Using a System Dynamics Approach as a Tool for Enhanced Company Performance through Developing the Imagination Models of Managers

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Abstract

In today's highly competitive market, many organisations are uncertain of how to structure themselves. For maximum flexibility and effectiveness there is, for most organisations a need to accommodate change and to introduce innovative methods that will improve efficiency and quality. Managers are required to exhibit much more imagination than ever before. This paper uses the systems approach to help managers consider corporate performance improvement through developing their imagination model.

A System Dynamics model of an existing non-traditional organisation has been developed. The company considered has completely innovated its organisational structure into what is commonly termed a "spaghetti" organisation as opposed to the traditional hierarchical organisation.

The authors believe that there is a vast potential in using System Dynamics Approach for developing managers' imagination model in the attempt to make a breakthrough for speed, quality and productivity; encouraging thinking the "unthinkable".

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1. Introduction

An important feature of the business environment over the past twenty years has been the frequency of change. In their everyday effort to survive organisations are desperately trying to find a way to increase their flexibility so as to adequately adapt to the quickly changing world outside.

This paper uses the tools of System Dynamics to illustrate an attempt by Oticon Holding A/S "to find the right way". Oticon is a hearing aid company with many branches both national and international.. Their headquarters in Copenhagen concentrates on product development and was recently selected for a British television programme called "Crazy ways for crazy days" as an example of a unique combination of information, environment and organisational structure that led to a dramatic shortening of the product development cycle. Because the structure is loose and intertwined, they describe it as a "spaghetti organisation".

On account of the TV programme we were interested to find more about Oticon. The director Lars Kolind was contacted and asked for more information. This was sent in the form of a documented case study [5] and a book [6] (written in Danish). The material in these documents gave an account of what happened at Oticon but it was felt that the dynamic picture was missing. The creation of this picture then became the objective of this project..

As System Dynamics models the world in the way that humans perceive it:- with their eyes and with their thoughts it was considered appropriate to build a different type of case study of Oticon including System Dynamics models as communication tools with the aim of challenging people to reconsider their subjective perceptions and develop their "imagination models".

Imagination is the ability to think creatively. Even when one imagine things, one is restricted by a pattern that has emerged through one's background, experience, interests, etc. Einstein said that we must depattern our minds before we are receptive to new patterns. If one can find a way to look at other people's perceptions of things it is surprising the discoveries that can be made. Imagination models can be developed and enormously enriched by the process of communicating one's perceptions.

2. Background to the Problem

In 1988, Lars Kolind attended a Hearing Aids Exhibition in Germany. He realised that the competition in his product field is very intense. From 10 medium size independent businesses of his size, only 5 would probably survive[5]. Oticon's limited financial base could never match the resources, which much larger corporations like Siemens and Philips, who owned major competitors, were willing to put into research and development in hearing aid technology.

His thoughts focused on the alternatives available to improve Oticon's performance. He started looking for a competitive advantage. Advanced technology and innovative design on their own were not enough as all firms faced these problems. Kolind was looking for something different. Oticon was not gaining enough benefit from the expertise of its employees. He decided to utilise this potential more but in order to do so Oticon needed a management structure that would allow ideas to travel very quickly through the organisation. This was the original motivation for the changes. He deliberately considered different alternatives, trying to pick one he could actually do something about.

Detailed research was carried out and the outcomes were noted by Lars Kolind. He considered the product development section of the firm numbering about 115 people. This resulted in the following changes.

Customer orientation - a holistic approach in understanding the customer. Sussane Smith (project leader) says : "In the old days the engineers were in charge. In the new organisation the customer is. Engineers have been forced to look at what we need to supply to the customer. "
There is a change from a product focused attitude to a marketing attitude. Lars Kolind decided that in the fast changing environment Oticon should have adequate sensors to detect these changes so as to be able to define a desired performance to respond to the environment. The customer has been personalised. A holistic approach to

understanding customer's needs has been accepted. Before they saw only the ears of the customer but now they were going to listen to the customer as a whole person with their psychology, social interests, attitude to fashion, etc.
Every employee is directly involved in a mainstream business action for the benefit of customers.

Quality. Quality is defined as a relationship between customer expectations and what the customer gets (in the past quality was just a measure of faulty products).

Integrated Product Development. The product arises from relationships within networks that include the user, the producer, the supplier, the components, the research in society, the marketing people. There is a team of seven employees who operate what is termed the "skill function". This ensures that employees keep up to date in their field of qualification. This function is performed by the former management as only a part of their job description and is responsible for organising discussions, supplying up to date professional information, etc.

Multiple jobs. The individual employee has multiple jobs. All employee's talents and qualifications which were not recognised before are now used. For example, an accountant speaks foreign languages and contributes in translation work, an economist, heads a product development team, etc. This applies to the managers as well, e.g. Lars Kirk, who was a production manager in the previous structure is now involved in the design, production and marketing .
People are encouraged to take on tasks they feel they can do and want to do. This increases enthusiasm and motivation as people are doing things voluntarily and brings in the necessary control of increased responsibility. It extends the individual employee's comfort zone thus overcoming a major barrier to liberation of the individual. This leads to an enormous increase in people' s creativity.

"Spaghetti" organisation. The hierarchical organisation has gone: no departments, no titles. All staff work in constantly changing product teams. Former department heads become mentors or project leaders. " The employee can be a part of different project groups at the same time, but his home is the project itself. This is not meant to be the road to anarchy but new long term means of surviving. The term "spaghetti organisation" comes from the structure being loose and intertwined so that to provide flexibility of restructuring when necessary . In the context of the firm everything is connected with each other. It is a knowledge based, project driven organisation. The focus is on the tasks to be fulfilled.
The product development teams bring the enthusiasm and knowledge of doctors, financiers, engineers, psychologists, marketers together into "thinking the unthinkable" (Oticon's motto).
The abolishing of the hierarchic organisation allows all other changes!!!
One of the managers says "It is important to understand the mobility of the employees, the multijob, you do not get that as long as you retain organisational hierarchy. On the other hand it is not enough to change the hierarchy but also the classical surroundings and the system of information."
The spaghetti organisation is a development of the matrix organisation. In traditional organisations it was considered sensible to have one boss as the stream of commands is direct. In the last decade or two the matrix organisations prove to be successful. These are organisations where an employee with a particular skill is a member of several different projects at the same time. The spaghetti organisation has developed that concept even further. Oticon's employees not only participate in several projects at the same time but they may have different roles in each project.

Efficiency groups. Efficiency groups are created to do the research into how to change the routine, cut procedures, reduce complexity costs.
There was a fear that the project groups will be competing or trying to listen what the others are doing and try to implement the same. It is not good to have everybody on the same track. The solution is for groups to work together. A lot of the work of the efficiency groups was concentrated on collaboration between groups

Open multifunctional office and laboratory environment. Everybody can change their working place. No one has a traditional office, no one has a permanent desk. Specialised "ad hoc" workstations exist to allow highly specialised work to be done. They are not permanent work places and are available to different project teams at different times. It is an ever-changing environment. This encourages the employees to look dynamically at connections between functions. The open office and laboratory environment allows:

-everybody to have access to resources when needed;
-encourages communication, people talking to each other;
-brings motivation and enthusiasm for work;
-everybody knows what everybody else is doing and ideas travel quickly; "no secrecy" is one of Lars Kolind's major priorities;
-information gets to the managers immediately, errors are corrected almost on the spot.

Computerised environment. Information system infrastructure. "The information system is built around a common industry standard graphical user interface. General applications include office automation, such as word processing, spreadsheets, database management, document handling and communications. Technical applications include computer aided mechanical, electrical, acoustical software and IC design, simulation and prototyping. Time management, project management, financial management and quality management systems help integrate the work of individuals and project groups into a coordinated whole."[5] All the information systems are perceived by the user as one single system.
The comprehensive information system gives everybody an access to all available knowledge. It is possible to consider then what new knowledge is needed.
In the past workers were sitting and waiting to be told what to do. Now they know what
has to be done and take initiative to do it. They participate in the planning, They can look in the computer system and get the necessary information.

Paperless office. The computerised environment has helped to decrease the paper work dramatically. "About 80% of all the paper has disappeared. Incoming mail is scanned and hard copies shredded for recycling."

Electronic meetings. Electronic meetings are encouraged. Brainstorming through an electronic meeting produces a proposal between 10 people every 1.5 minutes.

Dialogue is in. Dialogue is the main means of communication. The entire building is designed for dialogue and action. Small cafes are spread around to encourage dialogue and discussion.

A Computer Proposal Box. This encourages employees to contribute with ideas to solving problem situations. The firm uses the employee's overall creativity which is an extra efficiency.

Accountability. Employees performance is measured in terms of their contribution to the fulfilment of the projects they are part of. The employees are totally responsible for what they are doing. The project leader is responsible for the production, design and marketing of the product.
Internal rules exist to meet standard ISO 9000 (equivalent to BS5750) Balance between freedom and control has been established.

Reward system. Salary is determined once a year. The "personnel administrator" function is responsible to organise the evaluation each employee's performance once a year considering the opinion of the subject leaders, project leaders and the leadership group. No appeal is allowed.

Training.
A PC Club exists permanently for training and consultancy after working hours.
Self development is supported. Staff are encouraged to grow personally and professionally. There is no fixed amount for a training budget but employees are free to choose the training they feel they need. The new culture of freedom is promoted, new values developed.

3. Initial Perceptions

If organisations do not react they do not survive. This concept brought the ideas of Inertia and Momentum to our minds. Inertia can be defined[4] as that property of matter by virtue of which a body continues in its existing state, whether at rest or in uniform motion. Another definition is " the willingness of things to stay exactly as they are unless moved by sufficient force. Inertia is not the matter of opposition but simply of inaction." [2]. This was taken as the definition of Inertia for our problem. The effort or time needed to respond to a change in the environment is taken as a measure of inertia.

Another perception was that this model could be classified in the field of "new product development". An important feature of such problems is not the flow of goods or items but the flow of ideas, perceptions and information.

The following diagrams (Fig.1 & Fig.2) are our first attempts to link these two concepts together. We defined two types of inertia: the inertia of exploration and the inertia of action.

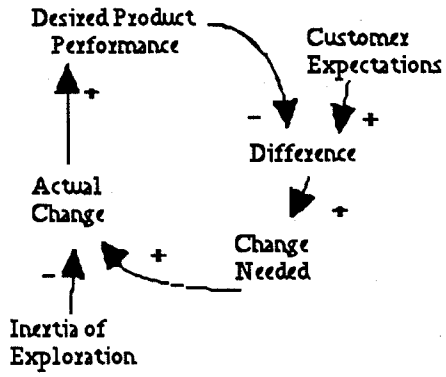

Fig. 1. The inertia of exploration

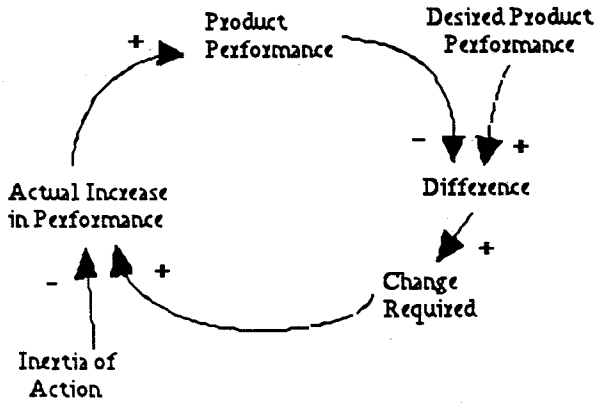

Fig.2. The inertia of action

The effort and the time needed to bring the performance of the system within the limits to maintain dynamic equilibrium with the environment depend on the inertia of the system. The elements that measure the change should have appropriate low level of inertia to detect the magnitude of change required. The inertia of the control and action elements as well as the inertia of the links between them should be of the same magnitude as that of the measure elements to allow the system to react to change.

The inertia of a system depends on the combined inertia of its elements and the inertia of the links between them. Lars Kolind has realised that only a completely integrated systemic approach where everything is changed simultaneously : structure, working environment, culture, strategy, policies and operation processes.

Thus the two diagrams could be combined (Fig. 3) to give the overall picture:-

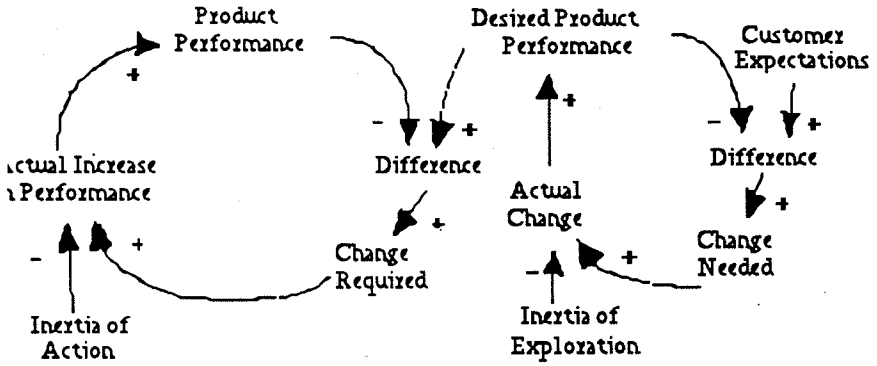

Fig. 3. The combined inertia

4. General Causal Model

Fig. 4 shows the general model of the causal links and feedback loops that influence the inertia of the system.

The inertia of exploration is very sensitive to the quality of information about changes in the environment (in this case the customer expectations). A holistic approach to exploration is very important for any organisation's success. Unfortunately, especially when successful, companies tend to restrict the exploration of the environment to their narrow perception of reality. This tendency could be reinforced by the momentum already gained. **Momentum** is defined as the potential of the firm to continue performing on the same way. To change, an external or internal force or action is needed. The increase of product performance increases the momentum. Maintaining a performance, the company is pointing in a specified direction and the momentum keeps it going[3]. The momentum feeds the Inertia of exploration which creates a bottleneck at the actual adaptation of desired product performance to customer expectations. The case of IBM could be explained in these terms. They had a powerful momentum caused by their success. This caused them to bypass the exploration of customer expectation. IBM rejected the production of microcomputers as they did not have enough information about the benefits to make it attractive for themselves.

Oticon found a simple and very efficient approach to dealing with the inertia of exploration It was realised by Oticon's management that for their organisation to survive
it has to maintain its homeostasis[1] with the environment. The stability criteria is to minimise the difference between company's performance and the performance required by the environment. Thus quality is defined in Oticon as a relationship between the customer expectations and what the customer gets (the actual product performance).

The existing quality gap directs the attention towards diminishing the inertia of exploration and balances the momentum loop.

Realising that the self adjusting mechanism of the organisation towards the environment is extremely important for its survival Lars Kolind aims at amplifying Oticon's sensor to detect the changes .

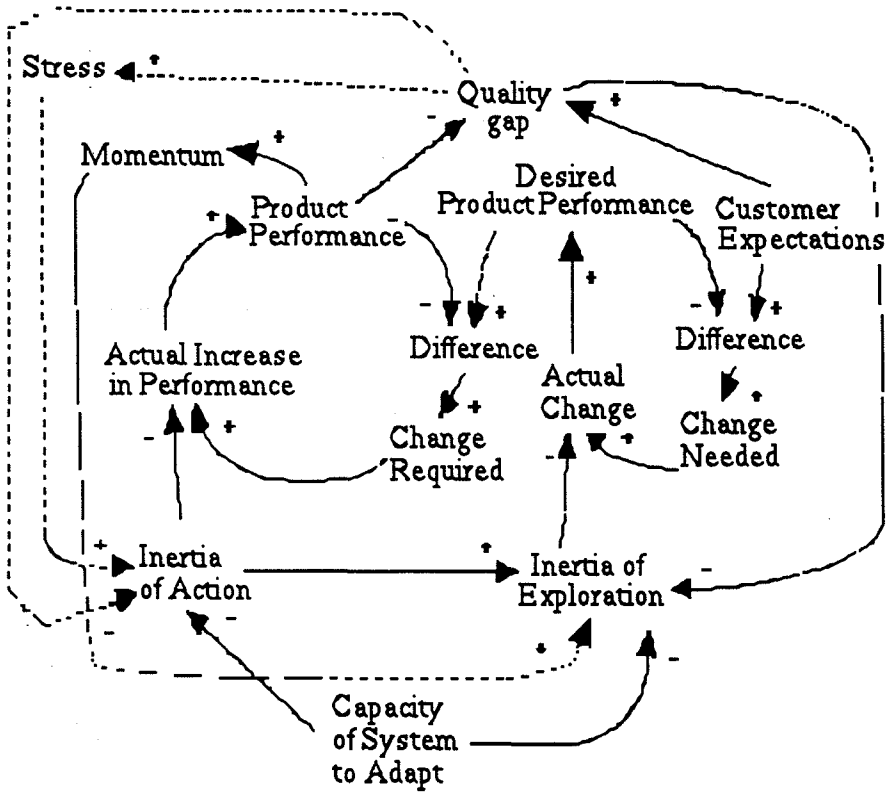

Fig. 4. General Causal Model - Step 1

Reducing the inertia of a system reduces its stability in a sense that it becomes highly sensitive to changes in the environment But systems with low inertia have proved to be much more adaptive to the environment and maintain a balance with it which makes them ultra stable in a sense that they can adapt and survive.

In fact there is a tendency to build "highly sensitive" systems whenever we need to design highly survivable systems. A typical example is the design of the European fighter aircraft. Here instability has been purposefully built into the system so that no momentum or inertia is allowed to develop and thus the aircraft is more adaptable to sudden changes in the environment.

The quality gap being a driving force creates a highly dynamic system. Originally it is there as a pressure to decrease the inertia of the system. But depending on its quantity and the rate of change it could actually increase stress, limiting the job related performance and thus increasing the inertia of action. Inertia of action can increase inertia of exploration as when nothing is happening, there is no motivation to explore. The links that are marked with a dotted line in Fig. 4 depend on the magnitude of the quality gap and its rate of change.

Bottlenecks in the system could also be caused by lack of capacity to adapt to the quality gap. The changes in Oticon aim at increasing dramatically the capacity of the company to react to changes in the environment.

Fig. 5 and Fig. 6 show the causal loop diagram of reengineered Oticon at two subsequent levels of detail, the last one aiming to introduce the links between all changes implemented. A Stella model has been developed and will be the subject of future research.

5. Conclusion

This paper presents an initial attempt to analyse Oticon's management reengineering approach using System dynamics.

The following findings have been noted :

- the systemic view of company reengineering is vital to success (Oticon's management proved this in a exceptional way);
- the quality model based on customer and employee's satisfaction is the driving force in maintaining the dynamic equilibrium with the environment;
- the integrated approach in designing the information system, the organisational structure and the working environment has a dramatic multiplication effect on the company's capacity to adapt;
- stress leading to employee's "burnout"[4] could diminish company' performance.

Our experience has convinced us that using System Dynamics in analysing company performance at subsequent levels of detail is a powerful approach in identifying potential bottlenecks, Catch 22 type situations and developing manager's imagination models in considering alternatives and communicating perceptions.

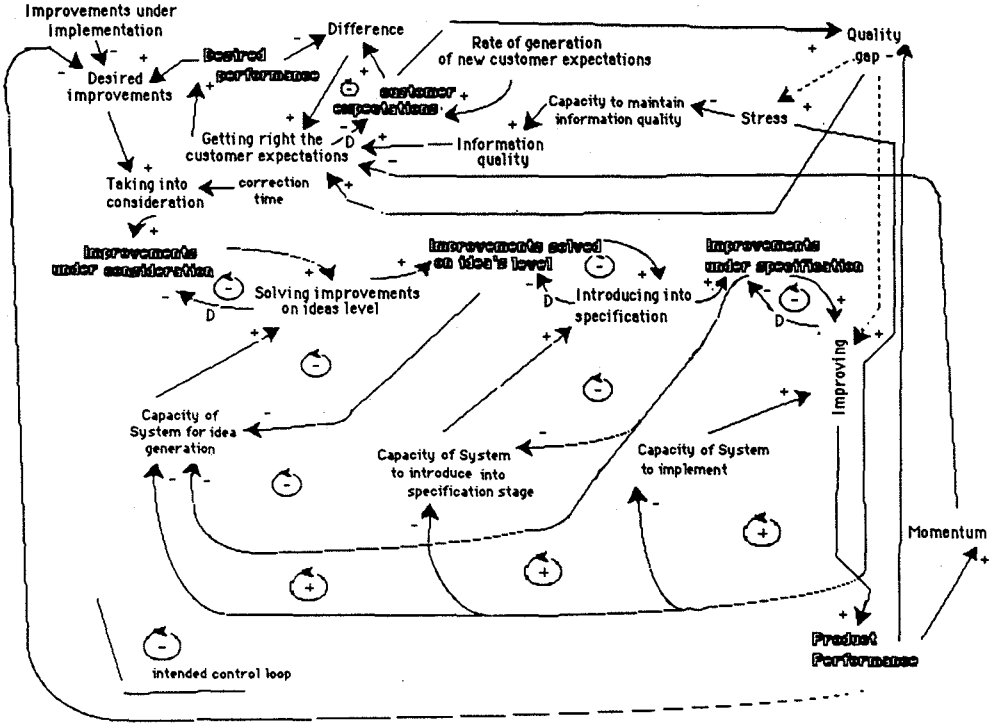

Fig. 5. Causal Model - Step 2

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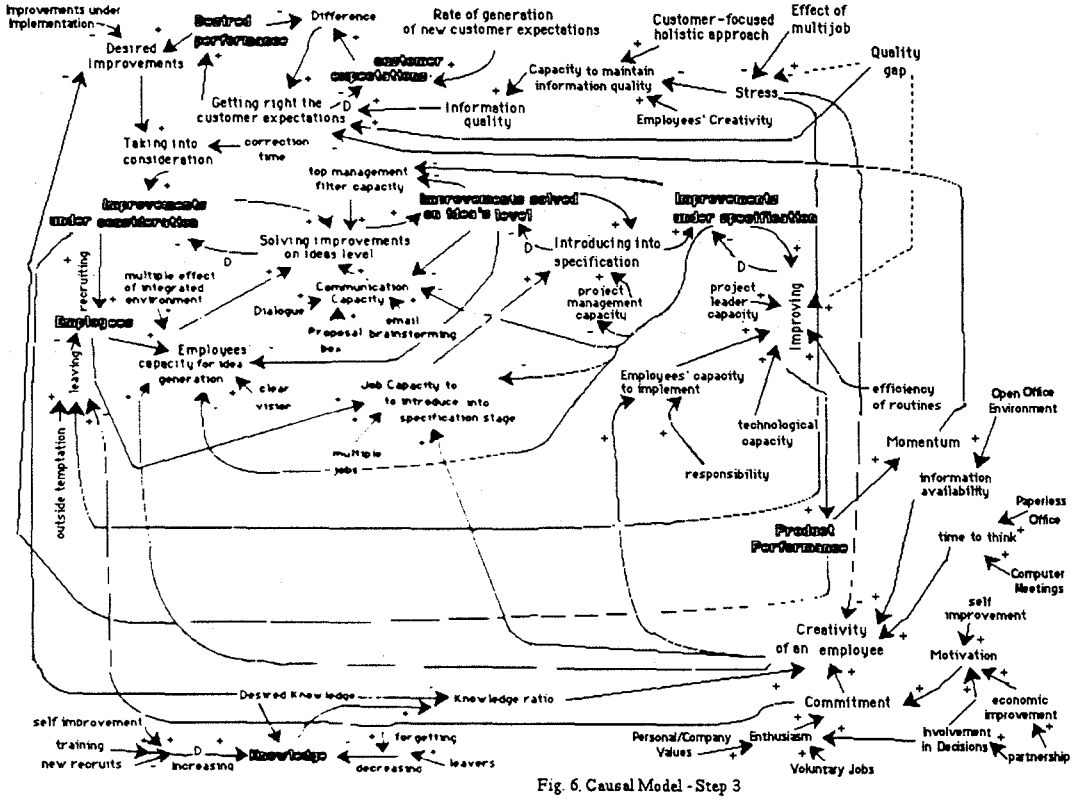

Fig. 6. Causal Model - Step 3

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