resource can usually be specified only by comparison with some benchmark. Three common benchmarks enable some precision in estimates of capability:

- An absolute maximum rate of resource-building – eg if every sales call won a new customer, how fast would the total customer-base grow?
- The resource-building rate of an exemplary firm, in the same sector or another – eg if our salesforce were as capable as Procter & Gamble's, how fast would we win customers?
- The resource-building rate of outstanding groups within the firm itself – eg if all our sales teams were as effective as the North region team, how quickly would we win customers? In one spectacular turn-round in the insurance industry, local office performance was transformed by a careful comparison between the skill-profiles and organisational processes in successful *versus* unsuccessful branches. These performance differences showed up in the number and values of policies sold, and the rate at which they later lapsed prematurely.

In practical terms, this treatment of capability means that each important resource has a closely associated capability (table 4).

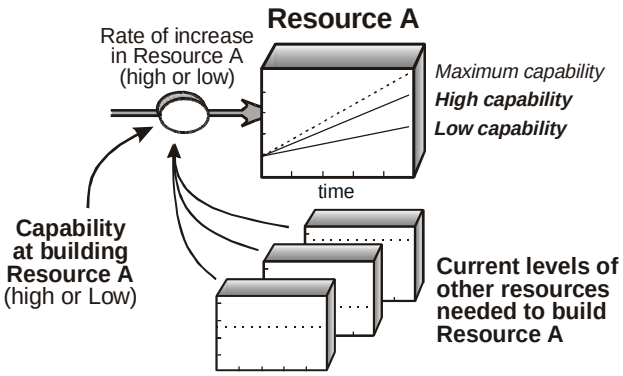
Table 4
**Capabilities associated with illustrative resources.**

| Tangible resource | Associated capability | Indicators of strong capability |
|---|---|---|
| Staff | Hiring | Success rate, retention rate, suitability of new hires |
| | Training | Average skill levels, retraining requirement |
| Customers | Selling | Customer acquisition and retention rates, quality of the customer-base |
| Products | Product development | Speed of product development, users' ranking of product functionality |
| Unit-cost | Production engineering | Rate of unit cost-reduction |
| Manufactured product quality | Production engineering | Reduction rate in reject fraction |

Note that 'capability' is more than the sum of individuals' skills discussed earlier (with the co-flow structure). Capability captures how well those individuals combine with organisational processes and information to perform their required role. Key resource-building or maintenance tasks may be focused on particular functions or staff groups, but are often contributed to, or hindered by, those in other parts of the firm. Customer service staff, whilst dominating efforts to retain customers, may have those efforts undermined if order-processing or delivery departments perform poorly.

Organisations may thus exhibit poor resource-building effectiveness in spite of having skilled people in key functions. Conversely, high-performing organisations may exhibit strong resource-building capabilities, even with relatively unskilled individuals.

Figure 7
**Representing 'capability' in the building of a resource**



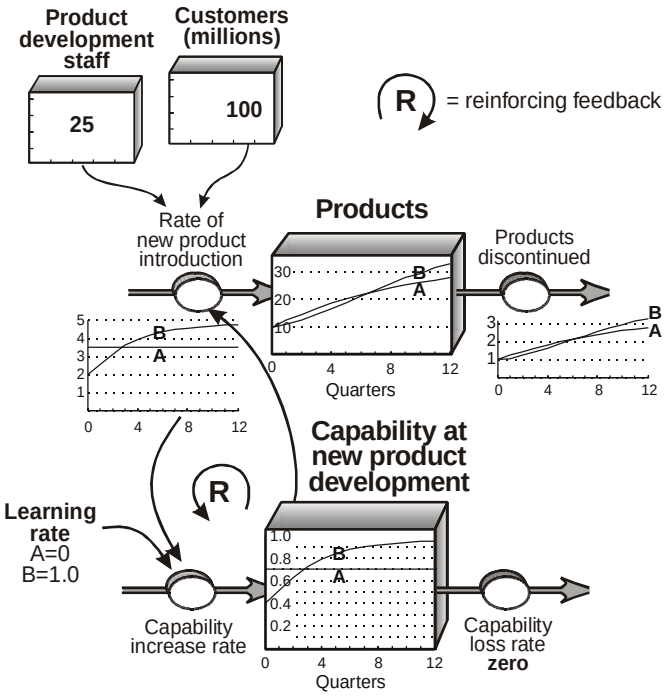

The above definition of capabilities makes it possible to represent formally the idea that the firm's net accumulation rate for each resource is a function, not just of its other resources, but its capability at that task (figure 7). Anything less than total capability is thus a 'brake' on the organisation's ability to achieve the fastest possible building of an important resource.

Learning – or capability-building – can also be formalised, arising from the accumulated experience at managing the resource. Figure 8 illustrates capability being built in new product development (NPD) for a consumer electronics firm, operating in a mature product sector of 100 million customers. In situation A, capability is high, but no learning takes place, whilst in B, learning enables initially low capability to grow, leading to a stronger product portfolio from quarter 7. The 25 NPD staff can introduce new products at a certain maximum rate, given enough customers providing feedback on the products' functionality. The capability thus grows in proportion to the flow of the strategic resource for which the group is responsible – the more quickly products are introduced, the more the group learns how to do so.

There will be limits to this increased learning from faster activity. Note too that learning can arise from both in- and out-flows. If a poor new item led to a fall in the customer-appeal of the product range, then NPD capability may still be enhanced.

Capability-building applies to the resource-system as a whole. Since the resource-system's power depends on the health of all of the firm's resources,

Figure 8
**Representing capability-building in new product development**




organisational knowledge is usefully thought of as a composite measure of all its individual capabilities. This formulation of capability, organisational knowledge and learning is largely consistent with established treatments of these terms (Sanchez 1997).

The mathematical formulation of DRSV was described in Warren 1999a and 1999b.

Intangible resource attributes, indirect resources, and capabilities all serve to adjust the net rate of accumulation $r_i$, of resource $R_i$, at time $T$. The accumulation of capabilities is closely analogous to that of resources. Capability $i$ builds at a rate that reflects the current rate of change in its corresponding resource (Eq. 1),

$$c_i(T) = \frac{dC_i(T)}{dT} = f\left[r_i(T)\right]$$

and the current level of capability $i$ is the integral of all changes to capability $i$ since time $0$, plus its initial level (Eq. 2).

$$C_i(T) = \int_0^T c_i(t)dt + C_i(0)$$

## Combined Impact of Intangible Factors and Capabilities

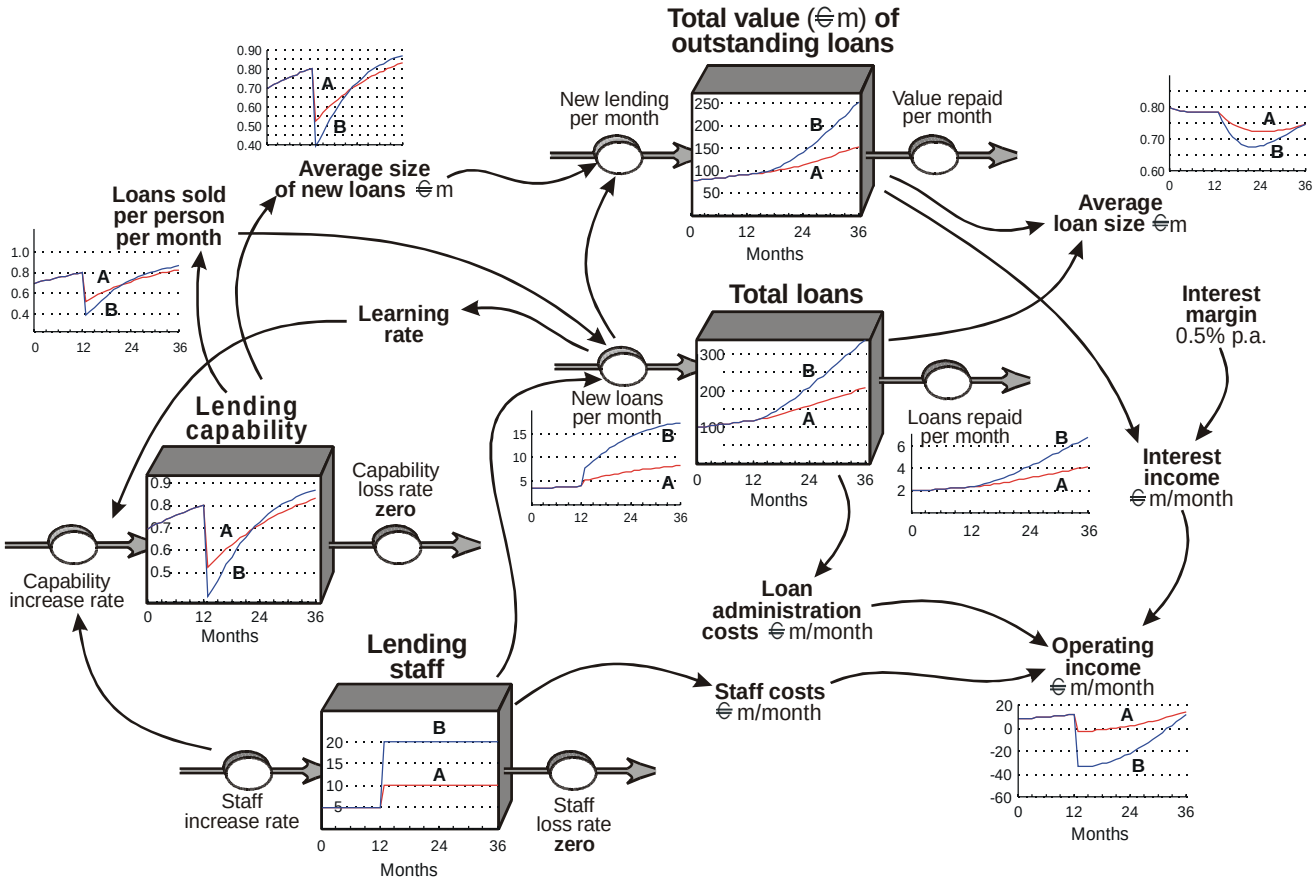
Figure 9 shows how intangible resource attributes, capabilities and learning combine to determine the performance of a bank's corporate loan portfolio. At top right is the total number and value of the bank's outstanding loans, from which the average loan size is calculated – the bank starts with 100 loans outstanding, valued in total at €80m, so the average loan is for €0.8m. At bottom left is the number of lending staff (initially five) and above this is their capability. The group has been together long enough for its capability to be 70% of the best in its sector, and still rising. This capability drives not only the rate at which each person can sell loans, but also the size of those new loans (top left). The area at bottom right shows the interest income the bank earns from the outstanding loans, the cost of the lending staff themselves, and the administration costs. Operating income is the difference between the interest income and these costs. As is common in DRSV, the financial performance 'hangs off the side' of the resource-system structure itself.

This system is able to grow, with more staff generating more loans, and more income, so that more staff can be afforded. Moreover, new lending enhances the bank's capability, resulting in better loans being sold at a faster rate. There is a limit to how capable the firm can become, and thus a limit to how quickly a given number of employees can drive growth.

After 12 months, the original team of five experienced staff are doing nearly as well as can be expected, so more staff are taken on to drive faster growth. Lines A and B illustrate two possible trends thereafter:

- *Line A.* The team is doubled, from five to ten, but the new arrivals initially dilute the group's effectiveness, capability drops, new lending per person slows and the size of new loans falls.

Figure 9
**The impact of intangible resource attributes and capabilities in bank lending**



Although growth accelerates, the rise is substantially less than the doubling of staff might promise, and the cost of the additional people immediately depresses operating income (bottom right). As the increased lending rate helps the group's capability recover (middle left), this lending rate is itself boosted, and the total number and value of loans outstanding grows strongly. However, this larger number of loans raises the total administration cost, so that operating income remains depressed.

- ***Line B.*** In an attempt to quickly overcome the diseconomies from a larger portfolio of smaller loans, the firm tries instead to quadruple in size by taking on 15 more staff. This strategy damages the lending team's capability severely, so both the rates of new loans per person and the average size of loans drops more sharply than in case A. Assuming that this set-back does not also damage the learning rate, capability bounces back strongly, so that the number and quality of new loan advances improve quickly. By month 24, the business is lending so fast that its capability accelerates past both that of the original group and the lower-growth option. Nevertheless, the much larger proportion of smaller loans still creates a high cost ratio, so that operating income stays depressed more deeply, and for longer, than in the first case. By month 36, though, improvements in lending capability and the number and size of the loan portfolio are on the point of pushing operating income sharply upwards.

This illustration, simplified from a real case, demonstrates how valuable, quantitative and dynamic (ie time-based) insights can emerge quickly from a managerial discussion of an important issue. The feedback and accumulation processes it captures were not just a theoretical construct, but were very real and serious for the firm. No other approach had previously offered a reliable insight into the apparently intractable problems of deciding how much to increase the size of the business, and estimating the performance and timing that might result.

It was also possible to extend the analysis to cover other important effects:

- As well as taking on smaller loans in its attempt to grow, the bank would also increase its risk exposure. This is readily captured with a second co-flow attribute-resource for 'Risk of the portfolio' – the fractional probability of default in any month. New loans, won by less experienced staff, bring a higher probability of default and raise the risk of the whole portfolio.
- Balancing this increased risk, the smaller loans would also be less heavily contested by rivals (Warren 1999b), thus raising the win-rate relative to line A or B. Moreover, this lower competitive intensity would also offer a higher interest margin, further boosting operating income.
- The initial loans would not all be exactly ₤0.8m, nor would the new loans all be for exactly ₤0.2m. Any such resource stock can be better seen as a spectrum of quality, ranging from best to worst. Figure 4 shows how this can be portrayed, and the system dynamics method can be extended to reflect arithmetically such attribute-quality curves.

## Conclusions

This article has focused on the influence of soft factors on business performance, and offered the means to tackle these subtle issues with confidence. By following the approaches outlined here, intangible resources, capabilities, and their behaviour over time can all be evaluated, together with their impact on tangible resources and performance. With its two companion pieces (Warren 1999a and 1999b), the article has explored four unavoidable features of business strategy, and shown how the DRSV offers a set of rigorous, fact-based frameworks to address these challenges:

- Business performance depends on strategic resources, whose levels accumulate and deplete over time. These processes are ubiquitous, not just in business but in all fields of human activity, and give rise to complex behaviours over time.
- The growth and decline of every strategic resource at any moment depends on the current levels of other resources (both tangible and intangible) and capabilities currently in place. This interdependence creates unavoidable feedback that further exacerbates dynamic complexity.
- Unless these dynamics of accumulation, depletion and feedback are captured, there is no possibility of explaining historic performance, and no means of anticipating the time-path of future prospects. (The mathematics of integration is the only means of accomplishing this task.)

- Soft factors – intangible resources and capabilities – are powerful drivers of growth and decline in the tangible resources that determine performance at any moment. Thus there is no possibility of understanding performance over time unless these too are evaluated and dealt with rigorously.

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