Supplementary files are available for this work. For more information about accessing these files, follow the link from the Table of Contents to "Reading the Supplementary Files".

Building a Knowledge-Based Strategy
A System Dynamics Model for Allocating Value Adding Capacity.

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ABSTRACT

This paper reports on a project which integrates the pioneering work on 'intangible assets' by Karl-Erik Sveiby with system dynamics based human capital modelling undertaken for the Australian Federal Public Service by the UNSW Centre for Business Dynamics. The project aims to create a dynamic 'management flight simulator' which helps managers understand better the dynamic interrelationships in organisation design and, in particular, the interrelationships between an organisation's profitability (both short-term and long-term) and investment in people competence, internal structure and relationship building measures with customers. The expected use of such a simulator is assisting managing partners of professional services organisations to improve the allocation of both their own and their staffs' 'value adding capacity'.

***KEYWORDS**: Knowledge management; intangible assets monitor; system dynamics modeling.*

Introduction

Despite the fact that simple human resources (HR) capacity models have been stock-in-trade for system dynamics software manuals and training courses for over a decade (High Performance Systems Inc., 1990a, 1990b; Wolstenholme, 1990) there are surprisingly few published papers that focus specifically on the personnel or workforce dimensions of the system dynamics of organisational value creation. Where organizational models are reported they typically focus on the production or distribution chain rather than on the people competence and people relationships of the organisation.

At the same time, whilst key corporate management paradigms such as Balanced Scorecard, Intangible Assets Monitor and Intellectual Capital Accounting are implicitly concerned with organisational feedback relationships, as implemented they evince little awareness of the existence of system dynamics modelling. Whilst interactions between key performance indicators are often acknowledged, perhaps by way of high level causal loop diagrams, the suites of decision support tools provided to implement such paradigms lack dynamic modelling capability.

Gulf between general management & systems dynamics

This lack of awareness by management practitioners of the field of system dynamics appears to be ubiquitous. An extensive review was made of management journals and WWW publications in relation to system dynamics perspectives on human resource management, workforce planning, workforce value creation and organisation design. Outside of the system dynamics community itself, the material was minimal. The review showed a widespread appreciation of the importance, and complexity, of 'system interrelationships', but little or no appreciation of dynamic modelling tools available to provide decision support in this regard.

Linard (1999) reported a similar lack of awareness of system dynamics concepts in public sector literature on organisational performance monitoring and evaluation and in the private sector balanced scorecard literature. Kaplan and Norton, for example, in their 10 years prior to 2001 of writing journal articles and case studies on the BSC, a concept that depends fundamentally on the causal feedback link between key performance indicators and organisation strategy, refer only once to system dynamics modelling ... *in a footnote*. (Kaplan and Norton, 1997).

Wolstenholme (1997) discusses factors associated with the gulf separating systems thinkers and current management practice where the prevailing methods *"are essentially linear, open loop approaches and heavily data orientated, but generally well used … the main reasons for this are simplicity and a strong relationship to what the organisation does and can relate to."* Wolstenholme emphasises that a system dynamics intervention is more likely to succeed if it can use existing 'accepted' management approaches as hooks by which to relate systems thinking and system dynamics to existing activities.

Morecroft (1997, 2000) suggests just such a 'hook', arguing that system dynamics is a natural way to unite two powerful ideas at the heart of mainstream management strategy paradigms, resource accumulation (resources being classified into tangible-intangible and managed-unmanaged) and dominant logic. A variety of papers from Morecroft's system dynamics group at the London Business School have focussed on the structural dynamics of organisations and the dynamics of resource structure.

Similarly, Wolstenholme (1998) and Linard (1999, 2000) suggest that the 'causal-chain' basis of the BSC provides a 'hook' to incorporate system dynamics concepts into scorecard implementation.

However, there are dangers in exploiting a management paradigm simply because it provides an apparently plausible 'hook' for system dynamics, if that paradigm is fundamentally anti-systemic. Who is catching whom? Thus, it has been argued that the BSC concept itself has some fundamental systemic flaws that cannot be remedied by 'retro-fitting' a system dynamics flight simulator. Sveiby (1999) contends that, whilst BSC and the Intangible Assets Monitor (IAM) have superficial similarities, BSC takes 'industrial era' theory of organisations for granted and simply adds non-financial measures to the traditional financial indicators in a non-systemic fashion.

IAM, on the other hand, takes an information era perspective. It is a stock/flow theory based on the notion of people as an organisation's only profit generators. Human actions are converted into both tangible and intangible knowledge "structures" which are directed outwards (external structures) or inwards (internal structures).

Conceptually, IAM is most amenable to a system dynamics framework. It has a strong systems underpinning and its 'stock-flow' understanding is compatible with system dynamics modelling concepts. These are strong 'hooks' for seeking a dialogue between a widely accepted management framework and system dynamics modelling. The key challenge in implementing IAM in a rigorous system dynamics framework relates to the IAM's significant focus on 'soft variables'

SDM & the People Dimension of Value Creation

'Soft variables' in system dynamics modelling

Many firms proudly boast "*people are our most important asset*." In public service organisations and professional services firms, people typically are the only value-generating asset. Depending on the problem situation being addressed, to simulate how management decisions may affect value creation in such organisations inevitably means addressing qualitative (or 'soft') variables, such as morale, productivity or work quality.

The use of qualitative variables is contentious in system dynamics modelling, as in other areas of the social sciences. Over the past 18 months, queries to the System Dynamics List-Server (<system-dynamics@world.std.com>) on questions relating to "attractiveness multipliers", "human behaviour in system dynamics models", "qualitative variables and the mapping of ideas" and "soft variables" generated robust exchanges of views amongst leading academics and professionals in this discipline.

Professor Geoff Coyle has provided a number of thoughtful and challenging contributions. In an early intervention he asked for a "*demonstration of the added value of quantification in cases where, as I have tried to explain, there may be serious uncertainties in data and causal mechanisms.*"[1]

To this George Richardson of the University of Albany responded: "*But if such "soft" variables are crucial to the policy dynamics of the system, then the only absolutely sure way we can be wrong is to follow Geoff's advice and not try to quantify them!*"[2]

Norman Marshall, of McKinsey & Company, took a very pragmatic view, referring to HR modelling done by that company: "*We were aware that on the one hand soft variables were important drivers of the system; on the other we knew that attempting to put them in would get us into a syndication exercise of religious intensity and geological timescales. So instead we built a much simpler model ...*"[3]

Jay Forrester, in a later discussion of these issues noted that if a factor is significant in a decision context "*... omission of soft variables is not possible. If one "omits" a variable, it has a very specific assumed value in the model. It is being set to zero or to some other value that inactivates the structure of which it is a part. To leave out the variable or concept is to say explicitly that it has no importance. Often zero significance is the most unlikely of the possible subjective estimates.*"[4]

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1 Coyle, G. System Dynamics List Server, <system-dynamics@world.std.com>, 16/8/00

2 Richardson, G. System Dynamics List Server, <system-dynamics@world.std.com>, 17/8/00

3 Marshall, N. System Dynamics List Server, <system-dynamics@world.std.com>, 21/8/00

4 Forrester, J. System Dynamics List Server, <system-dynamics@world.std.com>, 16/10/01

Forrester's comment may be applied to virtually all project management software packages. These products implicitly assume, for example, that increasing hours of overtime per week does not affect productivity, quality or the amount of re-workin either the short or long term. The effect of overtime on productivity or quality is implicitly assumed to be '1'. Empirical research across the broad field of project management demonstrates this to be false.

In HR management, judgements will inevitably be made which, implicitly or explicitly take into account diverse qualitative effects of options or strategies on staff behaviour. Performance management systems, bonus systems and performance based pay implicitly assume feedback impacts on qualitative factors such as firm loyalty, morale, productivity and so forth. To the extent that qualitative variables are perceived to be relevant to the problem under review, and would otherwise implicitly be factored into managerial decision making, it is far better to confront the choice values openly and explicitly rather than allow them to be hidden. In this way, decision makers and stakeholders are better able to identify the implications of the qualitative assumptions and to challenge their usage or valuation if this seems desirable.

Defining and valuing 'soft' human resources variables

In the system dynamics list server discussions noted above, Jim Thompson, from Global Prospectus, made a significant point*: "A soft variable is objectionable when its meaning is ambiguous. ... When variables are properly defined and explained, resistance to their use diminishes."*[5]

Our review of HR related papers to past four conferences of the International System Dynamics Society identified many papers where 'soft variables' were loosely defined and /or simply relied on plausible values of relatively ill-defined variables. 'Plausible', in this context, means based on the professional judgement of the modellers and consensus of the client team, but with no empirical basis or very limited data. Papers by two of the current authors, Linard and Dvorsky, were no exception.

An important dimension of our current project has been to undertake a detailed review of the HR research literature to identify empirical research into 'soft' relationships typically applied in system dynamics models of HR systems. In addition to adding rigour to our current modelling project and thereby assist its 'marketing' to senior managers, our literature review has the longer term aim to:

- provide a data source for system dynamicists working in HR modelling, against which 'plausible values' of qualitative variables may be judged; and
- propose rigorous definitions of HR variables typically applied in system dynamics models of HR systems; and
- promote standardisation of labels and definitions of terms in HR system dynamics models.

Over 1000 articles from 50+ journals have been reviewed thusfar, about 150 in detail. These covered the gamut of management related disciplines, including accounting, economics, labor relations, psychology and systems theory as well as specific HRM literature.

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[5] Thompson, J, System Dynamics List Server, <system-dynamics@world.std.com>, 17/10/01

Knowledge Capital, Knowledge-Based Strategy & Value Creation

Sveiby (2001) defines ten knowledge-based strategies to maximize an organisation's value creation. These seek to improve knowledge transfers between three families of intangible assets so that the capacity-to-act of people both inside and outside the organisation is enhanced. The three families of intangible assets are *external structure*; *internal structure; and individual competence*. The combination of internal structure and individual competence can collectively be called the firm's *'knowledge capital'*.

External structure

The *external structure* can be seen as a family[6] of intangible relationships with customers and suppliers, which form the basis for the reputation (image) of the firm. Some of these relationships can be converted into legal property such as trademarks and brand names. The value of such intangible resources is primarily influenced by how well the company solves its customers' problems, which involves an element of uncertainty. Reputations and relationships can be good or bad, and can change over time. They are partly independent of individuals.

Internal structure

When people direct their actions internally, they create an *internal structure*. The family of Internal Structure can be seen to hold patents, concepts, models, templates, computer systems and other more or less explicit administrative tools and processes. These are created by the employees and are generally 'owned' by the organisation. However, the organisation can legally own only a small part of the Internal Structure. The informal power play, the internal networks, the 'culture' or the 'spirit' can also be regarded as belonging to the internal structure. It is useful to include also the competence of individuals, such as that of support staff, accounting, IT, HR and management, in the internal structure family, since it is not possible to separate the internal structure from it's creators.

Internal structure is thus partly dependent on and partly independent of individuals. Even if the most valuable individuals leave a company, such as a consultancy firm, that depends heavily on them, at least part of both the internal and the external structures (for example, the brand name) will typically remain intact and can serve as a platform for a new start, (Sveiby & Lloyd, 1987).

Individual competence

The *individual competence* family consists of the competence of the professional and technical staff on the one hand and support and managerial staff including R&D staff, factory, sales and marketing employees – in short all those who have direct contact with customers or whose work directly influences the customers' view of the organisation.

The distinction between professional/technical staff and support/managerial staff is made because their different roles determine both how they relate to each other and

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[6] The notion of Family was suggested by Wittgenstein (1995). A family is a grouping based on common properties. Its contrast is the Category, which is a grouping based on division between mutually exclusive properties.

how they relate to the external world. Such a classification is useful for strategy formulation and action planning.

Knowledge strategies for value creation

Value creation can best be understood through the systemic interrelationships among these families of intangible assets, and the associated ten knowledge strategies, illustrated in Figure 1.

1. Knowledge transfers between individuals
2. Knowledge transfers from individuals to external structure
3. Knowledge transfers from external structure to individuals
4. Knowledge transfers from individual competence into internal structure
5. Knowledge transfers from internal structure to individual competence
6. Knowledge transfers within the external structure
7. Knowledge transfers from external to internal structure
8. Knowledge transfers from internal to external structure
9. Knowledge transfers within internal structure
10. Maximise Value Creation – See the Whole

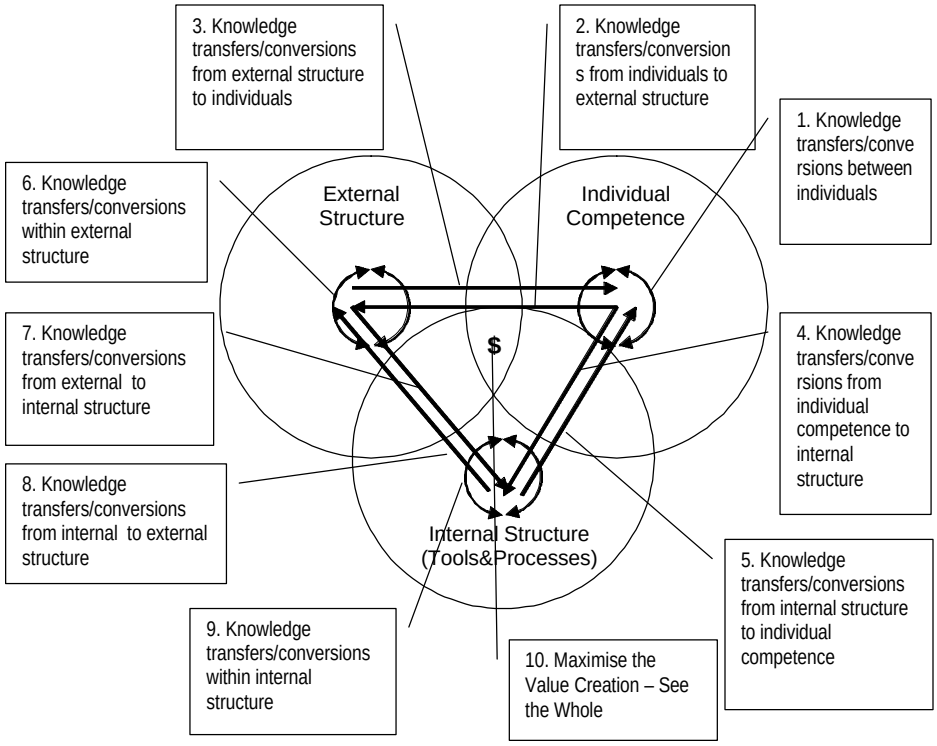


Figure 1. The Ten Knowledge Strategy Issues

Overview of Key Facets of the Dynamic Intangible Assets Monitor

The interrelationships among the ten knowledge strategies, provides the underpinning of the system dynamics 'management flight simulator' that is presented over the subsequent pages. The system dynamics model operationalises the intangible asset monitor within the context of a professional services organisation. Its design draws on Sveiby's extensive studies across diverse corporations and on studies by the UNSW team of professional services organisations and public sector agencies. It has been validated against a division of a multi-national firm.[7]

The various quantitative or qualitative relationships used in the model, and described in the following pages, draw on the HR literature reviw (Annex A), the authors' research and experience and empirical data and management beliefs of our client.

Knowledge Capital

The firm's two major internal resources are two stocks: Individual Competence and Tools & Processes.

1. The stock of Individual Competence

Individual_Competence of a professional services organisation consists entirely of its consultants and their capacity to act. (The capacity to act of support staff is placed in the Internal Structure).

Consultants in large professional services firms face a career path from out-of-university junior to Senior Partner. Most are weeded out on the way. Fewer than 1 in 20 of the juniors make Senior Partner.

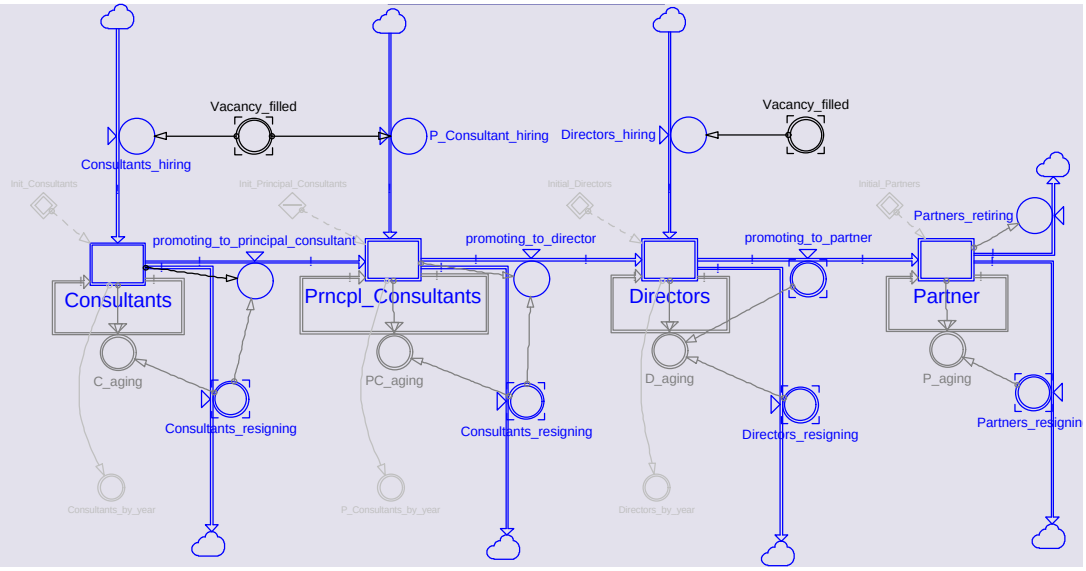


Figure 2. Employee promotion chain in a professional services organisation

[7] Data in the model supplied with the conference proceedings has been modified to protect the confidentiality and intellectual property of the organisations against which the model has been validated.

In the current version of the model, consultant competence is considered to be a function of consultant level (consultant, senior consultant, director and partner), time at that level and the firm's investment in competency enhancing activities.

Competence levels are influenced by:

Experience: this is simply measured in months in an employee category. Planned enhancements will modified this to include range of projects undertaken.

Quality of experience: the 'experience months' can be adjusted by a factor depending on proportion 'good learning projects'. This will be subsumed in the project range, noted above.

Formal training:

Meeting days: the time spent, under the direction of a senior partner or director, in formal project 'knowledge sharing'.

Recruit 'quality' factor: The raw competency of a novice consultant is adjusted to reflect the impact of time spent by Partners in recruitment.

Pace of change: This variable drives the redundancy of competency level and depends on the pace of development within the evaluated industry.

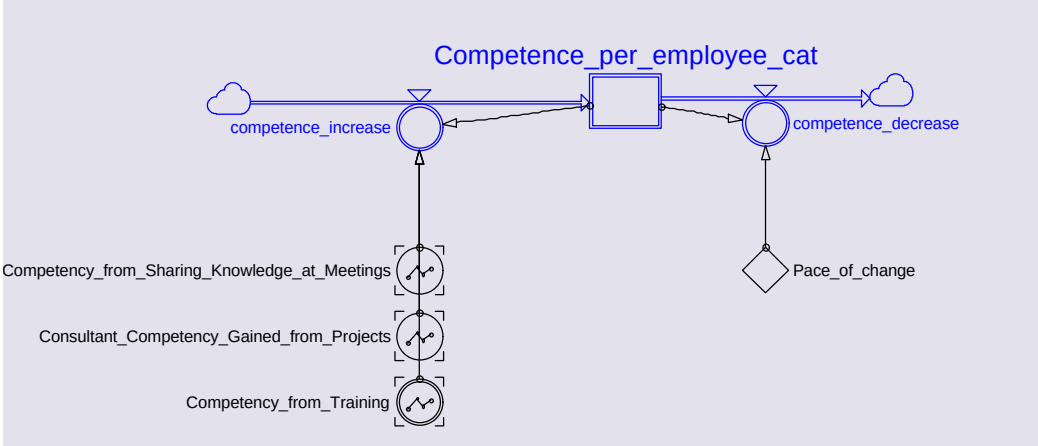


Figure 3. Competence

We can then calculate the stock[8]:

Total Competence for firm Group = Number of consultants on each level * Average Individual Competence for each level.

The ratio *Average Individual Competence* can be calculated as an indicator of competence in a project team, in firm Group as a whole, in subunits, etc.

From these definitions, staff turnover has a significant impact on the stock of individual competence, both directly and also indirectly.

[8] The algebra for combining qualitative variables is contentious. The authors regard the paper by Nathman (1994) as a key guide, supplementing the HR literature discussed above.

2. The Stock of Tools & Processes (T&P)

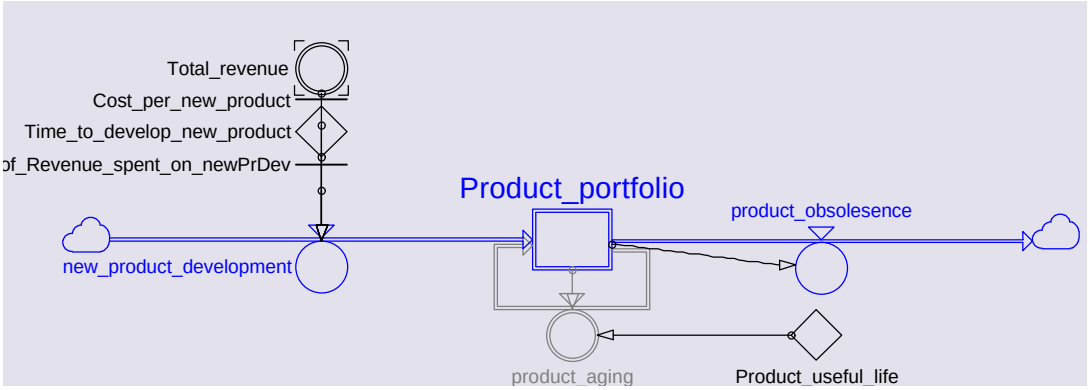


Figure 4. Product portfolio

A significant dimension of the firm's intangible assets is its investment in its 'product portfolio'. This both value adds to the capacity of the consultants (in terms of work efficiency and capability) and provides a product differentiator in the marketplace. At this stage, the model simply addresses the expenditure on new product development (typically capital investment in 'knowledge infrastructure' such as groupware communications products), average time spent on product development or maintenance and average obsolescence time.

When fully implemented, the stock of T&P will encompass:

Investment in knowledge databases: For internally generated knowledge databases this investment is defined as time spent entering the information moderated by the competence level of the staff entering the data. This allocates higher value to knowledge data created by more senior staff.

The value of external (acquired) knowledge databases is what firm pays for them converted into time at average cost. This allocates external databases a fairly low value compared to internally generated databases, which would appear to mirror reality.

Investment in generic tools acquired and made available to the consultants (such as this SD-model). Money paid in license fees is converted to competence value at average competence as the value.

Investment in organisation-unique products, tools and processes (both client related and admin). The R&D hours spent in development add to the stock at a rate of the respective staff competence value * time spent.

Support staff: The competence value of non-chargeable support staff is calculated in the same way as that of consultants, using their relative level of remuneration as an indicator of value.

Bought-in services, for instance admin support from the firm's central administration will be added by converting the internal allocation of costs to competence value. This will make the model more generic, by permitting comparisons between full in-house administration vs. subcontracted.

Depreciation: Useful life of knowledge data reduces the stocks.

Support staff turnover reduces support staff value.

Consultant turnover reduces the value of investment in generic T&P.

The total value of the T&P is a stock, which we add to the Total Individual Competence to get:

Knowledge Capital = Total Individual Competence + T&P

When fully implemented, the stock of Knowledge Capital will be able to be converted to a constant dollar equivalent.

Value adding capacity

Arguably the most valuable ability of a consultant is the capacity to add value to the firm, to the clients and to the colleagues. Typically, business simulations assume that allocations of resources are made with dollars as the bottleneck. This is not true for professional services. The bottleneck is 'Value Adding Capacity' (referred to henceforth in this paper simply as ‘capacity’).

The firm invests in capacity (recruitment + training + on-the-job experience, R&D in capacity saving/enhancing tools and processes); it buys 3rd party capacity (capacity-saving tools, sub-contracting in); and it spends capacity (in assignments, on client acquisition, on presentations, on writing proposals, in administration, on recruitment panels, on R&D, on management of juniors, etc) and it sells capacity to clients.

The Managing Partner's (MP) have the highest capacity per person are the most valuable resources of the professional services organisation. Few consultants have the attributes necessary to rise to this level. Their primary strategic concern is to get the optimum ‘capacity allocation’, between the competing requirements. The MP can spend capacity on:

- investing for the future (training, knowledge development, recruiting etc)
- doing assignments or project work;
- client acquisition and nurturing existing major clients.

In the model, the definition of *Capacity* = Time available per staff level * (Knowledge Capital / Total # of consultants).

‘Capacity’ thus has a (quality * time) by time dimension. It is based on the definition of ‘Knowledge’ as a ‘Capacity-to-Act’ (Sveiby 1997). Investments in Tools & Processes influence the Capacity by adding weight to the average individual competence.

For a particular firm it is possible to convert Capacity into dollars. The conversion factor will need to be customised to the particular wage structures and operating basis. It is also possible to convert IT costs and the costs of external databases into 'capacity' because they a capacity saving/enhancing tools.

External structure

The ‘external structure’ models the intangible relationships with customers and suppliers. The client population is divide among the overall Pool_of_Potential_Clients,

which constitutes the marketplace for the firm, Potential_Clients, who have engaged the services of the firm as a 'one-off' trial; and Established_Clients, who are satisfied with the quality of service of the firm.

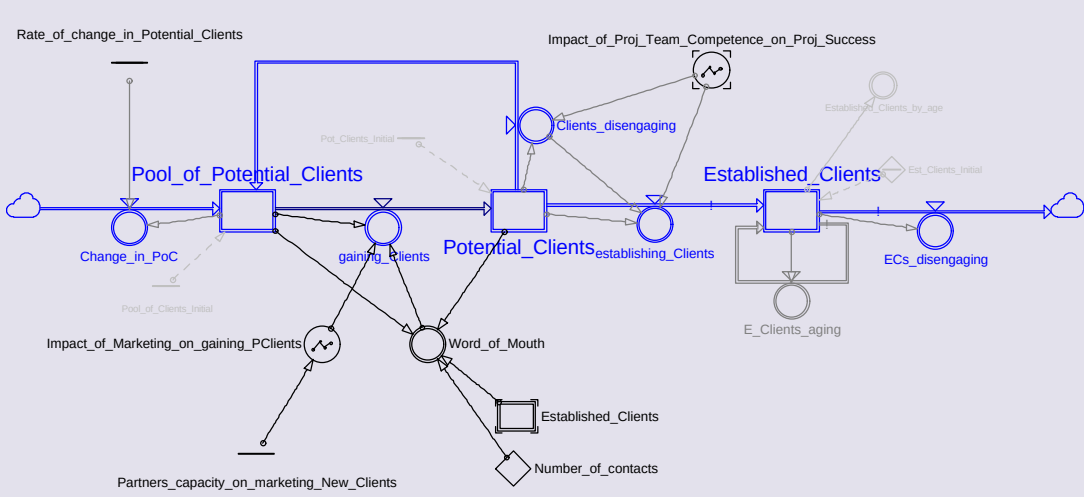


Figure 5. Clients process chain

Potential Clients are new clients, previously unknown to the firm, who are important for the firm's growth. Their transfer from the generalised Pool_of_Potential_Clients is influenced by:

- Capacity allocated to marketing efforts (Capacity as defined above):
- Partners and directors time allocated to potential clients
- First project success rate
- Referring clients – word of mouth based on overall project success rate

In relation to marketing impact, MW and BB clients as considered largely distinct, so two marketing budget variables are required.

The higher the capacity allocated to these efforts the higher the conversion rate from Pool_of_Potential_Clients to Potential_Clients. There is also a time lag between capacity allocated to marketing and the conversion to Potential_Client stock. Managers have a fairly well established view what the time lag is.

Clients generate a stock of potential projects, Leads (tenders) each month, which may be converted into Projects (Project_Backlog) and eventually to Work_in_Progress. The generation of leads is influenced by:

- Number of clients
- Type of client (MW or BB)
- Longevity of the relationship with a client
- Organisation's project success rate
- Maintenance of client relationship
- Capacity spent on responding to tenders
- Capacity spent on preparing and sending proposals to existing clients

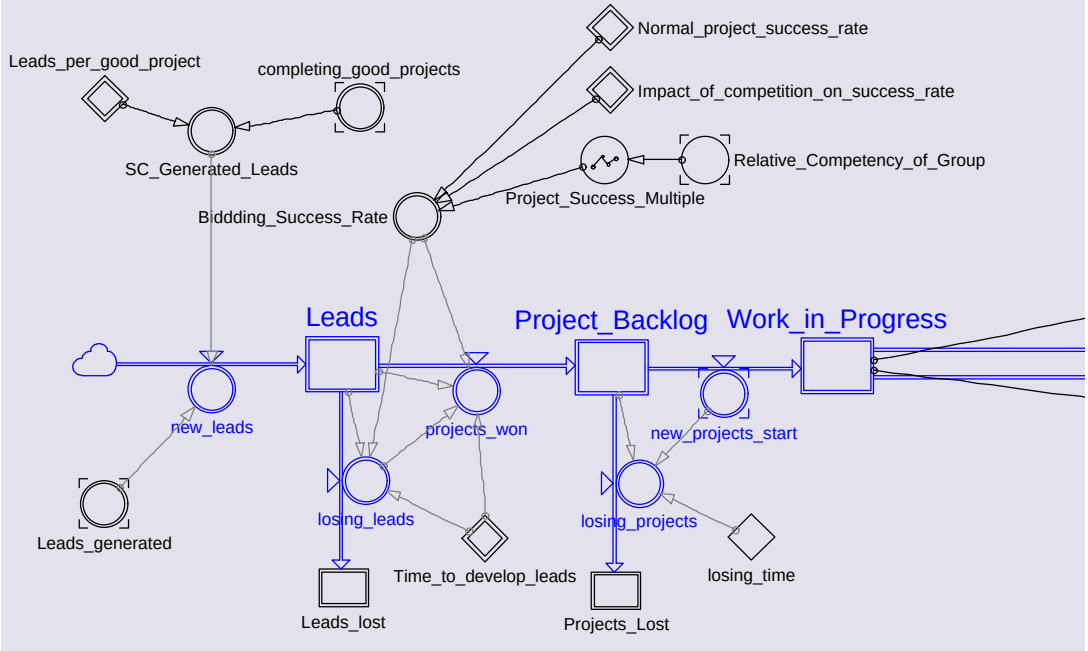


Figure 6. Leads and Project Backlog

"Most Wanted" Clients

The Client stocks are arrays consisting of 2 dimensions:

- Most Wanted clients (MW clients)
- other clients (referred to as Bread & Butter or BB clients)

MW clients are the strategic assets of the firm. They can be in a market segment the firm wants to enter, large 'Fortune500' firms or in strategic areas as discussed below. Typically small in number, they provide a significant portion of the firms income. Simultaneous loss of several MW clients may trigger a collapse of the firm, as has been seen in the aftermath of the Enron collapse. BB clients typically provide a large number of low value projects.

MW clients come with 'good' projects that influence:

- *Financial result* - they improve average fee per capacity, because they come from clients with less price sensitivity;
- *Learning* - challenging engagement that positively impacts on increase of the individual competence of the employees
- *New Products / services* - they increase the capacity and quality of products, tools and processes which can be leveraged to other clients;
- *Referring Clients and High Image Clients* - they improve the external structure by enhancing the conversion rate from potential client to client by actively endorsing the firm or by their own high image.

The value of this client classification is that it is highly action oriented. The firm can use it to be pro-active in its client selection. By allocating more or fewer resources to canvass the "learning type" of clients the firm will, for instance, influence the individual competence of its consultants.

Modelling the knowledge strategies

1. Knowledge transfers/conversions between individual professionals

Knowledge transfers/conversions between individuals are concerned with how to best enable the communication between employees within in the organisation and determine what types environments are most conducive to creativity. The strategic questions are: *How can we improve the transfer of competence between people in our organisation?* And: *How can we improve the collaborative climate?* The most important issues concern *trust* in the organisation.

The collaborative climate determines the willingness to share and co-create. The collaborative climate index (CCI) can be compared to the 'bandwidth' of all communication. The CCI is determined by a survey validated against a group of other firms. [Refer www.sveibytoolkit.com]

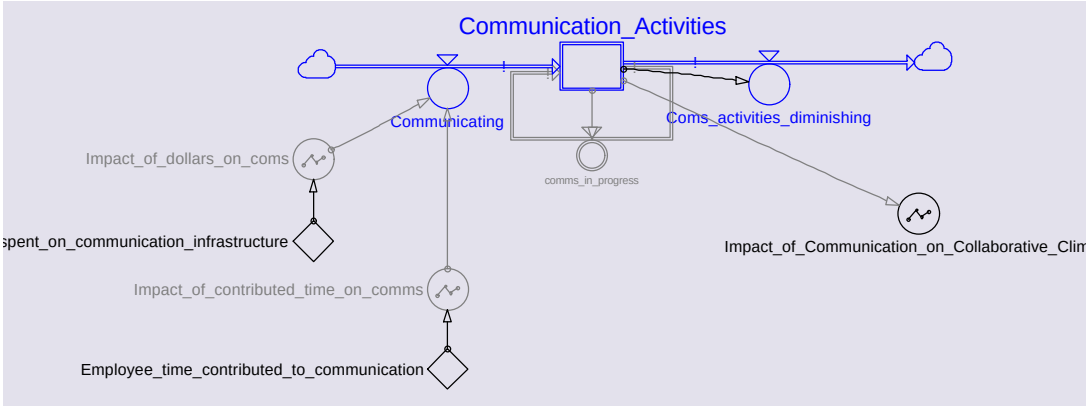


Figure 7. Corporate communication

Activities to improve the stock include:

- Spend capacity on Staff meetings
- Spend capacity on trust-building staff education
- Spend senior partner capacity on 'cultural indoctrination'.
- Spend capacity on manager education
- Spend capacity on recruitment

2. Knowledge transfers/conversions from individuals to external structure

Knowledge transfers/conversions from individuals to the external structure are concerned with how the organisation's employees transfer their knowledge to the outer world. The strategic question is: *How can the organisation's employees improve the*

competence of customers, suppliers and other stakeholders? Answers to such questions lead towards activities focused on empowering the employees to help the customers learn about the products, getting rid of red tape, doing job rotation with customers, holding product seminars, providing customer education, etc.

Activities to improve the stock (Figure 5) include:

- Spend capacity on client & public presentations and education
- Spend capacity on book writing/publishing
- Spend capacity on more elaborate reporting processes

3. Knowledge transfers/conversions from external structure to individuals

Employees learn from customer, supplier and community feedback: novel approaches to problem solving, innovative work practices, and new technical knowledge. Knowledge transfers / conversions from the external structure to individuals are concerned with how the organisation's employees can learn from the external structure. This is the counterpart of section 2, above. Organisations tend to have procedures in place that capture such knowledge (see section 7, below), but they are typically scattered, not measured and hence do not systematically influence strategy formulation. The strategic question is: *How can the organisation's customers, suppliers and other stakeholders improve the competence of the employees?* Answers to this question leads towards activities focused on creating and maintaining good personal relationships between the organisation's own people and the people outside the organisation.

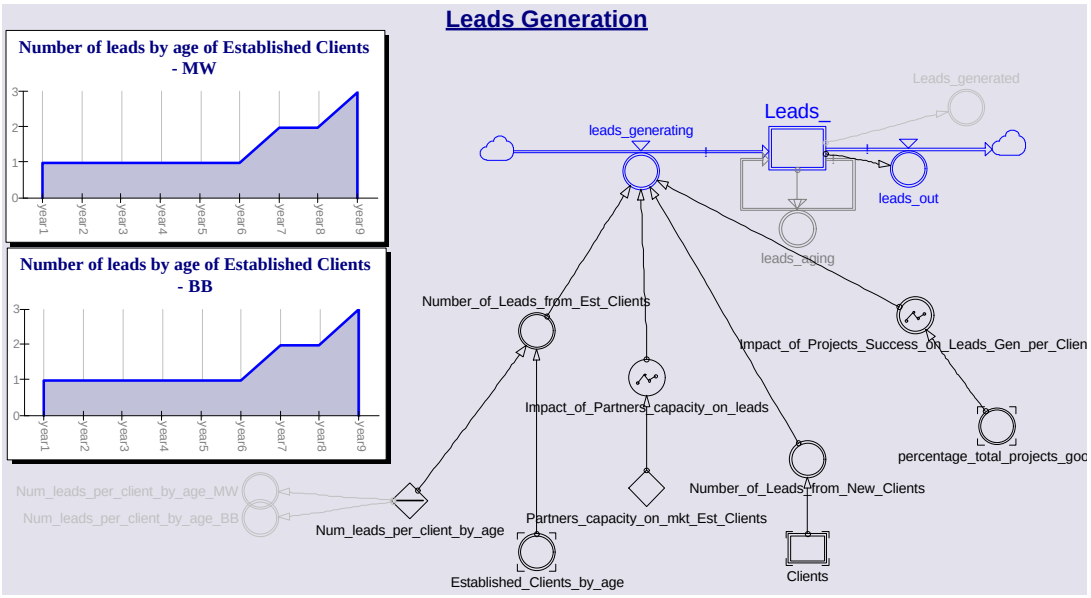


Figure 8. Leads generation and relations with external structure

Activities to improve the stock:

- Spend capacity on entertaining clients
- Spend capacity on joint ventures with clients
- Spend capacity of juniors (over and above project need) on client projects

4. Knowledge transfers/conversions from competence to internal structure

Huge investments are currently being by professional services companies made in order to convert competence (often tacitly held) individual into data repositories. According to IDC worldwide, knowledge management (KM) services spending will increase at a compound annual growth rate of 41%, rising from $2.3 billion in 2000 to $12.7 billion in 2005 (IDC, 2001). The idea is that information in such repositories will be shared with the whole organisation. Indeed, the marketers of database software have been so successful that many managers believe that buying a database is equal to knowledge management. Our model sees this as only one of nine strategic activities. The strategic question is: *How can we improve the conversion of individually held competence to systems, tools and templates?*

Answers to this question lead towards activities focused tools, templates, process and systems so they can be shared more easily and efficiently.

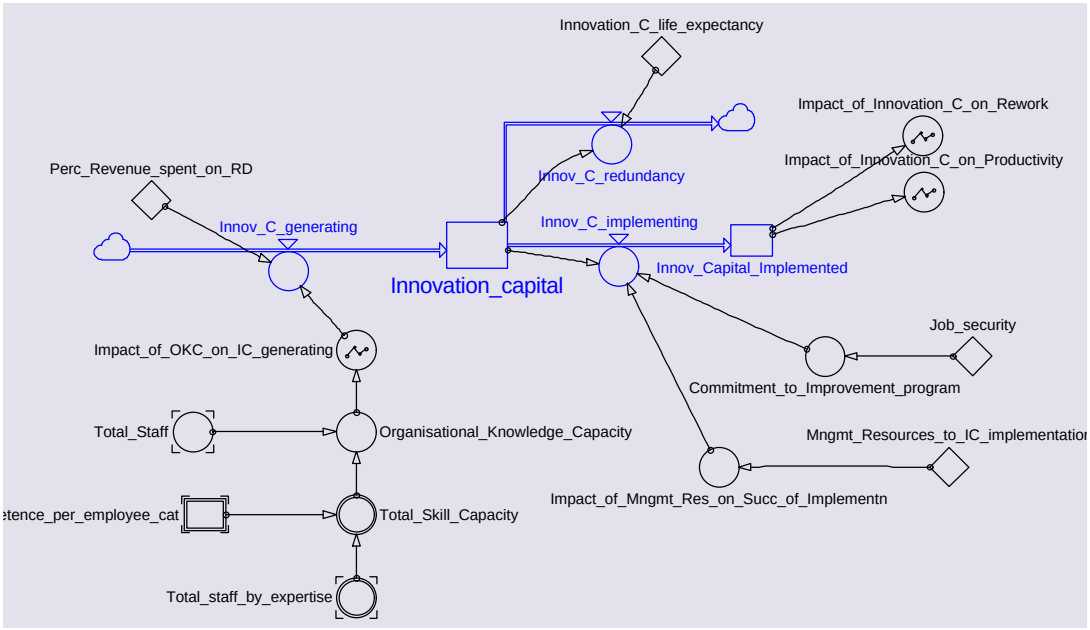


Figure 9. Innovation capital transfer

Activities to improve the stock of innovation capital include:

- Spend capacity on entering data in databases
- Spend capacity on R&D into admin processes
- Spend capacity on R&D into tool development
- Spend capacity on R&D into consulting processes/templates

5. Knowledge transfers/conversions from internal structure to individual competence

This is the counterpart of 4, above. Competence "captured in a system" is information and this information needs to be made available to other individuals in such a way that they improve their capacity to act; otherwise the investment is a waste. IT systems can

by definition only produce information. The key to value creation is whether that information generates competence. The strategic question is: *How can we improve individuals' competence by using systems, tools and templates?*

Answers to this question leads towards activities focused on improving the human-computer interface of systems, action-based learning processes, simulations and interactive e-learning environments.

Activities to improve the stock include:

- Buy + spend capacity on internal e-learning system
- Buy + spend capacity on KM system for projects, cases, etc

6. Knowledge transfers/conversions within the external structure

What do the customers tell each other about the services/products of a supplier? How are the products used? The conversations among the constituencies can have an enormous impact on a strategy of a company. Strategy formulation from a knowledge perspective adds a richer range of possible activities to traditional customer satisfaction surveys and one-way PR-activities. The company can support the competence growth of customers and influence how competence is transferred between the stakeholders in the external structure. The strategic question is: *How can we enable conversations among the customers, suppliers and other stakeholders to improve their competence to serve their customers?*

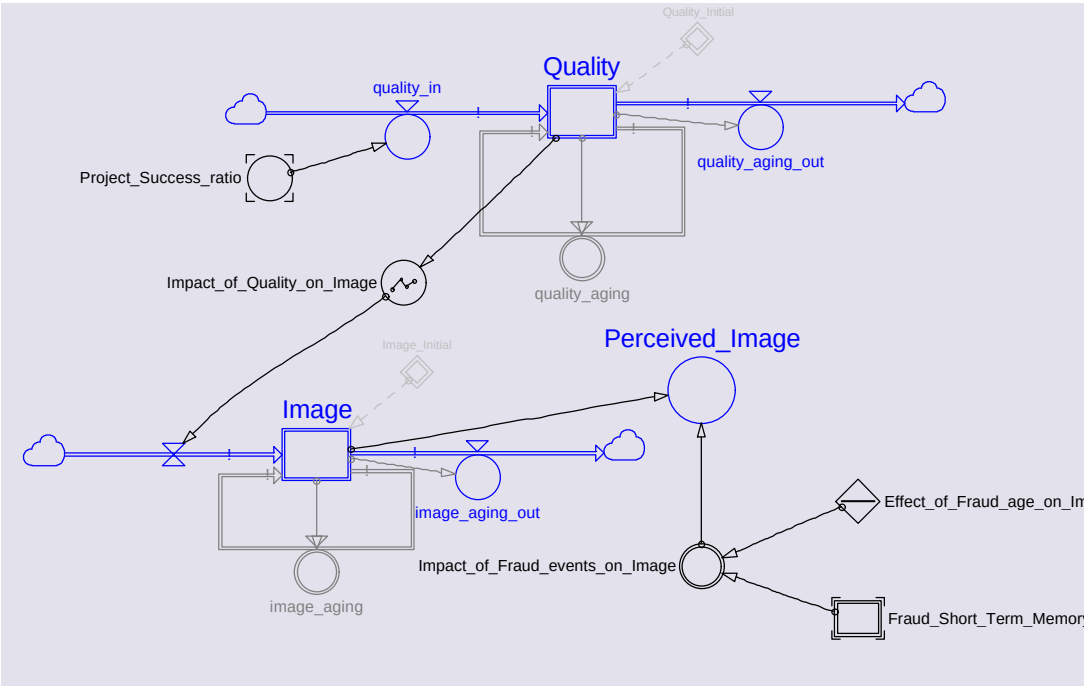


Figure 10. Quality and Perceived Image

Answers to such questions lead towards activities focused on partnering and alliances, improving the image of the organisation and the brand equity of its products and services; improving the quality of the offering; conducting product seminars and

alumni programs. They also lead to a focus on factors, such as fraud or quality failures, which have the potential to diminish or even destroy the firm's reputation.

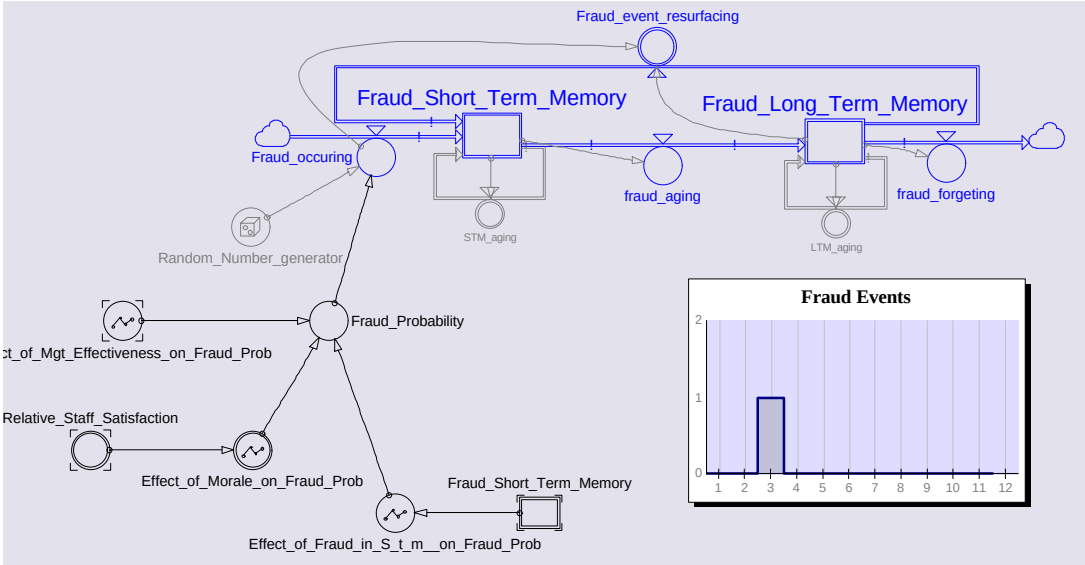


Figure 11. Fraud events

Activities to improve the stock include:

- Spend capacity on Client seminars
- Spend capacity on Image building activities
- Spend capacity on Alumni program
- Spend capacity on quality assurance

7. Knowledge transfers/conversions from external to internal structure

Knowledge transfers/conversions from external to internal structure are concerned with what knowledge the organisation can gain from the external world and how such new knowledge can be converted into action. The strategic question is: *How can competence from the customers, suppliers and other stakeholders improve the organisation's systems, tools & processes and products?*

Answers to such questions lead towards activities focused on empowering call centres to interpret customer complaints, creating alliances to generate ideas for new products, R&D alliances, etc.

Activities to improve the stock include:

- Buy Tools & Processes.
- Buy external Databases

8. Knowledge transfers/conversions from internal to external structure

This is the counterpart of 7, above. The strategic question is*: How can the organisation's systems, tools & processes and products improve the competence of the customers, suppliers and other stakeholders?*

Answers to this question leads towards activities focused on making the organisation's systems, tools & processes effective in servicing the customer, extranets, product tracking, help desks, e-business, etc.

Activities to improve the stock include:

- Invest in ExtraNet
- Spend capacity on client help desk

9. Knowledge transfers/conversions within internal structure

The internal structure is the supporting backbone of the organisation. The strategic question is: *How can the organisation's systems, tools & processes and products be effectively integrated?* Answers to such questions lead towards activities focused on streamlining databases, building integrated IT systems, improving the office layout, etc

Activities to improve the stock include:

- Invest in Office
- Build integrated Intranet
- Streamline databases.

10. Maximise Value Creation – See the Whole

The nine knowledge transfers/conversions exist in most organisations. However, they tend not to be coordinated in a coherent strategy, because management lacks the full perspective that a knowledge-based theory may give them. Most organisations also have legacy systems and cultures that block the leverage. Therefore, many of good initiatives go to waste or neutralize each other.

Investment in a sophisticated IT system for information sharing, for example, may be a waste of money if the organisation's climate is highly competitive – only non-essentials will be shared. Reward systems that encourage individual competition will effectively block efforts to enhance knowledge sharing. Lack of standards and poor taxonomies reduce the value of document handling systems. A program for knowledge sharing with customers is neutralised by red tape protecting commercial secrets. Efforts to use ex-employees for building marketing relationships are useless if people leave the firm alienated or alumni programs are delegated to the administrative function. Data repositories do not improve individuals' capacity to act unless the databases are made highly interactive.

A large number of actions will increase the capacity of a consulting firm in likely descending order. For calibration purposes the following list is presented to the Managing Partner for ranking.

- Recruiting more senior staff
- Recruiting higher quality staff
- Reducing the staff turnover
- Increasing proportion of "good" projects
- Spending time on investment in R&D

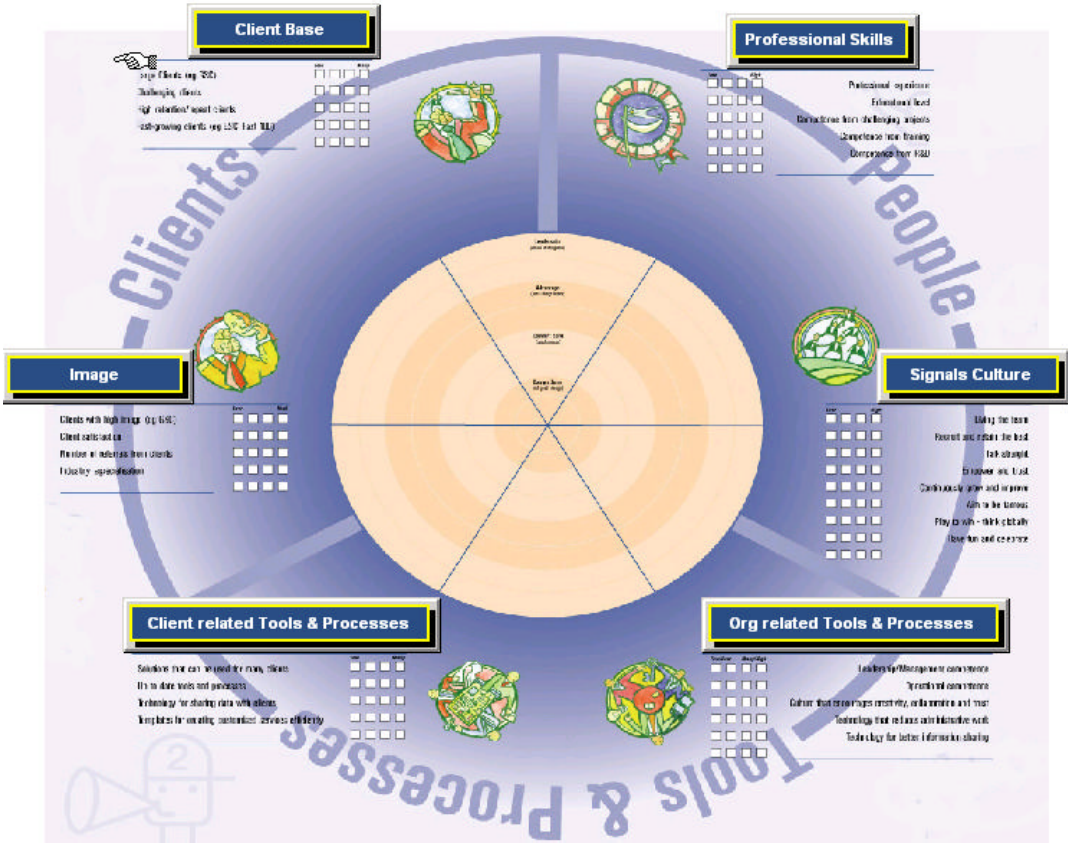
- Increasing the speed of career
- Spending time on training
- Reducing getting-up-to-speed time for new recruits
- Spending time on meetings for sharing information
- Spending time on entering data in databases
- Buying external databases

The flight simulator is designed to assist the Managing Partner assess the likely pay-off from such initiatives.

The System Dynamics Flight Simulator

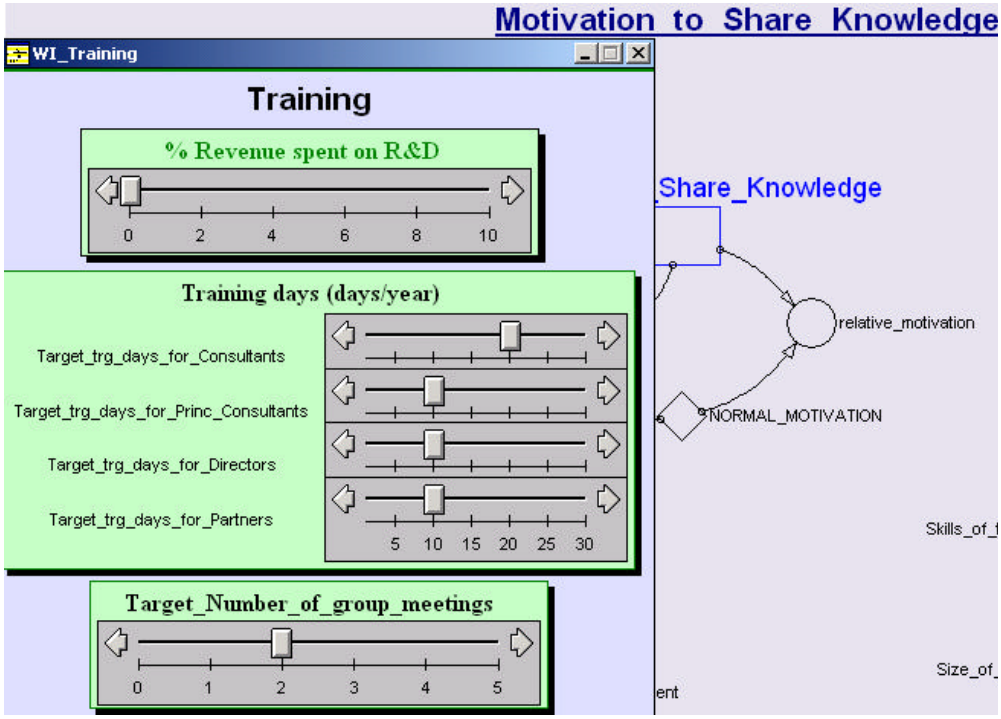
The control panel of the flight simulator is organised around three sectors which encompass the knowledge strategies discussed above: the firm's people, its clients and its tools and processes.

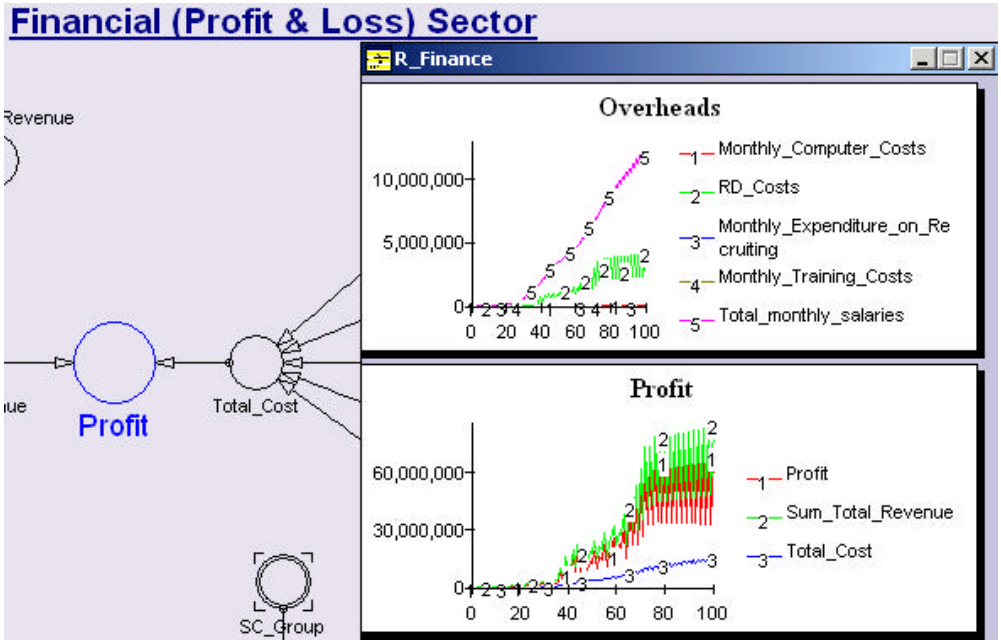
Buttons in the Client Sector give access to the model sub modules for Client Base and Corporate Image. Buttons in the People Sector give access to the model sub-modules for Professional Skills and the Signals Culture (in essence the feedback indicators); the Tools & Processes Sector gives access to Client and Organisation related tools and processes.



Navigation within the model is effected through menu bars:

The menu buttons also permit the user to control the simulation (run, pause, stop), to activate 'what-if' controls and to activate reports, as illustrated below.





The simulator structure has now reached a fairly stable state, although considerable fine tuning is expected to the mathematical relationships in the course of validation testing against the actual processes of a major professional services firm. Similarly, significant refinement is expected to the 'what-if' controls and output reports as we identify the particular needs of senior managers.

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