

Knowledge Matrix – a transformative organisation

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Abstract

The volatile external prerequisites of today make bureaucratic organisations dysfunctional. New organisational forms characterised by decentralisation, integration and diversity is emerging. The key question changes from “Which is the best way to organise the work?” to “How to give conditions for a good organisation to emerge while the work is performed?”.

A Knowledge Matrix organisation has been studied through participative observation by one of its managers. The organisation and the reasons behind it are described. Positive effects like; holistic awareness, alignment, flexibility, learning, motivation, co-operation and shorter time to decision are stated. But there are also problems of insecurity and vagueness. One big threat against the matrix organisation is if managers do not dare to loose control by creating autonomy for employees.

The organisation in question has also been studied of researchers by explorative interviews. The result is presented through a lens of complexity theory and focuses upon the interaction between independent individuals, the collective that each member is a dependent part of, the vertical relations, and the evolution of the organisation. The main conclusion is that interaction is not good enough to nurture a common internal model.

Another more successful matrix organisation is described to make the shortcomings of the first one clear. Managers in the success case were decisive to fulfil the change and trusted their co-workers. They made an extensive upfront work. And they invested heavily in communication to keep everyone informed and involved.

Volatile times: new environmental conditions for old organisational structures

It is possible to see two trends in organisational development. One trend is towards a post-industrial system with decentralisation, integration and diversity. The other goes back to old tayloristic and bureaucratic ideas, with focus on production and to compete with low price. It uses a rather simple organisation with a potent structure that determines most of the actions in the organisation: a one-boss hierarchy, centralisation, straight command and reporting lines, rules and instructions, negative feed-back control, and balance. We have more than 100 years of experience and research in using this type of industrial system and it may be reasonable to say that it is the most stable and efficient way to organise production. Why then do we have the other trend, towards a post-industrial system?

In criticisms of bureaucratic organisation, one central issue is that it neglects the human characteristics, and the dysfunctions could be expressed as follows ((McKenna 2000) s428):

- Goal displacement, means may displace the ends
- Conflict based on ambition of alienated and dissatisfied workers
- Neglecting need for informal organisation

- Division of labour out of step with requirement to work in teams
- Impersonality, leading to read tape and inability to cope with special cases
- Adaptation resisted because it demands changes in rules and procedures and a surrender of managers authority.

These kinds of internal dysfunctions were behind of the “goda arbetet” (good work) - venture in Swedish industry in the 80'ties. The development of information technology is another force to alter organisational structure. The bureaucratic organisation does not take full advantage of information technology.

But other, for this paper more central, dysfunctions appear in the relation between the volatile external prerequisites of today and the bureaucratic organization. As early as in the 50's, Burns and Stalker found that organisations operating in an uncertain and rapidly changing environment were more likely to be successful if they were very loosely structured with flexible, undefined and overlapping roles, an emphasis on horizontal rather than vertical communications, on information and advice rather than instructions, and on authority based knowledge rather than on rank (Burns and Stalker 1961). There are at least three types of outside pressures that lead to a need for different organisational structures ((Davis and Lawrence 1977) pp 12-17):

1. **Pressure for more than one goal.** An organisation that needs to focus attention both on e.g. complex technical issues and on unique project requirements of the customer can not afford to give a second-level status to either. *“Neither can be allowed to, arbitrarily, overrule the other. The needed behaviour is epitomized by a picture of two middle managers with equal but very different orientations and goals, sitting down to debate and argue over each and every point in their search for the answers that would optimise decisions for both technical excellence and unique customer requirements.”* (ibid p 13)
2. **Pressure for high information processing capacity.** Bureaucratic organisations coordinated by a communication hierarchy supplemented by rules, instructions etc, may work fine as long as they do not get overloaded with information. But if there is environmental uncertainty, high complexity of the organization' s tasks and independence among organisational members they do get very overloaded. *“If all three are high, conventional ways of handling the load tend to break down... it appears that this set of circumstances is to be the fate of more and more organizations, even in industries that we could label as stable and mature in the recent past... if the problem were only one of keeping more people informed of events, the response could be handled through increasing the flow of reports, briefings, and informal communications. But, of course, the tough part is weighing the significance of the new information and making decisions that commit the organization to a response that will prove to be wise over time.”* (ibid p 16)
3. **Pressure for shared resources.** *“...When performance pressures are real and strong, the need arises to fully utilize expensive and highly specialized talents... pressures will develop to share existing human resources... These resources will need to be redeployed in a flexible manner so that people can work on more than one task at a time or at least be readily available for assignment from one task to the next.”* (ibid p 17)

The emergence of a volatile market is influenced by globalisation and information technology like e.g. Internet. More and more agents have contact with each other and the couplings are getting tighter and tighter, giving rise to a multiplier effect (Holland 1995) where small

changes in one node is transformed to a lot of nodes, giving rise to an exponential change process like an avalanche. Globalisation also implies more competitors and increased mobility when it comes to capital, products, customers and competence. The development of the ownership of companies, where holding of shares is more and more impersonal and shortsighted is also increasing the volatility of companies' external prerequisites.

There is also market specific factors behind the fickleness ((Fulmer 200) pp 102-105): volatile markets are those with e.g. rapid technological development, governmental actions like e.g. deregulation, weak barriers to breach for new companies and with new technology merging former separately markets into one. And it is a reflexive relation; the volatile time is part of the external prerequisites and exerts an influence on companies, but at the same time it is the companies who form the volatile time.

New organisational structures and processes for volatile times

Companies exposed to the challenges of our volatile time are forced to search for new organisational forms. If we call the old bureaucratic and hierarchical organisation the thesis, a post-industrial anti-thesis may be formed as the opposite side of a dimension characterising different organisational structures see figure 1.

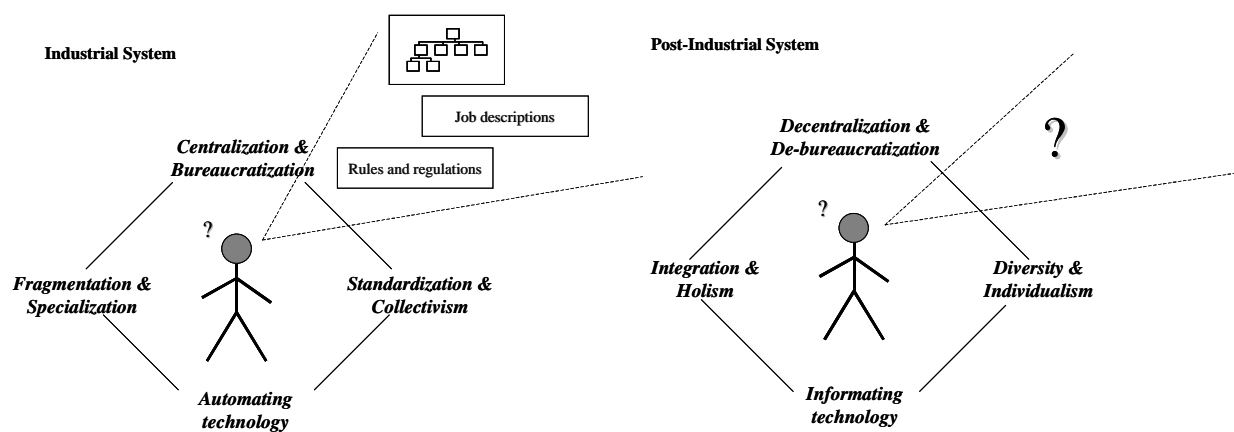


Figure 1. The traditional framework for work provided employees with organizational charts, job descriptions, etc. to help them comprehend and manage with their work. The post-industrial framework is present in many of today's organizations, but structures, processes, and tools helping in comprehending and managing with work in the new situation are still to be discovered. (According to Forslin, in(Forslin and Kira 2001)).

The question mark in figure 1 indicates that it is still an open question what kinds of organizational structures suites this post-industrial system. Six different model organisational forms may be distinguished ((Morgan 1989) p 64), in an order from the mechanistic, organised for stability, to the organic, organised for flexibility and change:

1. rigidly organized bureaucracy
2. bureaucracy run by a senior executives' group
3. bureaucracy that has created crossdepartmental teams and task forces
4. matrix organization
5. project based organization
6. loosely coupled organic network.

Later in this paper an example of a matrix organisation will be described.

It is not only the organisational structure that is challenged by our volatile time. Processes of social construction and experiential learning, not focused in earlier organisational literature, are rising in importance. It is important to understand the emergence of an organisation in the very open and flexible structure of post-industrial systems, see figure 2.

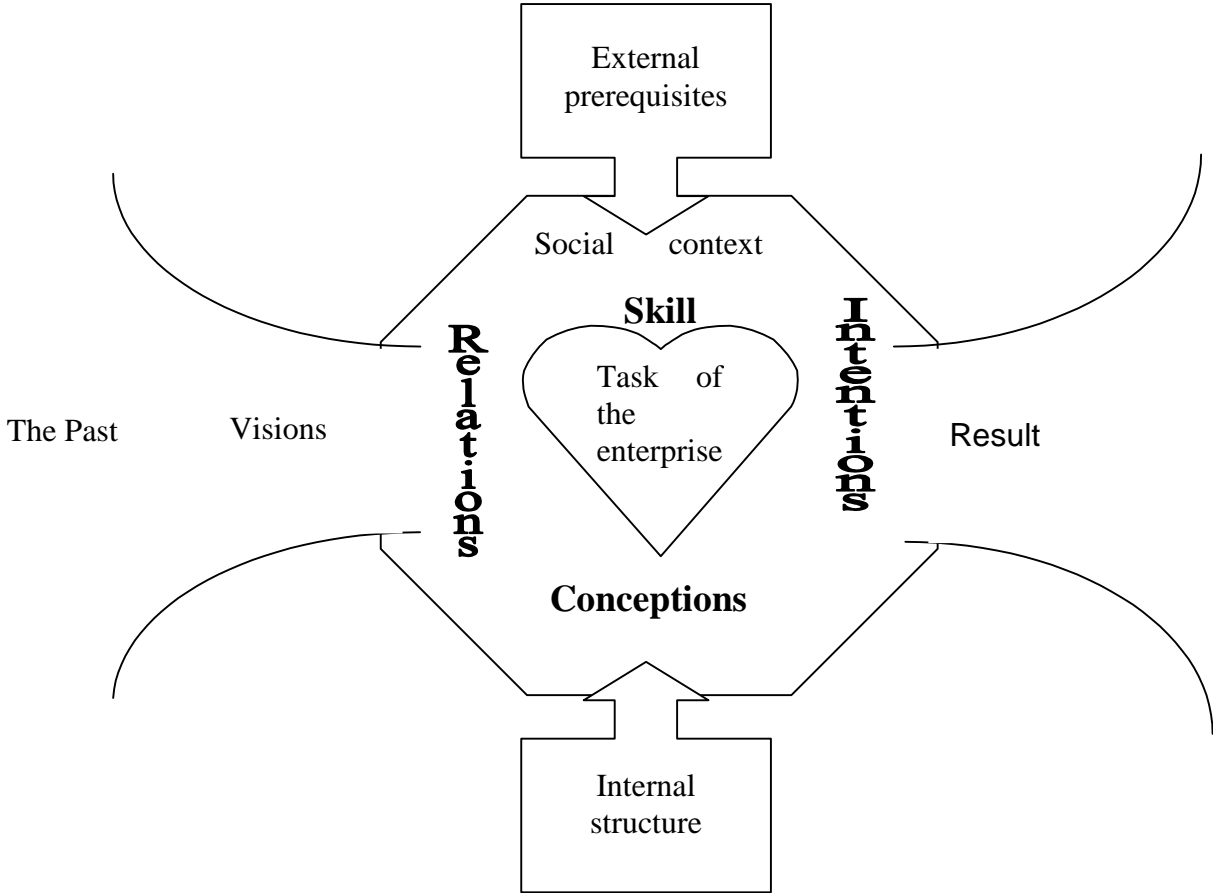


Figure 2 Work organisation from a perspective of social construction (Programme for Organisational Development and Learning Working paper)

Method

A matrix organisation has been studied using both participating observation and explorative interviews. Peter Ladan who is a program manager in the K-matrix organisation in question executed the participating observation. A description of the organisation is made by looking in the rear view on what has happened during the years. The result is presented under the following three headings: “*Knowledge Matrix model application in Ericsson organisation*”, “*Organisation*” and “*People*”.

The other empirical material of the paper consists of an explorative study of the same K-matrix, using interviews around three themes: intensity of work, competence and leadership, with 14 strategically selected organisational members (Backlund and Backström 2001). It was executed one and a half year after the after the change from a bureaucratic form of organisation to a K-matrix one. The result of this study is presented under the heading: “*Through a lens of complexity*”.

Under the heading “*A successful application of the Knowledge Matrix*” is the result from a post analysis of another organisation Peter Ladan has worked in.

Knowledge Matrix model application

Reasoning

How can an organisation survive and flourish in an environment that is characterized by great complexity, a very dynamic and constantly changing business situation, extreme competition and price pressure and scarcely available competence and resources. Last but not least, the future direction and strategy is very hard to determine and the current developments of product and solutions will see the end of its lifetime soon.

This is the situation where a business unit, found itself in about two and a half years ago. It was clear that processes were not used because the organization had not aligned itself towards the business needs. Separate islands of specific functions existed to deal with all the opportunities and withstand the threats that existed in the global markets. Almost everyone was thinking in his or hers own functional environment and had little or no knowledge about what was going on in the rest of the company. The connection to the end result with an understanding of one's own value add related to this, was not existing. Due to the distributed product and marketing management combined with an unclear future direction it was impossible to establish an overall efficient and effective competence planning for the organization. One that would enable the execution of the strategies.

Introduction of the Knowledge Matrix

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Furthermore, it was absolutely necessary to expand the solutions thinking and creation. This meant that the people in the organization needed to become more aware of their surroundings and apply a more end-to-end thinking (process) in order to create new solutions together. Finding opportunities and creating solutions is very much dependant on the level of integrative intelligence of the people in the organization coupled to an easy process for the establishment of these.

The customary hierarchical organisation is structured according to one grouping: functional, process, product, customer, or territorial. The matrix structure integrates two different groupings. It has typically three levels of managers: one general manager at the top, two kinds of bosses in the middle (one for each grouping), and below them the project leaders. This means that each project leader has two bosses, with balanced power, to report to.

Several Swedish companies are trying the Knowledge Matrix Organisation (K-matrix). It is a matrix organisation designed with the expressed reason to ensure knowledge development. The rows of the K-matrix are lines of business (Program) and the columns consist of areas of competence, see fig. 3. The managers of business are to see that there are profitable projects in each row and the managers of competence that there are competent personnel within each column. The majority of business decisions are made at the operational level and the work is to a large extent self-organised.

In the following text, we will try to look at the introduction and implementation of the knowledge matrix in the mentioned organization. We will look at the effects for the organization, people and business results. We will then try to sum up the pro's and con's of this new form of structure, and look a little closer to the risks.

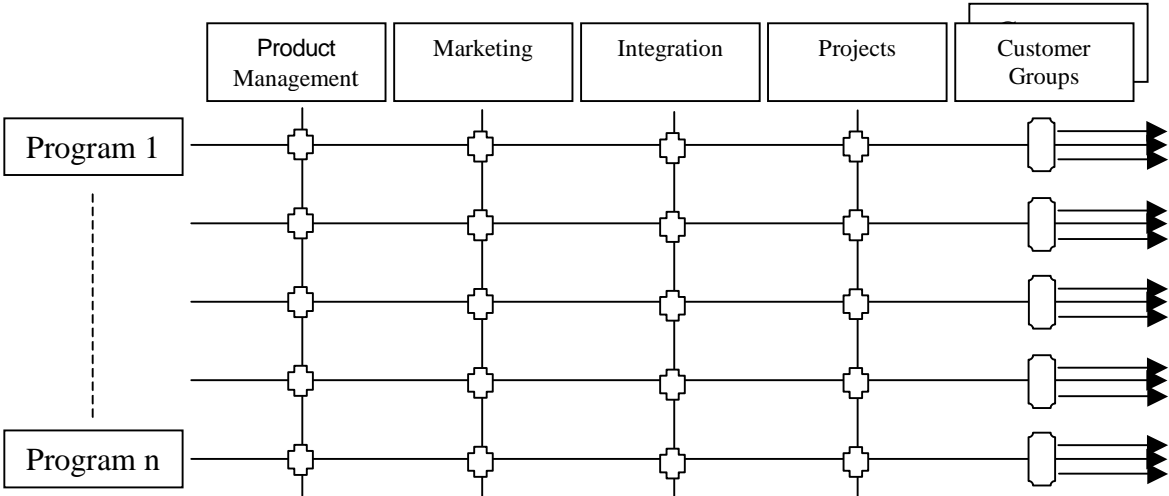


Fig. 3. Simplified picture of the organization as described in the following text

Organisation

Organisational set-up

The difference with this new form of organization is first the creation of a more complex structure. In one dimension the focus is on the short to medium term business result, through the introduction of so called programs. These programs consist of a program manager and business controller and sometimes a specialist. The program then hosts different competencies from the functional areas (“old line organization”). These functional areas are product management, marketing, integration and projects. All the activities are aligned in an overall business process for TTM (time to market) and TTC (time to customer) activities. To coordinate all the work in process, so called cross point managers are assigned, who function on the interface of their respective Functional Area (Line) and the program. When there are people working in the program from the same functional area as the cross point manager, he or she becomes their teamleader for these colleagues.

To manage the interface towards the market, customer groups host business managers, who maintain the contact with market units and customers. In some cases so called “push teams” are assigned from customer groups, to create a push for a specific product or solution towards the markets.

In the other direction, the focus lies on the longer-term issues (survival of the company). The creation of new products and solutions and competence development of the people. There are a limited number of managers, so a relatively flat organization is established. The functional areas responsibility is to see to it that the programs follow the right processes and procedures, to establish the business results. They hold responsibility for strategic decisions for products and solutions, escalation of projects issues are handled through them. As the functional areas man the programs, they have the responsibility for the competence development of the people. So it is actually the program managers with their respective controllers that have to look at their own competence development. Eventhough the overall responsibility for partner management lies within the functional area, the interfaces towards partners are managed through the programs on a day to day basis.

The introduced matrix is also meant to enable the principles of a learning organization. Through the cooperation with people from the different disciplines and background towards the same business goal and following the same process, would make it possible to learn in on the job situations much easier. One would much easier understand the effects of certain decisions or actions, as well as understanding the causes of certain happenings much better.

Strategies, mission, vision, objectives, goals, targets, etc. towards a wanted position and business results

The distribution of work, to achieve the overall goals and objectives and reach the wanted business results, has shown to be a far from easy process.

First to have the functional area managers and program managers agree on a common vision and mission has proven to be a lengthy process, where diplomatic, negotiation and compromising skills are a necessity.

Then to have their conclusions formulated and transferred into an overall Balanced Scorecard for the whole unit was another major step. After that it becomes relatively easy to distribute the balanced scorecard issues over to the functional areas and programs. But then the complexity kicks in. Now the Cross Point managers also have to set-up a BSC for their respective crosspoint. It was suggested that the functional area would identify issues in the process and innovation and learning dimension. The programs would identify issues in the financial and customer dimension. When this process was finished, cross-checked and double-checked after two months, we ended up with 4 X 7 X 4 scorecards (the 4 functional areas, 7 programs and 4 dimensions of the scorecards), to manage the important Key Performance indicators for our part of the division.

The next step was to then communicate all this material to the ‘working staff’. No wonder people got somewhat lost in this forest of indicators.

The upside of this process has been that everyone working actively in the establishment and monthly follow-up of these indicators, understood much better how the end to end process looked like. What were the issues, which were important for our business and who carries what kind of responsibility?

What was not exactly clear, was who had authority for what kind of decisions.

It became pretty clear, that this new organization model demanded people to negotiate with eachother about certain business issues on the basis of equality and mutual respect. Issues to discuss were for example resource allocation, priority setting of projects, or budget allocation, etc. The model demands that everyone shares an equal responsibility when it comes to the overall business result, as measured through the different dimension of the balanced scorecard. So, as far as leadership is concerned, managers need to constructively find and

create opportunities with each other. Diplomacy is a must, as there exist enough delicate issues.

What people, probably not enough realize, is that a matrix model is actually meant as a means to reach optimum efficiency. There are simply not enough resources to do all necessary activities at the same time, so we need to make prioritisations, quite often. This has actually led to some frustration, as the model does not come with clear and concise users' guide about how to handle these potential time bombs. Particularly in the beginning, a lot of higher management involvement was needed to help the organization on its feet and decide on what to do first. It took at least half a year before everyone understood how this could be done properly.

Another issue became the ownership of resources. Soon it also became clear that the resources belonged to the functional areas and the programs hosted these colleagues for their respective roles.

If we summarize the process as described above, we can see the following issues;

- It was very difficult to describe the organization and explain the model's complexity in simple words.
- Due to the relatively long time it took to ramp up the organization, everyone involved was internally focussed to make the changes work and had less time for external issues.
- It took time to distribute key issues via the cross point managers and assign tasks to people. At the same time it was hard to distribute responsibility and authority to everyone involved.
- Due to the relative high level of common goals and objectives, there existed a certain distance to these issues ("*how does this relate to me as individual?*") and it was not always easy to measure progress.
- It was not clear for the organization who could take a decision and on what issue.

And more positively;

- Several layers of management became very aware of common goals and objectives.
- Common goals and objectives became very aligned through the organization and became very much the common basis for all involved.
- The model enabled a higher level of efficiency, despite the longer introduction period
- Changes in both program and functional area dimension had little or no impact on the rest of the organization (flexibility)
- The model demanded a learning organization as basis where people could grow into their new roles and responsibilities
- The harmonization as a result of the alignment and way of working resulted in a higher motivation and comradeship in the management layer.
- Time to decision became shorter, due to better cooperation and application of ground rules (focus on common objectives, to a much lesser degree hidden agendas)

People

Solutions thinking & creation

As mentioned before, this model should enable a more process-oriented way of thinking. This is a necessity for the identification and creation of new solutions. This is a process where people's integrative intelligence is tested, because they need to create these new opportunities by utilizing each other's knowledge, experience and creativity.

People started to work across borderlines, which led to a better cooperation.

Another effect was that it became harder for everyone to understand what their neighbours were doing. In other words, a clear and concise picture of who was doing what has been missing. The effect of this was that people started to feel somewhat uncomfortable and became insecure about their own role. It was hard to feel comfortable when people were not sure that colleagues did certain tasks. Sometimes this was not visible and the organization chart did not give that information either. Managers needed to give guidance to what was necessary and why.

At the same time, a greater level of self-steering and self-control was required from the people. This led to that people felt somewhat uncomfortable with their empowerment and missed the comfortable simplicity of the traditional line-organisation. Some of them felt pretty much “alone in the dark”, while others felt very good about this higher level of freedom.

As everything was so relatively new, there existed no fixed procedures for how to do things or who to contact. All this was established “on the job”.

Certainly in the beginning it became obvious that the stress factor was higher due to a higher workload and an underlying uncertainty. Gradually, after focussed efforts from the management to change this, the stress level decreased to normal proportions.

One could also question why people have difficulty to work in a two or more dimensional organization. Have most of us not been raised in a family with two parents? A mother and a father, who had different powers over us. In a matrix model one could identify a line and or competence manager (function and competence) and an operational manager (objectives, tasks and results). Is this not the same model in a way? If these two dimensions are adequately aligned with each other, we can see a very positive effect. A Condition for a good working model is that there must not exist a conflict between both roles, and the value of both managers roles are different or are in imbalance. Then it will be the subordinates that find themselves in a difficult position, and are often being used to address personal agendas. The matrix set-up needs to be planned carefully, where harmony is important, whilst at the same time flexibility is a goal as such. It is certainly not another type of line organization. It requires another way of working and thinking.

People - summary

The model requires the following:

- Management commitment & guts (no fear of losing control)
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- Management roles in the two or more dimensions must be aligned and equally important for the company
- Mature process management for end-to-end business
- Process- and even better systems- thinking amongst everyone
- No outsiders (outside the matrix, working on the sideline)
- We attitude and teamwork (thinking and acting across organizational borderlines)
- Perseverance

What are the positive effects of working according knowledge matrix principles:

- Better understanding of the end-to-end process
- Higher awareness of objectives and targets
- Higher degree of business orientation

- Flexible organization
- Awareness of own added value to company result

‘It is not the organization that is the goal, it is the way in which we together reach our common goal ‘

Risks

Management Commitment

As described before, a must to set-up a matrix organization is first of all a management team that wants to implement this model, because of their believe in the positive effects it will have on the whole of the organization. Management must not be afraid to risk loosing some control by creating more freedom for middle managers and employees.

As problems arise during the introduction of this model, it is important that management shows perseverance to overcome these issues and make the change happen. One must not be afraid to overcome problems that arise because people do not automatically understand the model. All need to understand that it takes time for everyone to fully understand this new way of working and thinking. As the introduction is often introduced in a top down approach, changes are big that management looses its patience, because progress seems to be going too slow.

As many managers prefer the good old-line (fork) model, there will exist a lot of resistance towards applying this different way of working. Particularly when management changes, the new incoming manager (who often comes from outside the matrix) does not feel completely comfortable with his or hers new role. Therefore it happens that the matrix model disappears in the bin, and the good old fork structure is reintroduced as a means to solve all the unclearities and issues that exist in the organization. In reality these problems are often existing due to a not good working process management, but have little or nothing to do with the matrix model as such.

To conclude, commitment from the management is an absolute must.

Communication and Time factor

The time factor is an issue as well. Before introducing the model, analysis needs to be done of the maturity-level of the organization. How well are we working with process management? Is systems thinking present and at what extent, etc. To safeguard a smooth transition to the matrix model, a lot of preparations need to be made to define, describe and communicate all new processes, roles and procedures. The same goes for mission, vision, objectives, goals, etc. Proactive communication creates a readiness and receptiveness for the upcoming changes. This will then guarantee a transition, which can happen in a timely manner and does not drag along.

Autonomy

As mentioned before, a level of autonomy of the organization is required to safeguard a seamless cooperation with the outside world. This could be with other parts of the organization or with partners, suppliers, customers, etc. It is important that business can be done without continuous involvement of higher management. This has also a very big learning effect of the organization, which matures in this new role.

Performance measurement system

It is important that a measurement system is introduced to follow-up on the progress and defines proper action when deviations from the plan occur. In our example a balanced

scorecard method was used. It is a quite intensive way of working, but it ensures the right measurements and shows the right progress of the actual business state the company is in. It allows for a broad implementation on different layers of the organization, so that relevant information can be reported. The other advantage is that it gives a balanced view of the company's wellbeing at a certain point in time. It allows for an easy follow-up.

Competence management

It becomes clear that competence management must be managed as one of the success factors for the survival and growth of the company in the people dimension. It is important that this is disconnected from the performance review way of working. The key is to learn people to look after their own competence level and future needs and drive this process for a big part by themselves. A competence manager is the person to help in this process and needs to have a relation of trust with the employee, to enable this process to work. A line manager is therefore another function, where performance is the issue.

Extra attention needs to be given to the level of assertiveness of the people. In the matrix it is even more obvious that people get tasks put on them from two directions. It is therefore important that they learn to say "no" in an assertive way. Also as they need to get priority for their issue, it is necessary for them to be diplomatic as well as being able to negotiate with colleagues and or partners, suppliers, customers, etc.

Communication 2

It is absolutely necessary to communicate the way of working to the rest of the organization (outside the matrix). Interfaces / infrastructures need to be established before a proper functioning can be guaranteed. Again, this could also include suppliers, partners, customers, etc. It is imperative that a right expectation level is set with the environment in which the organization tries to do business.

Through a lens of complexity

Members of the K-matrix have a high degree of autonomy. Their acts are more influenced by their fellow workers and the customer, than by their place in the organisation and their superior. What metaphor can be used to understand such an organisation? The machine metaphor, where each organisational member is a small cog in a big wheel, is out of date. Even the organic metaphor seems to restrict the autonomy too much. It implies fixed relations between members and predefined goals of the acts. A complex system metaphor is more appropriate. Here the future is emerging out of interaction between members, which on one hand is independent individuals acting according to its own history and vision, and affordances in the context, when performing the task of the enterprise, see fig. 2. And on the other, is a dependent part of an organisation and acting according to that.

Let us look at our case through a lens of complexity. How will this affect our understanding of the problems of the organisation in the case study? What is needed for a complex organisation to function? Four areas will be focused:

1. the interaction between independent individuals (organisational members, suppliers, customers etc); frequency of interaction, closeness of relations and the quality of the dialogues
2. the organisation, the collective that each member is a dependent part of; a feeling of full membership in a community of understanding and shared experience
3. the vertical relations; about trust and not influencing, about giving requirements and a direction

4. the evolution of the organisation; a need for political disputes over different internal models.

Interaction between independent individuals

The amount of interaction is one conclusive fact indicating if it is appropriate to look upon an organisation as a complex system or not. In a bureaucratic organisation the need for interaction is extremely limited. Each organisational member may do his predefined and standardised work without talking to anybody, and hence the complexity metaphor is not usable in this case, the organisation is too stable. But too much interaction may also destroy the possibility for an organisation to employ complex behaviour. Not only an ability to change is needed, also a memory. If each new experience will change everything this will lead to chaos and not to complexity.

The ability of complex systems to process information is tied to its ability to have both order and chaos at the same time – its ability to both remember and to transfer memories. (Kauffman 1995) produced a famous simulation of stability and instability by building a network of light bulbs. Whenever a light bulb was turned on or off was dependent of the state of its neighbour light bulbs. The network was stable if each light bulb was connected to one or two of its neighbours. If they were connected to four or more, the behaviour of the network went chaotic, with most of the lamps twinkling, i.e. changing states all the time. Eventually Kauffman was able to tune the network to the border between stability and instability. In this phase, at the edge of Chaos, a change in a single light bulb sends signals across the system, and by doing this may produce order out of chaos: *‘So the behaviours in time and across the webbed network might become coordinated.’* (ibid, p. 90). *‘Just between, just near this phase transition, just at the edge of chaos, the most complex behaviours can occur - orderly enough to ensure stability, yet full of flexibility and surprise. Indeed, this is what we mean by complexity.’* (ibid, p. 87).

In this simple example it is only the number of light bulbs connected and the number of connections for each light bulb, deciding if the system is in the phase “on the edge of chaos”. In more advanced examples one agent may also be biased towards certain actions and perform them almost whatever signals comes from other agents. This increases stability of the system (Kauffman 1995) p 85). And between individuals in an organisation is even more complicated. The tightness in the connection differs. What some people do influences individuals more than what other do. And each individual is varying over time in how easy he/she is influenced. Still interaction is a basic condition for complex organisational behaviour and there is a need to arrange the requirements to get a balanced amount of interaction.

As an example of information processing in an organisation we may use it’s ability to interact with its environment (Backström, van Einatten et al. To be published). In order to cope with changing external conditions, an organisation should be able to recognise them. Organisations may have a capacity to draw a map of their surroundings, making use of the information they obtain in interaction (Marion 1999). Interaction with the environment will have an impact on the organisation. The organisation’s members engaged in interaction will remember the relations and patterns of action that have been exchanged. Through interaction, this part of the environment becomes a part of the actual world of the organisational members and thereby of the organisation. Several conditions have to be met to enable such impressions to form a “map” that the organisation can employ in improving its capacities in relation to the environment. The organisation has to be stable enough in order to build up a memory, while at the same time it has to be sufficiently dynamic to create a changeable map from constantly arising individual experiences. In other words, the organisation must be “on the edge of

chaos". Few shared meaning structures and too little interaction within the organisation cause rigidity, and an inability to update a common map. On the other hand, too extensive interaction and too great a sensitivity to impulses from the outside rapidly prompt major changes in the mapped image in various parts of the organisation. This generates chaos, and no one knows which map will serve to be shared.

Interaction seems to be a problem in the company of the case study. Everyday interaction in corridors and around the coffee table is very limited. Due to increasing work intensity this type of contact has almost disappeared during the last years. There is also a prevailing discontent about work meetings. A common problem for matrix organisations is "groupitis" (Davis and Lawrence 1977) p133). I.e. an idea that all business decisions has to be hammered out in group meetings and that it is considered illegitimate and not in the spirit of matrix operations to make decisions in other ways. The interviews also express need for another type of meetings, more informal and creative, around themes instead of controlled by an agenda. Still work meetings are mentioned as one of the most important ways to learn about the work. A study concerning networks of organisational members shows that only experienced personnel has contacts outside of work teams.

There is an indistinctness in more advanced communication, actions may be misunderstood and messages not efficiently transferred. There is a lot of research about human interaction and dialogue and it is not possible to cover it in this paper. But one important aspect is about listening and trying to understand by taking the perspective of the other, or decentration (Bjerlöv To be published).

Another aspect of interaction is covered by complexity literature; the use of building blocks (Holland 1995) pp34-). A complex system may manage novel situations by using its limited experience of other situations. This is possible by the use of building blocks, like the use of musical notation to transmit the endless variety of music. Holland gives the example of a person encounter "a flat tire while driving a red Saab on the expressway". Even if the person never experienced exactly this situation before, he is able to deal with the situation by using his repertoire of everyday building blocks connected to "expressways", "cars", "tires" etc. A complex system uses tested building blocks to model a novel situation in a way that suggests appropriate actions and consequences. There will be a tacit evolution of commonly understood building blocks when people interact in an organisation. But since they are of central importance for the organisations efficiency, it may be well worth to make the evolution of building blocks overt, to speed up the process.

The studied company uses a lot of different kinds of tools to aid personnel in different processes, e.g. balanced scorecards. These tools provide some building blocks as a by-product. But there has not been any consistent effort to provide organisational members with common building blocks in their work to understand, communicate and perform their work. Such contribution was one of the foundation stones in the Volvo-Uddevalla concept. E.g. to make it possible for one work team to assemble a whole car, all parts of the car was given meaningful names, easy to remember and communicate. While performing the work tasks, the names got connected to actions, and useful building blocks emerged.

Internal models have connections to the concept accessible meaning structures studied by (Dixon 1994). She brings out the importance of sharing experiences and information in the organisation. The described organisational learning cycle consists of four phases: broad participation in the collecting of information, universal and quick access to original information, resources for interaction and collective reflection about the information, and authority to act according to collective interpretations reach in interaction.

It is important to know to which category the person you interact with belongs; is he a colleague, a partner, a competitor etc. There is a need for tags (Holland 1995) pp 12) to show under which banner different persons are fighting to facilitate selective interaction. *“Well - established tag-based interactions provide a sound basis for filtering, specialisation, and cooperation.”* (ibid pp14-15). The tagging is a pervasive mechanism for aggregating people to an organisation and for maintaining the boundaries of the organisation. A member will be tagged as belonging to a work team, a department, division, etc. There may be a need to talk about at which level of the organisation it is appropriate to identify yourself with in different situations.

The tagging has not been studied in the company in question, but there is no indication on any problems concerning this feature. Members of the organisation seem to be very dedicated to do all in their power to fulfil what they understand to be the best of the company.

Information technology has not yet made its break through to support the interaction needed in complex organisations.

Workers as dependent parts of their organisation

Typical for complex systems is that agents aggregates into agents at a higher level, meta-agents, competent to perform more complex behaviour than the agents they are composed of (Holland 1995) pp 11-12). In this manner the organisational members becomes aggregated into an organisation. Above we argued that each member is an independent individual, but on the same time he/she is also part of a collective in a way that will heavily influence his/her actions. The aggregation is emerging during interaction between organisational members. Both the common language elements, or building blocks, and the common tag will influence members to perceive and act in a similar way. But the force of the common is even more powerful. Internal models will emerge, as in all complex systems (ibid p 31). Members have to share an internal model, if a complex organisation are to function. A model that allows them to infer something about the thing modelled. Which in turn will actively determining the members' actions (ibid p 34). Hence, such an internal model seems to be of central importance for the behaviour of a complex organisation.

A problem of not having a good enough internal model seems to have been observed by the company in question, since a book to all organisational members, giving a map over the company and its context, were being produced at the same time as our study was conducted. But the true internal model has to emerge in interaction between organisation members, and the interaction is not good enough for this process in the company today. The lack of such model is indicated by a lot of different problems expressed in the interviews:

- many people on each ‘ball’, leads to muddling thru`
- unclear who is the owner - who is giving support?
- unclear what the company expects from each person
- hard to say ‘No’ to a task

Vertical relations in complex organisations

The picture of an ideal complex organisation given in this paper is one were each individual may act completely according to his/her own head given that he/she is:

- having contact through interaction in networks with all important parts of the process using decentration and building blocks
- tagged to the organisation and dedicated to strive in the direction of the organisations endeavour
- using the common internal models and shared experience.

Some features of such an ideal complex organisation:

- decisions are made where problems arise and the knowledge about them is biggest
- individuals are keeping pace and acting in tune with each other
- enormous amounts of information can be processed in the networks of individuals
- conflicts can be handled long before they get out of control.

But what about the role of the manager? It is impossible for him to be as informed as the worker in question about important issues concerning each work task. If a leader amplifies his/her contribution to the workers decision process referring to the superiority, it may put the whole organisation out of pace and tune. Instead the advanced and demanding tasks for managers are to see to that the requirements of a complex organisation are fulfilled and to point out a direction for the organisations endeavour. And then just to trust the workers to do the best possible.

Many of the managers in the company of the case study seemed to give their subordinates great freedom and trusted them. But since the force of the common was not developed, this gave rise to some problems, as described above.

The journey from a bureaucratic to a complex organisation is a long one and there is a need for a cultural shift, a new way to understand work and organisation. Also the workers expectations on managers have to change. In the case study one of the most frequently mentioned problems concerned escalation of problems, i.e. to press a problem up in the hierarchy and let higher managers do the decision. But in complex organisations decisions are to be made where the need for them arise and extremely few problems has to be escalated. Other expectations on the ideal leader formulated by the interviewed personnel where more in line with complex organisations:

- Fight for your team
- Stand up, don't hide
- Listen and support - no grinding your own axe
- Have time for everyone, informal or formal
- Form an open (give-take critique and advise), understanding and cheerful atmosphere.

The understanding of causality when looking at processes has to change in a complex organisation, at least partly. Traditional indicators on input and output may still make sense. But to be able to understand internal processes, like innovation or work intensity, you have to adopt a new teleology (Stacey, Griffin et al. 2000). There are no rules of an 'if-then' kind in complex organisations. Transformations are caused by variations in the interactions. Questions given by company representatives as e.g. 'How does the work intensity influence competence development?' can't be answered, because there is no causal connection between 'work intensity' and 'competence development'.

Evolution of the organisation

In the picture given so far the complex organisation seems to be a very harmonically one, with all individuals in tune with each other and with conflicts handled long before they get out of control. Partly this is true, the intense interaction has unifying consequences, as mentioned above. But there will also arise political disputes in complex organisations, e.g. about the internal models. Since they are central for the behaviour of the organisation, and on the same time not prefabricated, but emerging out of interaction.

Complex systems are highly dynamic and adaptive. They are not only able to develop continuously, with maintained internal models, they may also develop discontinuously (Backström, van Einatten et al. To be published). These two forms of development may be

clarified by using the metaphor of a strange attractor (Nicolis and Prigogine 1989). A strange attractor can be described as a complex behaviour pattern that a system (e.g. a company, department, team) is attracted to, so that it repeats itself, but each time in a slightly different manner (Marion 1999). The power of habit makes us act in approximately the same way over and over again. We follow a track. But now and then we start to imagine a new way of acting and thinking for some reason, a new strange attractor is created in our mind. The more we get used to this new alternative the more likely we are to decide to take a jump and move over a ridge and into the basin of this new strange attractor, and follow this new track, i.e. acting differently.

A strange attractor emerges over time, e.g. when members of an organisation carry out its primary tasks, i.e. the tasks that have to be performed to ensure the organisation's survival. This is the purpose of an organisation's legitimate internal model, i.e. legitimate ways to understand and do things (Berger and Luckmann 1966). Most organisations are pluralistic. This means that in parallel with the legitimate model; shadow alternatives develop (Stacey 1996). The legitimate internal model strives towards status quo, the shadow towards change. If the legitimate model has defects in fitness, there is an opportunity for the shadow model to grow in strength. And, when time passes, it can suddenly take over, outperform the legitimate theory, and itself become the new legitimate one. This takes place when a large number of independent initiatives for change reinforce one another and merge into a significant movement. Emergence is effectuated via political interaction and collective learning (Stacey 1996). Political interaction means that people identify an issue and promote opinion in favour of it; they build coalitions, convince others, and negotiate with still others for support. The shadow theories may be looked upon as the genes of the organisation, memes (Marion 1999), pp 131). An organisation with a rich variety of memes or shadow internal models, have a lot of different options of behaviour patterns to select from and are thereby able to perform well and be fit in a variety of different situations.

A lot of people in the studied organisation are indeed complaining about tiresome political disputes in the organisation. Maybe the values concerning political disputes will turn more positive, if their important function for organisational development and sustainability were known. This would also make it possible to separate them from other kinds of more dysfunctional political disputes.

Conclusions from case study

Looking at the case study through a lens of complexity theory gives focus on interaction problems. There is a lot more interaction today than in the old bureaucratic organisation, but it is still not good enough. The control by means of standards, rules, instructions etc in the old bureaucratic organisation has not been fully replaced by something else. In a complex system the replacement is the common understanding. To be able to develop common understanding, internal models and shared experience, there is a need to facilitate the interaction between individuals connected to each specific work task. Connected to in a broad sense and including individuals both within and outside of the organisation. The interaction needs different kinds of support to function good enough.

- Everyday interaction in corridors and around the coffee table has to be acknowledged as an important and prioritised part of the work.
- Resources have to be allocated for meetings, especially in the beginning of new projects, allowing an internal model to emerge. But also later for collective reflection over experiences. These meetings can replace some of the time consuming formal and pseudo-democratic meetings of today.

- It may be expressed clearly that to evolve a work related net work of people is an important work task for each organisational member
- Technical support for interaction may be developed further
- The evolution of a common language, with building blocks and concepts, covering important aspects of the work task may be made overt and supported by the organisation.

A successful application of the Knowledge Matrix

In the beginning of the nineties a global company introduced resource and competence management. The goal was to gain centralized control over global resources with their respective competences. It would be possible to assign these resources to all global and local projects starting up all over the world. The problem so far had been that with the many projects that started, the right competence was lacking, which led to unsatisfied customers and higher costs. At the same time there were competent people sitting waiting for a new task, but because of a lacking system to identify and dispatch them, they ended up writing idle time.

To respect the cultural differences and relative autonomy of the working companies, an approach was taken to find the ‘best practice’ within the organisation. Working companies were to some extent working with resource and competence management, and they were eager to get their practices set as some sort of standard.

One of these companies was on the way to succeed with this new way of working. They had used a knowledge matrix model to support resource and competence management. Key of the success was that they had decoupled the line organisation. After having made an identification of the necessary competences, based upon their knowledge of the business needs, they documented all this information in profiles. These profiles formed the basis for the evaluation of the existing competence; it described the different levels (scaling), described the different behavioural attributes, etc. All in three competence dimensions. Plus also clear guidelines for how to handle it.

The organisational principles were mapped on a process model, so that working sequences and methods could easily be understood and applied. Everyone in the organisation was aware of the in which order things needed to be done, which function had certain authorities, etc. On top of these, goals and objectives were set for every individual, which focused on the company, own organisation and self. This formed a coherent set of rules, which led to a build in cooperative way of thinking and working.

People and work were organized following the matrix model. There were no line managers involved. The work was managed by operational managers, who were dividing up the work in tasks and activities in one dimension of the matrix. In the other dimension it were the competence managers, who ‘owned’ the people. They had bi-monthly meetings with the employees, where they discussed the work, the progress with objectives, the competence and necessary improvement areas. It gave employees a possibility to reflect upon themselves and on their performance. This competence manager became a person of trust, even though this role was combined with salary setting, but because of the openness and mutual respect, this led not to conflicts. For people from outside the organisation, it was very positive. This way of working gave an extra dimension to the company, because it showed that people are important and need some guidance and help with their own development. Salary is certainly not the only motivating factor to attract people.

This application of the knowledge matrix resulted in better results for the company and it’s employees during the period that this method was applied. People became more aware of their

own capabilities and limitations, and improved their skills where possible but learned at the same time to respect their shortcomings in certain areas. When people needed to move to another position because their profile did not match their role, they actually came with this conclusion themselves and fully accepted another position. So people and organisation became a much better match, while at the same time wanted objectives were easier to reach.

Conclusion from the success story

First of all the success of this change had been made possible through the belief and commitment of the management in this new way of working. Their decisiveness to make the change and their perseverance in encountering all the problems that arise when institutionalising this new model, led to the wanted result. One of the attributes of these managers was their belief in the good side of people. The model forced them to learn to let go of control for a big part and fully trust their people to get the right things done right. One can conclude that this model does not fit managers with a great need of control. They feel more comfortable in the good old traditional fork model.

Another success factor had been the upfront work that had been put into this. To describe the operating model, the business processes, all job families, profiles, roles and scaling was a time consuming effort. Then setting the goals and objectives and distribution over the employees became a logical next step. After this the operationalisation phase of the model which led to many small problems. These needed to be taken care of through direct support and assistance, before everything started to work as planned.

A third important factor for the success was the continuous communication to get and keep everyone informed and involved about the progress. This was performed through open dialogue and off course in written text. People did get the feeling that their managers were really involved and engaged in the success of this new way of working. It was not just another management technique, but a sincere approach to make a change happen throughout the whole company.

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