

A STUDY OF THE MANPOWER SYSTEM OF A SHELL R&D LABORATORY

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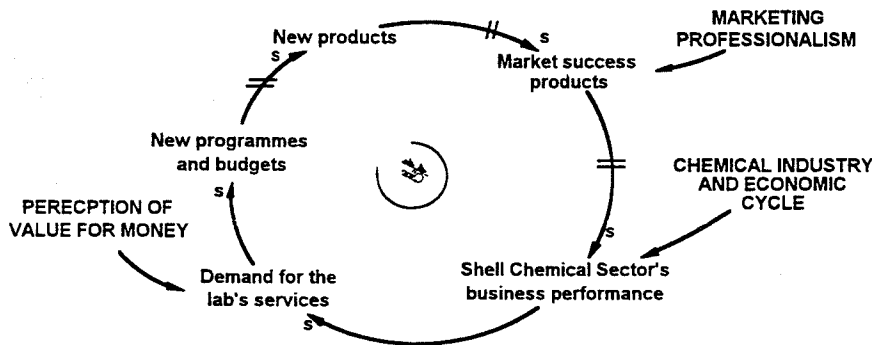
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Systems Thinking, Archetypes and Modelling have been used to understand the dynamics of the manpower system of a Shell Research Laboratory with the aim of assisting the management team in developing and testing policies which secure the long term health of the lab.

The study starts with a search, within the boundaries of the system for sources of leverage which could create steady, non-cyclical demand for our services. Demand for our services is created by healthy business performance and the perception by the sponsors that the lab provides good value for money. Higher demand for our services increases our opportunities for renewal of R&D programmes and budgets and in turn more or better products and services. However if the starting point is poor business performance everything will decline. Either way this constitutes a reinforcing loop.



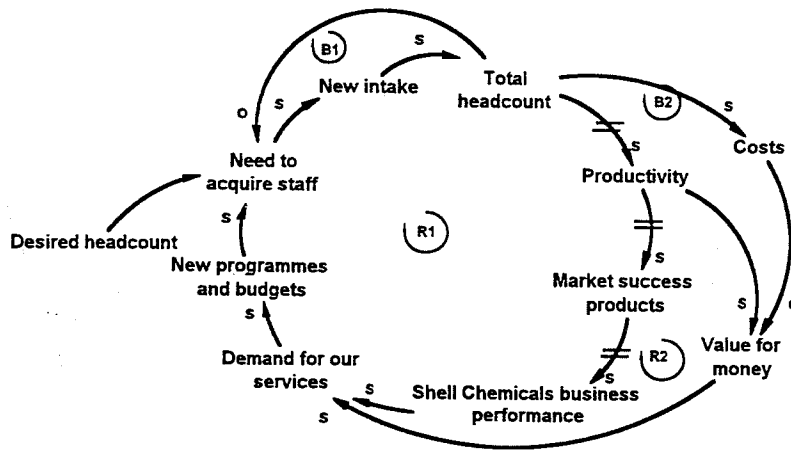
Historically, performance of the chemicals business has been cyclical with profitability oscillating every 7-8 years. These swings in industry/ sector performance affected the demand for the lab's services. We questioned if there were sources of leverage within our sphere of control which could positively influence the cyclical demand. One such source could lie in the multiple delays in the feedback loop.

A brief analysis shows that reducing the delays in product development dampens the size of the peaks and troughs in profitability. Cycle time reductions come from removing the barriers to the flow of work and activities across the many organisational and functional boundaries which the product development process crosses. System thinking suggests that no one (set of) individual(s) is at fault - that there is little to gain from assigning blame. It suggests that there are often structural reasons e.g. reward structure, management culture and behaviour which make individuals or divisions or functions behave the way they do. Leverage lies in designing the system which creates the circumstances for reducing the cycle times. An additional source of leverage lies in partnership with the business

Meet changes in demand by changing head count only- Limits To Growth.

Given the desire for new programmes and budgets, how is this demand met? The following figure shows the feedback loop associated with the most common practise which consists of looking at

the "*current total head count*", estimating what the "*desired headcount*" is for meeting the new demand and calculating the "gap" which can be called "*room or need to acquire staff*".



Starting the walk around the loops, we can see that more programmes and budgets create more room to take staff. This results in higher headcount, leading the system to believe that it will increase productivity, ultimately resulting in higher demand for our services. This creates the reinforcing loop *R1*, which can snowball either way, accelerated growth or decline. There is a second reinforcing loop *R2* which creates the perception of better value for money. - as headcount goes up there is a perception of higher productivity, and value for money. However in this loop there is a delay indicated by a cross-hatch line from "*headcount*" to "*productivity*" as it takes time for new recruits to become productive. What does "*productivity*" mean for us and how much are we in control of it? **Innovativeness** and **competitiveness** of our products and services and **fast cycle times** are factors clearly in our own hands. .

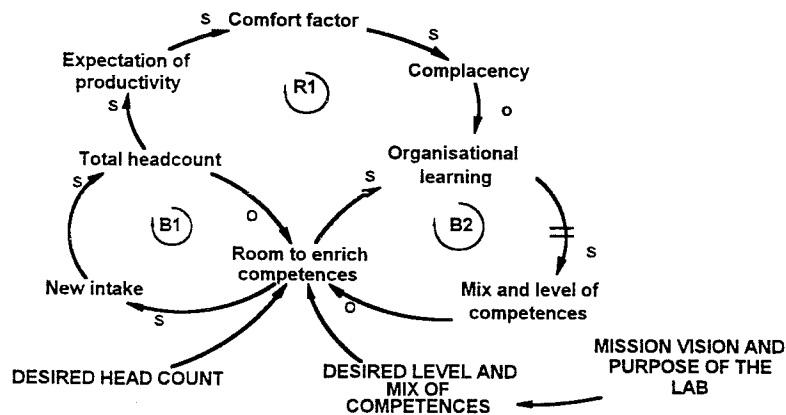
There is a negative influence shown in loop *B2* associated with costs: If we fill the gap or fill the room by taking on new staff, the headcount goes up and the costs go up. Higher costs combined with the delays in our output lead to the perception of poorer value for money and the demand goes down. Lower demand leads to lower R&D budgets and the reinforcing loop starts to reverse. Here we find the limits to growth archetype; if the growth in our productivity can only result from increased head count, then this growth will be limited by the balancing mechanism of increasing costs. Most managers also know that increasing headcount increases costs and creates a limiting condition, yet many respond to increasing demand by asking for more manpower. Why? Systems thinking suggests that in most situations where the limits to growth archetype operates there are underlying implicit norms which create limiting conditions and create resistance to change. What could they be in the system described above?

The above analysis raises many questions. What if the delays between need to acquire and productivity were removed? Would that solve the limits problem? If so what would that mean in terms of policy? Reducing delays requires having capacity "JIT" or somehow having the capacity "latent" in existing staff - so that we can draw on them and not rely on recruitment alone. An alternative might be having a pool of people to draw on such as "research associates". What if we reduce staff numbers to cut costs? Would that get rid of the limit? Probably not because then you might be under staffed and create in the boom times another archetype known as "*growth and under investment*".

What if we used the term "*room to enrich skills and competences*" instead of "*room to acquire staff*". This allows us to see that there are other ways to increase production or service capacity without excessively increasing headcount and costs. A concept of growing the lab by growing the collective capacity of people (or groups of people) and not so much by growing headcount emerges. The analysis which follows is based on this concept.

Two ways to fill the room- Shifting The Burden Archetype.

New programmes and budgets create a gap between the "*desired head count*" and the "*current headcount*". Simultaneously there will be a gap between the "*current level / mix of competences*" and the "*desired level and mix of competences*". These two gaps can be represented as the "*room / need to enrich competences*". There are two ways to fill this room. The first *B1* is by increasing intake and the second *B2* is by continuously growing the stock of skills and competences through learning. In systems thinking terms, these two choices can be seen using the "shifting the burden" archetype. There are two ways to solve the problem, one offers a symptomatic solution and the other a fundamental one. Increasing the headcount, the symptomatic solution, leads to the perception of increased productivity and creates a feeling of having filled the room to enrich competences without delays. This feeling could make the system complacent toward growing skills and competences and create dependency on the symptomatic solution leading to a side effect shown in loop *R1*.



The second balancing loop, associated with organisational learning is the fundamental solution. However it takes time to fill the gap between the new desired level and the current level. This loop has a cross-hatch from "*organisational learning*" to "*mix and level of competences*" indicating a delay. This delay makes the fundamental solution look less attractive. Although this route does not necessarily eliminate the need to take on more people, it does however reduce dependency on just one mode of expansion- by increasing headcount. The fundamental solution of growing competences and skills through continuous learning however provides sustainable productivity .

The fundamental solution is however too elusive to be easily invoked. It is even difficult to grasp. How can we know how much skill/competences we have in the lab and if they are growing by continuous learning? We do not have a currency for accounting for skills and competences at the aggregate or company level and in the current management culture "what is not measured can not be managed". What does "*learning*" mean anyway and how does it differ from training? Learning here means organisational or collective learning - that which enhances the organisation's power. Power of an organisation or a group is the extra *capacity generated by relationships*. It is the real capacity or energy which can only come into existence through relationships between functions, tasks, roles and hierarchies. Negative relationships reduce the collective competences of a group,

though individually they may be very competent people. This makes the competence stock elastic - growing when the relationships are rich, the beliefs are positive and when there is a learning culture. Creating and rewarding the behaviours and practises which nurture a learning culture is the fundamental solution.

In and out flows: A significant challenge for any manpower system is the maintenance of the level and mix of skills required in the short and long term, through the ups and downs of the business cycles, balancing costs and motivational factors using appropriate policies for moving people in and out of the system.

In and outflows of competences through movement of people is viewed using a "bath tub" metaphor. To maintain skills and competences at a desired level as people and skills flow out we can fill the system to the desired level and stop the outflow. With this solution we risk stagnation and de-motivation, and stop enriching the skills via assignments to the outside. Alternatively we can continuously let skills and competences in and out at very controlled rates. This option belongs to a world where employability could become desirable both to the employee and the employer, and rapid in and outflows are the norm. The net effect of the in and out flows paints the picture of a "high velocity organisation". In this scenario, how can we keep the skill and competence level as close to the desired level? Experiments with the bath tub model shows, when the level of water is high, if there are differences in in/out flow rates, it still feels comfortable. In other words, if the organisational stock of competences is high, it is easier to balance the in and outflows such that we do not disturb the productivity too much. The way to keep the stock of collective or organisational competences high is by accelerating the building of positive relationships through values such as trust. Secondly it requires that we have excellent feedback mechanisms to control the in and outflow rates. Whilst feedback for balancing headcount is tangible and therefore easier to address, balancing skill and competence stock at the aggregate or the lab level requires different management skills. The bigger the system, the more diffuse the feedback mechanisms become. Smaller teams recognise faster and more accurately what skills are flowing and growing. Local feedback, especially about this intangible and elastic variable becomes very important for the well being of the larger system. This realisation has important implications for our human resource planning processes. It raises many questions about what is best planned centrally and what "locally".

Quantitative modelling using Vensim: A model aimed at simulating the effect of our recruitment, promotion and exit policies on the flow of people from intake to exit at all job groups with a coflow of age was built. A couple of "what ifs" were simulated and the team could "see" what the future might look like, under a couple of scenarios. These were: "Status Quo Scenario" where we questioned "What would the total headcount, age and job group distribution be in 5-10 years if we continued the current hiring, promotion and attrition policies?". The second called "Back To The Future Scenario" where we questioned "What would the hiring, promotion and attrition policies have to be to keep the headcount, age and job group distribution the same in the future as it is today".

Policy formulation: The combination of the Causal Loop mapping and the quantitative model resulted in the management team revisiting the HR policies. It helped many in the team understand why certain decisions and policies were made this realisation is helping to reduce the gap between our intended policy and day to day practises.

The value of this study arose from the journey itself, the workshop days and the many discussions gave the management team an opportunity to share their mental models, and made explicit the basis for the policies.