"The Use and Application of Stafford Beer's *'Viable System Model'* as a Diagnostic tool."

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April 1999

This dissertation is presented in partial fulfilment of the requirements for the degree of Master of Science at the University of Cape Town.

Acknowledgements

I would like to thank:

My wife, Ros, for her support, patience and motivation.

To my daughters, Bryony and Cindy, for understanding that this was something I had to do.

To Professor Ryan for his supervision and patience.

To the Class of '93 for their support and help and more than anything - for opening my eyes.

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Synopsis

This research project is about one of the many tools available to the manager to evaluate an organisation, Stafford Beer's *Viable System Model.* The model as derived in his book 'The Heart of Enterprise', is reviewed in depth as part of the research. The model is then used to diagnose two organisations, a network marketing organisation, a growing and successful enterprise, and an engineering jobbing shop, an enterprise struggling to survive. It is shown how the successful enterprise conforms to the Viable System Model and the struggling one does not.

The network marketing company is further examined to identify elements that contribute to its success and it is shown that these elements do not exist in the engineering jobbing shop. A proposal is then put forward on how to reorganise the engineering jobbing shop and implement the elements of success identified in the network marketing organisation.

The research concludes by acknowledging that while it is beyond the scope of this research to categorically conclude that an enterprise must conform to the Viable System Model to be viable, the two specific companies researched here do suggest this. This is in agreement with Stafford Beer's contention that for an organisation to be viable it must at the very least conform to the Viable System Model. It is further concluded that the research demonstrates the usefulness of the Viable System Model in the evaluation of an organisation.

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1. Introduction

Why is it that certain organisations fail while others succeed? How does one know whether an organisation is succeeding and will continue to succeed? How does one identify that it is heading for disaster? How do you fix it?

These are questions that over a number of years working in industry have puzzled the author. Having worked in both successful and unsuccessful organisations it has become patently clear to the author that in order to be a successful manager it is necessary to be able to answer all the above questions, as well as many others that will derive from the above.

It was for this reason that the author embarked on a degree in Master of Science, specifically to study Operations Management, one aspect of which was to carry out research on an organisation or organisations for the mutual benefit of both the organisation and researcher.

That is what this research project is all about.

As one of the goals of the of the research project undertaken for the degree was that the research be carried out on the organisation in which the author was employed and that the research was of benefit to both the company and the researcher, as stated above, it was necessary to find a research topic to meet these criteria.

At the time that the decision was taken to carry out this research, the author was working for a small engineering jobbing shop located on the Auckland waterfront in New Zealand. In addition to this full time employment the author was also involved part time in a network marketing company. The research is based on both of these companies.

At the time the decision was made to carry out this research, the company of full time employment, Ace Engineering (an assumed name to protect the true identity of the company), was experiencing some difficulties. The symptoms of the problems were:

- high staff turnover
- drop in quality of work
- a loss was being made on jobs

Although there was much speculation as to the reasons for these, training and previous experience have shown that the causes for these types of problems are not obvious and need to be searched out.

In contrast, the network marketing company, Network 21, was enjoying success and apparently growing the business.

Why was there such a stark contrast between these organisations? It was this difference that sparked this research, viz. to study the success elements of the one organisation, the elements of failure in the other, and whether, having identified these elements, it would be possible to implement the success elements into the failing organisation to bring it back on track.

At that time it was becoming ever more obvious that the problems being experienced by Ace Engineering were going to lead to it's collapse if they were not addressed.

The author thus perceived that by carrying out this research project a number of goals would be achieved, viz.:

- A potentially serious problem for Ace Engineering could be addressed
- The author would undergo a learning experience
- The requirements for the degree in Master of Science would be met.

1.1 Research Structure

In deciding how to approach this research the author used the work carried out by John Gill and Phil Johnson, Research Methods for Managers, as a guide. Their work is reviewed in Appendix A1.

As the author was already immersed in the two organisations chosen for this research and observing their respective methods of operation, an inductive approach was indicated, the right hand side of 'Kolb's Experiential Learning Cycle'. The author was already exposed to concrete experiences leading to observations and reflections which will be followed by the formation of concepts in this research.

Considering the various research methods available as discussed by Gill and Johnson, the following reasoning was adopted in reaching the decision on which research method to use:

- *Experimental Research* - Since the decision was made to adopt an inductive approach to this research, experimental research was specifically excluded. To further justify this position, it might be argued that although the so called 'theoretically dependent variables' could be the problems observed in the organisation, viz. high staff turnover, quality of work and a net loss on jobs being undertaken, that it would be impossible to identify the so-called 'theoretically independent variables' as these could be caused by many factors both internal and external to the organisation. Indeed the existence of external factors would make it impossible for the researcher to manipulate the situation and observe the change in the dependent variable.
- *Quasi-experiments* - This was also not considered an appropriate research method for the same reasons as discussed above, viz. it is not possible to identify the independent variables, nor control groups and further the approach is still deductive as opposed to inductive.
- *Action Research* - As will be described later in this section, the environment in which this research project took place was not one in which the researcher would have been able to intervene and observe the reaction. Such an approach would not have been condoned.
- *Survey* - The approach to this project was not one of survey and thus this method was obviously inappropriate in this instance.
- *Ethnography* - It was clear that ethnography was the approach to adopt for this research as the author was already a participant in the system, being an employee of the company. Furthermore, this is an inductive approach which tied in with the decision to follow the inductive research approach.

Clearly, as the author was a full time employee of one of the organisations and involved on a part time basis in the network marketing organisation at the time that the topic was selected for the research project, he was fully immersed in both organisations as a participant. In neither case were these organisations entered for the purpose of research. As discussed above, the author selected the ethnographic approach as the most appropriate and adopted the position of participant for the reasons mentioned above.

As to the question of overt or covert observation, the author opted the for covert observation for Ace Engineering and overt observation for Network 21 for the following reasons:

1. As far as Ace Engineering was concerned, it had become increasingly obvious from general conversations and the attitude of management that research of the nature that the author wished to undertake would be seen as nothing other than an academic exercise and would be of no consequence whatsoever. It was also obvious that certain of the directors would take personal offence at any suggestion that they might not be running their business in the most efficient manner.
2. The senior management showed no interest in the personal development of the author or any other employee and felt that these sort of issues were a waste of company time and money and not to be pursued during company time.
3. As far as the Network 21 was concerned, being an international public company, information was freely available. Indeed the organisation has been the subject of a number of research projects. Network 21 thus had no problem with the author carrying out research on the organisation.

As to the ethical issues, being that part of the research was covert, the names used for the organisation of full time employment have been changed to protect their identity. However, the names used in the research pertaining to the network marketing organisation are real for the overall organisation as this information is freely available as mentioned above. The names of specific distributors have been changed for reasons mentioned later.

1.2 Research Plan

As mentioned in the introduction, the author was of the opinion that Ace Engineering was in imminent danger of collapse at the time that the decision was taken to carry out this research project. At that time this opinion was based on experience and 'gut' feel, however there was little point in the author investigating the situation any further as he was not on the management team and therefore not in a position to influence the situation. However, once the decision was made to research the problem, an entirely different stance had to be adopted.

It was the author's opinion that the owners of the company had no experience in running a company, all three of them being from technical backgrounds with no previous experience in management. While they recognised their shortfall in this area, demonstrated by the fact that they employed a Chief Executive Officer and a General Manager to run their business, they constantly interfered with the managers thus not allowing them to carry out the jobs for which they were employed. The formal and informal structure of the company did not appear to be the same. Furthermore it was also the opinion of the author that the company did not fully understand it's strengths and weaknesses and thus attempted to take on work that was not suited to it's abilities. These issues will be fully presented and discussed in the main body of this research.

The first stage of the research plan was to find a tool to investigate these opinions and attempt to find out precisely what was happening in the organisation. As was also mentioned in the introduction, the author was involved with a network marketing company, Network 21, which was apparently enjoying success. This apparent success was also an opinion of the author and had not been formally investigated. Thus the tool that the author sought needed to offer the ability to both investigate these opinions and compare these organisations in order to achieve the objective as stated in the last paragraph of the introduction, viz. *"To study the success elements of the one organisation, the elements of failure in the other, and whether, having identified these elements, it would be possible to implement the success elements into the failing organisation to bring it back on track".*

During the reading of the Master of Science degree, one of the many tools discussed and investigated was the *Viable System Model* as developed by Stafford Beer. This tool was used on a mini-project during the course of study to reveal the informal structure of an organisation and how it differed to the formal structure. This particular project was one of the reasons that ultimately offered an insight that lead to a redesign in that particular organisation. As the author recognised a similar pattern in Ace Engineering, where the formal and informal structures appeared to be different, as will be shown in this research, he felt this to be the most appropriate tool to carry out this research project after having investigated other possible alternatives as discussed below. *'The Heart of Enterprise'* by Stafford Beer is reviewed in Appendix A2. Conversely the author observed that the informal and formal structures of Network 21 were the same, thus offering the ability of comparison between the two organisations.

1.3 Choice of Methodology

In their book *"Creative Problem Solving"*, Robert Flood and Michael Jackson discuss the difficulty facing managers and management scientists seeking to use systems thinking and systems approaches when facing major organisational issues. They list the following systems approaches (pg 31):

- operational research
- systems analysis
- systems engineering
- system dynamics
- viable system diagnosis
- general system theory
- socio-technical systems thinking
- contingency theory
- social systems design
- strategic assumption surfacing and testing
- interactive planning
- soft systems methodology
- critical systems heuristics

They state that each approach has been tried and tested and works well in some circumstances. How then is the most suitable approach chosen?

In order to select an appropriate approach they group problem contexts according to two dimensions (pg 33):

- systems
- participants

Systems refers to the relative complexity in terms of the "system" or "systems" that make up the problem situation, while participants refers to the relationship between the individuals that stand to gain or lose from a systems intervention.

Considering systems they group these into "simple" and "complex" systems (pg 33) while participants are classified into "unitary", "pluralist" and "coercive" (pg 34). A table is then formulated with the participant categories forming the columns and the systems group forming the rows. This results in six categories, viz. (pg 35):

- simple - unitary
- complex - unitary
- simple - pluralist
- complex - pluralist
- simple - coercive
- complex - coercive

The various systems approaches mentioned above are then fitted into the relevant category and presented in a table format (pg 42). They refer to this as a *"System of systems methodologies"*. They further use the same table format to summarise their arguments presented in the earlier part of their book as to the relationship of dominant metaphors to methodologies (figure 2.3 pg 42). The metaphors are used as filters to look at problem situations and are:

- machine metaphor
- organic metaphor
- neurocybernetic metaphor
- cultural metaphor
- political metaphor.

Flood and Jackson then use Total Systems Intervention (TSI) (pg 45) to select an appropriate systems-based intervention methodology, or set of methodologies, by using the most appropriate metaphors and their link to the "system of systems methodologies" as discussed above. They hasten to point out that while there may be a dominant metaphor that leads to a particular methodology, there may be other metaphors which should also be pursued.

Firstly, considering Ace Engineering, the dominant metaphors were:

- organism (organic metaphor)
- team (political metaphor - unitary)

and a less dominant metaphor was:

- coalition (political metaphor - pluralist).

The "organism" metaphor or "open system" view (Creative Problem Solving Pg 9), suggests that this approach is suitable when there is an open relationship with a changing environment and when the environment is complex, containing a variety of competitors.

The "team" metaphor or "unitary political" system (Creative Problem Solving Pg 12), suggests this approach where there are common objectives with rare incidences of conflict and power being exercised by leadership.

The "coalition" metaphor or "pluralist political" system view (Creative Problem Solving Pg 12), on the other hand suggests this approach where there are diverging group interests with inherent conflict.

All three of the above situations apply to Ace as will be shown in the main body of the research. Table 3.1 on page 53 thus indicates Viable System Diagnosis as the tool to use. The table also suggests that Soft Systems Methodology could be an approach to address the more pluralistic part of the organisation.

Turning to Network 21 the dominant metaphors were:

- organism (organic metaphor)
- brain (neurocybernetic metaphor)
- team (political metaphor - unitary)
- culture (culture metaphor)

The "brain" metaphor or "learning system" view (Creative Problem Solving Pg 10), suggests that this approach is suitable when there is an emphasis on learning.

The "culture" metaphor (Creative Problem Solving Pg 11), suggests the suitability of this approach when the typical features of culture such as shared language, religion and history, and a general sense of belonging, are evident.

Once again it will be shown in the main body of the research that these metaphors represent the situation in Network 21, thus indicating Viable System Diagnosis as the tool to use, with Interactive Planning and Soft Systems Methodology also being indicated to a lesser degree.

Raul Espejo and Roger Harnden in their book *"The Viable System Model, Interpretations and Applications of Stafford Beer's VSM"*, present a number of papers by different authors on various aspects of the VSM. Part two of the book presents a number of papers where the VSM is applied to organisations. The particular papers discuss similar problems to those perceived by the author to be present in Ace Engineering thus lending weight to the decision to use this model as well as offering guidance in the use of the tool.

In part four of their book Espejo and Harnden present two papers offering a critique of the VSM, one of which is written by Michael C. Jackson. Flood and Jackson in their book Creative Problem Solving also critique the VSM. One of the main criticisms of the VSM is that *it "neglects qualities brought by the human actors who make up organisations"* (Creative Problem Solving, pg 110). In this research project the author has borne this criticism in mind and acknowledges this issue in the conclusions.

1.4 Phases of Research Project

Section 2 of this project is a description of the network marketing organisation, Network 21, followed by a Viable System Diagnosis on the organisation based on Stafford Beer's Viable System Model. Some of the key success elements of Network 21 are then identified and discussed.

Section 3 follows the same pattern as section 2 with the description and diagnosis being carried out on Ace Engineering. This is followed by a redesign of Ace Engineering using the insights gained in sections 2 and 3.

In the final section the conclusions of the research are presented.

2. Network 21

2.1 Description of Network 21

Network 21 is a network marketing organisation, network marketing being a method of moving products and services to consumers. The concept of network marketing has been taught and practised for many years. Rather than attempt to explain the concept of network marketing in general, this section will focus on Network 21 in particular.

Network 21 is a training and support organisation established to assist persons wishing to market products from the Amway Corporation for the purpose of earning either a primary or secondary income. The Amway Corporation will be discussed later in this section.

The organisation offers individuals the opportunity to start their own business without having to know how to run a business or the necessity to lay out capital. The operation of the business is explained in Appendix B.

Although the description of Network 21 as shown in Appendix B is not mathematically precise and assumes that at the time your frontlines breakaway you have other frontlines in place to be able to maintain the benefit of the 21 % rebate, the example demonstrates the power of this network marketing system. The description of the business as explained in Appendix B is referred to as the "Business and Marketing Plan".

There are six steps that need to be carried out by an individual in order to become a successful networker and these are as follows:

1. *Dreams / Goals* - individuals must set goals for their business and for what they wish to achieve by joining the business. They must have a clear picture of where they want to be and how they are going to get there.
2. *List of names* - a list must be compiled of every person that the individual knows, family, friends, business associates, etc.

3. *Invite* - all persons on the list need to be invited to join the business as everyone is a potential networker.
4. *Plan* - show the "Business and Marketing Plan" to all the above people.
5. *100 % user* - in order to be credible it is essential that all members of the organisation are themselves using the products they are attempting to market.
6. *Tapes / books / meetings* - Network 21 runs an educational programme consisting of tapes, books and business meetings to educate the members to help them, not only build a successful business, but also in all aspects of life.

The first contact an individual would have with Network 21 is when they are shown the "Business and Marketing Plan" by their potential sponsor. Once they have seen the plan, they will give one of three responses, referred to as A, B or C:

- *C category* are those that say no to the business. From this category comes the retail customers for the business. The organisation offers to supply them products as well as a personal service not obtainable in a conventional retail store.
- *B category* are those that do not wish to actively run a networking business but want to have access to the products at wholesale prices.
- *A category* are those that wish to run a networking business and are prepared to actively become involved in building the business.

It would be pertinent at this point to introduce the supply company from which Network 21 obtains the products and services which it markets to consumers. The supply company is the Amway Corporation. It is one of the largest direct selling organisations in the world. It was founded in Ada, Michigan, USA in 1959 and since then world-wide retail sales had grown to more than US$ 6.3 billion per annum by 1996. At that time the retail sales in New Zealand were $ 75 million per annum. There are more than one million distributors world-wide and the Corporation has more than 7000 employees. Today products are sold on a person-to-person basis throughout 30 countries of the world.

The continuing success and growth of Amway world-wide is due to the consistent top quality of the product range. All sales are backed by a 100 % money-back guarantee

of customer satisfaction. Continuing research and development is designed to ensure superior quality products.

On June 5, 1989, Amway was the recipient of the United Nations Environmental Achievement Award. Only the second corporation to ever be so honoured, Amway received this prestigious award for its commitment to environmental concerns around the world. A pioneer in introducing biodegradable cleaning products thirty years ago, Amway realised the importance of preserving the planet and continues to be at the forefront in this arena.

There are a number of organisations world-wide that market Amway products, Network 21 being only one of them. However, Network 21 is responsible for 25 % of Amway's turnover world-wide. The organisation is growing at a rate of 30 % per annum world-wide and the growth rate in New Zealand is no different.

The organisational structure of Network 21 is as shown in figure 1 on page 14. The organisation was started is the USA by a couple by the name of Jim and Nancy Dornan. Today they are Crown Direct Distributors, i.e. they have 18 groups that have broken away by achieving Direct Distributor Status.

Note: The names of the distributors mentioned from this point onwards in the research have been changed as the author did not specifically seek the approval of these particular individuals to mention their names is this research project.

One of these groups is headed up by a couple by the name of Rod and Mary of Australia. Today this couple are Executive Diamond Direct Distributors, i.e. they have 9 groups that have achieved Direct Distributor Status.

One of the 9 groups sponsored by the above couple is the Pete and Carol group of New Zealand. Today this couple are Diamond Direct Distributors, i.e. they have 6 groups that have achieved Direct Distributor Status.

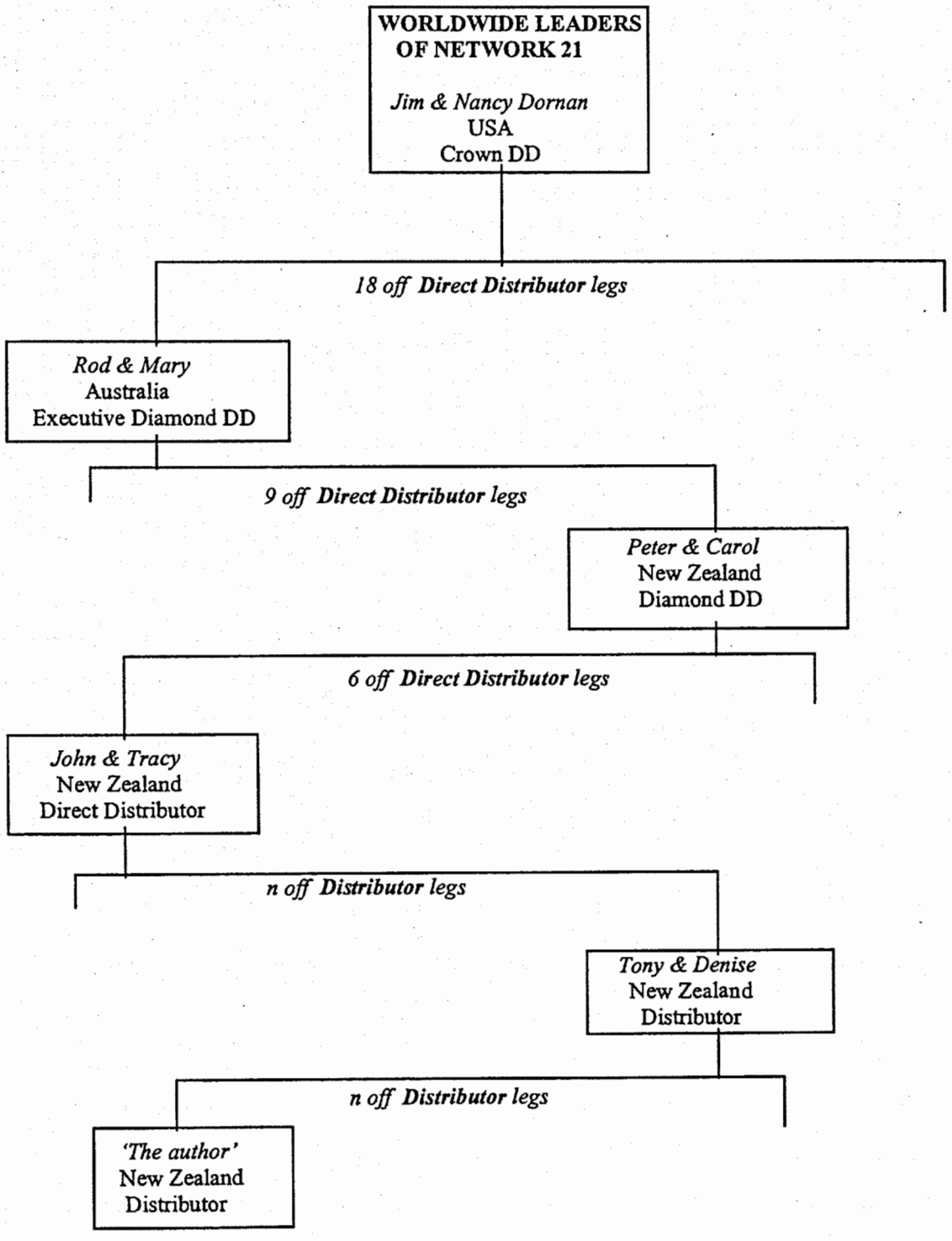

WORLDWIDE LEADERS OF NETWORK 21
Jim & Nancy Dornan
USA
Crown DD
18 off Direct Distributor legs
Rod & Mary
Australia
Executive Diamond DD
9 off Direct Distributor legs
Peter & Carol
New Zealand
Diamond DD
6 off Direct Distributor legs
John & Tracy
New Zealand
Direct Distributor
n off Distributor legs
Tony & Denise
New Zealand
Distributor
n off Distributor legs
'The author'
New Zealand
Distributor

Figure 1

One of the 6 groups mentioned above is the John and Tracy group, also of New Zealand. Today they are Direct Distributors, i.e. they are authorised to access the Amway warehouse directly.

As can be seen from figure 1, the author is one of the Distributors belonging to this group and is two levels down from the abovementioned couple.

2.2 Viable System Diagnosis on Network 21

In order to use the Viable System Model (VSM) it is necessary to initially determine the purpose to be pursued and then taking the purpose as given, to determine the relevant system for achieving the purpose. This is called the "system in focus".

"The facts about the system are in the eyes of the beholder. It means that both the nature and the purpose of a system are recognised by an observer within his perception of WHAT THE SYSTEM DOES". (Heart pg 9) In Network 21, "what the system does" is to sell products and to help people build a business. As this is done by the group, i.e. a Direct Distributor together with their group of Distributors, the group is the "system in focus".

The particular group that will be studied in this project is the John and Tracy group as this is the group to which the author belongs.

As one of the principles of viable system diagnosis is the notion of "recursion", we will start by looking at the whole Network 21 organisation world-wide, recursion level 0, in which the "system in focus" is embedded at recursion level 2, Network 21 being at recursion level 1. The various recursion levels are shown in figure 2 on page 11.

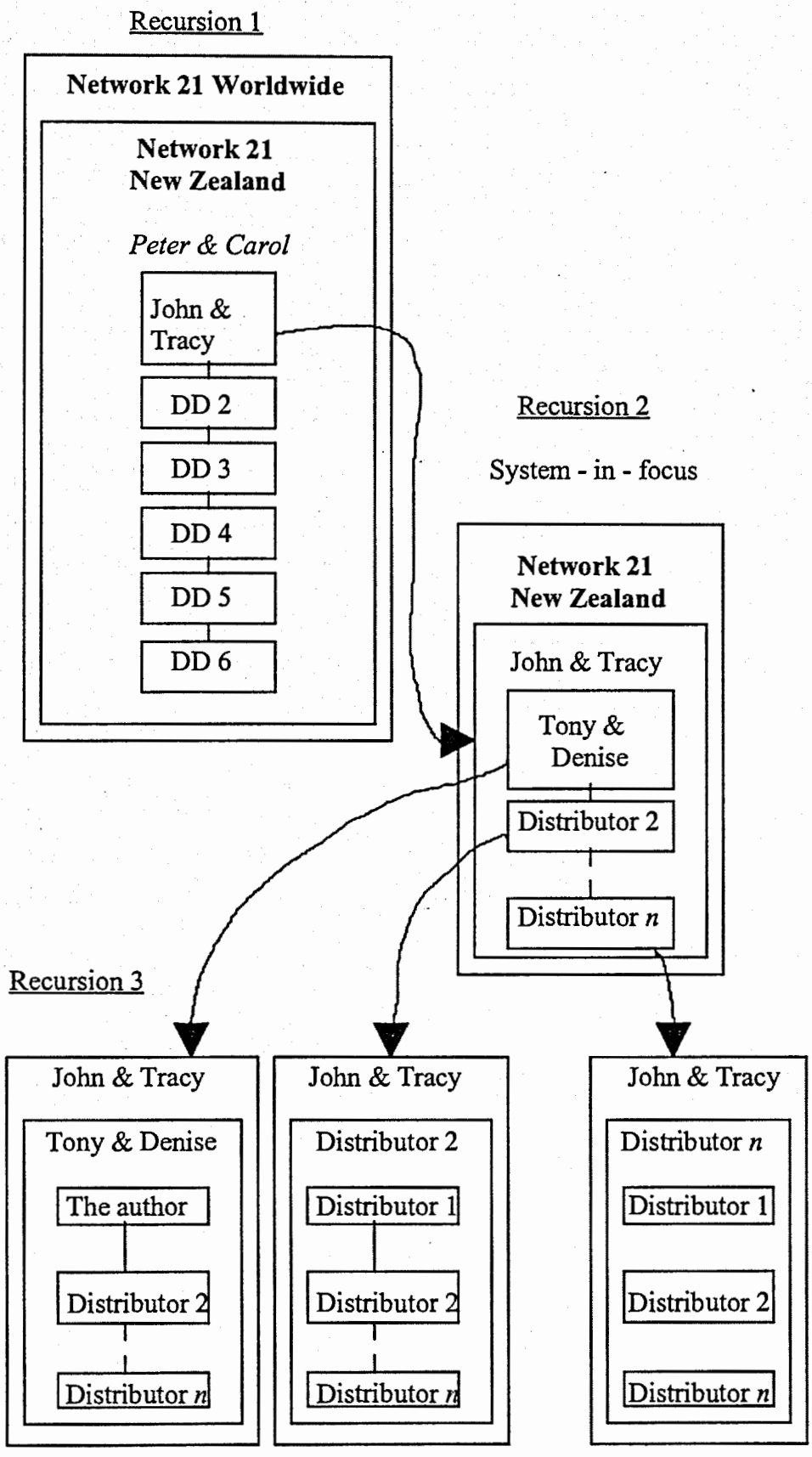

Recursion 1
Network 21 Worldwide
Network 21
New Zealand
Peter & Carol
John & Tracy
DD 2
DD 3
DD 4
DD 5
DD 6
Recursion 2
System - in - focus
Network 21
New Zealand
John & Tracy
Tony & Denise
Distributor 2
Distributor n
Recursion 3
John & Tracy
Tony & Denise
The author
Distributor 2
Distributor n
John & Tracy
Distributor 2
Distributor 1
Distributor 2
Distributor n
John & Tracy
Distributor n
Distributor 1
Distributor 2
Distributor n

Figure 2

As the objective is to test whether a group is a viable system as defined by the VSM, it will be assumed that this is the case and this assumption will be tested against the model. In order to do this each of the 5 systems of the 'System-in-focus' will be studied in turn.

2.2.1 System 1

The environment in which the 'System-in-focus' operates is the global retail and consumer market in which the Amway Corporation has a presence. Although the John and Tracy Group (J&T Group) is physically located in New Zealand, it is quite possible to recruit members from other countries, e.g. friends living overseas who once introduced to the business are supported by the most appropriate Network 21 distributorship in that country. Predominantly however the environment is within New Zealand and focused in the city in which the particular distributor is resident. Clearly there will be an overlap in the environment for those distributors operating in the same city as it is inevitable that at some point they could be in contact with the same people.

Thus the environment is one in which the distributors must compete with similar products from other manufacturers as well as potential competition from fellow distributors.

The operations of the group are responsible for the following:

- To 'prospect', i.e. approach potential people in order to be invited to show the plan.
- To introduce the business to people, i.e. show the "Business and Marketing Plan".
- To get prospective distributors to business meetings and seminars.
- To sign up new distributors.
- To look after any distributors signed up by the particular group.
- To service retail customers.

The management of the 'system-in-focus', i.e. John and Tracy, are responsible for the distributors in their group and for the following:

- Receiving and filling all product orders from their distributors.
- Organising group meetings for training on products.
- Organising training on prospecting and presentation of the "Business and Marketing Plan".
- Informing the group of seminars and assisting them to attend.
- Keeping the group informed about Network 21 and Amway, updates in policy, new products and ensuring that the group operates in accordance with company policy.

As Senior Management, John and Tracy, do not have the requisite variety to be involved in every detail of the day to day operation of the group, variety balancers need to be designed. Network 21, as in any company, has it's set of policies and rules and regulations and in joining Network 21 a distributor signs legal documents that they will operate in accordance with these. Network 21 and all it's distributors are also obliged to operate within the law of the particular country in which they operate, e.g. tax regulations, company law, etc. These constraints are passed down from Senior Management to the System One management who pass them onto the local operations. This is classified by Beer as the Corporate Intervention and these channels are denoted by I in figure 3 on page 17.

Clearly then the parameters within which the group may operate need to be defined and agreed upon. In essence these parameters are:

- Freedom to recruit distributors whenever they wish, wherever they wish and whomsoever they wish.
- Freedom to meet with their team wherever and whenever they wish.

Similarly this resource bargain is passed on to other distributors.

How then is the J&T group accountable to Network 21 NZ, and similarly the group distributors to John and Tracy? Network 21 does not operate in the same manner as a traditional business in that the distributors are not paid employees. There is thus no compulsion to recruit new distributors. The success of each distributor is dependent upon the effort they put into the business. The greater the effort and commitment by a

distributor, the greater will be the assistance from their upline. The level of commitment and accountability is shown in a number of ways, i.e.:

- Number of distributors recruited.
- Updated list of potential prospects.
- Results from meeting with prospects.
- Involving the upline in meetings and prospecting.
- Helping with the growth of the group by helping at training and seminars.
- Introducing new distributors to the upline distributors.

In this way guidance and assistance can be given to help develop the particular distributors business, which ultimately benefits the whole group. These resource bargain channels are denoted by II in figure 3 on page 17.

The management of System One, Tony and Denise and the other distributors, must conduct the operations of the group according to the above parameters that have been agreed with Network 21 NZ.

"Then the transmission of plans, programmes and procedures to the operational circle (the various distributors) should be regarded as an act of regulation.

This regulation amplifies managerial variety and also attenuates operational variety. Thus the regulatory centre is the focus of homeostasis between management and operations." (Diagnosing the System pg 41)

The regulatory actions that are in place between Tony and Denise and their distributors are as follows:

- Schedule of dates for seminars, training and meetings.
- Fixed schedule for ordering and collection of products.
- Prescribed method of recruiting.
- Prescribed Business and Marketing Plan.
- Prescribed method of marketing the products.

The distributors in turn need to deal with the environment in which they are marketing both the business and the products. The prescribed methods of recruiting, presenting

the business plan and marketing the products offer requisite variety in principle, but they must be amplified towards the market. This is done by face to face meetings with potential distributors and customers, by one on one demonstrations, business meetings and seminars.

In turn the variety of the environment is attenuated by the customers and potential distributors behaviour and reactions such as:

- Purchasing patterns.
- Preconceived notions about the products and the company.
- Product usage patterns.

Thus is *'The First Principle of Organisation'* (Heart pg 97) obeyed.

Now considering *'The Second Principle of Organisation'* (Heart pg 99), the information is transmitted from John and Tracy to the distributors (amplifiers) by:

- published schedules
- meetings
- seminars
- books and tapes
- product training
- Amway's monthly magazine, 'Amagram'

and from the distributors to John and Tracy (attenuators) by:

- lists of potential prospects
- results of meetings with potential prospects
- performance of downline distributors

Similarly, information is transmitted to the environment by the distributors in much the same way as variety is handled, i.e. by face to face meetings with potential distributors and customers, by one on one demonstrations, business meetings, seminars and the monthly Amagram magazine. The responses from the market to the distributors are by the orders placed, complaints received, responses to the business plan and attendance at meetings and seminars.

The *'Third Principle of Organisation'* (Heart pg 101) suggests that these communication channels must be capable of at least handling the information that is being transmitted.

As Network 21 conducts it's business by face to face meetings, all communications are primarily by person to person contact. The members are thus in a position to ensure that information is being correctly passed on and understood. This information is reinforced by seminars, group meetings, tapes, books and literature such as the Amagram.

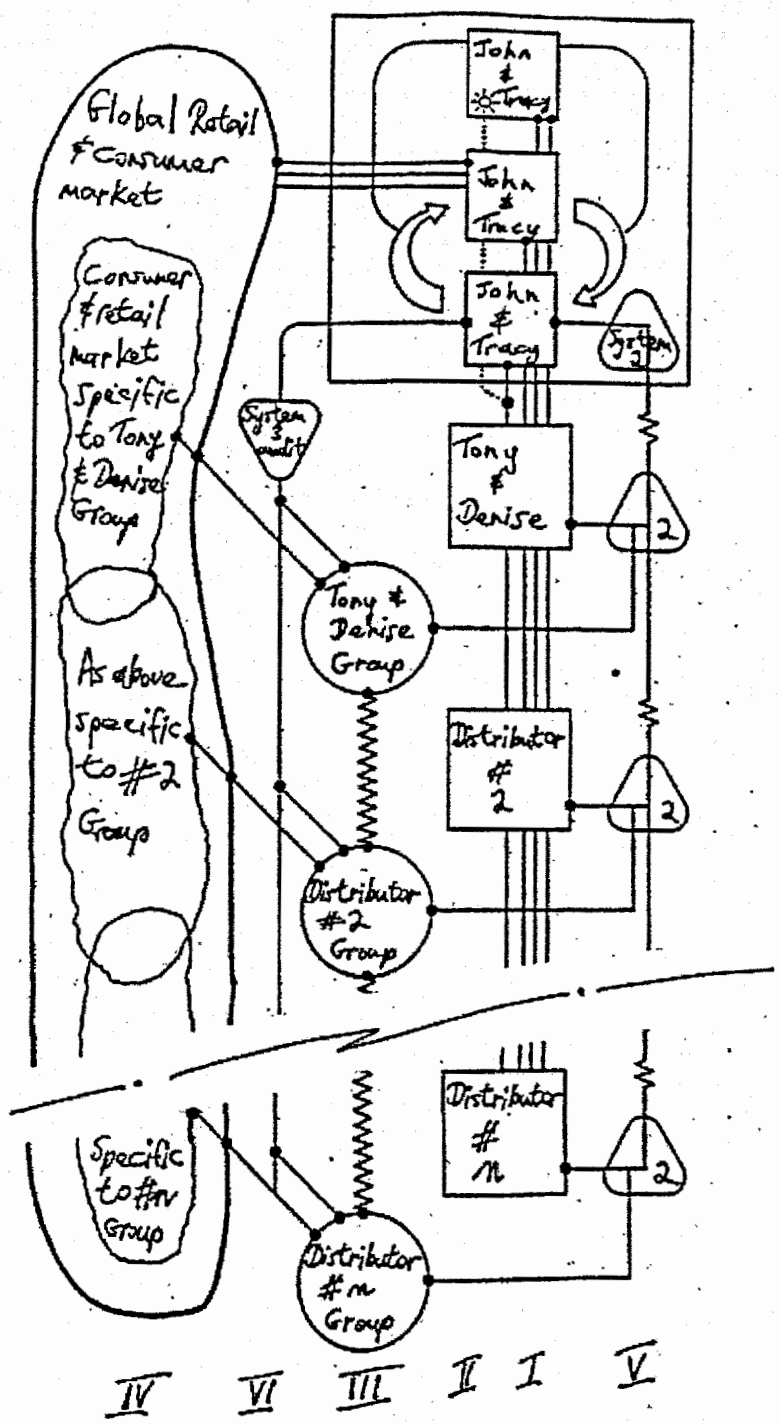
The Three Principles of Organisation do not in themselves acknowledge that the processes discussed above are dynamic.

"Here is a group of variety generators in continuous production of systemic states, so organised as to absorb each other's proliferation of variety. Then part of this organisation must have to do with the dynamo itself". (Diagnosing the System pg 55)

Thus Beer states *'The Fourth Principle of Organisation'*. (Heart pg 258)

Communications within the J&T Group are continually taking place. There are monthly seminars, the monthly book and tape program, weekly collections of products for distribution and telephone conversations as appropriate. There is generally a high level of contact between members of the Group.

Thus is derived the full account of System One of the System-in-focus as shown in figure 3 on page 22. It must be noted that all the distributors of the J&T Group are of equal importance to the group and are a replication of each other.



DIAGNOSTIC CHART OF SYSTEM IN FOCUS:
RECURSION NO: 2
NAME: John & Tracy Group
© S. Beer 1985

Figure 3

2.2.2 System 2

In considering System Two of the System-in-focus it is necessary to list all the possible sources of oscillation or conflict between the various parts of System One and conversely to identify those elements that have a damping or harmonising effect.

Possible sources of oscillation for the J&T Group are as follows:

- Incorrectly or badly presented Business and Marketing Plan.
- Insufficient of incorrect product knowledge.
- Attempts to 'poach' prospects from other distributors.
- Distributors not being fully conversant with the business.
- Where John and Tracy do not apply equal effort to their distributors, i.e. are seen not to be fair
- Where distributors do not adhere to company policies or national regulations.

Conversely damping or harmonising actions are effected by:

- Training seminars, business plan presentation meetings, being accompanied by upline when presenting plans.
- Product training, product literature.
- Training on policies and regulations.
- Established schedule for training, seminars and meetings.
- Fully prescribed methods of conducting the business.
- Education programme - tapes and books.

In order to prevent the abovementioned oscillations from going out of control, Network 21 New Zealand has in place regulatory actions which use the harmonising elements mentioned above. These are enacted in the form of policies and prescribed methods of operation as listed and shown in figure 4 on page 26:

- Prescribed Business and Marketing Plan. The business operates strictly in accordance with the plan. This includes the way in which the plan is used to prospect, to market products, to receive payment and the payment of rebates.
- A strong and strict code of ethics.
- Training schedules.

- Education programme.

These regulatory actions bring together all the distributors in the J&T Group. They also give all the distributors the opportunity to build relationships and learn from each other.

2.2.3 System 3

System Three surveys the total activity of the operational elements of the enterprise. *"It is aware of all that is going on inside the firm, now. This is because it has direct links with all the managerial units, which exist simultaneously in real time. It is also aware of the anti-oscillatory activity of System Two, since System Two is it's own subsystem"*. (Heart pg 202)

System Three sets out to integrate the operational elements with the intention of minimal metasystemic intervention. In order to achieve this and still obey Ashby's Law, the audit channel is used, leading to The First Axiom of Management.

The First Axiom of Management states (Heart pg 217):

> *"The sum of horizontal variety disposed of by n operational elements = the sum of vertical variety disposed on the six vertical components of corporate cohesion"*.

The first five of these six have been discussed above and are shown on figure 3 on page 22, viz.:

I. the Corporate Intervention
II. the Resource Bargain
III. operational linkages
IV. environmental intersects
V. System Two, anti-oscillation

The sixth component is the Audit and as Beer argues in Heart, this is accepted management practice and is capable of absorbing enormous variety.

The audits carried out by John and Tracy on their Group are shown in figure 4 on page 26 and are as follows:

- Tracking the number of new distributors being signed up.
- Accompanying the distributors to Business Plans presentations.
- Direct contact with potential prospects and customers.
- Looking at the sales trends of the distributors.
- Looking at the number of plans being presented, i.e. the level of prospecting.
- Monitoring the attendance at seminars and meetings.

As mentioned previously, there is no compulsion for a particular distributor to achieve a set goal or level. The audit however indicates to John and Tracy the level of commitment of any particular distributor. John and Tracy are thus able to determine the reciprocal level of commitment they should dedicate to the particular distributor.

It is important that both John and Tracy and the their distributors view the First Axiom as being applied in the same manner if the System-in-focus is to be viable. Both the parameters within which the distributors may operate and their accountability were discussed in Section 2.2.1 under System One. The distributors, as mentioned earlier, are under no obligation as to the number of people they attempt to recruit. Their success in the business is directly related to the effort they apply to recruiting. The relationship is not autocratic and is not seen to be so by the distributors.

Furthermore the purpose of Network 21 is clear to all, viz. to market the products of the Amway Corporation by recruiting distributors and by signing up customers. This theme is absolutely consistent right from the top of the organisation right down to the newly recruited distributor.

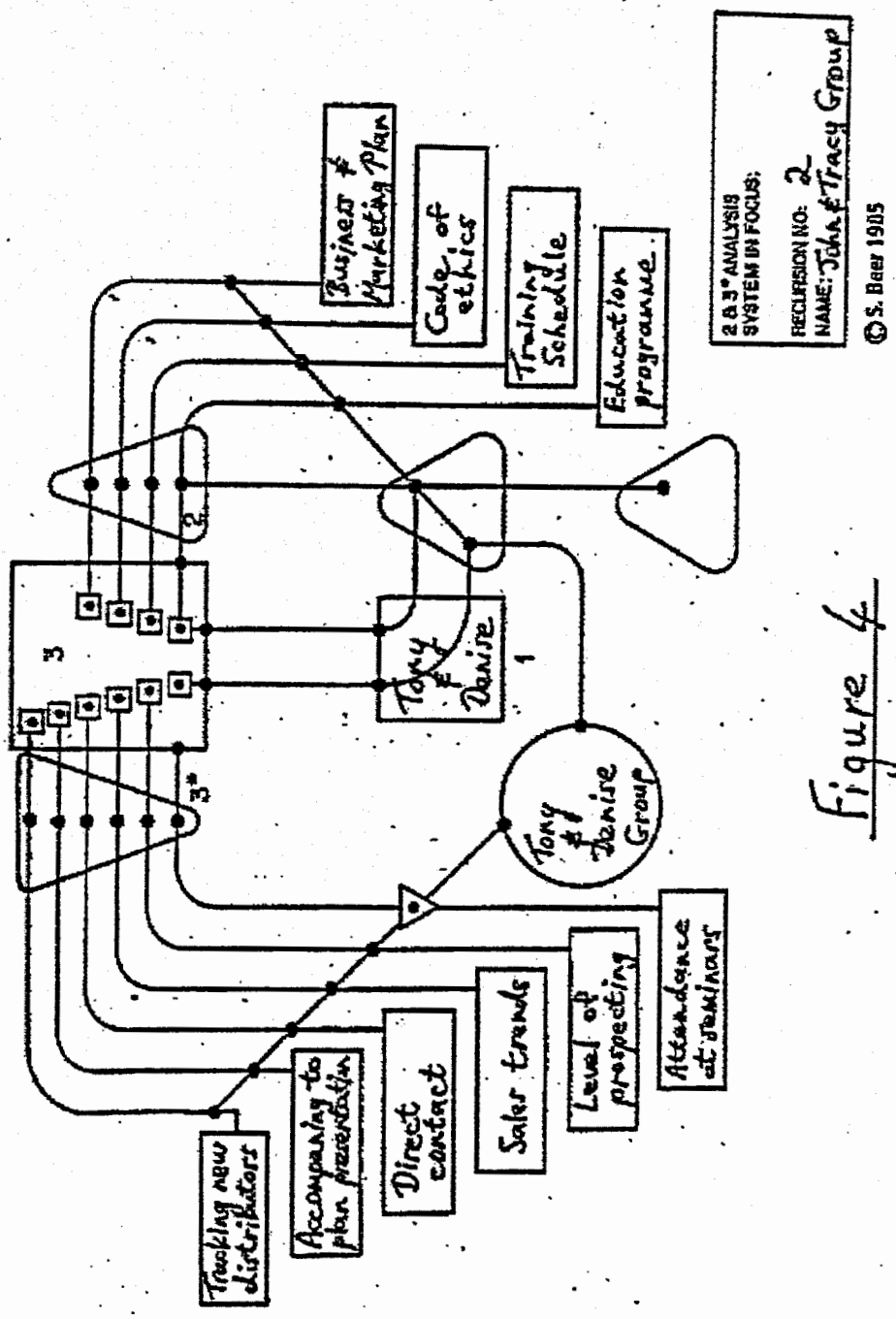

Business & Marketing Plan
Code of ethics
Training Schedule
Education programme
2 & 3* ANALYSIS SYSTEM IN FOCUS:
RECURSION NO: 2
NAME: John & Tracy Group
© S. Beer 1985
3
2
3*
1
Tony & Janine
Tony & Janine Group
Trawling new distributors
Accompanying to plan presentation
Direct contact
Sales trends
Level of prospecting
Attendance at seminars

Figure 4

2.2.4 System 4

System Four has to deal with the larger environment called Outside and Then. Firstly the *accepted* environment of the System-in-focus, the J&T Group, i.e. the wider environment in which it is contained, the global retail and consumer market, and secondly the *problematic* environment of the System-in-focus, i.e. the wider environment that belongs to it, i.e. environmental problems specific to the J&T Group such as the perception that Network 21 is a pyramid selling scheme (which is illegal in NZ) and the growth of other distributor networks covering the same area.

The activities of the System-in-focus that are concerned with the future are:

- Education of distributors.
- Development of the product range.
- Training.
- Ways of attracting new distributors.

In pursuing these activities, John and Tracy ensure that the training they deliver to their distributors is relevant to the product range available from Amway and the market in general. They equip their distributors with sufficient information that they can compete in the market against equivalent products. Their recommendations for product development are based on products they discover in the market supplied by other companies and requests and comments from customers and feedback from their distributors.

In general the above activities are pursued in conjunction with each other with the common aim of growing the business. As the business is generally carried out on a face to face basis via meetings, seminars, training sessions, etc., their is ample opportunity for the Group to participate in these activities to the mutual benefit of all the individuals in the Group.

Thus the organisation adheres to The Second Axiom of Management (Heart pg 298).

2.2.5 System 5

As discussed above System Four is about the future and this function is fulfilled by John and Tracy. System Three is about the everyday running and organising of the distributors. Both of these functions are carried out by John and Tracy as they are the metasystem of the System-in-focus. Neither of these functions can be carried out in isolation from the other and must take into consideration each other's requirements. Network 21 NZ cannot introduce a new product into the New Zealand market that the distributors cannot sell due to for example, not having local certification or not meeting local cultural requirements. Similarly the distributors cannot make promises to customers of products or services that have not been agreed upon by Network 21 New Zealand. This potential oscillation between these two roles must be controlled by System Five, which in the case of the System-in-focus, is once again John and Tracy. The fact that all three of these roles are carried out by the same two people ensures that the rules and principles of the VSM are abided by.

The full account of the System-in-focus is shown in figure 3 on page 22.

2.3 Identification of Key Success Elements of Network 21

As demonstrated in the Viable System Diagnosis carried out on the System-in-focus in Section 2.2 above, the J&T Group conforms to Stafford Beer's Viable System Model. It is known that the Amway Corporation and Network 21 are growing organisations. Whether these organisations were set up using the VSM as a guide, or whether, due to the nature of successful organisations, they would automatically conform to the VSM is beyond the scope of this research. Suffice to say that the above diagnosis has shown the VSM to be a useful tool which could logically be used as at least one approach to examining an organisation.

The above diagnosis did not attempt to examine some of the key elements of the System-in-focus or indeed the Amway Corporation and Network 21.

John Naisbitt and Patricia Aburdene, in their book 'Megatrends 2000', declare:

> *"The great unifying theme at the conclusion of the 20th century is the triumph of the individual. Threatened by Totalitarianism for much of the century, individuals are meeting the millennium more powerfully than ever before".* (Megatrends pg 322)

They suggest that this new era of the individual is happening simultaneously with the new era of globalisation and that this new era signals the demise of the collective. The power of the individual is further extended by new technologies such as fax machines and the Internet. With the rise of the consumer has also come the primacy of the consumer. The customer is now king. This does not mean that the individual is condemned to face the world alone. Individuals seek community, the free association of individuals. Individual differences, especially those reflecting contributions to enterprise, must be noted and rewarded.

Network 21 has recognised the era of the individual and the era of globalisation and has structured it's organisation to note and reward the individual and to market it's products globally, wherever they are manufactured.

The reward of the individual takes two forms, one being the recognition of their achievement by being asked to address business seminars around the world, recognition in the Amagram magazine, free holidays, essentially rewarding the ego, thanking them for the part they have played in the success of the organisation. Secondly, a monetary reward. The organisation is so structured that there exists the potential to make a large amount of money. The amount of money that can be made is directly related to the effort of the individual. The harder they work, the more money they will make. The efforts, or lack thereof, of other individuals within the organisation will not affect the ability of a particular individual to be successful. In essence the system is such that the individual is totally responsible for their own success or failure. They cannot blame the company, the manager or their supervisor if they do not succeed, only themselves.

The Amway Corporation and Network 21 have recognised the fact that the world has become a global village. It is one big business and the fact that some parts are in different countries makes no difference to the way the business operates or to the products sold. Many of the products are made in the USA, equally if it is more economical the products are manufactured elsewhere for world-wide distribution.

The success of the business hinges on the motivation and education of the persons in the organisation. Enormous effort is thus dedicated to this area. The education not only focuses on the organisation and the products, but also on self development, leadership, people skills and generally in areas that are of benefit in all walks of life. The programme is designed to grow the individual and takes the form of business seminars, meetings, a tape programme and a book programme. Similarly the motivation comes from seminars, motivational tapes and the involvement with the organisation. All of these focus on the positive, and never does the organisation practice negative criticism. The result is motivated, happy and excited people.

The real strength is evident in the synergy of the team effort. The moment an individual works hard the other members of the group help. Not only does this mean that the individuals become more motivated, but also when the upline members of the group make an effort, they are also rewarded as all business of their members is also business of their group, hence they too benefit. The net result is a win - win situation.

In his book 'Network of Champions', Dr. Shad Helmstetter contends that after studying many businesses he has identified nine key virtues of successful Amway distributors. To a lesser or greater extent he has found some of these virtues present in other businesses, but never all nine. By virtues he does not mean lofty qualities beyond the reach of the average person. He is referring to the kinds of qualities that he contends should have been guiding our lives and businesses all along.

Nine "Key Virtues to build Your business". (Network of Champions pg 20)

*Key Virtue #1: **Vision***

How far can you go? *How far can you see?* You can only go as far as you can imagine yourself going. If your imagination stops at some advancement level a few steps above where you are now - that's exactly how far you will go. If, on the other hand, your imagination knows no boundaries, neither will your future.

*Key Virtue #2: **Positive use of your time***

Through the proper use of time management tools and training it is possible to find the time to succeed.

*Key Virtue #3: **Commitment***

If you don't commit you can't succeed. It is necessary for the individual to make a psychological agreement with themselves that says "I choose to commit".

*Key Virtue #4: **Belief***

Similarly to the virtue of commitment, a person must believe in themselves, in their ability. It is necessary to take a leap of faith.

*Key Virtue #5: **Self-acceptance***

This is about accepting yourself as you are. You do not have the wrong personality, the wrong past, the wrong education, the wrong background or the wrong family. Accept yourself as you are.

Key Virtue #6: ***Taking responsibility for yourself***

Your future and what you do with it is up to you. No one has the right to stand in your way. It is up to the individual not to give in to the negative beliefs of others.

Key Virtue #7: ***Caring about others***

This is about a genuine willingness to help others succeed, to find the wants, and the dreams, and the fears, and the hopes of the people with whom you associate.

Key Virtue #8: ***Spiritual values***

In order to inspire people, an individual needs spirit within. The word "inspire" means to *put spirit within.* If the individual does not have spirit within them, how can they inspire others?

Key Virtue #9: ***Positive reprogramming***

Having the wrong mental programming is the greatest reason of all why people fail - at *anything.*

"If you build those nine principal virtues into your business, and into your life, you will greatly increase your chances for success". (Network of Champions pg 39)

"The organisations that will truly excel in the future will be the organisations that discover how to tap people's commitment and capacity to learn at all levels in an organisation". (The Fifth Discipline pg 4)

In his book "The Fifth Discipline - The Art and Practice of The Learning Organisation", Peter Senge contends that five new "component technologies" are gradually converging to innovate learning organisations:

- **Systems Thinking.**

  Events in nature, human endeavours and business endeavours are distant in time and space, and yet they are all connected within the same pattern. The system can only be understood by contemplating the whole, not any individual part of the pattern.

  Systems thinking is a conceptual framework that has been developed to make the full patterns clearer and to help us see how to change them effectively.

- **Personal Mastery.**

  Personal mastery in this context means a special level of proficiency. People with high levels of personal mastery are able to consistently realise the results that matter most to them and this is done by becoming committed to their own lifelong learning.

  This is the discipline of continually clarifying and deepening our personal vision, of developing patience and of seeing reality objectively. It is an essential cornerstone of the learning organisation and thus the commitment to and capacity for learning in an organisation can be no greater than that of its members.

- **Mental Models**

  " 'Mental models' are deeply ingrained assumptions, generalisations, or even pictures or images that influence how we understand the world and how we take action". (The Fifth Discipline pg 8) This applies equally to our personal lives and our business lives. *"Many insights into new markets or outmoded organisational practices fail to get put into practice because they conflict with powerful, tacit mental models".* (The Fifth Discipline pg 8)

The discipline of working with mental models starts with turning the mirror inward; learning to unearth our internal pictures or the world, to bring them to the surface and hold them rigorously to scrutiny. This includes people exposing their own thinking effectively to make that thinking open to the influence of others.

- **Building Shared Vision**

The inspiration of organisations over the years has been the capacity to hold a shared picture of the future they seek to create. When there is genuine vision, people excel and learn, not because they are told to, but because they want to.

The practice of shared vision involves the skills of unearthing shared "pictures of the future" that foster genuine commitment and enrolment rather than compliance.

- **Team Learning**

The discipline of team learning starts with "dialogue," the capacity of members of a team to suspend assumptions and enter into a genuine "thinking together." The discipline of dialogue also involves learning how to recognise the patterns of interaction in teams that undermine learning. The patterns of defensiveness are often deeply ingrained in how a team operates. If unrecognised, they undermine learning. If recognised and surfaced creatively, they can actually accelerate learning.

Team learning is vital because teams, not individuals, are the fundamental learning unit in modern organisations. When teams are truly learning, not only are they producing extraordinary results but the individual members are growing more rapidly than could have occurred otherwise.

Turning to Network 21 it can be seen how these five "component technologies" are present in the organisation.

The whole manner in which the organisation is driven is such that all members are constantly being informed how the whole system works and what the effects are of the various decisions. The running of the organisation is totally exposed for all members to see and the consequences of one's actions are constantly being reinforced. The whole approach is one of systems thinking.

In terms of personal mastery, the constant motivation and comprehensive educational programme is specifically geared to improve personal mastery as the organisation has recognised that to succeed the members must grow.

The area of mental models is dealt with at meetings, seminars and via the education programme. The business constantly exposes its members to each other thereby bringing to the fore the great diversity of people in the business, their particular attitudes and outlook on life. The rich mix of characters and the fact that all can succeed helps to make everyone aware that it is not possible to categorise those that will succeed and those that won't. In essence one's mental model of the business and the type of person who can succeed is exposed and modified.

Clearly the whole way in which the business is run is about shared vision and team learning.

There is clearly a common thread between these issues in the learning organisation and the System-in-focus, Network 21 and the Amway Corporation. There is also clearly a parallel with Beer's Heart of Enterprise where he specifically designs the VSM to be able to learn, to change and adapt. The similarity between the Shared Vision and Team Learning discussed above and the Operations Room and Management Centre discussed in Heart of Enterprise is also evident.

Using the insights gained in section 2.2, the Viable System Diagnosis on the System-in-focus, and section 2.3, the identification of key success elements, this research will now focus on Ace Engineering with a view to using these insights to redesign the organisation.

3. Ace Engineering

3.1 Description of Ace Engineering

Ace Engineering, an alias as discussed in the introduction, is an engineering jobbing shop situated in a 2000 m^2 complex on the Auckland waterfront. The shop floor is made up of three sections, viz. fitting, fabrication and machining. The company operates in the marine and industrial sectors, with the marine sector constituting the larger part of the business. The work in the marine sector is largely repairs to ships passing through Auckland, to vessels operating in the local waters and to the local fishing fleet. The work in the industrial sector is also largely repair work or rebuilding pieces of machinery that can no longer be repaired. The company also carries out small turnkey projects, such as the recent conversion of a 60 T dumb barge to a fully surveyed powered barge and the design and subsequent modification to a 50 m long autoclave.

The company belongs to a group of seven companies called the RNR Group, Ace Engineering being one of the companies (See figure 5 on page 37). Once again the names of the group companies have been changed to protect their identity. The RNR Group is owned by three directors. All three directors come from technical backgrounds, two being ex marine Chief Engineers with 'foreign going Chief's tickets', and the third being a qualified Fitter and Turner. Two of the three directors work within Ace, as the Production Manager and the Technical Manager, and the third director manages one of the other group companies, Ross Tech. The total number of employees in the group is approximately 150.

Ace carries a staff of approximately 35 permanent employees, 7 of which are on a salary and the remainder are tradesmen paid on an hourly basis. The annual turnover of the company is approximately $3.5 million.

The company is a relatively young company, being only six years old. It was started as a consultancy, but the directors soon realised that there was a need for more jobbing shops in the marine sector and so started offering this service as well. The

company started in small premises with tradesmen being brought in on a contract basis as and when needed. As the business grew it became necessary to obtain larger premises, hence the current premises were purchased by the property company, City Securities. The directors also decided that they wished to expand the company, but realised that they did not have the skills to manage a larger company, their experience, abilities and interests being in the technical arena. They thus decided to employ a professional business manager as well as other professionals to run those areas of the business where they were not skilled.

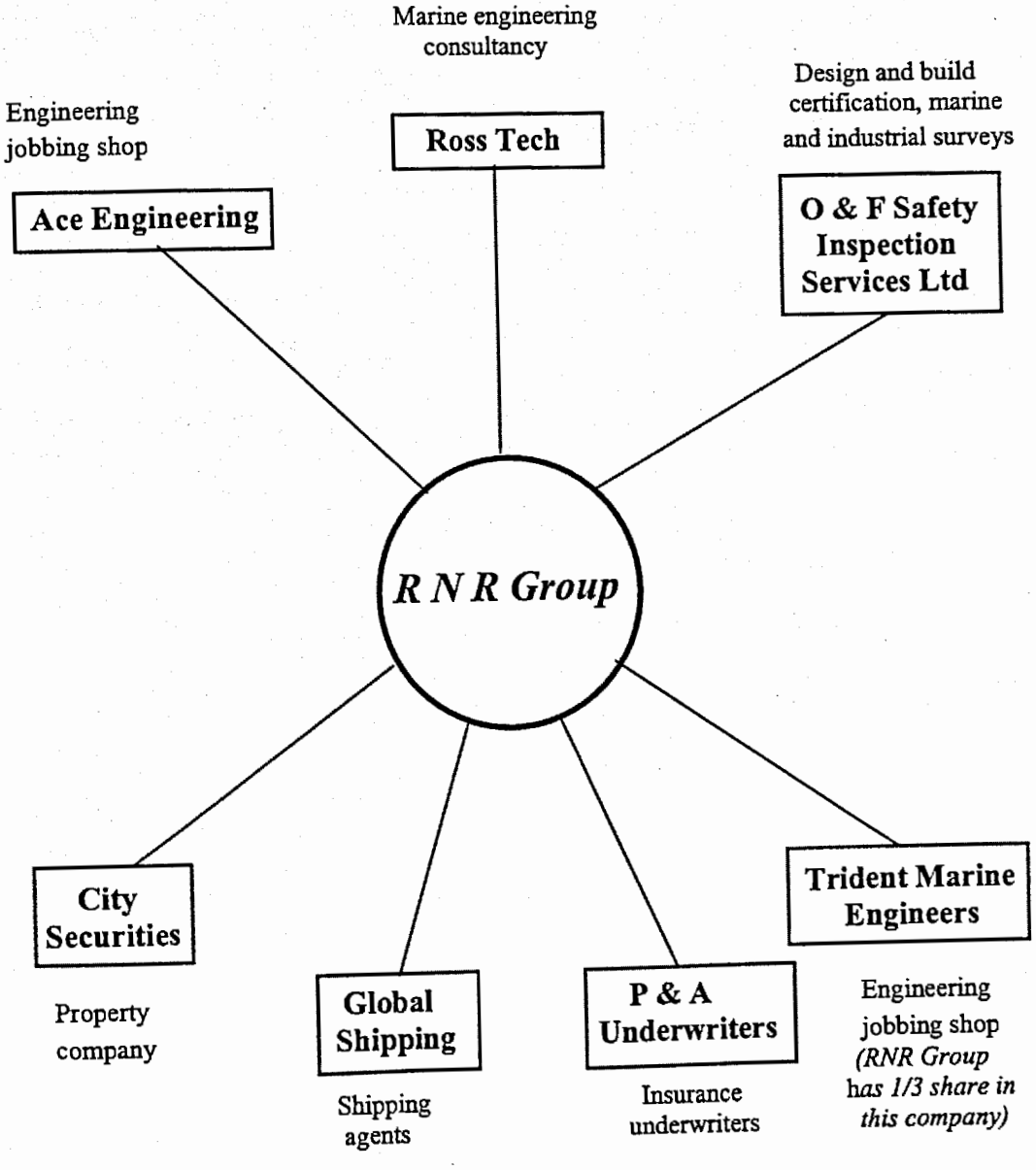


Figure 5

The current company structure is as shown in figure 6 on page 39. There are three departments within the company, viz. Administration, Production and Technical. These departments are accountable to the General Manager, who in turn is accountable to the Chief Executive Officer of the RNR group.

As mentioned above, the annual turnover of the company is approximately $3.5 million. This equates to a monthly turnover of approximately $292 000.00. This annual desired turnover figure for the company was decided upon by the company management based on the monthly overheads and an expected profit of between 25 and 30 % on all work carried out. During the first quarter of 1996, the average monthly turnover met this target. In order to achieve this it was necessary to stretch the company resources, the tradesman having to work an average of a 60 to 70 hour week consistently and staff members having to work most Saturdays and many Sundays. The availability of work in the market place at that time was such that this was possible. However, even though the turnover was being met, the desired profit was not. In fact during 1995 the company made a loss of $170 000.00. Furthermore the staff turnover was high. During the 18 month period from the time when the author joined the organisation to the time this research data was collected, of the 35 tradesman in the workshop, only 5 of the original staff were still in the employ of the company. This staff turnover included 3 workshop foreman and today they operate without a workshop foreman, this role being carried out in part by the Foreman's Assistant and the leading hands and in part by the Production Manager.

ACE ENGINEERING COMPANY STRUCTURE

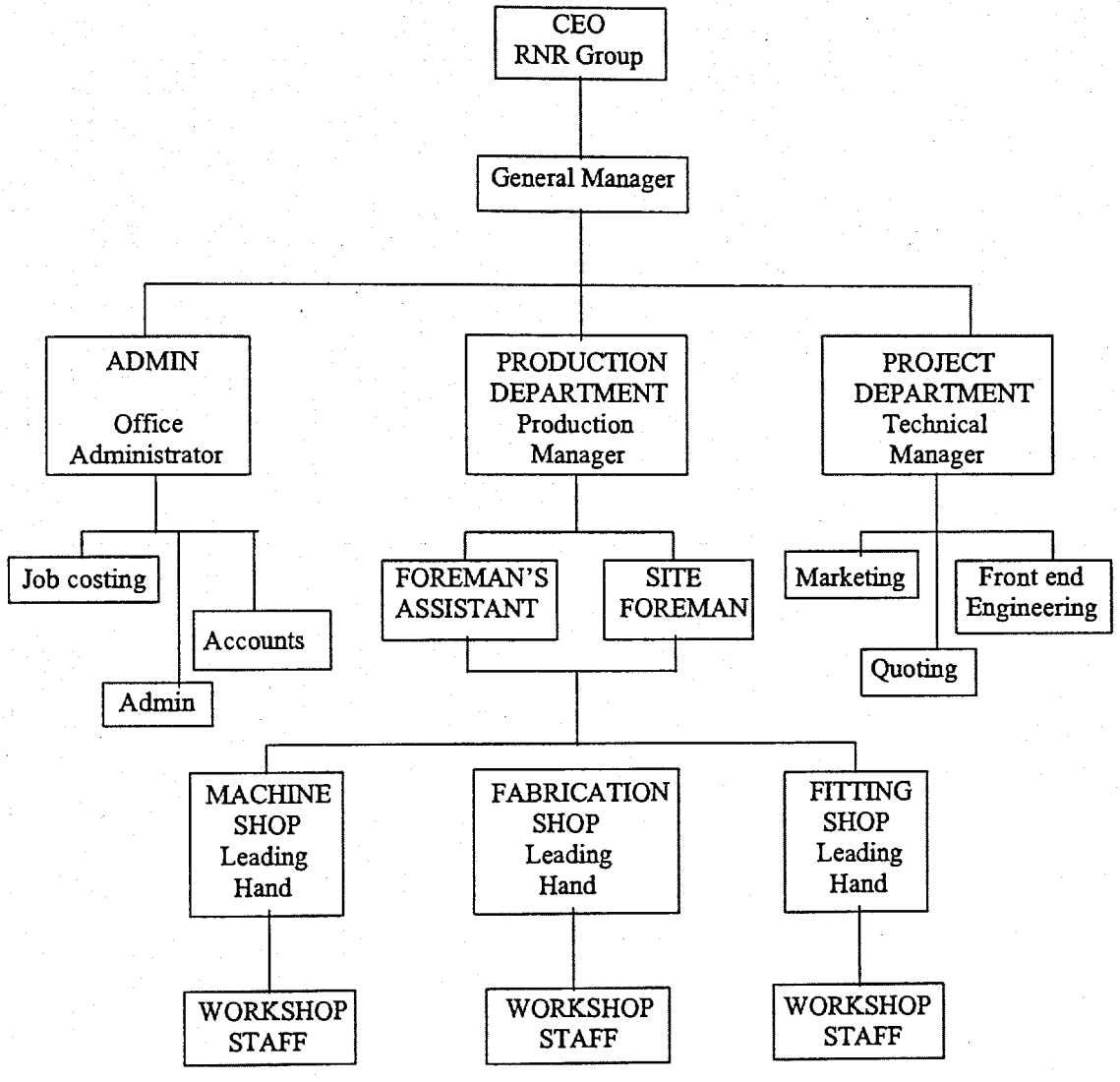


Figure 6

3.2 Viable System Diagnosis on Ace Engineering

As the objective of this section is to carry out a Viable System Diagnosis on Ace Engineering, and following the approach adopted in Section 2.2, let us start by looking at the whole RNR Group in which Ace, the System-in-focus, is embedded at recursion level 1. The various recursion levels are shown in figure 7 on page 41.

3.2.1 System 1

The marine engineering environment in which Ace operates is the global and local marine repair market. Ships on international routes tend to carry out planned repairs and maintenance in ports where they can receive the most competitive pricing. In this respect Ace has to compete with dockyards around the world. As far as the local marine market is concerned Ace competes against other ports within New Zealand.

With regards to the industrial sector Ace operates mainly in the Auckland market and must compete against companies based in Auckland as well as those that have set up outside of Auckland but have geared themselves towards the Auckland market.

The operations of the group are divided into three areas, viz. Production, Project / Front End Engineering and Administration. The responsibilities of the three sets of operations are as follows:

Production:

- The operation of the machine shop.
- The operation of the fabrication shop.
- The operation of the fitting shop.
- Site work, i.e. ship repair in the harbour or dry dock.

Each of the above areas have a Leading Hand responsible for the particular area under their supervision and report either to the Site Foreman for marine work or the Foreman's assistant for industrial work.

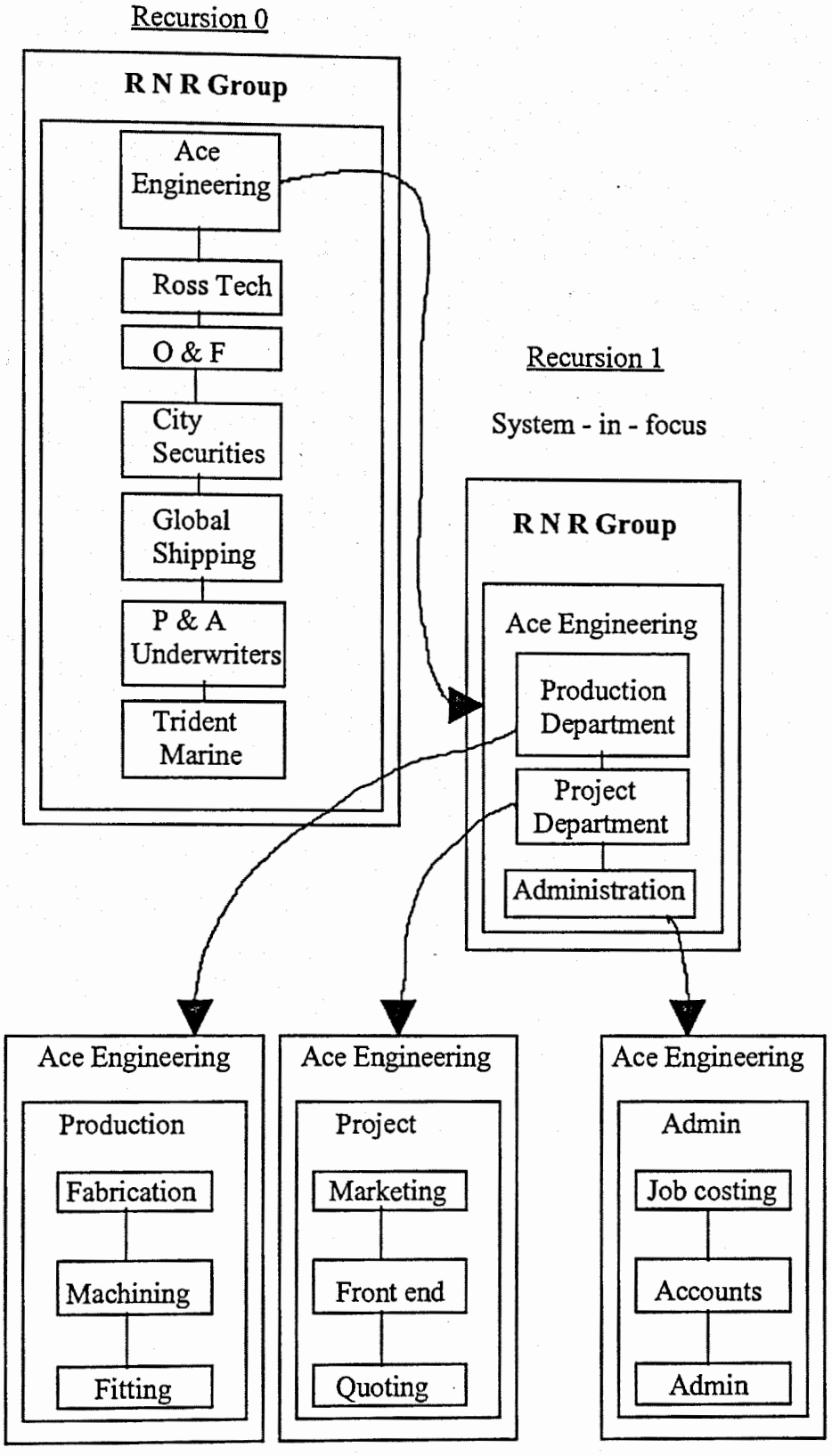

Recursion 0
R N R Group
Ace Engineering
Ross Tech
O & F
City Securities
Global Shipping
P & A Underwriters
Trident Marine
Recursion 1
System - in - focus
R N R Group
Ace Engineering
Production Department
Project Department
Administration
Ace Engineering
Production
Fabrication
Machining
Fitting
Ace Engineering
Project
Marketing
Front end
Quoting
Ace Engineering
Admin
Job costing
Accounts
Admin

Figure 7

Project / Front End Engineering:

- Marketing.
- Estimating and quoting.
- Front end engineering.

This department has two members, the Technical Manager and the Project Engineer. The marketing of the business is carried out by the General Manager, the Technical Manager, the Project Engineer and at times the Production Manager, the estimating and quoting by the Technical Manager and the Project Engineer, and the front end engineering by the Project Engineer.

Administration:

- General administration.
- Accounts.
- Job costing and invoicing.

This department has three staff, the Office Administrator, the Admin Clerk and the Receptionist. While the general administration and reception functions are carried out by the relevant staff as designated by the titles, the job costing is carried out by the Production Manager and the Office Administrator, and the accounting function is carried out by the Office Administrator.

The System One management of the various operations are respectively the Production Manager, the Technical Manager and the Office Administrator. However, the Technical Manager usually looks after the site work in the harbour and dry dock, thus he also has a role in the management of the Production Department.

Once again, as discussed under System One of Network 21, the Senior Management, does not have the requisite variety to be involved in every detail of the day to day operations of the various departments and variety balancers need to be designed. However, in the case of Ace, there are no clear policies or guidelines as discussed below:

- Marketing - There is no marketing policy and it is unclear as to exactly what services the company is offering. The three staff members responsible for this area

each have a different approach based on their perception of where the company is trying to position itself. Furthermore the Production Manager often gets involved in marketing, further confusing the issue.

- Estimating and quoting - There is no policy with regards to estimating. No standard times for tasks are set and no standard mark ups have been agreed upon. There are no formal terms and conditions for tendering. Final quotes are not discussed or evaluated and vary considerably depending on who is doing the estimating.
- Front end engineering - Once again there is no policy to cover this area. Designs and plans proceed with little or no discussion and are totally driven by the Project Engineer as per his interpretation of the requirements.
- Production - While the Production Department is in itself a more clearly defined department, there is no procedure linking Production to the Project Department. What is actually carried out is not always what was quoted on.

As there is no established corporate requirement on System One, there is no resource bargain struck between the System One and System Three and similarly accountability is unclear. Further there is a confusion of roles as the Production and Technical Managers are also the owners and company directors of the RNR Group. They thus involve themselves in the everyday activities of the various departments with their director's hats on confusing the staff and giving contradictory instructions. This issue will be discussed further in the following sections.

As far as regulatory actions are concerned there are none in place. There are no reports generated, e.g. the estimate against final cost for projects, very few meetings, no reports on projects lost against projects won, etc.

3.2.2 System 2

Firstly let us consider the sources of conflict between the various parts of System One:

- The company has no planning meetings and thus the Production and Technical Departments do not know what each are doing, what jobs are in progress or what resources are available. All information gathered is informal.
- As the Production Department has two managers involved in running the department, viz. the Production Manager for the workshop and the Technical Manager for the site work, there is internal competition for resources. As there is no plan or production schedule, promises are made to customers on completion dates which are frequently not able to be met as these promises are made with little or no knowledge of the commitments of the resources.
- Similarly quotes are given to customers making promises of job duration's and completion's with little or no knowledge of availability of resources.
- There are no established rates or times for tasks.

The harmonising actions that do take place are informal and are due mainly to the relaxed relationship between the staff and managers. Most staff are aware of what work is in progress and as the Production and Technical Managers are fellow owners and directors they obviously recognise the need to meet the company's commitments. In this way they informally 'muddle' their way through the work juggling the resources in an attempt to meet their commitments.

The General Manager attempts to carry out this co-ordination as he recognises the need. However, the Production and Technical Managers do not and any attempt to formalise any planning is overruled by them in their directors roles.

3.2.3 System 3

Once again considering The First Axiom of Management let us consider each of the six vertical components of corporate cohesion:

I. The Corporate Intervention - this intervention is primarily by interference from the Production and Technical Managers in their role as directors and owners. It takes place on an ad hoc basis usually overruling the General Manager and confusing the staff. Both of these directors have recognised that they do not have the training

or experience to manage the business, hence the appointment of a General Manager. However, having recognised this fact they still do not leave the General Manager alone to do his job.

II. The Resource Bargain - As discussed earlier, the roles of staff are unclear as there are no job descriptions, no objectives set, no appraisals, etc. There is no resource bargain struck between Systems One and Three.

III. Operational linkages - As mentioned earlier there are no formal linkages between the departments, all communication being informal.

IV. Environmental intersects - There is no proper account taken or allowance made for competition.

V. System Two - anti-oscillation as discussed on section 3.2.2 above.

VI. The Audit - the only formal audit carried out by the company is via the job costing function. This is where the discrepancies between the quotes and actual costs are exposed. Unfortunately these discrepancies are not used to formalise quoting procedures or establish standard costs, times or mark ups.

As shown above The First Axiom of Management is not obeyed. The relationship between Systems One and Three is confused, with System One sometimes finding they have freedom to act as they see fit and at other times finding instructions are given with little or no discussion. There is no clear agreement on what the company is trying to achieve, even amongst the directors.

3.2.4 System 4

As mentioned in the description of Ace Engineering in Section 3.1, the company started as consultancy and grew to an engineering jobbing shop due to the demands of the market at the time. The high economic growth of New Zealand during the mid 90's was a significant factor in the demand for services such as those which Ace Engineering offer. It was only after Ace had enjoyed a relatively rapid growth that the problems began to manifest themselves. The company now has a larger overhead, a larger workforce and requires a different management philosophy than when the company was smaller. There was no necessity in the earlier years for the company to look too far ahead as the market demands were driving its growth. This situation has

now changed, however the company does not have a system in place to plan for their future survival. The directors of the RNR Group, acting in System Four roles within Ace, realise that they need to increase their work, but they do not have a strategy as to where they wish the company to go, what sector of the market they want to capture or indeed what their market is doing and how is it changing and developing. They have made attempts to enter new market areas, such as the dairy industry, for which they ill equipped and inexperienced. While the directors have employed experienced executives, such as the General Manager, to carry out this function, they do not leave them to fulfil this function and do not trust the advice they are given.

The company does keep in touch with the short term future of the industry. The dry docking and sailing schedules of vessels are published giving the company the opportunity to approach the owners and operators well in advance to try and secure work. However, in general the company is living from hand-to-mouth.

3.2.5 System 5

System Five of Ace Engineering, the board, is made up of the three owners being the Production and Technical Managers of Ace Engineering and directors of the RNR Group, the Manager of Ross Tech and director of the RNR Group, and the Chief Executive Officer. While the Production and Technical Managers work within Ace, the manager of Ross Tech and the CEO do not. The General Manager of Ace clearly has a System Five role within Ace, but is excluded from this board. There is a confusion between the RNR Group roles and those within Ace Engineering.

While the role of the board should be to set the strategic direction of the company and to control the oscillations between Systems Three and Four, this is not happening. While the CEO, acting in a System Four capacity within Ace, is trying to look ahead and find new business for the company, he is not considering System Three while he is doing this. He has attempted to push the company into areas of business that it does not have the expertise to handle. While the System Four role is to look for opportunities, the System Five role should be to balance these potential opportunities with the capability of the company. He is failing in the System Five role when he

seeks to push the company into those areas of business, such as the dairy industry, that it is not capable of carrying out. The directors also fail in this respect as they support the CEO in these endeavours. While the board wishes the company to move into new areas they are not prepared to invest in the resources required to achieve these desires.

The directors also are not able to distinguish between their System Five and System One roles. This is clearly a difficult situation. While they should only act in their System Five roles when sitting at board meetings and setting policy, they unfortunately 'pull rank' on the General Manager on a daily basis when they should in fact be acting only in their System One roles. Having set a policy and tasked the General Manager to get on with it they interfere if they do not think things are going the right way. He then becomes frustrated at never being able to achieve his goals and he ends up spending most of his time in a System One role.

The board wishes the company to be something it is not and the directors seem incapable of recognising the fact that the company is not able to enter new areas of business without fully investigating and understanding the requirements in these new industrial sectors. The staff are well aware of their capabilities and that the company cannot succeed in these areas and hence simply treat these attempts to enter new areas of business with little or no enthusiasm. Essentially Systems Five and One do not agree on the direction of the business.

3.3 Redesign of Ace Engineering

As shown in Section 3.2 above, Ace Engineering does not conform to Stafford Beer's VSM. Let us then start this section by considering what could be done to ensure that Ace conforms the VSM. We will then look at the key success elements of Network 21 identified in Section 2.3 and consider how these could be implemented in Ace.

Turning to Section 3.2 it was shown that the operations of the various departments do not happen in accordance with the formal organisational structure. The Technical Manager looks after the site work which should be run by the Production Manager,

the General Manager and Production Manager get involved in marketing and the Production Manager gets involved in job costing.

If the staff in the System One operations were to operate in accordance with the company structure and System Two regulatory activities were recognised, many of the problems would be addressed. The Technical Manager's expertise is just that, technical. When quoting for work, he and the Project Engineer should be determining precisely what is required, discussing the issues with the customer and planning and pricing accordingly. The jobs should then be clearly documented and handed over to the Production Department. The only other involvement should be a System Three audit as and when required by the General Manager as per an audit policy set by him. Having said this, it is thus essential that the Production Manager sets standard times and costs for tasks which he would then require the Project Department to use when quoting. The final submission of quotes, including costing and time schedules should only take place after discussion and approval of the General Manager. This should be done in conjunction with the Production Manager and a published production schedule and manpower resourcing so that the Project Department is aware of the commitments of the Production Department.

The Production Manager should remove himself from the job costing activity. It is a relatively simple task to capture time and material spent on any particular job, provided the tradesmen use the correct codes on their timesheets and any purchases are booked against the correct job. Once this data is entered into the computer a report is easily generated giving the actual costs of any job. The General Manager should then be comparing the actual against the estimated and making adjustments to standard times and costs. This would free up the Production Manager from getting involved in detail that can be better handled by a computer and to concentrate on running the Production Department and looking for production improvements.

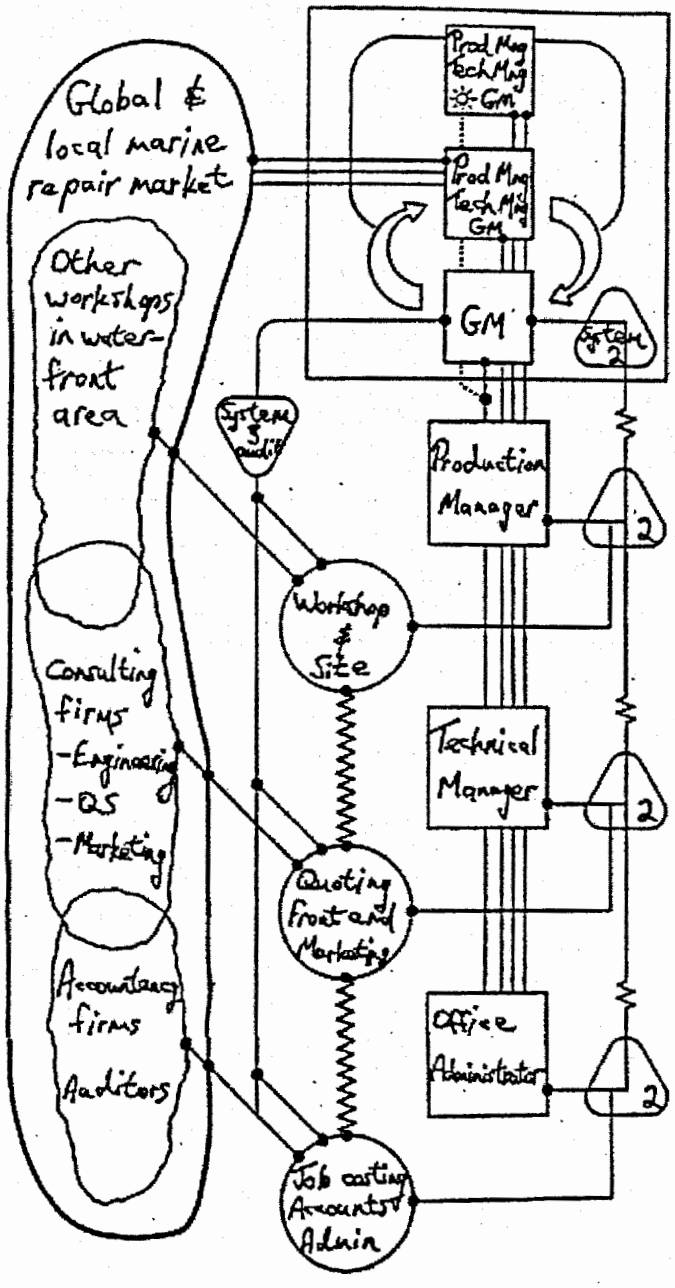
As far as marketing the company, the General Manager should be determining the marketing strategy so that all involved in this role are consistent. Unfortunately the direction of the company and the market segment it wants to fill is determined by the board. No matter what this ultimately is, it is the General Manager's task to direct

those involved in the marketing in accordance with the policy. The difficulty here is that the board cannot agree on exactly where the want the company to be. They have tried to target sectors of the industry, such as the dairy industry, where they not able to cope. The real expertise of the company lies in the marine sector. The company is able to react quickly to short duration repair work which is carried out on a 'charge up' basis. However due to the cyclical nature of this work the company must have other work to keep the labour force and equipment working. Planned repair work and small turnkey projects in and around Auckland can fulfil this function and the time and effort of the directors should be geared towards perfecting the company's abilities in these areas.

However, the largest problem for the organisation is the two directors working within Ace. They seem unable to separate their roles of directors of the RNR Group and day to day System One managers of Ace Engineering. The key to the future viability of the organisation lies with these two directors. How exactly this issue can be resolved is beyond the scope of this project. The company has the staff with the ability to set up systems and run the company as a viable enterprise provided they are allowed to so by the directors.

The General Manager and the Production and Technical Managers in their System Four roles in looking to the future of the company should also be considering the staff they need to keep the company viable. They should be ensuring that they are in keeping with current employment trends in the market if they wish to have the right staff that will sustain them in the future. As was mentioned in Section 3.1 on the description of Ace, one of the problems the company is experiencing is high staff turnover. The company needs to put forward a strong effort in the human resources arena.

Following the above discussion it is suggested that Ace Engineering organise itself to conform to the VSM as proposed in figures 8 and 9 on pages 50 and 51 respectively.



DIAGNOSTIC CHART OF SYSTEM IN FOCUS:
RECURSION NO: 1
NAME: Ace Engineering
© S. Beer 1985

Figure 8

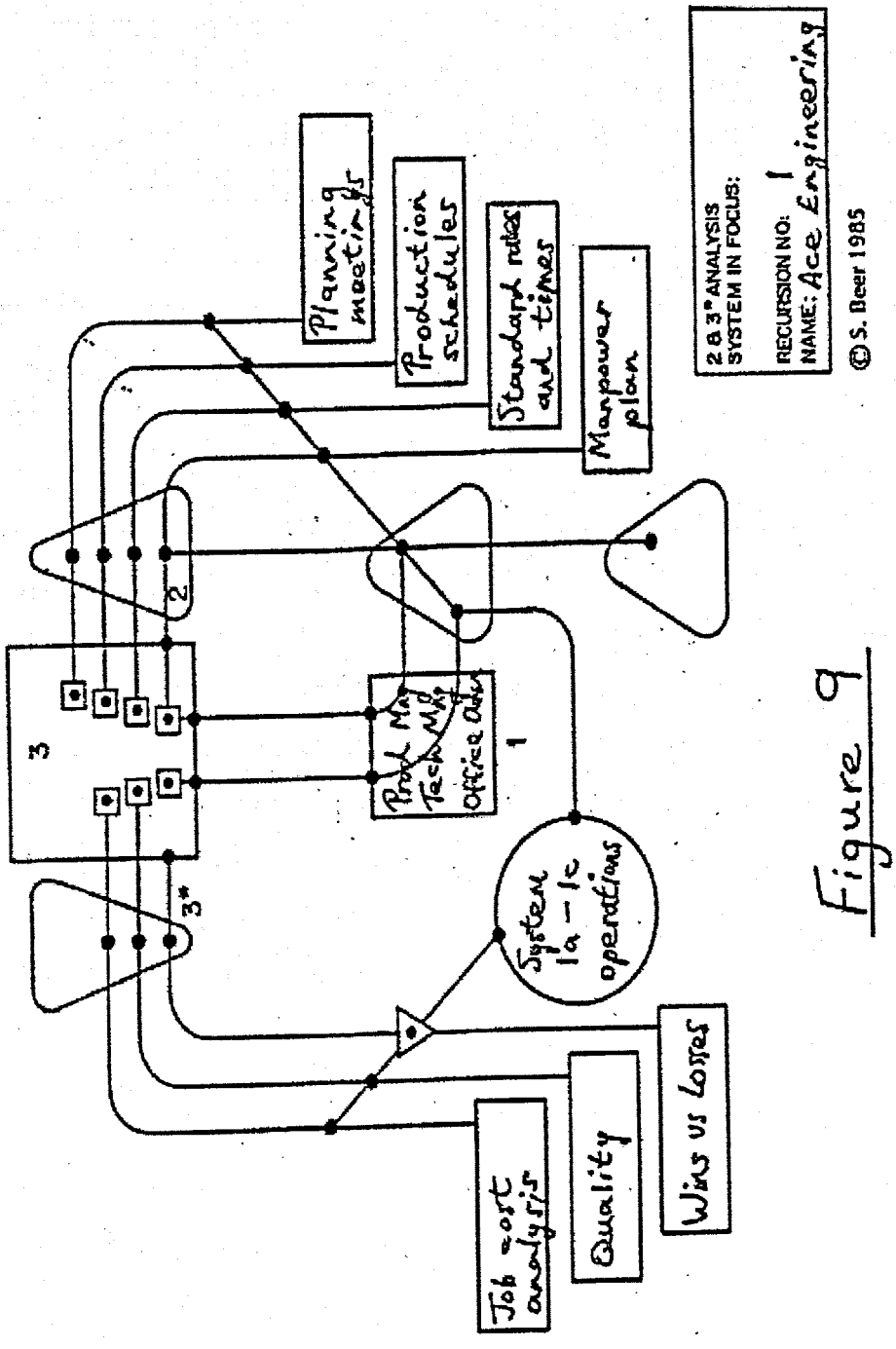

Planning meetings
Production schedules
Standard rates and times
Manpower plan
2 & 3* ANALYSIS
SYSTEM IN FOCUS:
RECURSION NO: 1
NAME: Ace Engineering
© S. Beer 1985
2
3
3*
1
Prod Mgr
Tech Mgr
Office Mgr
System 1a - 1c operations
Job cost analysis
Quality
Wins vs Losses

Figure 9

As mentioned in the introduction to this section, we will now move on to examine the key success elements of Network 21 identified in Section 2.3 and consider how these could be implemented in Ace.

Network 21 has clearly understood the triumph of the individual eluded to in 'Megatrends 2000'. Ace Engineering has not. There is no bonus or incentive scheme, no reward policy, no annual appraisal, i.e. there is no way the individual can measure their performance or value to the organisation.

"Organisations learn only through individuals who learn. Individual learning does not guarantee organisational learning, but without it no organisational learning occurs". (The Fifth Discipline pg 139)

Personal improvement and continuing education should be actively encouraged. While it is clear that a smaller organisation such as the RNR Group may well not be able to afford to cover employees salary while they are away studying, it is equally clear that they can make the environment conducive to continuing education. During the time that an employee is involved in study they can ensure that they do not expect overtime which will interfere with classes or study time and they can allow time off to write exams. It would further be sensible to encourage study in a direction that would benefit both parties. Obvious courses would be supervisory courses and project management type courses. The organisation is in dire need of these skills. This approach would also serve to motivate the employees and encourage them to remain with the company.

As far as synergy of the team effort is concerned, it is now well understood and accepted that the power of a team exceeds that of individual efforts. As opposed to the current practice of merely issuing instructions, it would be more beneficial to all concerned if the employees were involved in the process of deciding how best to approach a particular job or a particular problem that needs to be addressed. Let the final decision be made based on team discussion. The employees are then more likely to support the decision.

The above should apply not only to specific jobs but also to overall company decisions that might have an impact on the individual's future. Over the last 18 months the company has lost a number of good individuals who are now successfully positioned in opposition companies.

Considering the nine key virtues postulated by Dr. Shad Helmstetter in his book 'Network of Champions', let us see how these could be applied to Ace.

Key Virtue #1: ***Vision***

Let the employees be part of the vision. Hear their opinions and ideas. Let them know how they stand to benefit if the vision is achieved.

Key Virtue #2: ***Positive use of time***

Implement time management tools into the organisation, such as planning diaries for the individuals where appropriate, project planning tools for jobs in the shop and on site, and most important of all - communicate. The current lack of briefing meetings constantly leads to confusion amongst all the staff. Seldom does anyone have a full picture of a job or project. Further, communication tends to halt rumours which can very often be most destructive.

Key Virtue #3: ***Commitment***

First and foremost it is essential that the directors commit themselves to resolving the company's problems by opening their minds, by listening to their employees, by searching for and acknowledging their shortcomings and then by actively changing their approach to resolve the situation. From their commitment to themselves, their company and their employees, a similar commitment will follow from the employees.

Key Virtue #4: ***Belief***

From the commitment will come the belief. An unwavering belief from the directors and senior management that they can build a successful organisation will transfer to the employees.

Such a strong belief and commitment from the employees should have a strong effect on reducing the staff turnover.

Key Virtue #5: ***Self-acceptance***

This is not a problem area for the company as the directors believe in themselves and that they can achieve success. The very fact that they had the courage to start their business is proof.

Key Virtue #6: ***Taking responsibility for yourself***

As mentioned earlier the employees have had little choice but to take responsibility for themselves with little or no regard for the wants of the company. It would obviously be more beneficial to harness this to the mutual benefit of both the company and the individual. Give the employees responsibility, reward them accordingly and make them accountable for their actions.

Key Virtue #7: ***Caring about others***

Due to the current attitude of the directors and management, it will be necessary for these persons to have an attitude change if they are to care about their employees. If these persons can understand the benefits that will be derived by changing their attitude to their employees, hopefully they will genuinely change their approach.

Key Virtue #8: ***Spiritual values***

By caring about their employees, the directors and management will win their faith. They should then be able to inspire their employees to achieve greater success to the mutual benefit of both parties.

Key Virtue #9: ***Positive reprogramming***

In order for the organisation to succeed it is essential that the directors recognise that their current beliefs on how to run their organisation must change. They have to change their mental models. This will be a major challenge, however absolutely essential if they are to succeed.

Turning to the five new "component technologies" as described by Peter Senge in his book 'The Fifth Discipline':

- **Systems Thinking**

  Most of the decisions made in Ace are reactive, responding to a particular event. There is little, if any, understanding of cause and effect. The whole work environment is rushing to complete an emergency job and dropping everything else to get this one finished. The job that has to go out the door first is the one that gets all the attention. It is essential that the directors and the senior management start to recognise and understand circles of causality thus enabling them to make decisions based on a structural understanding of the situation.

- **Personal Mastery**

  As mentioned above there is an unwillingness in the organisation to assist the employees in improving themselves, in helping them to learn, and indeed there is an unwillingness by the directors themselves to continue learning, to change with the environment, to learn new techniques. They are unwilling to even

keep up with modern technologies such as computers and have not learned how to use a computer, nor do they wish to. They have failed to realise that with the expansion of their company and the growth of the scope of the work they are now taking on, they too need to improve themselves, to grow themselves.

- **Mental Models**

  Very powerful mental models exist within the directors and management of the organisation. The background of the directors, that of the marine industry, is an autocratic environment, not participative. They cannot accept that people want to be involved in their own future, that they will respond better when involved in decisions rather than being instructed to do something. They do not easily accept that there are often more ways of doing things than their way.

- **Building Shared Vision**

  There is absolutely no shared vision within the organisation whatsoever. Even amongst the directors the vision for the company differs.

- **Team Learning**

  Dialogue takes place between the directors, however the other members of the organisation are not involved in any such process. The very managers and professionals they have brought into the organisation to help turn it into a successful company are themselves seldom involved in dialogue. There is no team environment within the organisation.

The directors and management need to recognise and understand these five "component technologies" and change their attitudes and approach accordingly. Precisely how these are explained to them and how they are motivated to make these changes is once again beyond the scope of this research. Perhaps the realisation that

their organisation is sinking further and further into trouble will ultimately force them change.

Conclusions

We have carried out a Viable System Diagnosis on both Network 21 and Ace Engineering. We have shown that while Network 21 conforms to Stafford Beer's Viable System Model, Ace Engineering does not. It has also been stated that Network 21 is a successful and growing organisation while Ace Engineering is a struggling organisation. Whether the conclusion can be drawn that for an organisation to succeed it must at least conform to the Viable System Model and that if it does not it will fail, is beyond the scope of this project. However, Stafford Beer, in his book 'The Heart of Enterprise', does contend that this is the case. In the specific instance of Network 21 and Ace Engineering this research project would concur with this contention.

The Viable System Diagnosis on Network 21 showed how the organisation is set up to succeed, how variety is dealt with and how the organisation keeps up with progress and the constantly changing market. Looking more deeply we examined the organisation from the perspective of a learning organisation as discussed by Peter Senge in his book 'The Fifth Discipline'. It was clear that Network 21 followed those principles examined and discussed. We further discussed the nine key virtues of successful Amway distributors as contended by Dr. Shad Helmstetter in his book 'Network of Champions'.

We then turned to Ace Engineering where the Viable System Diagnosis showed why the organisation did not conform to the Viable System Model. The insights gained by this diagnosis lead us to propose changes to the organisation to ensure that it does conform to the Viable System Model. We also considered the aspects of the learning organisation examined for Network 21 as well as the nine key virtues of successful distributors and suggested changes within Ace Engineering to adopt these approaches and attitudes to help turn Ace Engineering away from being a struggling organisation to being a successful one. We also acknowledged that one of the major problems facing Ace Engineering is the attitude of the Production and Technical Managers. Their attitudes will have to change and this will be a hard 'nut to crack'.

As discussed in Section 1.3, Choice of Methodology, and shown in the main body of the research, the coalition metaphor was also present in Ace Engineering. This suggests both Strategic Assumption Surfacing and Testing (SAST) and Soft Systems Methodology (SSM) as additional approaches to investigating and solving Ace Engineering's problems. They also take into account the criticism of the VSM that the human actors are ignored by the tool. It is thus the suggestion of the author that this research would need to be extended by adopting both of these methods in continuing to evaluate and redesign Ace Engineering. These tools will enable the interrelationships between the directors and the staff to be further examined and debated with a view to involving all the members of the organisation in solving the problems of Ace Engineering.

Finally, it is felt that this research project has shown that Stafford Beer's Viable System Model is an invaluable tool for examining and diagnosing an organisation and that the insights gained are at the very least a valuable beginning in the evaluation of an enterprise. It is not the only tool or method of diagnosis, but one in a suite of many.

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Appendix

Appendix A - Literature review

Appendix A1 - 'Research Methods for Managers' by John Gill and Phil Johnson

The Role of Theory in Research Methods

Theory and practice

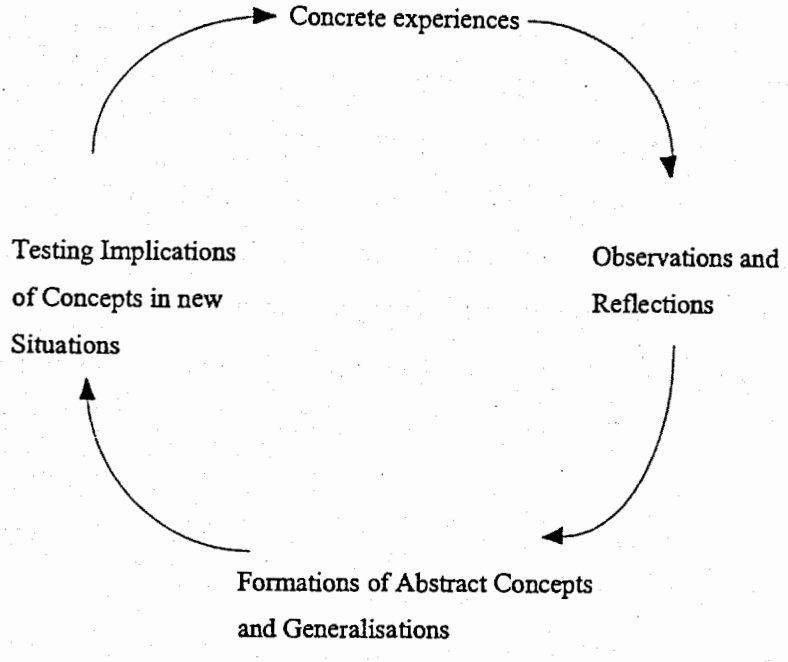
"Although we may not be immediately aware of it, our everyday lives are fundamentally interwoven with theory". (pg 23)

The term 'theory-laden' is thus used to refer to the way in which the prior theories and values of the observer influence what they see. *"Thus the issue of how observation is 'theory-laden' raises the problem that there is no independent or neutral point from which an observer might occupy and objectively observe the world and thus all knowledge is knowledge from particular points of view or paradigms".* (pg 23)

Gill and Johnson thus launch into their work by trying to demonstrate that the conception of theory being divorced from practice is due to a misunderstanding of the nature and purposes of theory.

This section of their work begins by looking at "Kolb's experiential learning cycle", shown below. *"The learning cycle implies that learning may start with the experience of an event which the individual then reflects upon in trying to make sense of it. This might lead to the generation of explanations of how or why something happened the way it did. These explanations can then be used to form an abstract rule or guiding principle that can be extrapolated to new events of a similar type to that already experienced. Learning can also start at the point where such a rule is merely received from others by the learner, along with the explanations and expectations, and is subsequently applied by the learner and thereby tested out. In either case, whether the rule is received or generated, its testing in new situations creates new experiences*

which ultimately leads to new rules. Particular individuals might emphasise particular elements of the learning cycle due to the presence of particular predilections into which they have been socialised". (pg 25)



Kolb's learning cycle demonstrates two social science research methods that are used, viz. deduction and induction.

Deduction

"A deductive research method entails the development of a conceptual and theoretical structure prior to its testing through empirical observation. Deduction in this sense corresponds to the left hand side of Kolb's experiential learning cycle". (pg 28)

Essentially the process of deduction might be divided into the following four stages: (pg 28)

1. The researcher decides which concepts represent important aspects of the theory or problem under investigation. The theory of interest links two or more concepts together in a causal chain. However, since concepts are abstract they are not

readily observable, and are thus not open to empirical testing until they are translated into observables, that is they have to be operationalised.

2. Through the operationalisation of a concept it becomes defined in such a way that rules are laid down for making observations and determining when an instance of the concept has empirically occurred. By creating rules for making observations we are making a clear definition of what it is we are going to observe. In this we create indicators, or measures, which represent empirically observable instances of occurrences of the concepts under investigation, i.e. we link the abstract concept to something that is observable and whose variation is measurable.
3. The process of operationalisation enables the construction of clear and specific instructions about what and how to observe. Priority is given to things that can be corroborated and agreed upon by other observers thus emphasising the control of potential bias. This creates a tendency in this approach to dismiss the analysis of the subjective or intangible.
4. The outcome of the above is the process of testing, by which the assertions put forward by the theory are compared with the "facts" collected by observation. Often once tested and corroborated, the theory is assumed to be established as a valid explanation. These are often termed covering-law explanations. In practice the statistical version of the covering-law, whereby the relationships asserted by the theory have only some degree of probability of obtaining across all circumstances, have been adopted by those working within the deductive tradition.

The meaning of corroboration is open to some dispute because the testing of a theory inevitably involves a finite number of observations, and even if all the observations confirm the theory, there is no assurance that a future observation will conform to the theory.

Some observers feel that while theories can never be proved true, they can be falsified, since only the contradictory observation is required. If this tradition is followed it is known as the "hypothetico-deductive method". This approach emphasises that what is important is not the sources of the theories, but rather the process by which those ideas are tested and justified. Generally this approach is

intimately bound up with what is often termed "positivism". Three of the main characteristics of positivism are: (pg 32)

- the view that, for the social sciences to advance, they must follow the hypothetico-deductive methodology used by natural scientists, i.e. the experimental method;
- the knowledge produced and the explanations used in social sciences should be the same as those proffered by the natural sciences, e.g. that A caused B;
- the above entails social scientists treating their subject matter, the social world, as if it were the same as the natural world of the natural scientist.

"It is from objections to the implications and assumptions of such a conception of social science that particular inductive approaches to research arise". (pg 32)

Induction

"The logical ordering of induction is the reverse of deduction as it involves moving from the "plane" of observation of the empirical world to the construction of explanations and theories about what has been observed. In this sense induction relates to the right hand side of Kolb's learning cycle, i.e. learning by reflecting upon particular past experiences and through the formulation of abstract concepts, theories and generalisations that explain past, and predict future, experience". (pg 33)

The modern justification for taking an inductive approach in the social sciences tends to revolve around two related arguments.

Firstly, it is felt by many researchers working within the inductive tradition that explanations of social phenomena are relatively worthless unless they are grounded in observation and experience.

The second argument arises out of a critique of some of the philosophical assumptions embraced by positivism. We shall examine this second argument more closely.

The error in blindly following the approach of the natural sciences in the study or the social world is contended to be the fundamental error by certain of the researchers who draw attention to the following issues:

1. Human logic has an internal logic all of its own which must be understood to make action intelligible.
2. The subject matter of the natural sciences does not have this subjective comprehension of its own behaviour.
3. The social world cannot be understood in terms of causal relationships.

Inductivists therefore reject the stimulus-response model of human behaviour that is built into the methodological arguments of positivism. This is rejected in favour of:

a. stimulus ⟶ experience and interpretation ⟶ response
b. interpretation and meaning ⟶ action

Although these differences have resulted in somewhat different methodological traditions, both a. and b. share a commitment to conceiving human actions as arising out of actor's subjectivity. This view has created particular methodological commitments.

- It creates serious objections to the positivist contention that social phenomena might be treated as being analogous to things of nature.
- Social scientists, in order to adequately explain human behaviour, need to develop a sympathetic understanding of the frames of reference and meaning out of which that behaviour arises.
- This methodology avoids the highly structural approaches of deduction. The deductive researcher, by formulating a theoretical model prior to empirical testing, imposes an external logic on a phenomena that has an internal logic. In order to discover this internal logic, to is recommended that an unstructured approach to research is adopted to allow for access to human subjectivity, without creating distortion, in its natural everyday setting.

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- The counter-argument to this kind of inductive research is that it is unreliable since it is not replicable and therefore bias cannot be ruled out.

Experimental Research

This method of research falls at the deductive end of the continuum. It requires the identification of a particular phenomenon or factor whose variation we are trying to explain. This is known as the 'theoretically dependent variable.' It is then necessary to identify the phenomena or factors whose variation explains or causes changes in the dependent variable. These are known as 'theoretically independent variables.'

Indeed the type of true or classical experiment in which the researcher can manipulate the independent variable and observe the change in the independent variable is usually only possible under laboratory conditions.

Quasi-experiments

As in the case of the true experiment, the aim of the quasi-experiment is to analyse causal relationships between independent and dependent variables, but by removing it from the laboratory situation. Since the focus is thus on real-life and naturally occurring events, subjects cannot be randomly or systematically allocated to experimental and control groups. Rather these groups are identified in the field in terms of whether or not they have experienced the notional experimental treatment or independent variable.

"So instead of attempting to manipulate the incidence of the independent variable by selecting equivalent control and experimental groups and then administering an experimental treatment, the researcher attempts to identify people who have naturally experienced the notional experimental treatment. The attempt is then made to compare their consequent behaviour with as similar a group as possible who have not experienced that event of phenomenon". (pg 55)

Action research

Action research is a variant of the quasi-experiment. The approach is that of a planned intervention by the researcher into some naturally occurring event. The effects of the intervention are then monitored and evaluated with the aim of discerning whether or not that action has produced the expected consequences. In other words, the researcher acts upon their beliefs or theories.

Survey

Survey research can be conducted with either a deductive or an inductive approach. Depending on the approach a questionnaire will be formulated which is appropriate to the particular research.

Ethnography

"The ethnographic approach is fundamentally that of anthropology and allows the researcher to use the socially acquired and shared knowledge available to the participants to account for the observed patterns of human activity. The key feature of this approach is that it is based on naturalist modes of inquiry, such as participant observation, within a predominantly inductivist framework".

In ethnography the focus is on the manner in which people interact and collaborate in observable and regular ways. Ethnographers thus usually place more emphasis on observation and semi-structured interviewing than on documentary and survey data. This approach is based upon the belief that the social world cannot be understood by studying artificial simulations of it in experiments or interviews, for the use of such methods only shows how people behave in those artificial experimental and interview situations. It is thus argued that in order to explain the actions of people working in organisations, it is necessary to arrive at an understanding of the various cultures and sub-cultures present in the particular organisation, for it is out of these systems of meanings, beliefs and values that rational action arises.

Issues in ethnographic research

"It is not possible to define ethnography as a single method of collecting information since it usually entails the varying application of a battery of techniques so as to elucidate the subjective basis of the behaviour of people. It is nevertheless still possible to review the various choices available to the ethnographer. These choices are usually taken in the context of an ethnographer's philosophical commitment to comprehending the behaviour of subjects in their natural and everyday settings through an inductive development of an empathetic understanding of those actors' rationality". (pg 108)

It is considered by some researchers that their are three main available approaches:

- observation
- participation in the setting
- gathering reports from informants

Which route is followed is largely governed by decisions about the type of 'field' or 'social' role to be adopted.

Field roles in ethnography

Perhaps the most important aspect of the field role which an ethnographer may adopt relates to the extent to which the researcher decides to 'participate' in the natural setting of subjects' behaviour, and the extent to which the identity and purposes of the ethnographer are revealed to those subjects.

Participant and non-participant observation

These vary from the observer's complete immersion in a social setting, by adopting a role of full participant in the everyday lives of subjects, to that of spectator in which the ethnographer only observes events and processes and thereby avoids becoming involved in interactions with subjects.

The former enables the researcher to share the experiences of the group, organisation or community by not merely observing what is happening but also feeling it. Certain researchers feel that participant observation can enable the researcher to penetrate the various complex forms of misinformation, fronts, evasions and lies that are considered endemic in most social settings, including business. Thus it can enable access to what people actually do (the informal organisation), as opposed to what they might claim they do and which official sanctions impel them to do (the formal organisation).

While participant observation has these strengths in research, there is the danger that by becoming involved in the everyday lives of the subjects, the researcher internalises subjects' culture and becomes unable to take a dispassionate view of events and unintentionally discards the researcher elements of the field role, i.e. they actually become a member of the organisation , or 'go native'.

Where the field role is limited to that of spectator, the consequent lack of interaction can raise the opposite problem, i.e. the observer fails to gain access to and to understand the cultural underpinnings of the subjects overt behaviour and actions.

"Indeed, the observer may inadvertently analyse and evaluate those events and processes from the perspectives and rationality of their own culture. It might, however, be claimed that since the role of the spectator entails no interaction with the subjects it is less likely that the observer's presence will affect the situation and cause some change in their usual behaviour". (pg 110)

Overt and covert observation

This refers to whether the subjects know about, or are aware, of the presence of a researcher, or where the actual purpose of the observer is hidden. There are usually two main rationales behind the use of covert observation.

First, it is often argued that people may behave quite differently when aware that they are under observation. Thus the degree of naturalism or ecological validity is reduced if observation is not employed covertly.

Often the most vaunted advantage for ethnography over other research procedures is its greater ecological validity. This, it is argued, reduces subjects' reactivity to the researcher and their data collection procedures. However, even when the observation is covert, the researcher is present and involved as a member and inevitably must affect the phenomena under investigation in some way. This problem has important implications and instead of it being treated as a source of bias, it can be exploited. How people react to the presence of the researcher may be as informative as how they react to other situations. Rather than to attempt to eliminate the effects of the researcher on the phenomenon under investigation, the researcher should attempt to understand their effect upon, and role in, the research setting and utilise this knowledge to elicit data.

Thus rather than seeking to eliminate reactivity, its effects should be monitored and as far as possible brought under control. By systematically modifying one's role in the field, different kinds of data may be collected whose comparisons may greatly enhance interpretations of the social processes under study.

A second reason for using covert research is often because it would be impossible to obtain access to do the research if the subjects knew one was a researcher, or knew the true nature of the research.

Ethics and ethnography

Ethical issues in ethnography arise from the nature of the relationship between researcher and host organisation and between the researcher and the subjects they study.

The findings of these investigations are often published and this may bring with it a number of problems.

It is clear that to publish such research it is necessary to obtain the consent of those involved. This of course may lead to changes to the report being requested which

would place the researcher in a moral dilemma. In the case of covert research it would be necessary to change names in order to protect the identity of those concerned, and indeed the fact that they were being researched thereby also protecting the researcher.

Making Methodological Choices

Several research approaches have been presented and inevitably the researcher must choose an approach.

"It is important to be aware that the different methods available have different inherent strengths and weaknesses, which need to be taken into account in relation to the goals of the research when an approach is selected". (pg 121)

Evaluation criteria

With regard to the validity of any research findings, it is possible to distil four criteria that might be used in evaluation. (pg 121)

1. *Internal validity* - This criterion refers to whether or not what is identified as the cause or stimuli actually produce what have been interpreted as the effects or responses.
2. *External validity* - Generally this criterion refers to the extent to which any research findings can be generalised or extrapolated beyond the immediate research sample or setting in which the research took place. The manner of external validity is often subdivided into: (a) *Population validity* - This criterion concerns the extent to which it is possible to generalise from the sample of people involved in the research to a wider population. (b) *Ecological validity* - This criterion concerns the extent to which it is possible to generalise from the actual social context in which the research has taken place and data thereby gathered, to other contexts and settings. This is also related to the issue of how artificial or atypical the research setting is relative to natural contexts typical of normal everyday life.

3. *Reliability* - This criterion basically refers to the consistency of results obtained in research. To satisfy this criterion it should be possible for another researcher to replicate the original research using the same subjects and the same research design under the same conditions.

Using these criteria it is possible to evaluate each of the approaches and decide upon the most appropriate methodology for the particular project.

Appendix A2 - 'The Heart of Enterprise' by Stafford Beer

(The author wishes to acknowledge that the diagrams as presented in this literature review are taken directly from Stafford Beer's book.)

In his book the "Heart of Enterprise" Stafford Beer declares that every enterprise is a *system*, and in particular must be a *viable* system.

Chapter one - An entry

What is a *system*? This definition proves to be not so straightforward. Beer is anxious to point out that a system has a *purpose*, but hastens to point out that not everyone, even those most involved, might agree on what the purpose actually is. Where then does the idea come from that a system has a purpose? Beer contends that it comes from us, the observers of the system who recognises its purpose (pg 8).

Perhaps then it is us that recognise that there is a system in the first place, although we can agree that there is a system, for example a motor car or a professional society, but we may well not all agree about its purpose.

Beer contends that if we cannot agree about the purpose of the system we shall not agree about its boundaries, and if we don't agree about its boundaries how can we be sure we actually recognise the system?

The facts of the system are in the eye of the beholder. It means that both the nature and the purpose of the system are recognised by an observer within his perception of WHAT THE SYSTEM DOES.

Thus the facts are not objective reality but rather are our conceptualisation of the purpose of the system. Thus these are the only facts that we can recognise.

Beer then poses the question as to whether we will ever be able to communicate about systems. He thus contends that the only way we can communicate is to agree on the

CONVENTION about the nature, the boundaries, and the purposes of the system before we can agree on what is to count as fact (pg 10).

Given accepted conventions, any system has an effort applied to make it work. This effort produces a pay-off from the system. Except in exceptionally simple systems, the pay-off is NON-LINEAR in relation to the effort put into the operation. (pg 14)

This is a well discussed phenomena, eg. economists talk of 'diminishing returns', psychologists talk of 'learning curves'. Lots of people talk about this 'rule of thumb' especially recognising the 80 - 20 Law.

Traditional management conventions look to chop off the 20% of the tail that requires 80% of the effort and thus become more profitable. In terms of systems theory herein lies the rub. The relationship between effort and pay-off tends to stabilise itself to the same 80 - 20 curve after the original 20% has been chopped off. If we continue to chop off the 20% we will eventually having nothing left.

The point that Beer makes is that we often fail to contemplate the systemic consequences of policies which are made as discrete decisions and that there is not enough agreement as to the real nature of the system concerned.

Herein lies a major objective of 'The Heart of Enterprise'. *"If we can agree on the nature of a system for viable organisation, then it will be possible to elucidate the systemic relationships that uphold it."* (pg 16)

Having challenged the reader thus far Beer moves on to look at the commonly used slogan: *let us get our priorities right.*

In setting priorities we need to be very careful. If we set priorities between the subsystems, considering each on its own merits, we may fail to understand the nature of the system as a whole. If the purposes are known then the priorities are clear.

Beer sums up his introduction to Heart with the following statement: *"We cannot successfully handle any system that we are disposed to manage unless we obtain an insight into its nature. That nature, as we have seen, is to do with purposes, with boundaries, and with other matters which are not customarily investigated within our institutions - because their mores effectively forbid it."* (pg 24)

Chapter two - Double entry

Beer moves on the question what MEASURES are appropriate. Traditionally we use the FOUR M's:

- Men
- Materials
- Machinery
- Money

He suggests that in today's world measurement includes the Four M's but is best donated as COMPLEXITY.

He postulates that this is due to social and technological change and that these changes are increasing their *rate* of change. To further exacerbate the rate of change he further suggests that the *nature* of the changes is such that there is increasingly more connection between separate things, more movement about the world by individuals and the growth of the *global* markets.

Management is thus becoming more complex and receiving more interference further causing this complexity to proliferate.

Traditionally we measure the Four M's in terms of money, but how do we now find a measure that includes complexity? We need to find an objective measure, but as Beer points out if systems are a subjective phenomena, this will be a troublesome task.

Beer chooses VARIETY as the measure of complexity and defines the same as the number of possible states of whatever it is whose complexity we want to measure.

Since the number of possible states can be counted, the measure will be a number. Beer then proceeds to demonstrate by way of an example that the number of states depends on our perception of the system. We need to agree on what the system is to agree on the variety measure and what the system is will depend on its PURPOSE. (pg 34)

The exercises show that the greater the interaction the greater the variety and relatively simple systems can suddenly be found to have a variety way beyond the capability of the human. Beers contends that managers have learned to cope with this variety proliferation by preventing interaction. MANAGERS DESTROY VARIETY. But this is the main cause of the trouble as discussed earlier. We divisionalise the company, we manage by exception, we functionalise, we set objectives. These are all variety destroyers. *"It is critically important to understand this; because every move we make that constrains complexity also blocks off opportunity."* (pg 39)

A manager will have a number of areas / departments / divisions under his control. As demonstrated above each of these will generate variety, more variety than he can deal with in detail. It is not possible for a manager to be aware of all the states of his subordinates.

In cybernetic terminology these areas / departments / divisions are referred to as boxes. If all possible states are observable the box is transparent. If not the box is opaque. Truly opaque boxes are known as *black* boxes.

The question is, is it possible to manage a truly black box? Beer demonstrates by way of example that it is possible thus giving rise to what he calls:

The First Regulatory Aphorism (pg 40)

> *It is not necessary to enter the black box*
> *to understand the nature*
> *of the function it performs*

In real life the black boxes are not wholly black, but muddy. This gives rise to partial explanations and encourages managers to enter the black box seeking the causes resulting in a disregard for the First Regulatory Aphorism.

A manager of an enterprise must try to understand what is going on. Beer contends that two mistakes are commonly made. The first is to conclude that we understand invariance in a system without studying it for a sufficient length of time. The second is that information is simply ignored.

Beer concludes the discussion on the measurement of variety by posing the question of the variety measures that are generated by black boxes. If we don't enter the black box we don't understand its internal structure - and therefore its number of possible states is provisionally a function of the total variety manifested by the interaction of its input and output schemata. (pg 45) Thus he asserts:

The Second Regulatory Aphorism (pg 47)

> *It is not necessary to enter the black box*
> *to calculate the variety*
> *that it potentially may generate.*

Chapter 3 - Emergency exit

We have observed that by manipulating the inputs to the muddy box we may influence the outputs. But how does management know which strings to pull? The answer Beer suggests is to operate outside the muddy box. If the output states that management wishes to hold constant are selected and constantly measured against a constant, the deviation between the two can be measured and used as a feedback signal to modify the input.

Unfortunately in a dynamic system the measurement takes place *after the event.* What is needed is a feedback mechanism that is able to deal with time lags. But as well as being able to cope with time lags, the feedback mechanism must be able to cope with unexpected disturbances from outside the system.

It has been argued earlier that as the system is not given its nature and boundaries are uncertain and it's purposes are subjective. We call a system STABLE once its feedback adjuster can handle predicted fluctuations but a system that can handle its own explosiveness in the face of unlisted uncertainties we call ULTRASTABLE. This is a system that will operate in the face of perturbations that have not been envisaged in advance - at the design stage. (pg 62)

We have said earlier that we chose to operate outside the muddy box by introducing the notion of feedback in order to induce SELF-REGULATION. Now Beer suggests we need to move outside of the feedback system to achieve ultrastability and in so doing induce SELF-ORGANISATION.

We have now introduced the Adjuster Organiser whose object it is to modify the design of the Feedback Adjuster. Refer to the figure below (pg 64):

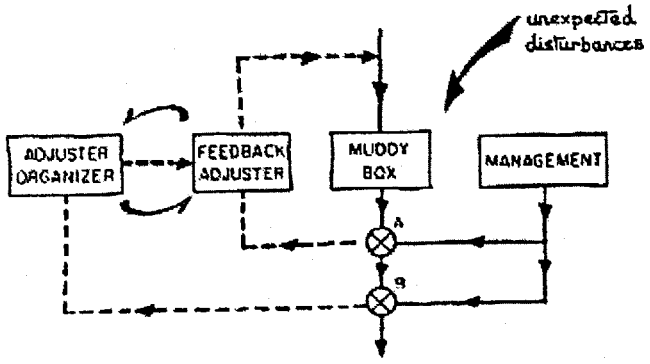


Figure 16. The regulatory system, growing from Figure 12 through Figure 15, acquires a *learning* facility

"If a regulatory device works, and if it gradually converges on a smooth performance, we can infer that the Feedback Adjuster is steadily acquiring an adequate representation inside itself of the input-output relationship. This regulation presupposes a representation of equivalent variety in the regulator as is exhibited in practice by the muddy box configuration." (pg 65) We know that this will not be the total variety that the box is capable of generating or the muddy box would be transparent to the regulator. This is why the Feedback Adjuster needs an Adjuster Organiser to cope with the time lags and simultaneously model the whole system.

"It is now clear what the role of this machine has to be: it is to modify the design of the Feedback Adjuster so as to accommodate a higher variety representation of the muddy box." (pg 66)

How does the Adjuster Organiser do this? There are two approaches in Cybernetics. One is continuously experimenting with the design of the Adjuster which Beer suggests, because it is random, takes too long. The second is to predispose the Adjuster Organiser to particular rather than random experiments. The outcomes will still be unpredictable, but the variety would be very much constrained.

This predisposition must come from a higher level. Higher in the cybernetic sense is used to mean 'over and beyond' rather than to more senior. It is thus a 'Meta' system and is METASYSTEMIC to the lower level. In future we will thus refer to the previous figure (fig 16) as a MANAGEMENT UNIT and it will be represented as shown in the following figure (pg 71):

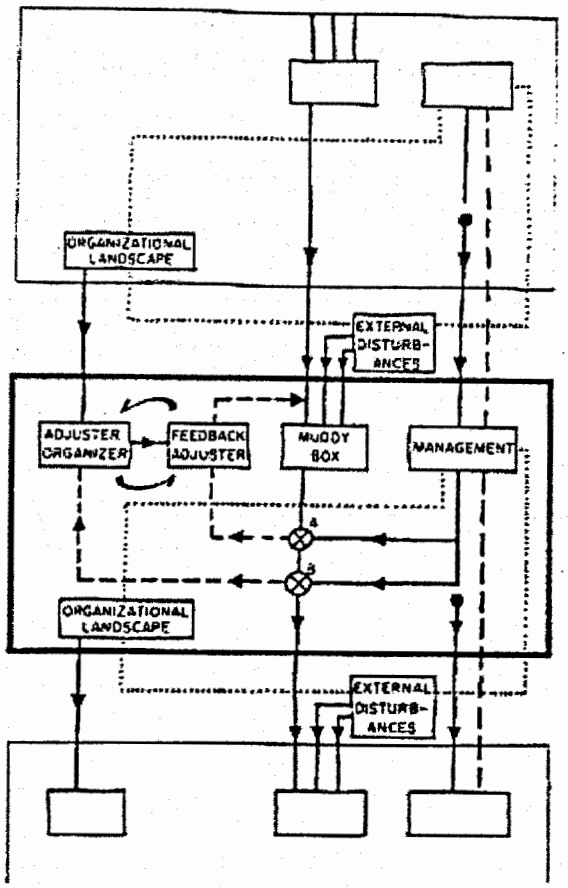


Figure 17. showing how three management units of the sort described, are arranged in an hierarchical cascade in which all mechanisms and all vertical connections are invariant. The diagram exhibits organizational recursiveness

"A fundamental characteristic of the Management Unit is that it treats the proliferating variety of its representation of the world it manages as a muddy box, and regulates it by manipulating the inputs in relation to the outputs". (pg 70) Hence the task of management is to design the Feedback Adjusters.

The other feature of the Management Unit is that the Feedback Adjusters are made adaptive. This is where the Adjuster Organisers come into play, which has been shown to require input from a Metasystemic level.

"The fact is that however strongly the hierarchical structure operates, nothing can save the manager from his personal obligation to regulate his own muddy box", which reiterates the point made earlier - 'regulation presupposes a representation of equivalent variety in the regulator as is exhibited in practice by the muddy box

configuration'. Hence if management does not have adequate variety to design the Feedback Adjusters, Adjuster Organisers are needed.

Beer concludes this section of Heart with the contention that the Management Unit is a general solution for managing black (or muddy) boxes without entering them. Most importantly, as shown in fig 17, each of the boxes is structurally identical. This is a cornerstone to his management model.

If we consider a traditional organisation chart, Beer contends that every box on the chart shares the same organisation, ie. every box is the Metasystem of the box below right throughout the chart. If, as has been argued earlier, the task of management is to handle proliferating variety, the interconnectivity of the boxes as suggested by the management unit is a massive variety reducer.

"The principle of organisational and interactional invariance is called RECURSIVENESS. Each level of organisation is a RECURSION of its metasystem." (pg 73)

Chapter 4 - The exit

It has been said previously that that the variety of the regulator must be at least equal to the variety of that which it is regulating. This law has been stated by Ross Ashby many years ago as the LAW OF REQUISITE VARIETY.

It has been demonstrated that variety absorbs variety, and in fact that the only thing that can absorb variety is variety. It has also been shown that systems naturally tend towards self-regulation. It was for this reason that it seemed appropriate to call this natural law the 'Law of Requisite Variety'.

Beer postulates that as with any natural law, this law will inevitably assert itself, just as the law of gravity will assert itself on an aeroplane. In the short this can be resisted. In the case of an aeroplane by expending energy. In the case of a management system requisite variety can be pumped in, but as Beer suggests this is done at a price - in the expenditure of information.

As discussed in the last chapter we moved outside the muddy boxes to manage proliferating variety by using Feedback Adjusters and Adjuster Organisers. We were essentially attenuating the variety of information being sent to the manager. In the same way the variety being passed to the muddy box by the manager must be sufficiently amplified that Ashby's Law is obeyed. (Beer uses an example of the ratio of police to criminals to demonstrate that the police do not have sufficient variety to control criminals as they are outnumbered. Their variety is amplified by their managers by such things as collecting records, supplying motor cars, using sophisticated communications systems, etc. to match their variety with that of the criminals).

Thus the Law of Requisite Variety entails an equation in which both variety attenuation and amplification are involved. Beer at this point makes two important statements, viz. both the attenuators and amplifiers need to be designed and that they must be inserted on the appropriate side of the equation.

Following on from our earlier representation of the Management Unit, Beer proposes an ELEMENTAL ORGANISATIONAL UNIT which is represented in the figure below (pg 96):

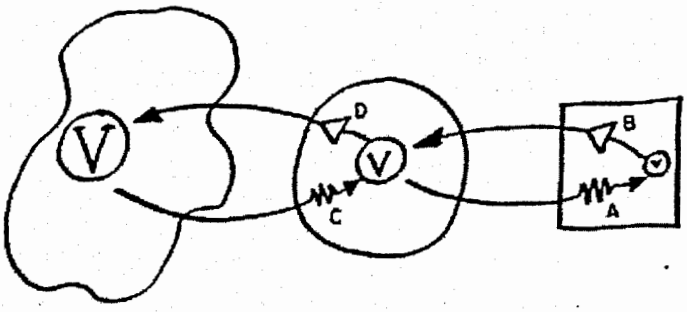


Figure 21. Figure 20 redrawn to show how amplifiers and attenuators are introduced into the variety diffusion process to accommodate Ashby's Law

The square represents the management unit, the circle the operation it regulates and the undefined shape a loosely defined environment. For ease of representation these are separated but in reality the square is embedded in the circle which is embedded in the loosely defined environment. The standard electrical symbols have been used to denote an amplifier and an attenuator.

Out of this comes:

The First Principle of Organisation (pg 97)

> Managerial, operational and environmental varieties, diffusing through an institutional system, tend to equate; they should be designed to do so with minimal damage to people and to cost.

The Second Principle of Organisation (pg 99)

> The four directional channels carrying information between the management unit, the operation and the environment must each have a higher capacity to transmit a given amount of information relevant to variety selection in a given time than the originating sub-system has to generate it in that time.

The Third Principle of Organisation (pg 101)

> Wherever the information carried on a channel capable of distinguishing a given variety crosses a boundary, it undergoes transduction; and the variety of the transducer must be at least equivalent to the variety of the channel.

Chapter five - Bases of viability

The Oxford dictionary defines *viable* as: able to maintain a separate existence.

It has been discussed earlier that a system attempts to survive by self organisation, ie. to be a viable system. Beer then contends that those enterprises that have failed have done so because they have failed to obey the internal criteria of viability, and it is these internal criteria of viability that need to be established.

So far we have considered black boxes and muddy boxes and their embedment in the managerial unit and the elemental organisational unit. We now need to expand these into the enterprise.

The most commonly used tool to evaluate the enterprise is the organisation chart. However we have shown that this proliferates variety. Earlier a number of ideas were suggested to reduce the massive variety that is generated by the black boxes. This is to divide the viable system into two parts, one of which essentially consists of the operational elements. This is the element that undertakes the systems basic activities and consists of an operation (circle), in which is embedded a management unit (square), and an environment in which all of that is embedded, ie. the elemental organisational unit derived earlier - figure 21 on page 96.

What then is the second part? It is the collection of subsystems that exists to look after the operational elements. It is the metasystem as defined earlier. It was also argued earlier that every level of the organisation is a recursion of its metasystem. Hence the

metasystem of any one viable system is an operational element in another viable system at the next level of recursion. Beer thus states the following theorem:

Recursive System Theorem

> In a recursive organisational structure, any viable system contains, and is contained in, a viable system.

This theorem Beer says troubles many who have made use of his work. The question that is asked is: *"If a viable system is one 'able to maintain a separate existence', how is it that a viable system contains viable systems which are clearly not separate from the viable system in which they are contained?"* (pg 118)

The answer Beer says lies in the word 'able'. In principle parts of the organisation could be sold off, but only if the corporation sees merit in it.

Beer continues to build his model by moving on from the single elemental organisational unit, or operational unit, and its relationship with its metasystem to and organisation with multiple operational units, as would be the case in most enterprises. For purposes of the discussion he considers three operational units. This is represented as shown in figure 23 below (pg 121) :

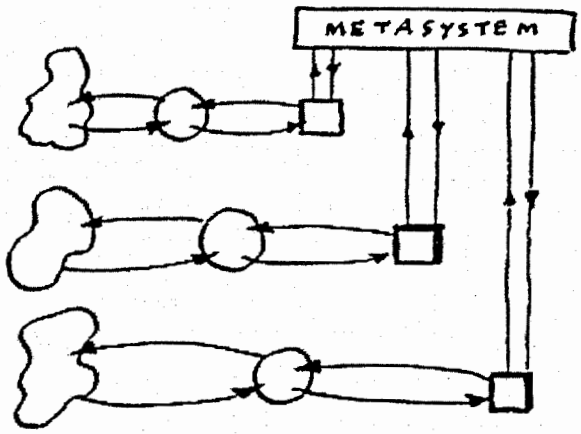


Figure 23. Three operational elements in their relationship to a metasystem (but without relationship to each other)

If we look closely at each unit and its relationship with the metasystem we have the following relationships of attenuation and amplification as argued earlier (pg 121):

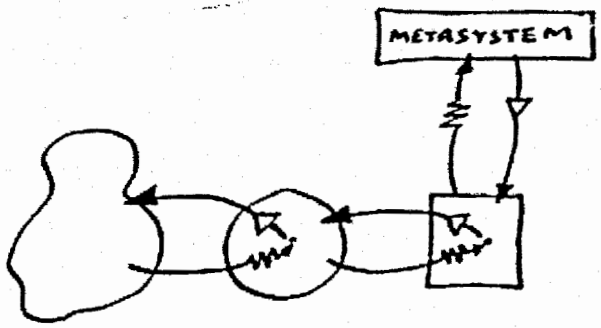


Figure 24. The relationship between any one operational element and its metasystem

While in the model showing all the elements we may not be able to show the level of detail as shown here, it is implied that they will always be present.

Now clearly in an enterprise, while each of these units has its own job, there is a logical relationship between the units and between each of them and their shared metasystem. Figure 23 can thus be redrawn as shown below by figure 26 (pg 126):

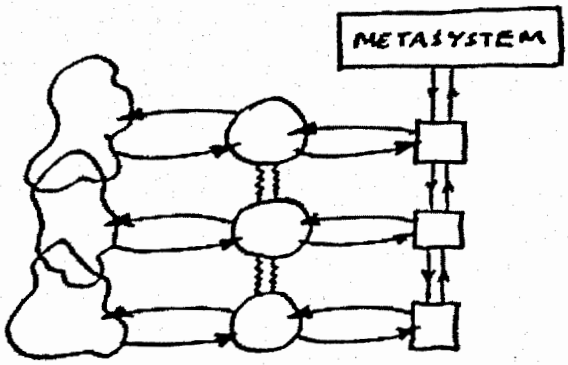


Figure 26. Three operational elements in their relationship to a metasystem, and (compare Figure 23) in their relationship to each other

At this point it must be stressed that there are no implied levels of seniority by one unit being above the other or by the fact that vertical lines from the lowest unit pass through the unit above. Rather it is a case of there being insufficient space of the diagram to draw all the lines. It must also be borne in mind that at all time the Three Principles of Organisation apply.

Beer concludes the chapter by postulating that the model developed thus far appears to be a necessary component of a viable system. By definition he then chooses to refer to the collection of operational elements as SYSTEM ONE. Finally he states that System One is not sufficient as a condition of viability, but that it is necessary.

Chapter six - Freedom

When an operational element, the double looped horizontal chain, was first discussed it was stated that it was free to act. The management unit (square) had things to say to the operations (circle), and the operations had things to say to the environment. However, when several operational elements were introduced, it was shown that vertical links between the elements were introduced and a metasystemic activity became involved.

"Whatever impinges on the free activity must arise in a different DIMENSION. A good definition of a dimension is 'a condition of existence'. It is a condition of

existence for the operational element that it subsists within a larger whole, containing other elements." (pg 146)

The interaction between the operational elements and the metasystem that contains the whole cannot be depicted in the horizontal. The impact is thus orthogonal, ie. they stand at right angles. Once again it is stressed that these diagrams tell us nothing about seniority.

Beer thus suggest that at any point in the space that the two-dimensional diagram occupies, two organisational forces are at work, ie. an *operational* force on the horizontal axis, which is concerned with the effectiveness of the elemental operations, and a *coherence* force on the vertical axis, which is concerned with systemic viability. Thus at any point on the diagram these orthogonal forces interact, and it is this interaction which DEFINES FREEDOM within the viable system.

Beer proceeds to demonstrate the above by way of a number of examples and finally states that the reality of the problem of freedom within an institution lies, not in the subjective impressions of the people involved, but in what the institution DOES to them by way of variety constraint.

From within the enterprise these matters are relevant to viability. From outside however there is more which Beer states as follows:

1. Handling horizontal variety is difficult for the management unit. It must design amplifiers and attenuators to meet the Three Principles of organisation.
2. Because of the interaction of the orthogonal forces there is an intervention in the horizontal variety equation in the elemental operations which diminishes there autonomy.
3. Intervention by the metasystem further diminishes the variety disposed by the management unit of each operation.

Therefore

> *The metasystem should make minimal use of variety attenuators in its dealings with the management units in a downward direction.* (pg 158)

4. If minimal attenuation is desirable, should there be any? The minimum is in principle zero.
5. However, if there were zero metasystemic intervention, elemental operations would do their own thing which would not be consonant with each other.

Therefore

> *The metasystem must make some intervention, and should make only that degree of intervention that is required to maintain cohesiveness in a viable system.* (pg 158)

6. Cohesiveness is however a function of the purpose of the system.
7. But systemic purpose is a subjective phenomenon.

THEREFORE

> *Freedom is in principle a computable function of systemic purpose as perceived.*

Beer then proceeds to examine further the conclusion that minimal intervention by the metasystem in the vertical plane is essential to viability and what this means in the corporate management context.

The metasystem, by intervening to attenuate variety in disposable by the management unit, is in fact amplifying its own variety downwards. What is happening is that there is a struggle for requisite variety in the vertical management plane.

It has been argued that if Ashby's Law demands that amplifiers are in place, they must be designed - or they will disadvantageously happen. If this is the case, requisite variety is lost.

Chapter seven - Constraint

The last chapter demonstrated that the urge for freedom in the operational element is countered by the necessary call for cohesion that inhibits the variety disposable in the horizontal plane. In cybernetic terms this is called *constraint.*

It was stated earlier that System One is not sufficient as a condition of viability, but that it is necessary. System One inheres in a metasystem whose roll remains to be unfolded. Consider what happens whenever inter-related subsystems having disparate criteria interact. They will go into *oscillation.* This will become uncontrolled oscillation unless a sufficient element of damping is introduced.

Earlier the mechanism of damping was discussed when we introduced the notion of feedback. At that stage feedback was discussed in the horizontal plane. We now have the same situation but turned through 90 degrees. We are now talking about oscillatory behaviour in the vertical plane.

These oscillations are derived from vertical interactions in the operational domain and are thus high-variety. Thus the system required to handle these oscillations must be of high variety. But it has been said that this vertical linkage that runs to the metasystem must operate with minimal variety in relation to corporate cohesion if autonomy is to be upheld.

Beer thus contends that the need for a System Two is demonstrated. "It's function is anti-oscillatory with respect to vertical interactions within System One in the operational domain, but it necessarily operates in the vertical plane of the managerial domain - OUTSIDE the channel that is often called 'command". This is shown if figure 30 below (pg 176):

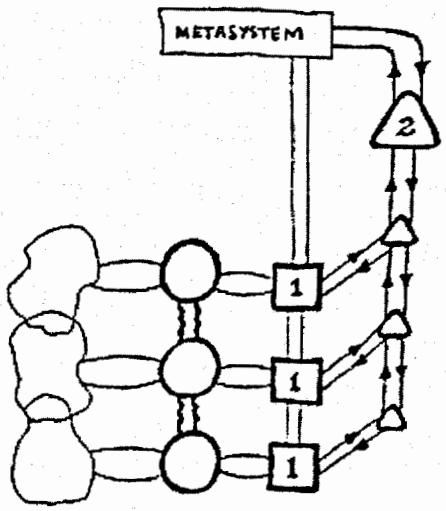


Figure 30. The genesis of the anti-oscillatory System Two. It is necessary to any viable system. Therefore it can always be discovered: but usually it goes unrecognized

System Two is necessary to prevent System One going into uncontrollable oscillation. It is not about power, although it does intervene in the freedom of System One, but rather about the highly specific function of damping oscillations. It is thus a service to System One.

Beer contends that this role is not well understood in managerial culture and that many so-called services, such as advisors, become dominant in terms of power. He suggests that if this role were to be clearly identified as being solely for the purpose of being anti-oscillatory, we would not suffer the consequences of power play.

Further problems that Beer has found with the understanding of System Two is that it is often identified with general clerical tasks. While every enterprise dedicates effort to anti-oscillatory activities, Beer contends that there is no managerial correlate available to match it, hence attempts to identify anti-oscillatory activities with general clerical tasks leads to failure.

While there seems to be no disagreement with the need for a System Two in an enterprise, there needs to be a recognition of its true nature thus enhancing its design and performance.

Chapter eight - Inside and now

Up to this point in the book Beer has argued the derivation of System One and the necessity for a regulatory mechanism, which has been named System Two, to dampen uncontrollable oscillations within System One. He argued that since the interactions within System One are continuous in time, System Two must be continuously in being. Furthermore, its criteria can only be formulated at the next level of recursion. It is thus a subsystem of the metasystem in which System One is embedded.

But, argues Beer, nothing has been said about what the metasystem actually is. At this stage it is a black box. Thus in order to gain an insight into this particular black box, Beer proposes to call it System Three. Whether System Three is the metasystem, or whether the metasystem also has other roles to play is still to be discovered. The diagram is as follows (pg 201):

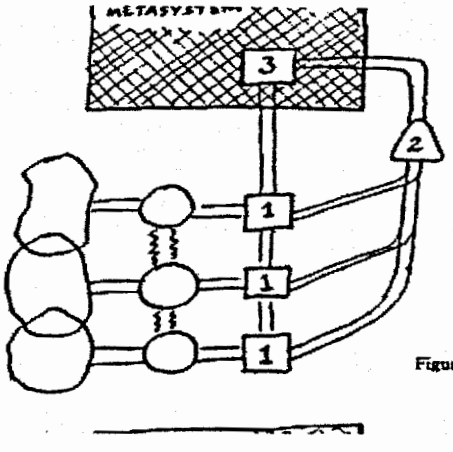


Figure 31. The emergence of System Three

System Three surveys the total activity of the operational elements of the enterprise. "It is aware of all that is going on *inside* the firm, *now*. This is because it has direct links with all the managerial units, which exist simultaneously in real time. It is also aware of the anti-oscillatory activity of System Two, since System Two is it's own subsystem". (pg 202) For the first time a subsystem has been encountered that can see all operations simultaneously and must therefore play a role in promoting viability. Beer points out that the managerial style may well differ between organisations which will affect everyone's perception of freedom. However he argues that as long as we adhere to the cybernetic rules the constraints on freedom will derive from the structure of viability rather than from whim or ideology.

System Three sets out to integrate the operational elements. Beer then poses the question - what is the logical intention of integration? As has been argued, it is the minimal metasystemic intervention that is consistent with cohesiveness within the purposes of the viable system, remembering that the purposes are determined by those involved with the system.

Exactly what minimal interventions are depends on the circumstances of each particular system. However it is fairly clear that getting the most out of System One would be at least one of the purposes, which is different from saying that we want to get the most out of each operational element. *"The systemic machinery is supposed to do better than that: the product is called SYNERGY".* (pg 203) This refers to the results that derive from having a viable system, rather than a collection of parts.

"Synergistic behaviour derives from the recognition of mutual support between the operational elements. It is intended to lead to a higher total pay-off for the total system than the sum of independently acting elements could produce, even if one or more of the elements is thereby rendered less profitable than it might have been without invoking synergy. It is this fact that determines the metasystemic location of synergistic planning. And it is this fact that determines the minimal degree of metasystemic intervention in System One". (pg 203)

Beer then tackles the question of the variety generated between the various systems and points out that Ashby's Law is not adhered to by the model as derived to this point. It has been shown that the horizontal variety within the operational elements, System One, is massive. The variety absorbed by System Two is much less since System Two deals only with those aspects that threaten oscillation, although this variety will still be substantial. System Three on the other hand is meant to represent the cybernetic policy of freedom, ie. minimal intervention. This suggests far less variety than even System Two. Thus Beer suggests that System Three does absorb the variety of System One.

Since it has been shown that the metasystem is the System One of a higher level of recursion, in which the whole system is embedded, System Three must have the capability to absorb the variety of System One.

Beer suggest that the best way to handle this is to allow direct interaction between System Three and the *operations* of System One. A diagrammatic representation of this is as shown below:

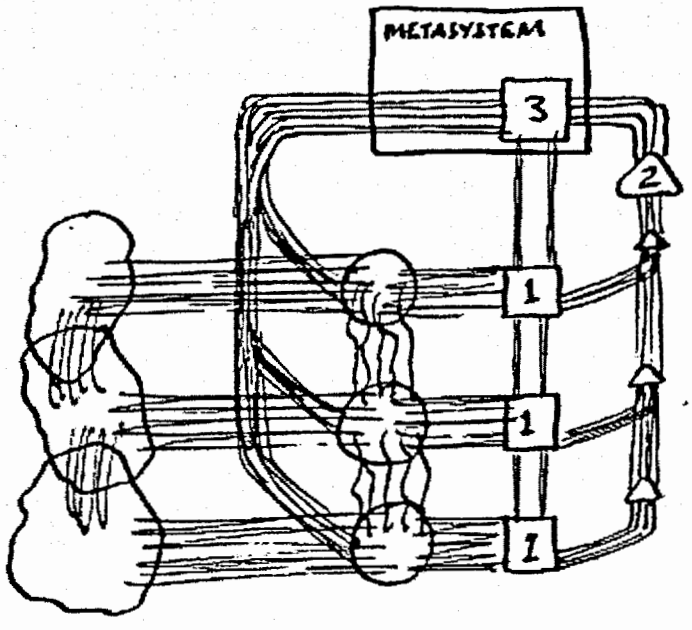


Figure 35. An impresionistic picture of the variety interactions that must necessarily obtain within Systems Three-Two-One, if Ashby's Law is to be vindicated

Hence the following equation can be offered:

> The sum of variety deployed by System Three in the vertical plane
> = the sum of variety deployed by the elemental operations in the vertical plane

In this way Ashby's Law is obeyed.

Beer contends that the most obvious example of this newly introduced loop is the AUDIT. We are all familiar with the current accounting practice of auditing, but Beer asks why this should be limited to the accounting function.

Thus the audit is a two-way loop between the operational matter-of-fact and the relevant sub-system of System Three. This will result in a continuous output of the audit that calls for the modification of System One behaviour. This will ultimately reach the management units by way of instruction, ie. by metasystemic intervention. But Beer contends that this is totally expected and belongs to the minimal intervention category.

Consider the two diagrams below. The first shows the autocratic mode of management while the second shows the autonomous mode of management minimising the metasystemic intervention by using the audit loop.

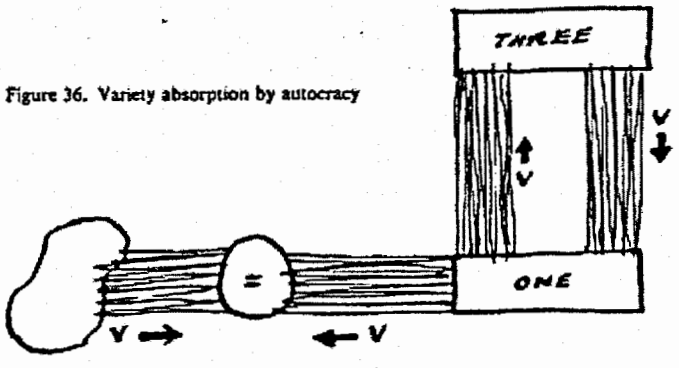


Figure 36. Variety absorption by autocracy

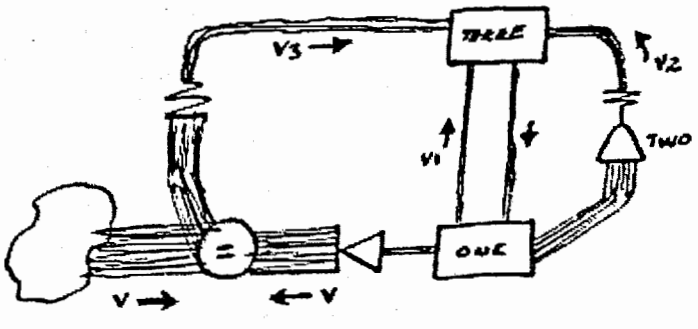


Figure 37. Variety absorption by autonomy

The enquiries up to now have elicited six interactive elements in the vertical plane. The first three are the variety-interconnections in the vertical plane of the ENVIRONMENTAL, the OPERATIONAL, and the MANAGERIAL domains. The second three are the channels of METASYSTEMIC INTERVENTION, the ANTI-

OSCILLATION CHANNELS that innervate System Two, and the OPERATIONAL MONITORING CHANNELS of System Three.

"Then because of the cybernetic laws that govern the embedding of System One in its metasystem, which we have been calling the principles of organisation, it becomes possible to make a definitive statement concerning the internal and continuous stability of the enterprise. It is this:

> The sum of horizontal variety disposed of by *n* operational elements
> = the sum of vertical variety disposed on the six vertical components
> of corporate cohesion

This is **The First Axiom of Management"**. (pg 217)

Chapter nine - Outside and then

The model derived to this point has led to a structure whereby an enterprise must be organised to handle it's own internal regulation. This arrives from the cybernetic laws that have been argued, and while a particular institution may not look like the Systems Three-Two-One diagram, as the organisation chart is the usual convention, cybernetic conventions will enable translation from one language to another. It is at this point that Beer states that the model becomes a useful diagnostic tool.

"To use this work it is VITAL to know at all times at exactly which level of recursion one is operating. And since many managers operate at different levels of recursion, in different roles, confusions often occur". (pg 226)

Beer thus argues that Systems Three-Two-One are necessary components of a viable system which account for internal stability. But, says Beer, this alone cannot be

sufficient for viability because it takes no account of 'progress' at the level of recursion for which this set of systems constitutes the internal elements.

It was shown earlier that the enterprise is embedded in an environment (the square in the amoeboid shape). The viable system that we are modelling must respond to this larger environment. But System Three cannot do this as, by our definition, it is concerned with inside and now. So Beer declares a new system dedicated to the larger environment which he calls OUTSIDE AND THEN. This is System Four, and once again he we are reminded that this does not betoken 'seniority'.

Beer then states that there are two senses in which System Four has to deal with the larger environment called Outside and Then. Firstly the *accepted* environment of the corporation, ie. the wider environment in which it is contained, and secondly the *problematic* environment of the corporation, ie. the wider environment that belongs to it.

He depicts the situation as shown in the figure below:

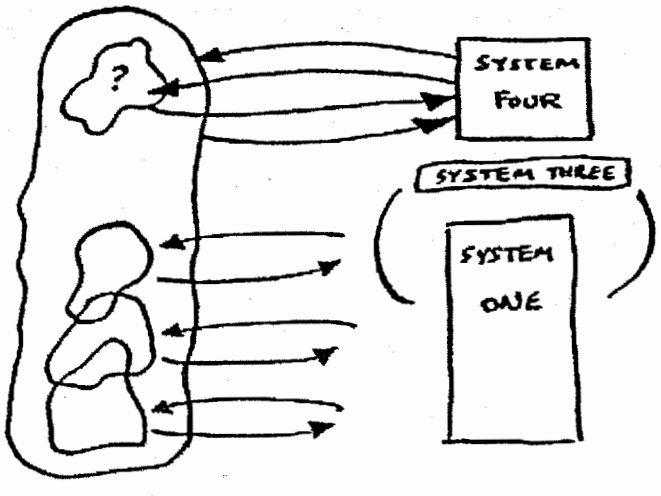


Figure 38. The emergence of System Four. It is determined by a larger environment and an unknown future

What counts as a System Four activity in an enterprise? Beer suggests R and D, Market research, Corporate planning, Economic forecasting, Management development. For viability these activities should be integrated, but Beer says they

usually are not. *"Assuming that this allegation is true (and is it not?) the question arises: does it matter? I think it does, for two distinct and powerful reasons".* (pg 231)

Beer says that the first of these reasons is the change in the rate of change. The exponential expansion of technology, especially electronic technology, has meant that System Four is in continuous action. This he suggests is the reason for the invention of 'corporate planning'.

The second reason is that the responsibility for adaptive behaviour has shifted, and Beer suggests that this fact has not been recognised. This responsibility belongs to the boss, but he delegates responsibility. In the instance of System Four functions he delegates to various disconnected teams of advisors. This is the traditional 'line' and 'staff' functions. Beer states that it worked in the past but works no longer and should be abandoned.

The notion of staff is supportive and is essentially advisory. However, when the contemporary activities of System Four are examined it is apparent that these characteristics no longer apply. The reason, says Beer, is that all sub-systems of Four are using new technologies that are probably outside the competence of the boss to evaluate. *"The fact is that, whether they wanted it or not, System Four people have acquired a great deal of power in the modern enterprise. They must be held accountable for the exercise of that power. The 'staff' man has no power at all that is not simply a reflection of the boss's power; these people have".* (pg 232)

Beer suggests that by considering these two arguments, it is evident that System Four is a continuous and powerful subsystem of the metasystem. New managerial concepts are thus needed to effect the integration of these System Four activities.

This integration would entail involvement between the elements at the level of their own variety generation. It embodies the cybernetic realities that have been discussed and is stated in terms of the principle (pg 234):

Every regulator must contain a model of that which is regulated.

The enterprise must contain an adequate model of its total environment if it is to be viable. The notion of environment must itself contain a regulatory model of the range of possible futures, and this says Beer, is precisely an explanation of the necessity for System Four. System Four houses the viable system's whole apparatus for adaptation and therefore must contain a model of the viable system of which it is the System Four.

Beer then poses figure 39 to show how this Development Directorate ought to work (pg 236) :

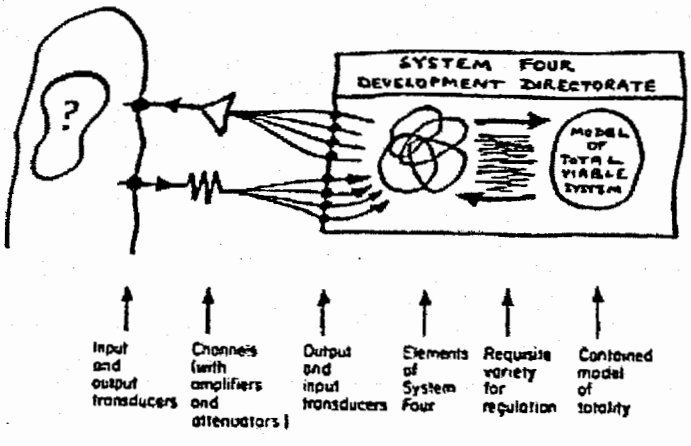


Figure 39. Key components of System Four

Referring to the accepted and problematic environments discussed earlier Beer states that this diagram depicts only the accepted environment. The problematic environment is related to the creative capabilities of the enterprise. Beer contends that contemporary management only reacts to stimuli that reach it from the environment and that we need to enter the arena of creative management, that of inventing the future. Most people he says appear to believe that the future is something that will happen to us, whereas it is certainly open to humankind to take charge of these events. As far as the model is concerned, this means considering the interaction between

System Four and its problematic environment. This is now a new issue, that of initiative.

This is captured in the diagram shown below:

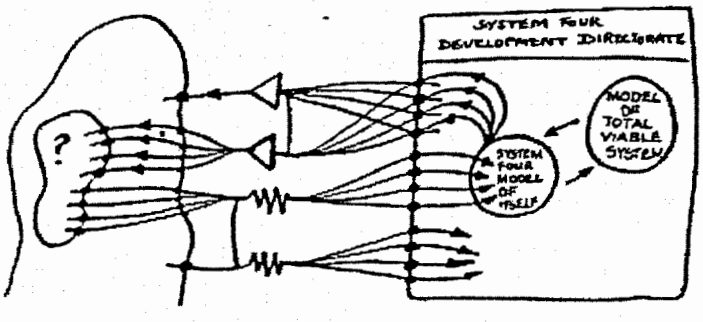


Figure 40. The System Four mechanism for interrogating the problematic environment

Beer contends that innovation in our management culture is understood to be a matter of flair, of inspired guesswork. But, says Beer, successful innovators use existing channels and transducers to stimulate and interrogate the problematic environment, but design new attenuating filters and transducers to 'hear' and understand the answers coming back. This is done by a feedback mechanism because the new filters and attenuators have to learn by their own experience.

Earlier the integration of the various sub-systems was discussed. There must be an intersect of all of these sub-systems, and Beer calls this the 'kernel' of focus. It is here that the management task exists. But who should undertake this task and how?

Beer proposes that just as we nominated an Operations Directorate for System Three, so we should nominate a Development Directorate. This Development Director should be a full member of senior management and not just a tame intellectual. This says Beer in his experience has proven to be very threatening to senior management. Further, as such a position is about future management culture, such a person is unlikely to be found in the ranks of the existing management, which is further threatening to the existing senior management.

The final question that Beer poses in this discussion on System Four is: how should the managerial duties of System Four be discharged? He proposes the Operations

Room, a type of club-house, a place for System Four managers. This is a concept used by Beer and on which he has written at length.

"For the Operations Room is a tool of total management, and arises in the context of each of the subsystems of the metasystem. But it has a very special development role. System Three, after all, if there is no Operations Room, can go and look at the operations themselves. But System Four has no operations to examine; it has only its creative facility to visualise alternative futures, and to invent them .....

..... Outside and Then". (pg 243)

Chapter Ten - Metasystem

To this point in Heart Beer has argued the case for Systems One to Three and finally Four as a subsystem of the metasystem to deal with Outside and Then.

Beer then poses the question *"whether the catalogue of necessity has reached the status of sufficiency in accounting for the viable system".* (pg 252)

Thus he draws figure 43 to show the structural findings to this point and suggests that this diagram exhibits a weakness within the internal structure of the metasystem. He goes further and says that the system depicted could not possibly be a viable system.

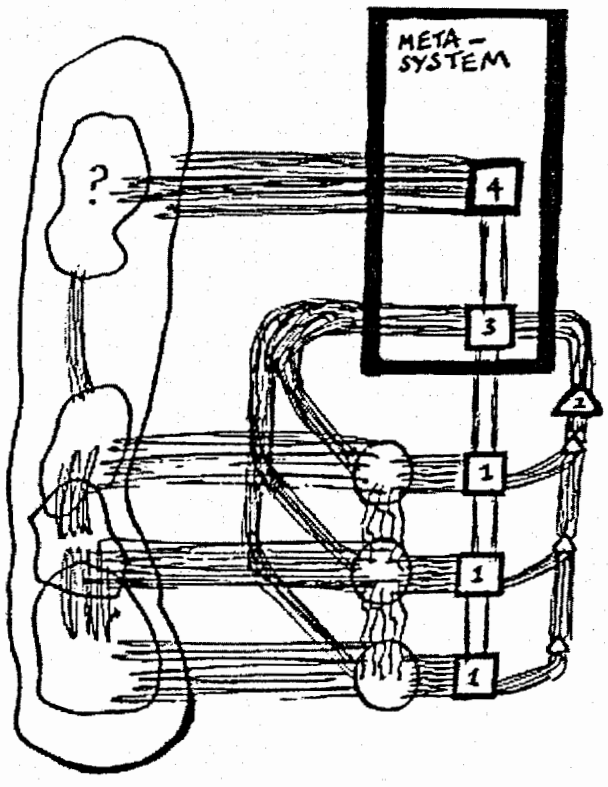


Figure 43. An impressionistic picture of the balance necessarily existing between the system and the metasystem. But the internal structure of the metasystem is variety-inadequate ... why?

As was argued earlier, System Four is a line function and is in no sense senior to System Three. They are accountable to each other for the variety each disposes in carrying out their activities. As they should not attenuate each other's inputs nor inhibit each other's variety, the channels of the vertical axis must remain tenuous connections. However these vertical connections do not obey the First Axiom of Management and the Law of Requisite Variety will exert itself. The metasystem as shown is torn between present and future preoccupations.

This then begs the question: wherein lies the power to determine the balance between the Three-Four relationship? Since the links on the vertical axis between Three and Four are of low variety, Beer suggests that there is a logical necessity for new loops connecting Three and Four which do not belong to the same axis. These are shown in figure 44.

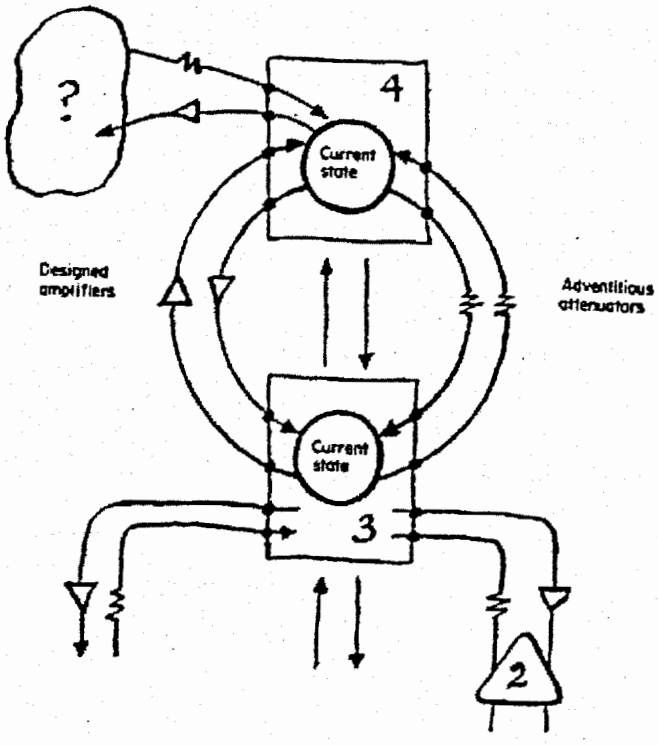


Figure 44. The Three-Four Balancer

The diagram shows System Three originating messages (which it seeks to amplify) to System Four making clear the needs of the business. System Four originates (and amplifies) messages to System Three which will illuminate future prospects that it expects the enterprise to confront.

At this point Beer suggests that the Three Principles of Organisation are finally satisfied, but that there is one important point that has not been discussed, ie. they must be distributed through time. He thus postulates a fourth principle:

Fourth Principle of Organisation (pg 258)

> The operation of the first three principles must be cyclically maintained through time, and without hiatus or lags.

"It seems evident that the easiest way to meet the requirements of all four management principles is to extend the notion of the Operations Room. Let it become the Three-Four clubhouse, and not merely a development orientated place. The argument, be it noted, is moving towards the provision of a management centre. It

would replace the Boardroom, the Executive Suite, and all those committee rooms. Here System Three and System Four would exhibit themselves to each other, in a continuous mode, and absorb each other's variety". (page 258)

Beer then returns to the question of wherein lies the power to determine the balance of power between the Three-Four relationship. The case for the management centre has been argued, but what happens if the Three-Four loops go into uncontrolled oscillation? System Two is not designed to reach into the metasystem. Thus says Beer we reach the final argument as to the logic of viability. There has to be a System Five which will monitor the operation of the balancing operation between Three and Four. "The argument is complete: Three-Two-One *plus* Three-Four-Five is a viable system - where the second group is metasystemic to the first". Beyond System Five says Beer is not System Six, but rather the next level of recursion, of which this fivefold viable system is an operational element.

Beer then poses the question: What is System Five? It is about closure. *"Closure is what makes the language complete, self-sufficient. Closure turns the system back into itself, to satisfy the criteria of viability at its own level of recursion. Closure is the talisman of identity".* (pg 260) This closure is supplied by 'the boss'. It is his cybernetic function.

This can be done in an autocratic manner which would make the system vulnerable as this autocratic boss cannot deploy sufficient variety to absorb the variety of Three-plus-four and he would thus be basing his closure on a much attenuated input.

The cybernetically preferred solution would be to provide closure by ensuring that no uncontrolled oscillations arose between Three and Four. As variety absorbs variety, System Five must monitor the regulatory machinery between Three and Four to ensure this does not happen. This is depicted in figure 46.

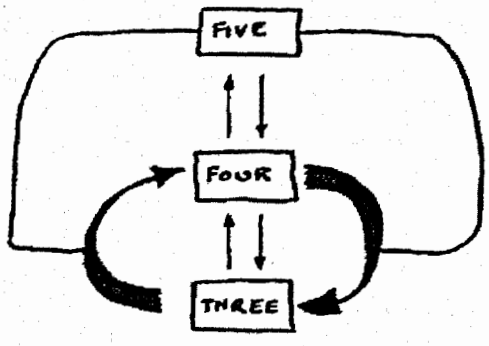


Figure 46. System Five conceived as the monitor of Three-Four interaction, in which their respective high varieties are deployed to absorb each other

"Within any one viable system, System Five is the metasystemic administrator of Ashby's Law. It necessarily absorbs the residual variety of the Three-Four interaction". (pg 263)

Before finally concluding the arguments for System Five, Beer postulates three final components which he states as relevant to the argument.

Firstly, Inside-and-Now was found to depend upon Systems Three-Two-One while Outside-and-Then depends upon Systems Three-Four-Five. System Three is thus the common element: it is the managerial fulcrum of the viable organisation. It is thus natural says Beer, that the role of Chief Executive should reside at the fulcrum - System Three in practice really runs the enterprise. This is incongruent with the hierarchical model which places the power in System Five.

Secondly then, who is the 'boss'? In an autocratic situation it will be one person, but even says Beer he is likely to be run System Three, which controls his access to internal variety. In a more democratic situation System Five is likely to consist of many people (such as representatives of management, of shareholders, of investors) which is contrary to popular belief. Thus it is difficult says Beer to see where the power of closure resides. "It may be in System Three, since System Five is, in a very real sense, deriving from superior knowledge, its puppet. It may be in another level of recursion where System Five is a mere System One, and therefore, in a sense, a puppet again".

Beer argues that probably System Five's main problem is its belief that it is not the puppet of some other system and is often supremely arrogant, essentially unaware of its fundamentally subservient role.

Thirdly, given that it was argued that System Four is seen as a 'staff' function, it is usually virtually empty. Without a System Four clearly in place there is no Three-Four interaction and no Five monitoring of that interaction. The whole metasystem then collapses into System Three.

Beer concludes this section of Heart by likening this metasystemic collapse to a decerebrate cat:

> *"You take a perfectly good cat, anaesthetise it, and remove the cerebrum. You can pin the decerebrate cat to the table, and keep it fed. It lives on; its viability is ensured by a bogus environment, and is sustained by artificial sustenance. If you prod its leg, it kicks back. And this is called 'living'. If we think this through in institutional terms, we diagnose a major pathology of our times".* (pg 265)
>
> The unwillingness of the established people to accept a legitimate System Four and the inability of senior people once promoted into System Five to accept the ambiguity of their new roles and not interfere at the level of System Three or System One.
>
> *"Thereby do our institutions become decerebrate cats. Management is noticeably failing the world, in the absence of metasystem. It can just manage to say miaow".* (pg 266)

Chapter Eleven - Measurement

"To know something properly you must measure it". (pg 279)

Beer contends that our ability to generate figures and thereby assume that we properly know what is going on is a delusion and that by the manipulation of these numbers we are experiencing the proliferation of variety.

Secondly he raises the question as to what counts as a measure. *"The measurement taken may count for a proxy of the matter concerned, but whether it can reflect the variety involved is another matter".* (pg 280)

Thirdly he contends that different observers of the same event would use a measure that would somehow include something of their own personalities.

He thus concludes that the whole of the inherited approach to measurement for management is flawed.

Beer then offers the following set of definitions for the arena of management information (pg 282):

Fact:	*That which is the case.*
Noise:	*A meaningless jumble of signals.*
Data:	*Statements of fact.*
Information:	*That which CHANGES us.*

Noise becomes data - when the fact is recognised.
Data become information - when the fact in them is susceptible to action
How can I possibly know that I am informed?
- Only because I have changed my state.

He then proposes the following cybernetic definition of a manager (pg 284):

"A manager is a human being who has refined the brain's ability to recognise patterns, and to compare the key characteristics of such patterns, in the context of extremely complicated systems comprising men, materials, machinery and money;

He has become skilled in recognising a change in his own state, by recognising information in the data flowing around him and his ambient noise;

He has the motive, and has cultivated the style, necessary to transduce his own change of state into a change of state in the extremely complicated system of which he is a manager".

Beer then considers the traditional forms of measurement, eg. Return on Investment, Profit / Earnings ratios, etc., and suggests that a good manager can manipulate these results to suit their argument. Then keeping in mind Ashby's Law that only variety absorbs variety, he suggests that the manager's job is three-fold:

1. To set the criteria of stability
2. To detect instability
3. To change the criteria

Thus the NEEDS of the manager to their job is:

"The manager's requirement of measurement is that it should measure stability and instability in the system that he (this being his role) has subjectively defined". (pg 287)

Beer thus proposes an arrangement for measurement as follows:

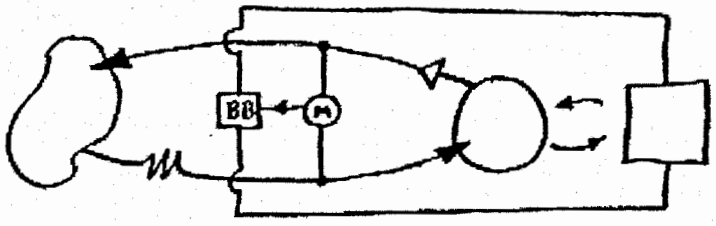


Figure 49. Completion of Figure 48

where M is a meter that detects the messages that are flowing around the loop. These are messages that say 'I am all right' or 'I am not all right - do something'. In addition these messages are continuous and therefore the rate at which they flow also indicates the level of unease.

BB is the management tool for understanding what is happening. Sooner of later says Beer management will have to learn how to master this tool which does not need to know the details, but needs to set the criteria for the meter. Once again it is seen that the management is outside the system showing that even System One management is metasystemic. If this diagram is rotated into the vertical position we have once again System Five.

"These approaches effectively repudiate the ***causal*** *view of the world on which existing managerial measurement is based".* (pg 290) Our culture, contends Beer, continues to propagate the belief that 'every event has a cause'. Management thus tends to look for a unique cause of systemic failure which is inappropriate as complicated systems will fail because they are potentially unstable.

Thus the meter that is checking for stability is looking at the following:

- what we normally do - ACTUALLY
- what we plan to do - CAPABILITY
- what we wish we could do - POTENTIALITY

Thus the meter will measure the ratio between the declaration and the response for each of the three criteria.

The ratio of

- actuality to capability is called - PRODUCTIVITY
- capability to potentiality is called - LATENCY
- actuality to potentiality is called - PERFORMANCE

Having taken care of the meter, Beer suggests that it is then management's metasystemic responsibility to set the criteria as to what will count as a destabilising admixture in productivity, latency and performance.

He contends it should not be about setting some arbitrary percentage deviation from the norm, which is commonly done, the typical causal approach, but rather about using statistical theory which, with the aid of computers, will detect changes long before any human. He points to Statistical Quality Control which has been in use in production management for many years.

Secondly there should be the ability to learn by experience. We should be looking directly at the relationships that are seen to occur, and thereby we may succeed in reinforcing those which lead to outcomes that we deem satisfactory and to extinguishing those which do not.

Beer concludes the discussion on measurement by pointing out that since System Five is itself metasystemic within the metasystem (Systems Three, Four and Five) of the viable system, Systems Three and Four must absorb each other's variety as System Five cannot do it. System Five thus demands a set of measurements based on the arguments of this chapter. Thus these two arguments follow:

The Second Axiom of Management (pg 298)

> The variety disposed by System Three, resulting from the operation of the First Axiom, and the variety disposed by System Four, are equivalent.

The Third Axiom of Management (pg 298)

The variety disposed by System Five is equivalent to the residual variety generated by the operation of the Second Axiom.

This discussion on measurement has depicted the manager as someone who could transduce, rather than translate, the change in himself. In addition the manager in System Five must listen to himself doing the job. Here contends Beer is the closure for the viable system.

"In the viable system called 'the human being', this function is usually called conscience". (pg 299)

Chapter twelve - Plots...

Considering the basic structural model for a viable system has been derived and the theorem of recursion which declares that all viable systems contain, and are contained in, other viable systems, Beer states that is now necessary to show that each level of recursion exhibits the viable system as an isomorphic mapping, a one to one mapping, of that same viable system at the levels of recursion above and below it.

The recursive system theorem gives us a tool for organisational description and of variety engineering that is an attenuator of the variety proliferated by a large organisation. Traditionally the organisation chart is used, but the alternative offered here has been to treat a viable system as consisting of two levels alone, the level of operational elements and the metasystem that organises those elements. *"Then in order to encompass a large organisation using such a descriptive device, we need the concept of recursion; thereby every viable system contains, and is contained in, a viable system".* (pg 308)

It was stated above that we need to have an isomorphic mapping of elements from one level of recursion to another. We have shown that the elements to be mapped are the Systems One to Five with all the linkages, but where do we begin and where do we end, especially when we realise that the corporation belongs to an industry, to a community, to a shareholding ownership, etc. Moving in the other direction , the plant contains the viable systems of departments, of sections, of men and women themselves, of their families, etc.

"In short, the recursive logic on which this approach to the science of effective organisation is constructed admits no 'origin' and no 'limits'. What counts as the origin, at any given moment, is the focus of our attention at that moment, which could be called Recursion Level x. The modelling of organisation moves away from any x towards the microcosmic in one direction, and towards the macrocosmic in the other. As managers, we need to be extremely wary of cutting short the PROCESS thus defined, and of saying: my responsibility ends here". (pg 312)

The concept of recursion as discussed is shown in the diagram below:

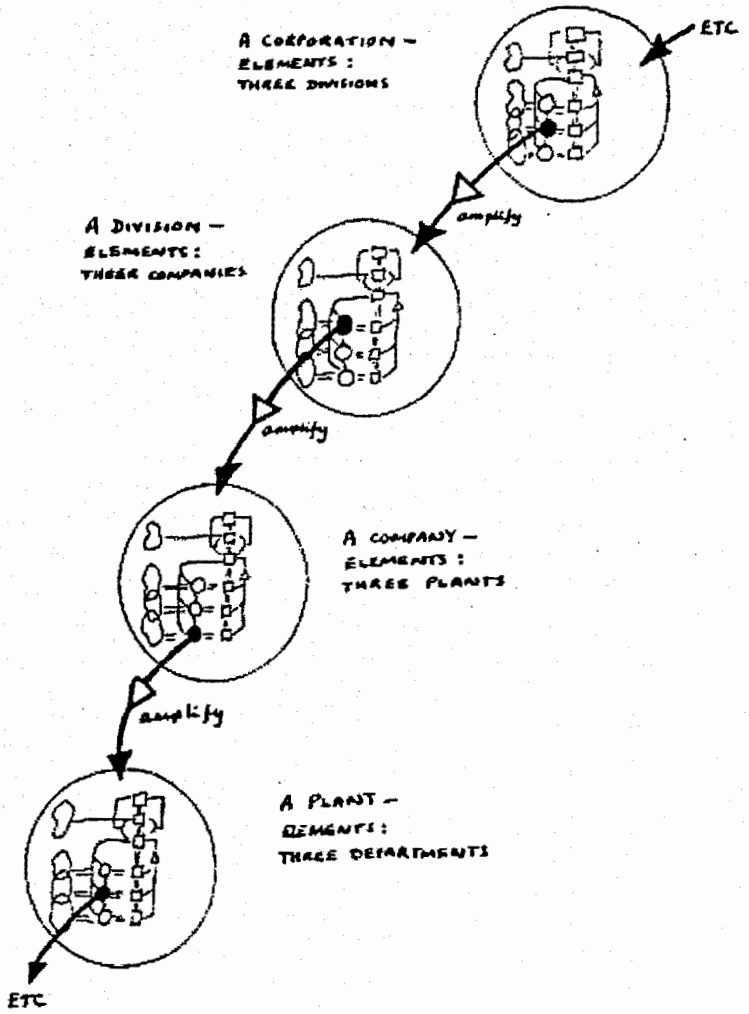


Figure 51. The organization of the corporation conceived of as a recursive *process*

This diagram indicates the following:

1. It makes clear which particular organisational unit belongs to each level of recursion.
2. It indicates that the institution believes itself to consist of this set of recursions, being part of a series extending in both directions.
3. It emphasises the invariance of the structure of viability at every level.
4. It can readily be expanded to indicate how many models must be constructed.

The diagram below gives a close up of two levels of recursion. By rotating the page through 90 ^{0} it can be seen the second recursion is the same as first recursion.

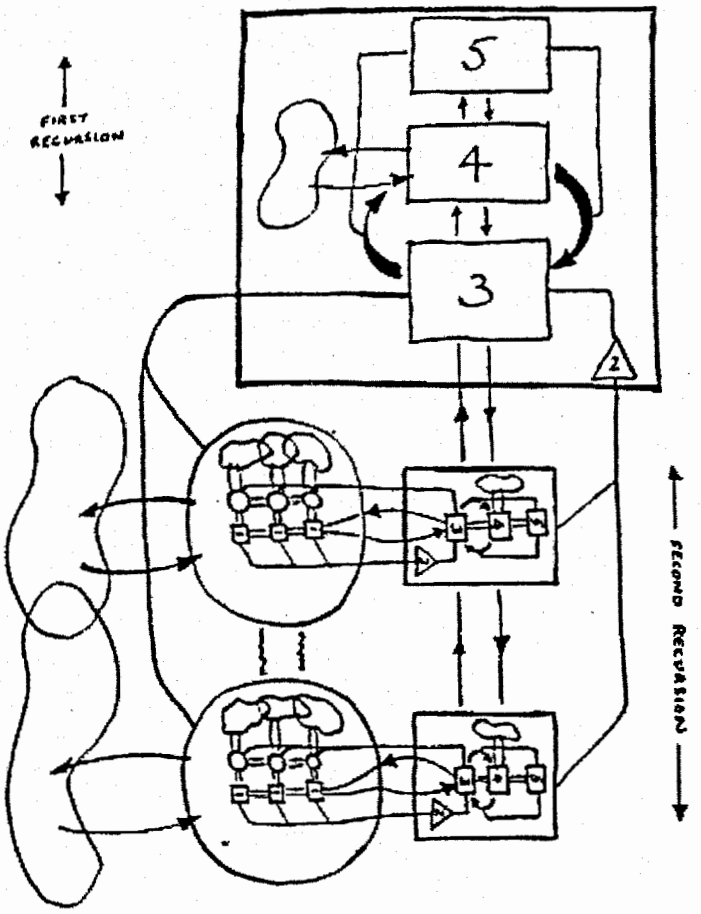


Figure 52. One method of depicting two recursions of the viable system (but note the misplacement of environments)

The problem however with this diagram is that the environments represented by the clouds are not shared by the two recursions which is contrary to that which has been discussed. This says Beer creates problems in representing the model in a two-dimensional space while still maintaining the concept of orthogonality. At this point Beer relooks at System Two and proposes a more elaborate convention as shown in the diagram below:

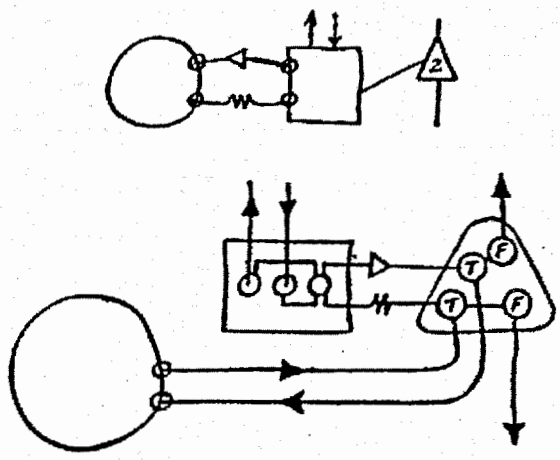


Figure 54. Replacing the familiar convention for System Two with a more elaborate one

T represents the managerial transducers of information to and from the operation itself, while F are the filters of the information flow, which feed only such information as is needed for systemic damping purposes into the vertical domain of System Two.

Thus the new diagram, figure 55 (pg 321) of Recursion *x* isomorphically maps the embedded viable system of Recursion *y*; and also has the potentiality to map onto Recursion *w*, in which *x* itself is embedded.

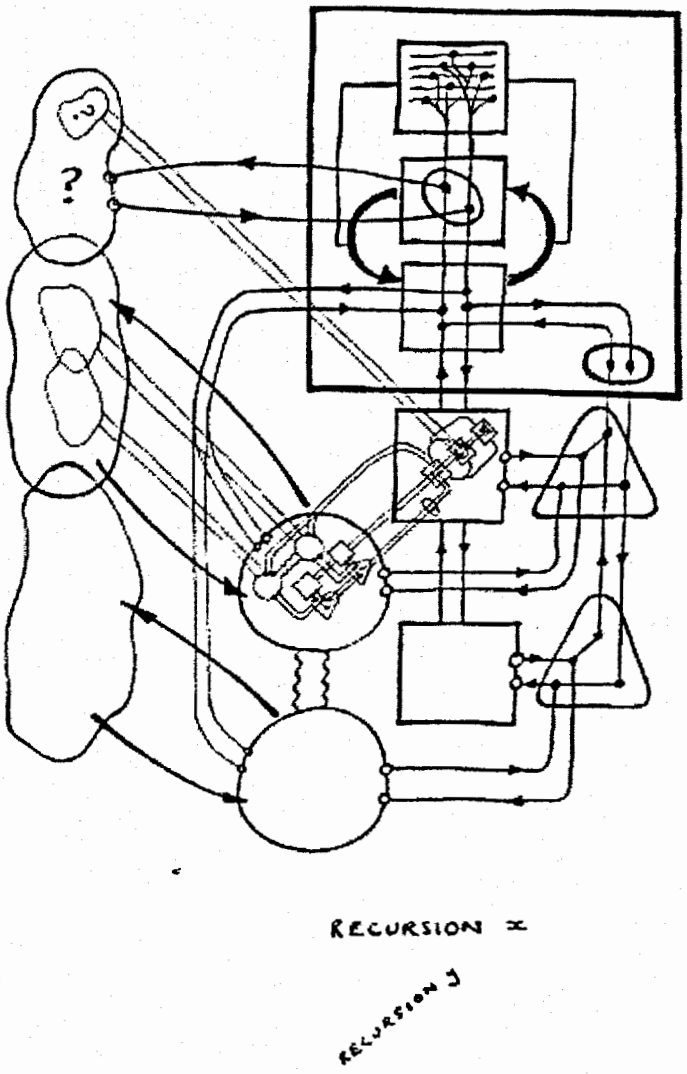


Figure 55. Definitive model of two recursions of the viable system (the diagonal of the page being used as the second dimension)

Finally then Beer draws figure 56 (pg 323) and reminds the reader that the cybernetic approach depends upon the structural invariance of viable systems, conceived as an operational system regulated by a metasystem.

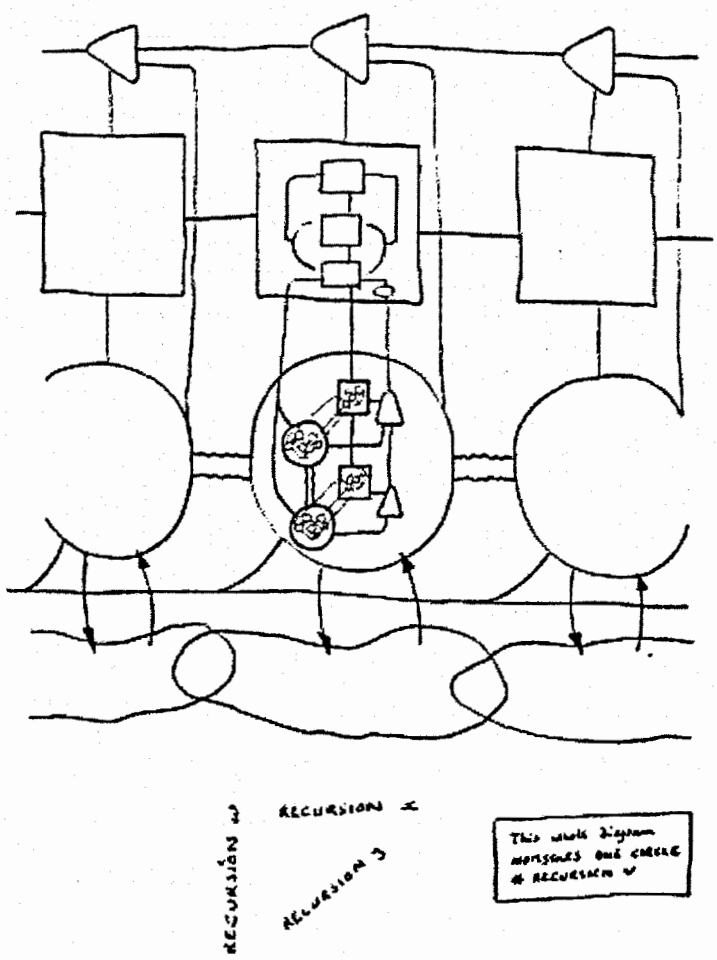


Figure 56. Definitive model of three recursions of the viable system. Recursion *w* (to be viewed under a 90° rotation) shows only Systems One and Two. Note that the whole diagram represents *one circle* of Revursion *v*

Chapter thirteen - ... and plans

"Cohesiveness is the primary characteristic of organisation.

This fact derives from the very purpose of organisation which, as was seen earlier, exists to contain the variety proliferation that arises from the uninhibited interaction of the elements of a system. In breaking down that interaction, the process of organising itself creates a problem of fragmentation which only its capacity to provide cohesion can offset". (pg 335)

Beer suggests that the 'glue' that creates this cohesiveness is the recursive logic as discussed earlier and that it is not static but rather a process. This process is PLANNING.

Planning is a continuous process, which contends Beer is a notion that conflicts with the traditional approach to planning of a plan based on next month, next year, etc.

"Not only is there is no logical validity in the entailed premises that everything develops at the same pace, or with the same degree of likelihood, but there is no chronological validity in the notion that epochs are somehow marked out to notify the requisite changes that would denote any need for managerial action". (pg 337)

In attempting to plan we should be engaging in a continuous process. This continuity arises from the constant readjustment of rational expectations against shifting scenarios - in circumstances where some sorts of expectation are more rational than others, and some sorts of scenario are more credible than others.

The traditional belief is that plans are products of advisory groups that are submitted to competent authorities for decision. This, contends Beer, is ridiculous, the arguments against this having being elucidated in the discussion on System Four. *"Planning happens only when there is an act of decision. The act commits resources now, so that the future may be different from what would otherwise have simply happened to us".* (pg 337)

It thus follows says Beer that the only planners are managers, viz. those people who are entitled to commit resources.

Following these arguments leads to the fact that plans must continually abort because more information must have become available since the date the plan was proposed.

Thus concludes Beer, plans do not have to be implemented or not by those in authority. What the authority does constitutes the plan and its realisation.

This says Beer is the reality of management. *"The institution hangs together because, and only because, plans are constantly aborting - and, in so doing, realising the actuality called profit and loss, success and failure, reward and punishment, happiness and misery, and (in the long run for the viable system) life and death".* (pg 338)

Beer contends that due to the continual interaction that takes place in an organisation, the plans produced for the managers seldom, if ever, contain any surprises. This is because information is passing around the loops in an informal manner. Staff sound out their bosses informally and soon realise from the reactions received and comments made what direction to take. All of this, says Beer, is the planning system.

Considering the above arguments and those concerning recursion, Beer states the following law using Recursion x as the focus (pg 355):

The Law of Cohesion for Multiple Recursions of the Viable System:

> The System One variety accessible to System Three of Recursion x =
> the variety disposed by the sum of the metasystems of Recursion y.

Chapter fourteen - Calm and alarm

The model that has been derived to this point, contemplated at any one level of recursion, comprises two hierarchical stages, Three-Two-One and Three-Four-Five. The elucidation of the model has shown how to deal with the first, hence Beer turns his attention to the articulation of the metasystem. This is the problem of 'senior management' and he contends it should be characterised by calm.

The Three-Two-One component is autonomous, subject to the Law of Cohesion and if there is no calm in the metasystem it is because it is accepting the role of continual intervention.

Considering the three systems of the metasystem, it cannot be expected that the three systems are mutually exclusive of key people. These key people will contribute to all the components and must apportion their attention to the various components accordingly.

"Articulation of the metasystem has to do with agreement about how the various roles involved are being discharged. It has nothing to do with titles displayed on office doors, nothing to do with the organisation chart and who reports to whom, and nothing to do with liaison committees charged to keep the various roles in touch. It is a continuous negotiating process - or more realistically, a continuous struggle for power". (pg 369)

Thus contends Beer, there is a need for comradeship at the top of any enterprise. This is expressed by mutual loyalty, agreement as to institutional identity and behaviour, and determination in a common intent. It is however critical that this negotiating process, which is to do with interpersonal variety, matches the demands of the laws of managerial variety, or else a dilemma will arise. Either the comradeship is blown apart, or the leadership function is finally abdicated, or both.

"If the objective is to solve the equations of managerial variety without disturbing the continuously adjusting solutions to the equations of interpersonal variety, then we are explicitly seeking an articulation of the metasystem that is self-conscious with respect to its cybernetic, as well as to its psycho-social, adequacy". (pg 373)

Beer contends that this point of self-consciousness is reached by a system that has developed the power to recognise itself at the infinite recursion. *"People tend to think of infinity as a definite location that is always further away than you can possibly go. On the contrary, infinity is a process; thus to understand the process is to understand infinity without going there".* (pg 373)

In the discussion on measurement it was argued that we are primarily interested in the detection of instability. *"Instability is inimical to the contemplation of the infinite recursion, and therefore to corporate self-consciousness"* (pg 374). Beer suggests that

there are two features about instability that need to be considered, ie. that it may set in anywhere and at any time, and that there are always pre-symptoms of the fact. However, typical management information systems report on stability and by the time instability is discovered it has already set in.

The problem we face, says Beer, is that of a time barrier. Historical information, even if it is a day out of date, cannot change history, although it may well change us. What we need is data about stability that can be transformed into information about the possibility, the likelihood, of incipient instability. Then we have a chance to avert it. As discussed in the chapter on measurement, the use of real time data allows the management systems to be treated as probabilistic rather than causal. Action may be taken now to prevent incipient instability becoming actual. Thus we have the opportunity to break the time barrier.

Thus contends Beer, it seems that calm is a function of alertness and comes from being poised to read the signs of incipient instability. Thus the cycle time for measurement is determined by the dynamics of the system. Since System Three tunes in to the stability of System One, it will find both short cycle (eg. overloading of machines etc.) and long cycle (eg. inadequacy of preventative maintenance scheme) times. Thus the 'inside-and-now' system is not concerned only with short-range planning. Nor is System Four concerned solely with long-range planning.

"So in terms of articulation of the metasystem, which is the search for self-consciousness at the infinite recursion, it becomes clear that we cannot make functional divisions, nor geographic divisions, nor planning divisions based on time horizons, and then propose to join them again in a metasystemic articulation; because none of these sets of categories maps onto the criteria of viability". (pg 377)

How then, asks Beer, are the divisions to be metasystemically articulated? One of the common approaches is the matrix organisation where each division is divided into a number of functions, plus the geographic regions, plus a number of time-based divisions (eg. short term, medium term, etc), which will result in a large number of elements well beyond the capability of the human being to manage.

The senior manager is a member of a comradeship that in its own activity articulates the metasystem. He should alert himself to the interpretation that will be placed on his leadership by all those internal and external systems to which his metasystem is metasystemic. He needs some sort of Operations Room or clubhouse, the precise form of which would depend upon the cultural conditions of the enterprise whose metasystemic clubhouse it ought to be.

There is no uniform prescription for this clubhouse, contends Beer, but one feature that is quite general has to be the provision for the intercommunication of the senior managers that reflects the comradeship and it is on this that the articulation of the metasystem depends.

Experience has shown, says Beer, in successfully viable systems that a manager spends enormous amounts of time explaining to his colleagues what he is doing. Any attempt to economise on this time results in the system losing its viability. "The impossibility of providing a uniform prescription for this aspect of articulation, is something even more particular than 'the circumstances': it is founded absolutely in the question of **style**.

In order to gain an insight into the stylistic effect on the design of the management centre, Beer proposes the diagram as shown in figure 63 (pg 383).

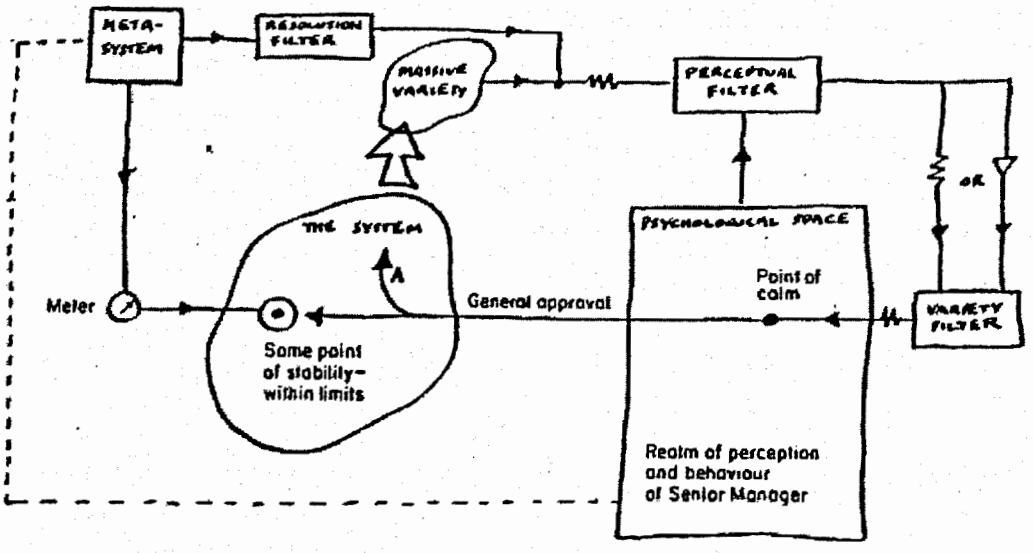


Figure 63. Handling incipient instability, stage 1

The resolution filter, designed by the metasystem, is about the degree of resolution at which we see what is going on, eg. we know the machine is being operated but do not know who is operating it.

The perceptual filter is designed by the manager himself, perhaps from a lack of self-knowledge. It is part of his physiological make up. It is determined by ignorance, prejudice, incompetence, etc.

The variety filter is one of which the manager is conscious. It his formal way of attenuating variety.

Beer contends that the problem with this diagram is that by the time data has passed through these three filters it is likely any signals of instability will have been taken out.

Thus he says a special mechanism is required to deal with the crucial question of alertness to incipient instability. This special mechanism would be a device, operating in real time, that monitors chosen points of stability by statistical methods, and aims at breaking the time barrier in the sense earlier described. He thus proposes a second diagram, figure 64 (pg 389). The manager reacts to the alarm caused by the instability and he has to move his position in his psychological space to somewhere more

comfortable. The model proposes that he moves through a three-phase trajectory to return to his point of calm.

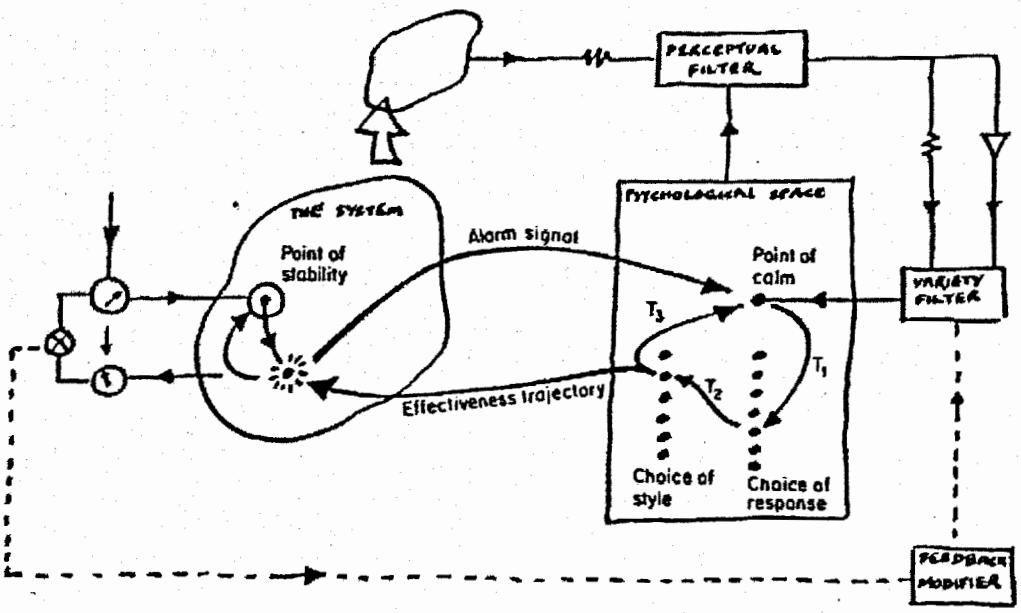


Figure 64. Handling incipient instability, stage 2

Trajectory T1 is that of judgement and he must choose from a range of possibilities. T2 is his choice of style and T3 is the effectiveness trajectory, being a product of T1 and T2. The diagram has also introduced a feedback modifier to affect the design of the variety filter.

This diagram suggests that the judgmental and stylistic preferences of the manager are independent of each other, but says Beer, they are not. One does not use a sledgehammer to crack a nut.

It is thus better to teach a manager to know himself than to know what someone supposes that he ought to be, and he should understand the systemic nature of the viable system in which he participates.

Thus Beer proposes the final version of the diagram, figure 65, in which it is intended to convey the mutually inhibitory effects of the choice of response and the choice of style. This diagram also introduces a measurement of the discrepancies between the

variety filter and the feedback modifier which will highlight the inadequacies of the perceptual filter.

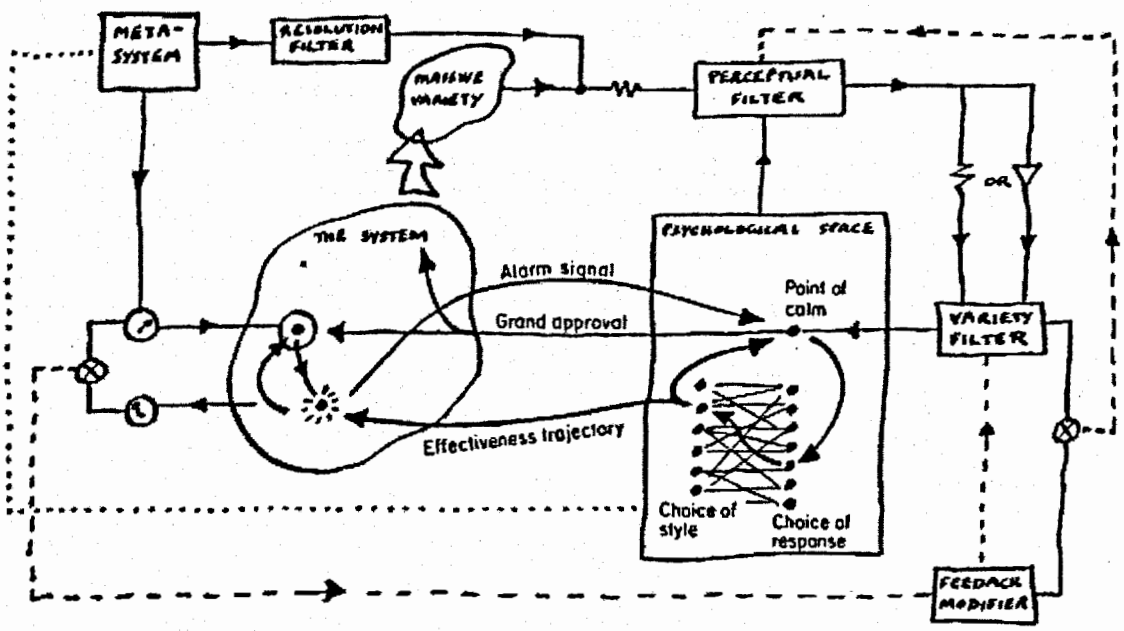
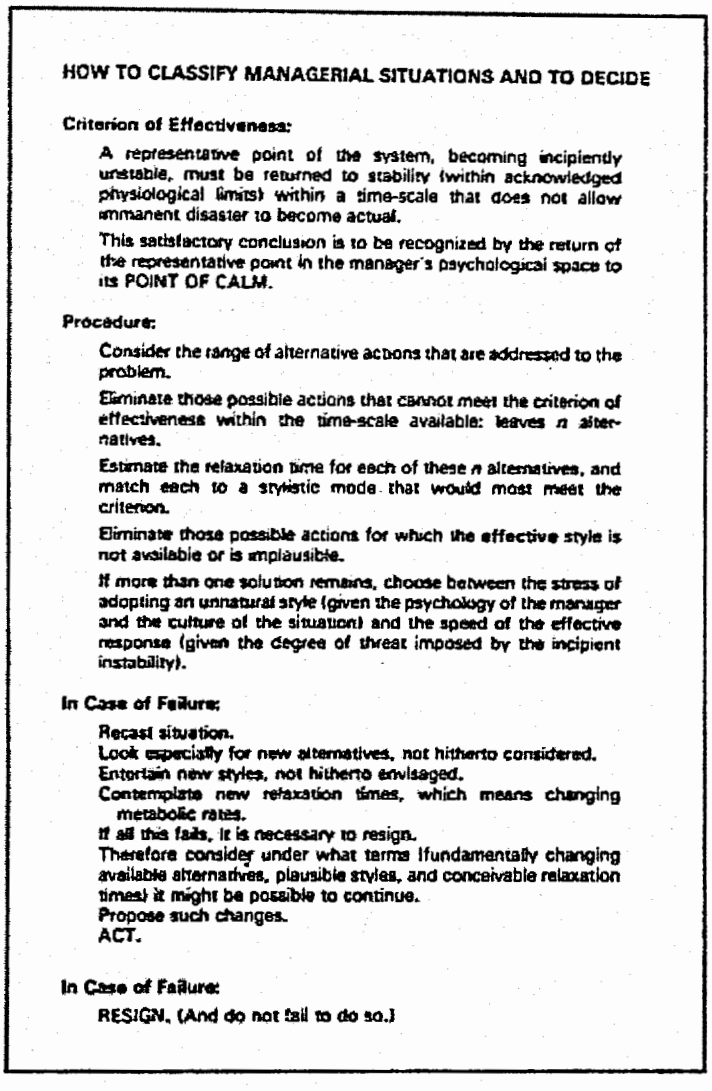


Figure 65. Handling incipient instability, stage 3

Considering this final diagram Beer contends that the situation in which the manager finds himself is dependent on two major parameters, variety and relaxation time. *"The real concern is with the proliferating variety that must needs be absorbed; and with the time that must needs elapse before the iterative loops of the managerial system can assimilate that variety and return the representative point of the system to stability and the psychological state of the manager to its point of calm"*. (pg 391)

Beer concludes the chapter with a final diagram, figure 66, all in words, in which he offers a way of classifying the situation in which a manager, faced with incipient instability finds himself.



HOW TO CLASSIFY MANAGERIAL SITUATIONS AND TO DECIDE

Criterion of Effectiveness:

A representative point of the system, becoming incipiently unstable, must be returned to stability (within acknowledged physiological limits) within a time-scale that does not allow immanent disaster to become actual.

This satisfactory conclusion is to be recognized by the return of the representative point in the manager's psychological space to its POINT OF CALM.

Procedure:

Consider the range of alternative actions that are addressed to the problem.

Eliminate those possible actions that cannot meet the criterion of effectiveness within the time-scale available: leaves *n* alternatives.

Estimate the relaxation time for each of these *n* alternatives, and match each to a stylistic mode that would most meet the criterion.

Eliminate those possible actions for which the effective style is not available or is implausible.

If more than one solution remains, choose between the stress of adopting an unnatural style (given the psychology of the manager and the culture of the situation) and the speed of the effective response (given the degree of threat imposed by the incipient instability).

In Case of Failure:

Recast situation.
Look especially for new alternatives, not hitherto considered.
Entertain new styles, not hitherto envisaged.
Contemplate new relaxation times, which means changing metabolic rates.
If all this fails, it is necessary to resign.
Therefore consider under what terms (fundamentally changing available alternatives, plausible styles, and conceivable relaxation times) it might be possible to continue.
Propose such changes.
ACT.

In Case of Failure:

RESIGN. (And do not fail to do so.)

Figure 66. Handling incipient instability, final stage — a procedure for using the model

Chapter fifteen - Life and death

"The viable system is organised recursively, and maintains its independent existence at each level of recursion. This independence, at any one level, is conditional on the cohesiveness of the whole. 'The whole' is simply an arbitrarily defined chunk of an infinite recursion: that part over which we consider ourselves to have power of edict, should we care to exert it". (pg 403)

As was discussed earlier, the purpose of the organisation is seen differently by different people. This obviously raises the question of the identity of the enterprise.

Even within the arbitrary whole, says Beer, each level of recursion is likely to answer the identity question differently. How then does the enterprise remain as a viable system?

The answer says Beer is that viable organisations produce themselves. The staff may come and go, it's departments may be closed down or opened up, but it still retains it identity.

"In cybernetic terminology, this enterprise is called autopoietic. The word derives from the Greek: poio means 'to make'. So an autopoietic system makes itself - continuously. What business is it in? It is in the business of preserving it's own organisation". (pg 405)

"In the concept of autopoiesis we have the final testimonial to viability. The viable system is directed towards it's own production". (405)

How, asks Beer, is this identity preserved? Considering one level of recursion, Beer suggests that the state of calm envisaged in the last chapter is the outcome of much filtration. All the five subsystems carry variety in accordance with the Principles of Organisation and they all have a damping role in respect of oscillatory behaviour in the viable system itself. The viable system must maintain this general calm if it is to preserve it's own organisation.

"Management information systems, as conventionally understood, exist to exercise this function. They are massive attenuators; and they promote the calm that ignorance of 'little local difficulties' underwrites. In the limit, however, this whole design will send the organism to sleep". (pg 406)

The measurement of instability was introduced to deal with this lethal calm. The alarm signals introduced in the last chapter do not belong to management information systems. They are in fact orthogonal to the calming system. Beer chooses to call these alerting signals **algedonic** which derives from the Greek words for pain and pleasure.

These alerting signals are triggered by the same basic data but will be handled differently by the different filters. Beer postulates that the algedonic signals are organised to break through recursivity. It is however critical that this algedonic signalling equipment is correctly designed.

"The ultimate pathology of the viable system concerns the failure of cohesiveness, and of its inter-recursive algedonics. This turns out to be an aberration of its autopoietic function.

The viable system is autopoietic: it produces itself. Thereby it maintains its living identity. It preserves its own organisation". (pg 408)

But, asks Beer, to what end?

Because of the subjective nature of systems, there is an identity crisis in every enterprise, and that crisis is associated with what purpose is alleged to be upheld.

Beer uses the example of a hospital to suggest that if the focus of the staff is upon keeping the hospital as a going concern rather than healing sick patients, then the autopoietic function is diseased, rather than healthy. It is a structural fact of any viable organisation that a proportion of time must be devoted maintaining necessary autopoiesis. This time is exactly the time required to maintain System One - which is the viable system at the next level of recursion.

"Only a viable system exhibits autopoieses at all, since autopoiesis is defined as a 'characterisation of life'. Therefore the whole of 'this' recursion is autopoietic, but through and only through its System One which constitutes the whole of the next lower recursion. Systems Two, Three, Four and Five are not in themselves viable systems at any level of recursion: therefore they should exhibit no internal autopoietic behaviour whatever". (pg 412)

Thus in order to detect pathological autopoiesis, it is only necessary to study the actual behaviour of these four systems.

"Strong arguments were advanced in early chapters to show that the 'purposes of the system' are imputed by the observer. The system's purpose , we said, is simply what it does. It is in this cause that we observe System One to be autopoietic; it is in this cause that we observe Systems Two to Five not to be so, in a healthy enterprise".
(pg 412)

Appendix B - Network 21 Business and Marketing Plan

In order for an individual to start in the business, it is necessary for them to be invited to join the organisation. The person who invites the individual to join is called the "sponsor" or "upline." The sponsor, as well as being a member of Network 21, has access to the supply organisation, the Amway Corporation, either directly or via their upline.

All members of the organisation have access to Amway products at a discount of up to 30%. This discount is the same for the sponsor and the individual signed on by the sponsor, referred to as 'you' in figures B1 to B7. In order to be successful, the organisation suggests that each individual in the system turns over $200.00 per month. At a 30 % discount this equates to a profit of $60.00 per month when the products are sold at retail. Per annum, this amounts to $720.00. In order to simplify the system, rather than using dollar values, a system of points has been devised and is referred to as PV (points value). Currently in New Zealand 1 PV = $2.00, thus $200.00 is equivalent to 100 PV. Besides mark up made on retail sales, a rebate is paid on volume of product moved, the greater the volume moved, the greater the rebate. Figure B2 shows the % rebate against the PV.

Network 21 recognises that on a retail basis the individual would need to have a large customer base to attain the movement of products that would result in the full benefit of the rebate system. This would amount to no more than operating a retail business. As most individuals have neither the inclination nor the time to be a sales person, it is at this point that the concept of networking is introduced. The objective is now for you to sponsor other individuals into the organisation. For the purposes of the discussion let us assume that you sponsor 7 persons into the organisation. The objective is to encourage each of these persons to move 100 PV of product every month. As these persons are also entitled to the 30 % discount, your benefit would be from the overall movement of products through your business. If each person moved 100 PV then the total PV through your business would be 800, including your 100. According to the rebate table you would be entitled to a 6 % rebate which is 6 % of

$1600.00, or $96.00. Add this to the $60.00 from your retail sales and the total amount is $156.00 (figure B3).

Developing the networking concept further, the objective is to encourage all the 7 members in your business to themselves sponsor individuals into the business. Members signed on directly by yourself are referred to as frontline. If all 7 frontline in the example were to each sponsor 4 persons on the same basis as described above, then the total PV per month in your total group would be 3500 for your group and 100 for yourself, a total of 3600 PV. This would result in a rebate of 15 % of $7200.00, or $1080.00. However your frontline would themselves be entitled to a rebate of 3 % as each of them would have turned over 500 PV, i.e. a rebate of $30.00. The total for the 7 groups would thus be $210.00, leaving you with $870.00 plus $60.00 retail, a total of $930.00 (refer to figure B4).

Following the same principal and assuming that the 4 persons that each of your 7 frontline sponsored, each sponsored 2 persons, the total PV for your group would be 9200, or $18400.00. This would result in a rebate of 21 % or $3864.00. Once again your 7 frontline would also be entitled to a rebate, in this case 9 % of 1300 PV, $2600.00, i.e. $234.00. Over all 7 groups this adds up to $1638.00. You are thus left with $3864.00 - $1638.00 = $2226.00. Including your $60.00 retail your total amount would be $2286.00. On an annual basis this would result in an income of $720.00 from retail sales and $26,712.00 from the rebate of 21 % (refer to figure B5). For ease of calculation the rebate value is based on $2200.00 per month in figure B5.

To summarise to this point, the two methods of earning an income are by retail sales, suggested $200.00 turnover per month, and by sponsoring enough people to bring the total movement of product through your organisation to a level where you can obtain the maximum rebate allowed by the system, 21 %.

It can however be seen that just as you can attain the maximum rebate, so too can any of the members of your group. If they attain this level, they too will receive a 21 % rebate leaving nothing over for you. It is at this point that Network 21 and Amway authorise the individual who has attained the maximum rebate level to breakaway and

access the warehouse directly rather than obtaining the products through their upline, thus becoming a Direct Distributor. You are however recognised for having brought the individual to this level and are thus paid a royalty of 4 % of this individual's turnover for as long as their business is operating. This royalty is also willable and thus is passed on to your children and their children. For ease of calculation let us assume that this individual is turning over $20,000.00 per month in their business. A 4 % royalty would thus amount to $800.00 per month. Let us also assume that 6 of your 7 frontline attain the this maximum rebate, i.e.. your royalty payment would be 6 x $800.00 per month or $57,600.00 per annum (refer to figure B6). The significance of having 6 of your frontline breakaway is that this is a particular level of recognition in the organisation, referred to as Diamond Distributor.

Diamond Distributors are entitled to seven further bonuses for having attained the level of having 6 frontline breakaways. In 1996 in New Zealand these seven bonuses amounted to $11,000.00 per breakaway group, i.e. $66,000.00 (refer to figure B7). The total income thus available to the individual from retail sales, maximum rebate, royalty payments and bonuses is $150,720.00 as shown in figure B7.

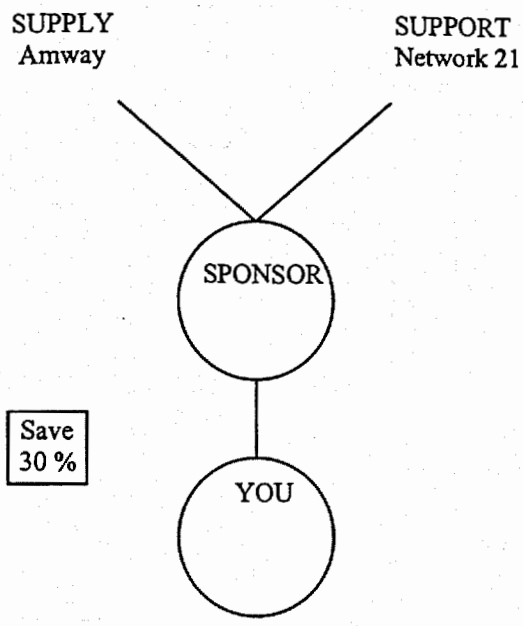


Figure B1

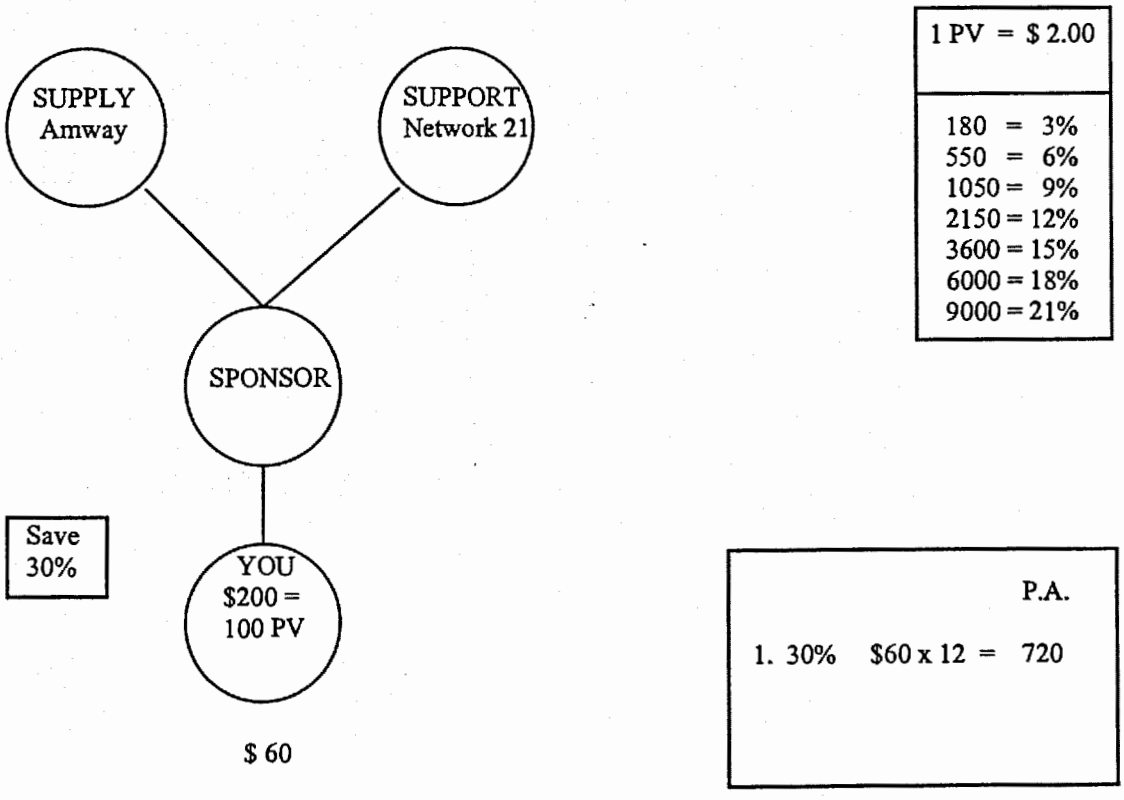


Figure B2

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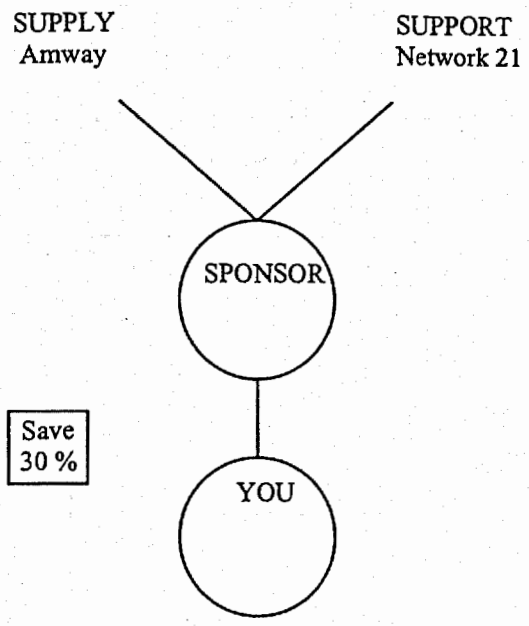
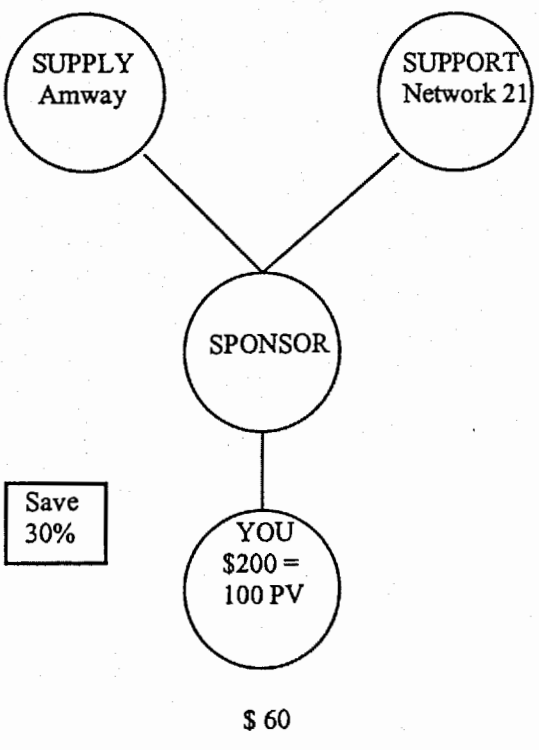


Figure B1



1 PV = $ 2.00
180 = 3% 550 = 6% 1050 = 9% 2150 = 12% 3600 = 15% 6000 = 18% 9000 = 21%

			P.A.
1. 30%	$60 x 12	=	720

Figure B2

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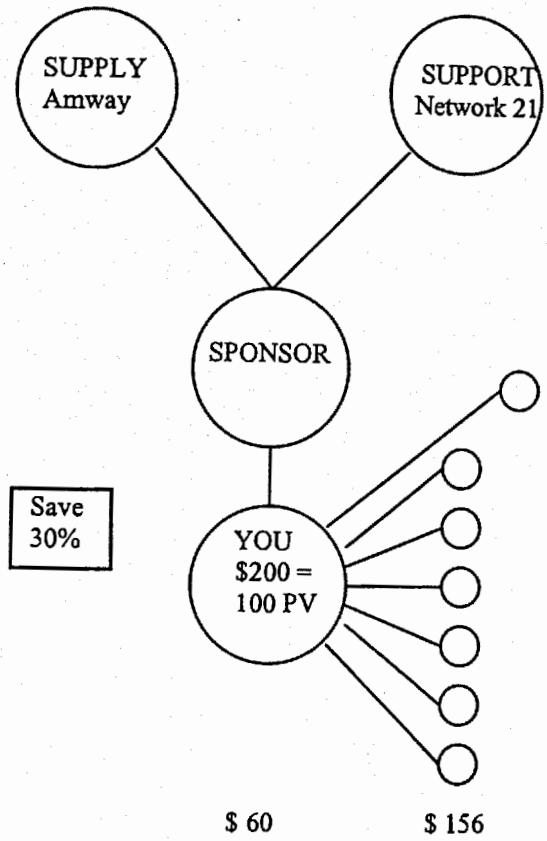
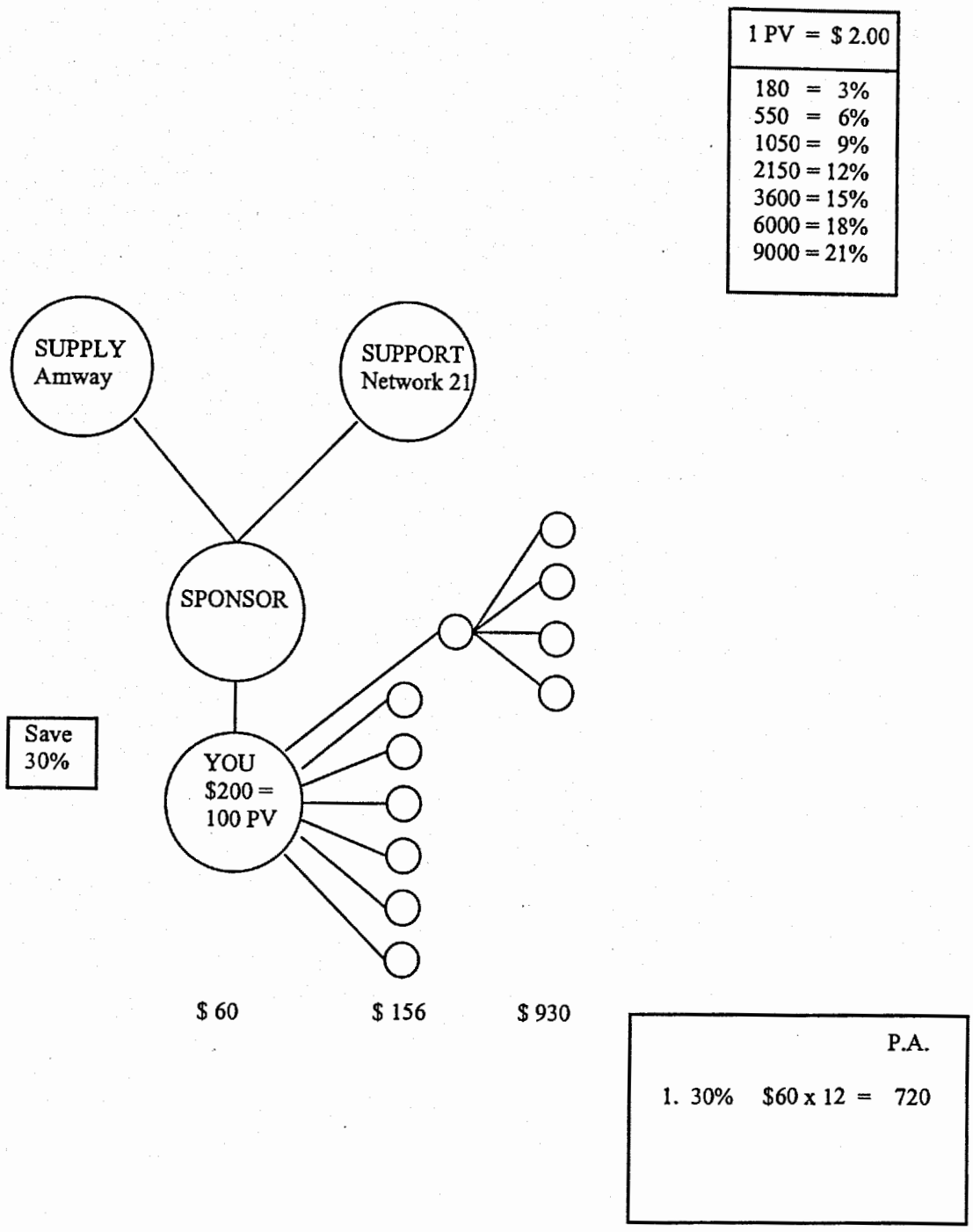


			P.A.
1. 30%	$60 x 12	=	720

Figure B3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2150 = 12%
3600 = 15%
6000 = 18%
9000 = 21%
SUPPLY
Amway
SUPPORT
Network 21
SPONSOR
Save
30%
YOU
$200 =
100 PV
$ 60
$ 156
$ 930
P.A.
1. 30% $60 x 12 = 720

Figure B4

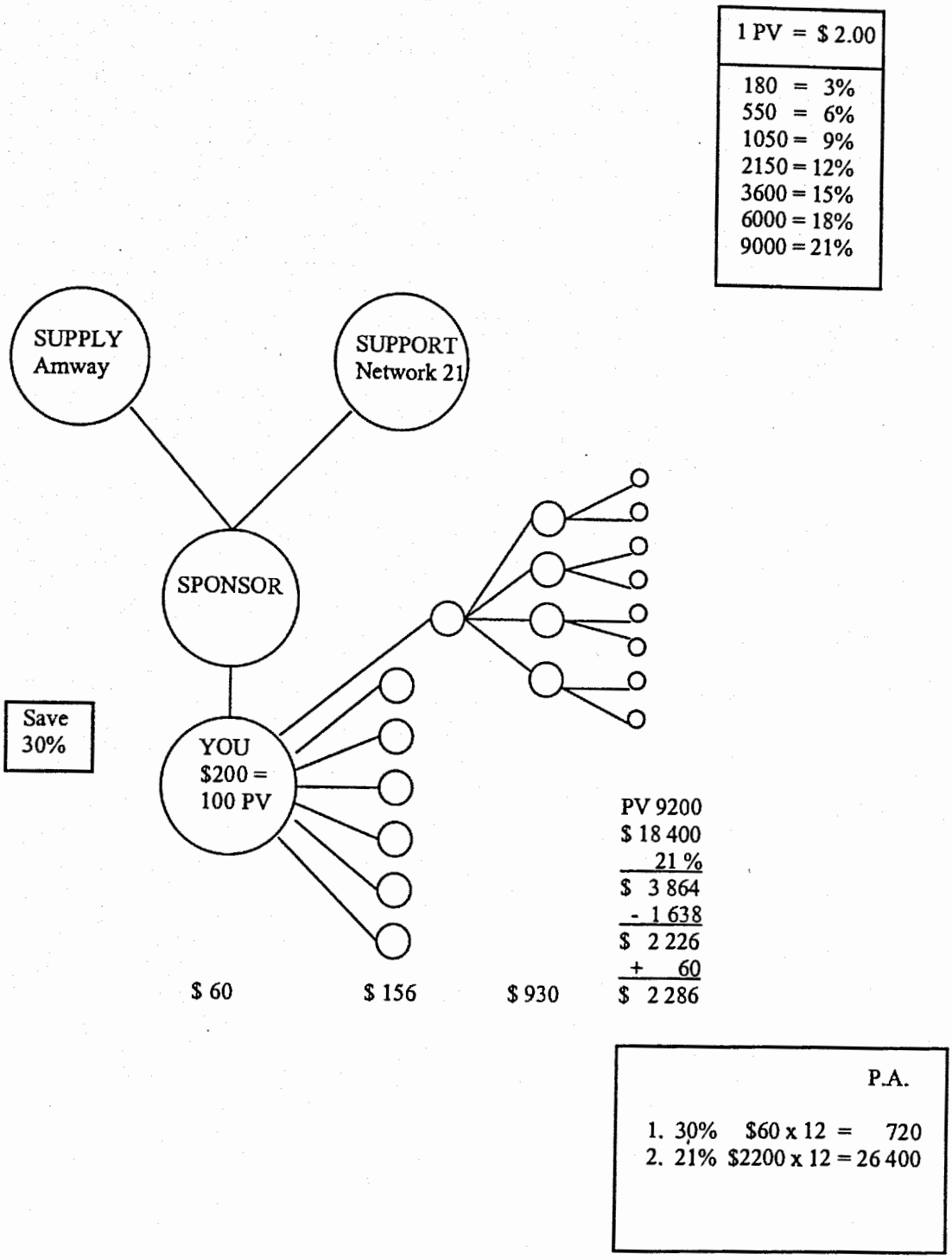
1 PV = $ 2.00
180 = 3%
550 = 6%
1050 = 9%
2150 = 12%
3600 = 15%
6000 = 18%
9000 = 21%
SUPPLY
Amway
SUPPORT
Network 21
SPONSOR
Save
30%
YOU
$200 =
100 PV
$ 60
$ 156
$ 930
PV 9200
$ 18 400
21 %
$ 3 864
- 1 638
$ 2 226
+ 60
$ 2 286
P.A.
1. 30% $60 x 12 = 720
2. 21% $2200 x 12 = 26 400

Figure B5

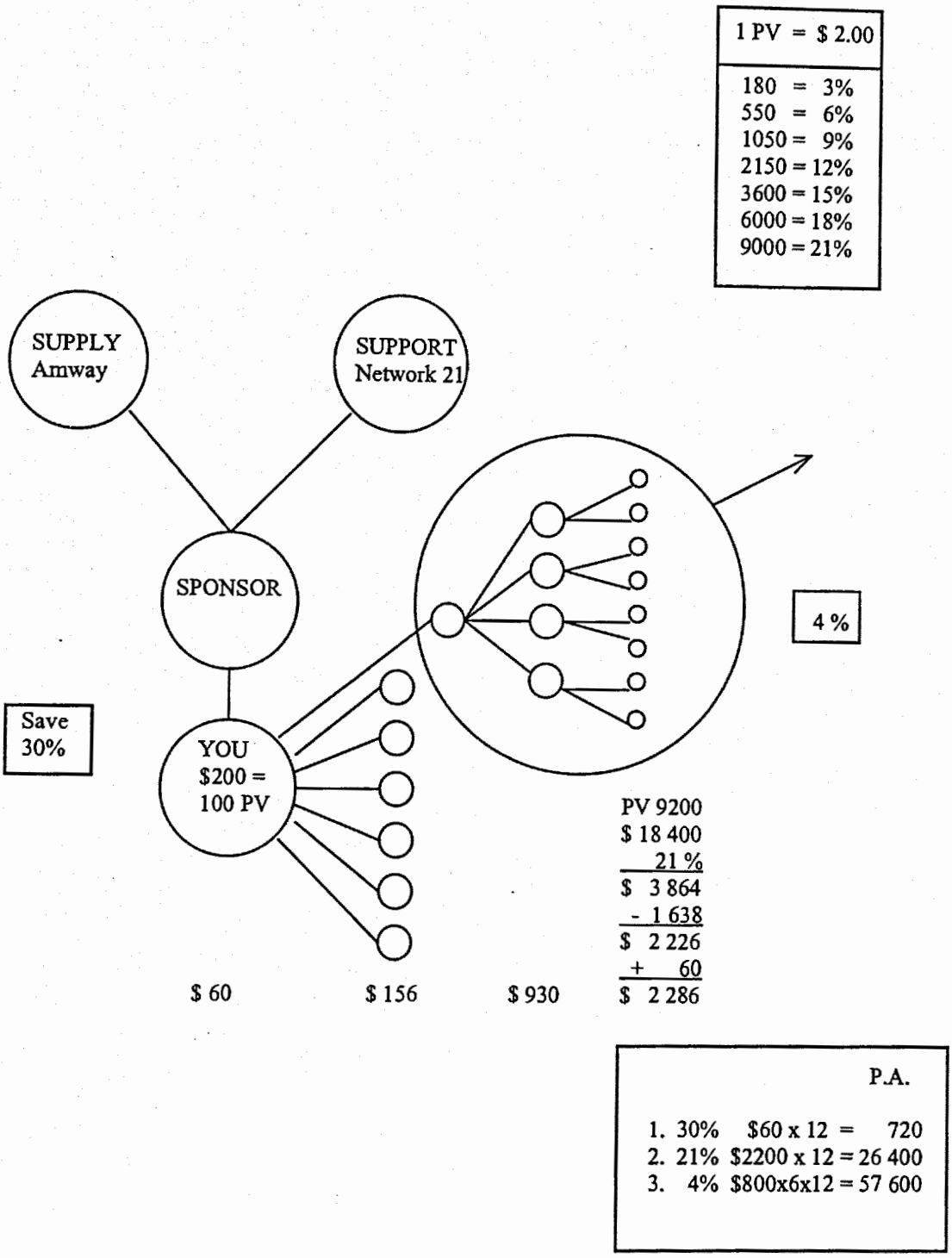
1 PV = $ 2.00
180 = 3%
550 = 6%
1050 = 9%
2150 = 12%
3600 = 15%
6000 = 18%
9000 = 21%
SUPPLY
Amway
SUPPORT
Network 21
SPONSOR
4 %
Save
30%
YOU
$200 =
100 PV
PV 9200
$ 18 400
21 %
$ 3 864
- 1 638
$ 2 226
+ 60
$ 2 286
$ 60
$ 156
$ 930
P.A.
1. 30% $60 x 12 = 720
2. 21% $2200 x 12 = 26 400
3. 4% $800x6x12 = 57 600

Figure B6

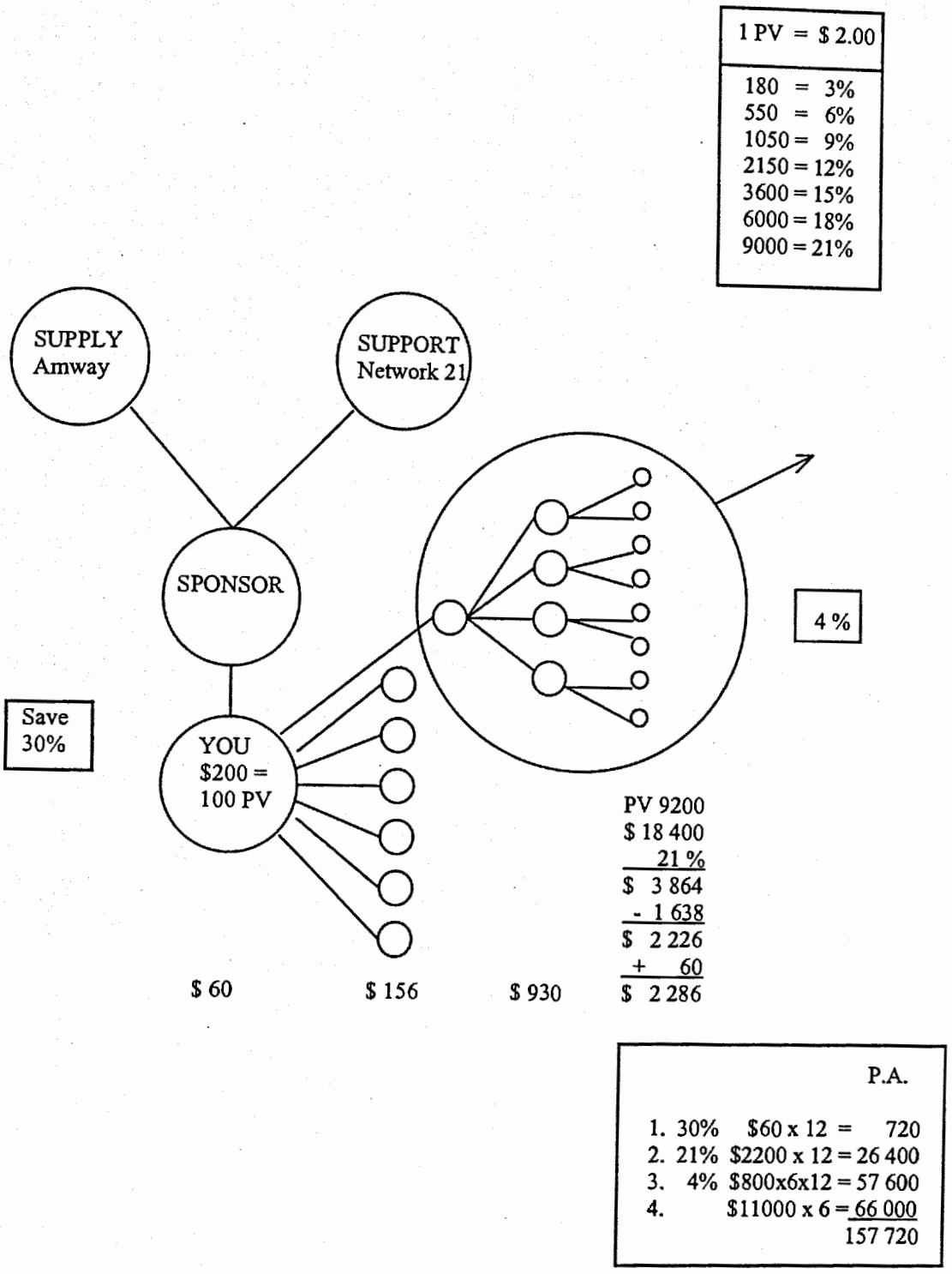
1 PV = $ 2.00
180 = 3%
550 = 6%
1050 = 9%
2150 = 12%
3600 = 15%
6000 = 18%
9000 = 21%
SUPPLY
Amway
SUPPORT
Network 21
SPONSOR
4 %
Save
30%
YOU
$200 =
100 PV
PV 9200
$ 18 400
21 %
$ 3 864
- 1 638
$ 2 226
+ 60
$ 2 286
$ 60
$ 156
$ 930
P.A.
1. 30% $60 x 12 = 720
2. 21% $2200 x 12 = 26 400
3. 4% $800x6x12 = 57 600
4. $11000 x 6 = 66 000
157 720

Figure B7