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Managing non-programmed re-innovations in a company network

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Abstract

This paper discusses the management of re-innovations in products, processes and organisational structures within a company network. The focus is on young, immature networks that are implementing the new way of working together and in which there are thus a lot of emergent ideas on how to improve the original innovation. In this paper, we identify and analyse factors that support managing process innovations in this kind of environment. The study concerns organisational levels ranging from strategic to workshop. We also discuss briefly the interrelations between identified factors and between network's and company's (strategic)

objectives. Based on this understanding of the phenomenon, we introduce a preliminary management model for supporting process innovations management in a company network.

This paper is based on a real industry development project where a tactical network of 9 companies was set up in the boat building industry. The majority of companies belonging to the case network are SMEs (Small and Medium-sized Enterprises) and thereby the SME viewpoint is emphasised in this paper. By EU Commission's (2003) SME definition companies that have less than 250 employees are medium-, less than 50 are small- and less than 10 are micro-sized.

1 Introduction

Today's companies build and operate in multilateral networks in order to build more complex products that require know-how on several branches and to increase flexibility in market changes. These are actions which increase companies' competitive edge. One of the main challenges in the networked business environment is to increase effectiveness by managing process improvements holistically. Partially behind this lie innovations that rise from different organisations and organisational levels. Tidd et al. (2001, p. 20) write that the process of innovation management is, on a general level, the same basic sequence of activity regardless of the organisation's internal or external environments. They further recognise, however, that networks of companies may operate according to complex coordination arrangements and device careful legal frameworks for protecting intellectual rights. All this together with the lack of understanding for other network companies' businesses, the lack of understanding network's operation holistically, the lack of personal contacts and deficiencies in depth and density of network's relations, imply that in there are also some special characteristics in managing

innovations in networks. Information and Communication Technology has recently reached such a level that it could promote the management of information over distances (Hardwick M. et al., 1996, p. 46) and thereby also in company networks. This means that information could technically be shared reasonably fluently between organisations. The challenge is getting the networks' decision makers to pay attention to this information, employing the information and taking the necessary actions, which will turn inventions into innovations. As Roberts (1988, p 13) puts it, innovation is the invention and its successful exploitation.

Company Alpha, the manufacturer of a premium class yachts, confronted these challenges during a recent supplier network start-up and development project. The company aimed for increased efficiency, flexibility pertaining to market changes and increased production speed in manufacturing its smallest yacht. The objective was simultaneously to move from project oriented manufacturing to more process oriented production of small series, because serial production was seen as one of the key factors in achieving a good price-quality ratio for the products. Because the company believed that networked production could achieve these goals, they decided to design a new yacht concept and a yacht that can be manufactured in a networked production environment. The new yacht that was introduced is a racer-cruiser class boat that is quite standardised with some customer options, whereas the company traditionally built heavily custom-tailored products that, with the exception of the hull, all differ from each other. The new product also introduced a new production technology and new materials since, due to desired racing characteristics, the yacht had to be light weighted without compromising the luxury of a cruising yacht (hence racer-cruiser).

In order to do this, the company launched a network start-up project during which the following was done: the product design was refined to suit networked manufacturing, partners were selected, work distribution together with responsibilities were defined and production management was designed. Furthermore, mechanisms for quality assurance and mechanisms for improvements in quality, process and product were built. These activities partly took place after the production start.

The magnitude of the case network's production efficiency development is depicted in figure 1. The graph actually depicts the realisation of required total resources per produced end-product, but it also reflects the magnitude of the efficiency development objectives that were set when the production started in the network. The efficiency improvement objectives were set based on experiences from earlier boat models. The shown figures are indexed for confidentiality reasons. The first boat (# 1) is indexed as 100. The prototype (# 0) is not included in the figure because it would add bias to understanding the magnitude of the efficiency improvement for three reasons: 1.) #0 was not built by the network, 2.) one of the reasons for building the #0 was testing the solutions and 3.) the construction of the #0 was utilised as a learning opportunity. The network companies participated in building the #0 as observers which in turn increased the building hours since the manufacturing process proceeded purposely quite slow. Had the #0 been included, its index would have been 187.

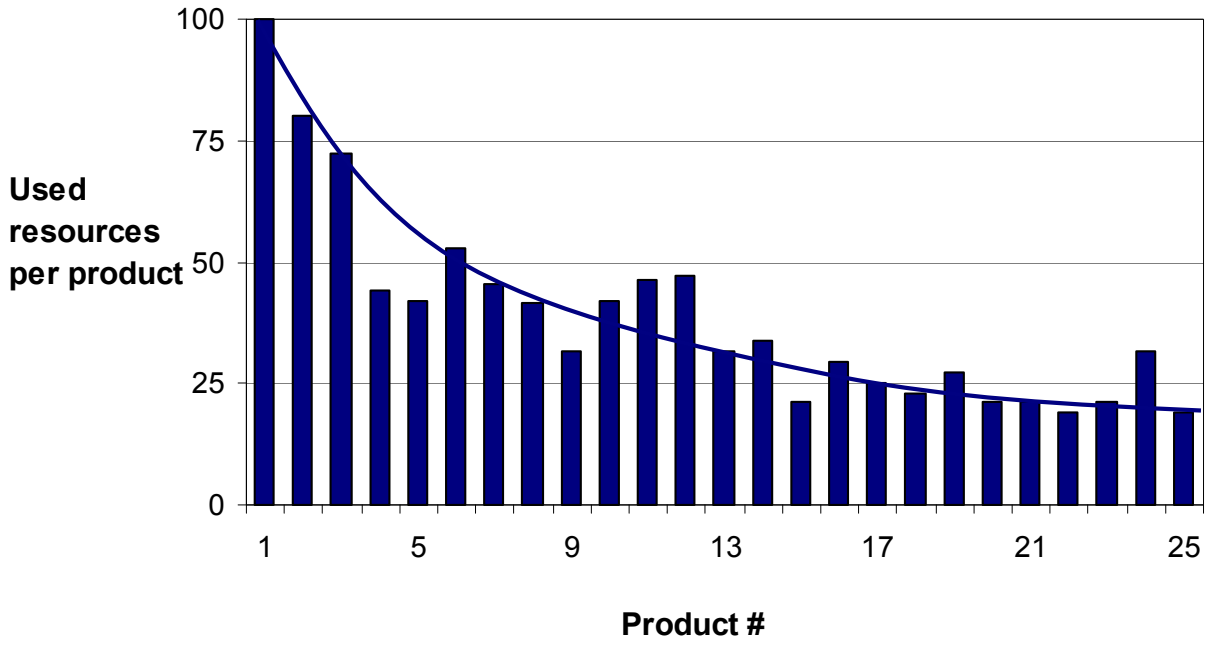

Figure 1. Development of resource needs per product.

A corresponding efficiency improvement objective was also set for each company. Meeting objectives of this magnitude necessitates that systematic manufacturing processes are developed and that mechanisms and processes for turning emergent improvement ideas into innovations are introduced. These innovations further refine the manufacturing processes and the product.

2 Objective and research question

The objective of this study is to find and enhance understanding of factors that support managing innovations in the company network. The focus is on, mainly incremental, non-programmed innovations (see e.g. Gobeli and Brown, 1987) that take place during implementation of the original innovation. Biemans (1992, p. 44) calls these kinds of innovations "re-innovations" as exemplified by the following: "During the implementation, the innovation may be changed or modified by the user (re-innovation)". In the boat industry case the original innovation consists

of the new product and the related new manufacturing processes: the concept of a serial boat. Re-innovations in the case are ideas that started to emerge after the network was set up and the production had begun. These ideas addressed how to develop the production process and product further. These innovations are stimulated both by the underlying new production processes as well as the new challenging product, together with its technological solutions. The objective of this study can be presented in the form of a question: which factors support non-programmed emergent re-innovations in a company network.

3 Research methods, validity and data collection

This study is based on action research that was conducted in companies involved in building up the network and the particular mechanisms for managing network operations development (innovations) on operative level. In the research, constructive approach was central. The needs rose from practice but were also linked to theory; a construction for problem solving was created and implemented in practice. The theoretical contribution is built on the existing theories by complementing it. The approach was a result of the development situation in the network when the work started. The fact that people from different companies participated in the problem solving was considered as an important factor in building up a trust. The small sizes of the participating companies (of nine involved companies, only two were large and one medium-sized) reduced their own individual possibilities to actively lead long-term developments.

In this study we use both qualitative and quantitative data whereby we aim to improve the validity (see e.g. Jick, 1979). Triangulation is also used in a manner where several researchers were involved in collecting and analysing the data, also several data collection methods were

used. However one ought to be careful when generalising the results since they may be somewhat specific to the studied cases which are also of limited number. The data collecting was done by:

- Interviewing key persons in the network companies, which yielded qualitative data. The managing director was the key person in the smallest companies (three companies out of nine had less than 20 employees), the production and/or unit manager was the key person in larger companies (a total of two, plus one mid-sized). In Company Alpha the product team and management were considered as key persons, and in the other large company, the unit manager and foreman. No interviews were conducted in the one SME, which joined the network later. The total number interviewed people who contributed to this study, was 32. Out of these 23 represented Alpha. The majority of the interviews were made by two interviewers, one concentrating on interviewing and the other on writing a memo. Some interviews were group interviews and others were personal interviews: people from the operational level were interviewed as groups, because it was estimated that would be courageous in stating their viewpoints and opinions in this way.
- Qualitative data, concerning how production time should develop over time, was collected from historical data sets. Data concerning the realised efficiency was collected from the production management systems.
- The action research oriented development group working yielded also data for this research. The memos of these meetings were used as data sources.

4 Factors influencing innovations management in a manufacturing network

Biemans (1992, p. 10) analyses the different classifications of innovations made by researchers and presents an outcome that is relevant also from the point of view of this study: innovation is not by definition a new product but it can refer to production process, organisational structure or relations between people. A similar classification was already presented in 1967 by Knight (p. 482). The classification emphasises that the invention behind the innovation can also concern the production process and organisational structure. It also implies that the product, production process and organisational structure are interlinked and that efficient innovation management requires taking all these issues into account.

In a production network, the relations between companies are defined by the organisational structure of the network, companies' functions in this structure and the relations between people from different companies. This means that the innovation, regardless what it is about, may influence company relations. According to Håkansson (1987, p. 14), networks have three basic elements. These elements are actors, activities and resources, and they all depend on each other. Actors are individuals, companies or even groups of companies that perform activities. The activities which are performed by the actors, are refining work or transactions. Resources are human and physical assets which the actors use to perform the desired activities. When using this definition of networks, we can conclude that innovation in a business network affects actors, activities and resources. Therefore, an innovation in a network should be assessed from these viewpoints. Especially, if we consider non-programmed re-innovations, assessing becomes emphasised to enable holistic view of the influences. If we jump to implementing straight away without assessing and analysing them first, there is a danger. Some issues that are purposely

designed in some way when implementing the original innovation may be changed and not towards better. If this happens, one the innovation can not be called successful.

Defining successful innovation is, however, not particularly straightforward. It can usually be done after the invention is implemented but the real challenge is how to evaluate the success during the innovation process. (Dornblaser et a., 1989, pp 193-194) If we study the product innovation matrix that is based on Gobeli's and Brown's (1987) ideas, we notice that they have considered two major factors that innovations have an effect on: the customer and manufacturer. In a production network these both factors are worthy a second thought. The customer for the end product is the end customer, but before the product reaches the end-customer there are several customerships within the production network. The companies are always customers of the previous companies in the chain / network, the network as a whole can be the customer for work and know-how of a single company in the network. If there is a clear principal company in the network, it can be the customer. And finally, of course, the end customer is not only the principal's or network's customer, but a customer of every individual company in the network. For the end-customer the network is the manufacturer of the product. Despite this, the customer contact interface may be one single company and the customer does not necessarily even know that the product is not entirely manufactured by this company.

Within the network, the manufacturer of the component is the preceding company, or companies, in the chain. To sum up, the concepts of being a manufacturer and customer are complex in company networks. This complexity means that, in a network, one has to analyse the idea (the potential innovation) from several viewpoints:

- How internal and external customers benefit from the innovation.
- Who the actual customer is (some innovations do not benefit the end customer; some innovations make work more difficult for the company next in line, who receives the component from the preceding company, but the innovation may be beneficial from a holistic view).
- How the manufacturing network and its individual companies benefit from the innovation (the innovation may have positive overall outcome from holistic point of view but it may be negative from single company's viewpoint).

⇨ How to share benefits and profits holistically between different levels and types of customers and manufacturers in the network.

Davenport (1993, p. 31), in his analysis of process innovations, also noticed that all processes are the beginnings of other processes, either within or outside the organisation. Thus, a process innovation will often result in changes in the upstream or downstream processes.

To conclude, the innovation management in networks require taking following factors into account:

- An innovation is not restricted to a product but it can also be a process or an organisational innovation.
- The product, (production) process and organisational structures are interlinked.
- Innovation may, regardless of subject, influence the networked companies' relations with one and another.
- Innovation affects actors, activities and resources in the network.

- The degree of success can usually be determined after implementation.
- Customers and/or manufacturers should benefit from the innovation and it should additionally be possible to define how the benefits and profits is shared among them.
- The concepts of customership and being a manufacturer can be understood on several levels and from different angles.

When evaluating the success of the innovations during implementation, these viewpoints should be considered.

5 Techniques for studying innovation processes

This chapter briefly discusses different techniques for studying innovation processes. The aim is to consider different approaches to studying the cases in this paper, since it is not self evident what technique is suitable. First, the technique must somehow take into account the factors recognised above and secondly, that modelling an innovation is not simple because the innovation process is seldom straightforward.

The trouble is that the innovation process has often been viewed as a sequence of separable functional stages (such as design, production and marketing) and sequentially ordered in time and linked with transition routines to make adjustments between stages. These simple unitary stage-wise models lack empirical validity or correctness. Schroeder et al. (1989, p. 113) So instead of the functional stages, the model should take into account the mix of decision makers that together solve the problem holistically. Since everything can not be decided at once, it is natural to think that the innovation process has to be modelled using some kind of stages. Instead

of being straightforward, the stages may be iterative and overlapping. In addition to this, moving between the stages is not necessarily a conscious act nor does it have to be based on certain rules.

Saren (1984, p. 11) has classified models for product development process into five categories. These are the departmental-stage models; the activity-stage models; the decision-stage models; the conversion process models and the response models. The advantage of the activity-stage model, in comparison to the much criticized departmental-stage model, is that it does not presume that the process crosses different functions. Instead, the model consists of activities that people from different functions can perform together. The decision stage models add the decision making aspect to both the departmental- and the activity-stage models. The conversion process and response models have a slightly different approach. As Biemans (1992, p. 37) writes, these models avoid setting an order to events in the innovation process and therefore, they avoid the criticism which is directed towards so-called stage-models. The weakness of the conversion process model is that it is too general to support the understanding of the innovation process. The conversion itself is often much like a black box (Biemans 1992, p. 38). The focus is on the inputs and outputs but the model does not give enough of an in-depth view on how these inputs are treated and utilised during the conversion process. The response models present an innovation as a reaction of the firm to a stimulus and the model merely concentrates on the early stages of inception aspect within the innovation process (Biemans, 1992, p. 39).

The empirical innovation cases in this study are specific, hence this modelling technique does not have to be applicable to other studies, it is enough that it supports these cases. Due to the characteristics of the cases, the stage models are potential despite their shortcomings. The three

major elements in all cases are that there were different evaluation and problem solving activities, these activities were conducted by a number of people that co-operated in different ways and that there were formal decisions being made before implementation. Studying the actual process requires ability to model some details of the process. Therefore, a decision-stage model combined with activities seems most suitable. The challenge is that even in these simple cases the process was not straightforward, but iterative and actually rather messy. Since the decision-stage models seems otherwise appropriate, the aim is to take the loops and iterative nature into account in the verbal description of the cases and, within the realms of possibility, in the modeling too.

6 The manufacturing network

The manufacturing network was built around the product innovation, a racer-cruiser yacht, the idea of which was the principal's (Company Alpha) interpretation of the end customers' needs. Based on these two innovations, the product and networked production process, the principal broke the product into main components and preliminarily defined the interfaces. A large number of possible suppliers were analysed. The candidates represented both companies that had previous history of working with the principal as well as new companies. The final selection was made based on a company's ability to produce the desired component. The focus was on the ability to provide complementary, not overlapping, competencies. In addition to this reputation, image, innovativeness and desirable economic situation were important. The network which was created is depicted in figure 2. Also shown in the figure are material flows and the relations between companies in the network. The figure depicts the network as it was when the cases took place.

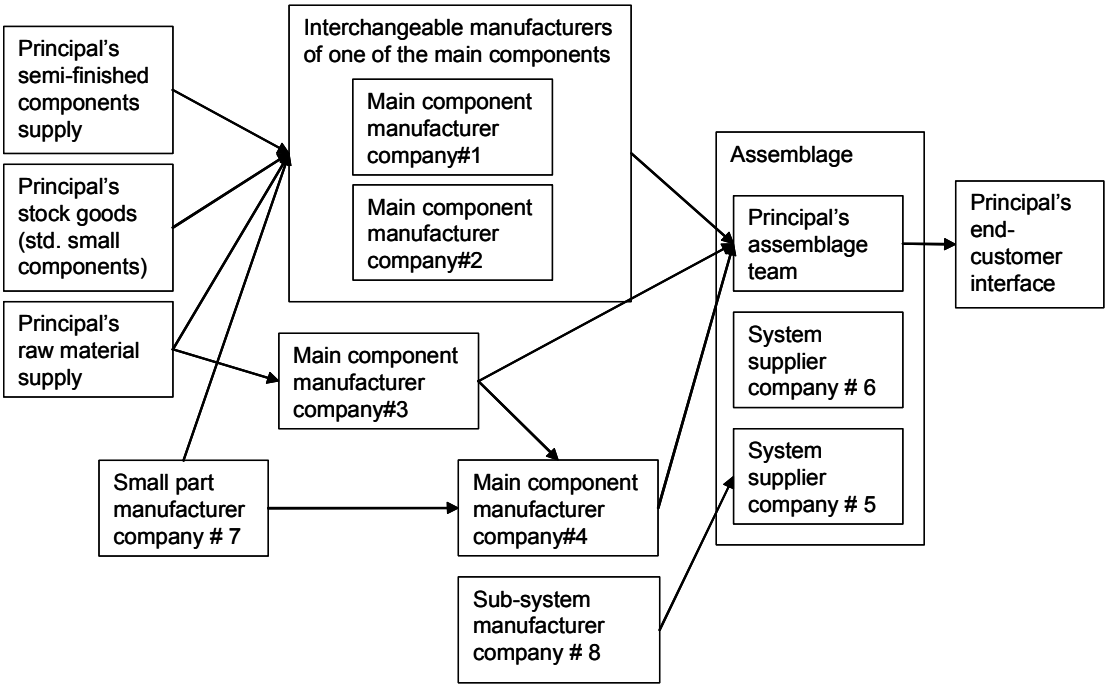

Figure 2. The case network.

Table 1 further clarifies the characteristics of the companies in the network and their business relations.

Table 1. Network companies' characteristics.

	Company#1	Company#2	Company#3	Company#4	Company#5	Company#6	Company#7	Company#8
Was new business created	Yes	No	No	Yes	No	No	No	No
Was new manufacturing tehcnology involved	Yes, new material created some challneges	Yes, new material created some challneges	Yes, new sensitive finisihing, module-thinking	Yes, new material that are difficult to handle	No	No	No	No
History of working with principal	No	Some	Active	No	Active	Some	No	No
Size	Small	Small	Small	Medium	Large	Small	Small	Medium
Do other companies in the network have the same competence?	One network company and the principal	One network company and the principal	Principal	One network company for some products, the principle for other.	No	No	Company that left the network and the principle	No
Special remarks	Parallel manufacturing with company#2, who has the same product	Parallel manufacturing with company#1, who has the same product. Joined network due to # 1's tehcnical and ecdonomic challenges	-	Company quit the network after startup phase due to failed attempts to develop product to ease mannufacturing process. Underlying also pricing disagreements. Tasks moved to company#7 and to the principal.	-	-	Joined the network to manufacture a portion of parts that # 4 used to manufacture.	Subsupplier of company #5, important module, requires special knowledge

In the following chapters we analyse three incremental non-planned re-innovations that took place after the production had started in the described production network. The reasons for selecting these three cases are:

- These three ideas and respective innovations played a substantial role in attaining the desired efficiency improvement.
- The innovations influenced the manufacturing process, network (organisation) and product. Like Biemans (1992) and Knight (1967) recognised in their studies, these represent the various targets that innovations can have.
- Two of the case innovations were considered successful after implementation, whereas the third innovation was evaluated in contradictory ways by different interest groups.

In the case analysis, the cases are individually described, modelled and analysed. This is followed by the conclusions of these cases. The focus is on identifying the idea and taking necessary actions to enable implementation on an operative level. The operative implementation itself is left out of the focus, though it is recognised as an important task, which plays a major role in achieving real business benefits.

6.1 Case 1: Re-innovation regarding production process of a major component

The main component manufacturing company # 1 had difficulties in achieving the projected improvement in their manufacturing efficiency. The overall working time was too long and contrary to assumptions, the production time did not decrease fast enough despite that the workers became familiar with the product. There were also difficulties in keeping the production schedule, and as a result, also the quality was in danger. The company had know-how on the

manufacturing process, but they could not determine what caused the manufacturing hours to stay high. This lead to a situation where there was internal pressure and customer need for productivity improvement.

The principal and the company agreed on seeking the help of a consultant. The consultant systematically filmed the manufacturing process and analysed it together with the workers. The problem was localised to belonging to a phase during which the company had to work on semi-finished components, which stemmed from the principal. This phase was done in a very difficult working position. During the analysis it became evident that fixing this problem internally would still not lead to the desired improvements in efficiency: the working position is hard to change unless the heavy component is flipped during the manufacturing process. Flipping the component, however, would expose the component to damages. The discussions to develop the semi-finished component commenced. The goal was to have the troublesome parts, which caused the difficult working position, already integrated to the component during the manufacturing done by the principal. In figure 3 there is a simplified model of how the idea was refined into innovation.

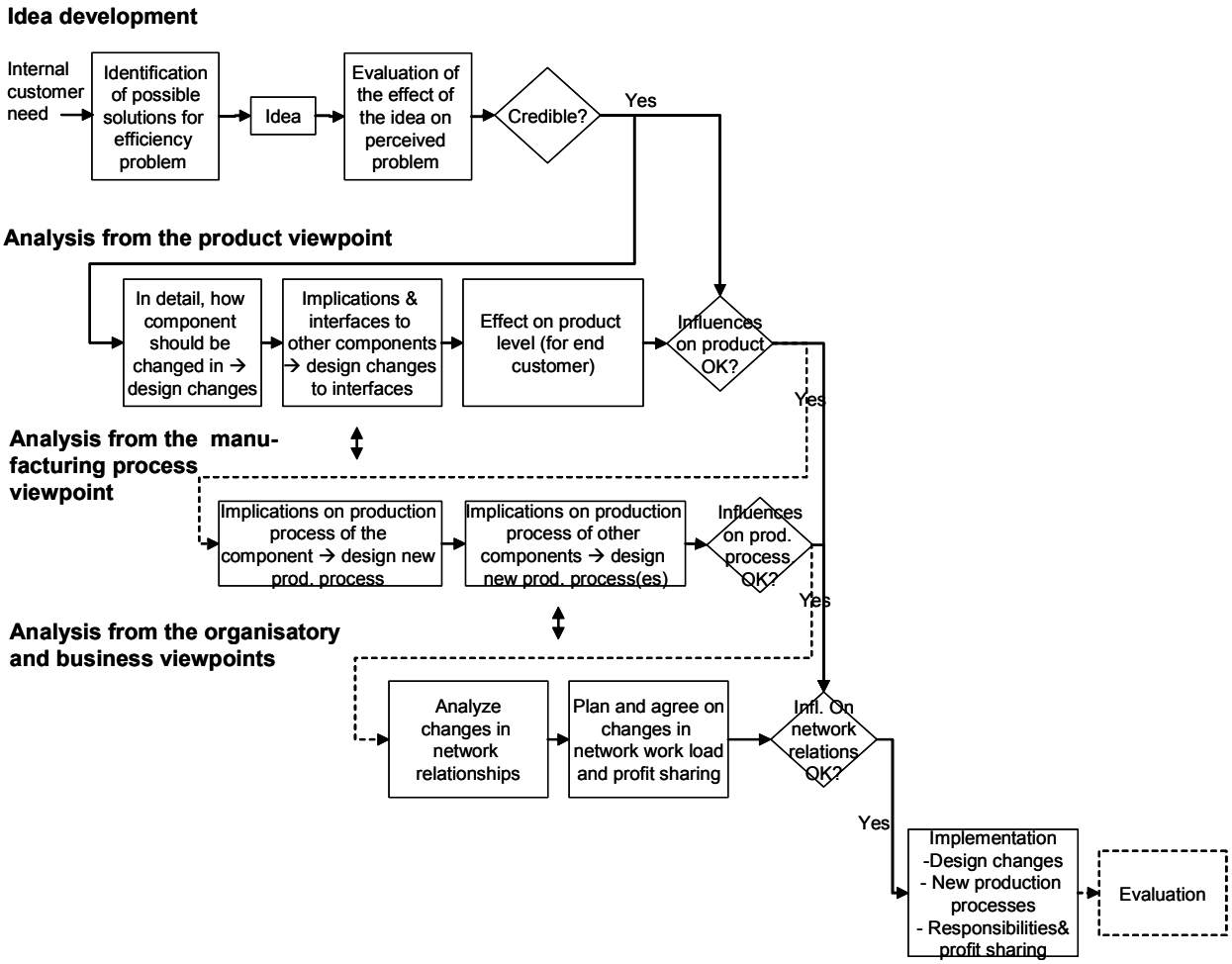

Figure 3. From invention to innovation model, in case #1, where a major component's structure and related manufacturing process was changed.

In **idea development an** external facilitator (consultant) was used to 1.) localise the performance gaps and their origin; 2.) help in shaping the problem description and preliminary high level ideas on solution; 3.) help to sell the idea as a credible solution to the principal (this includes estimating its influence on the manufacturing company's efficiency). Credible documentation was already needed in this phase since the technical changes to the product and the implications for the production process were not self-explanatory for the people involved. Thus, selling the idea required several meetings and discussions, too. In this phase the key players were the

component manufacturing company's CEO, consultant and principal's project manager (PM), who was in charge for building the production network and starting the networked production. The researchers acted as observers.

The analysis from product viewpoint took place when the PM discussed the matter with the design department and asked for revised design plans. The phase was done iteratively so that it overlapped with the **analysis from the manufacturing viewpoint**, which involved the PM and the production managers from the principal's function (, those who manufactured the semi-finished component). The company # 1 was not active during these phases: these issues were considered to have been evaluated from their viewpoint during idea development phase. The CEO from the manufacturing company was in contact with the PM who, in turn was working on this issue with principal's design and manufacturing departments. During these phases the manufacturing company's CEO was extremely worried about the slow speed in which decisions, which would lead to corrective actions, took place. At the same time his company could still not meet the required efficiency and struggled with losses. The PM tried to motivate the different departments and the departments' decision makers to support the changes. The relations between company # 1 and the principal became inflamed and mutual trust suffered. The problems that the PM encountered in his own organisation were not communicated as first hand information to the CEO of company # 1 and thus, distrust arose. Finally, the intensive negotiations within the principal lead to an agreement regarding the technical changes. The researchers played an action research oriented role during these phases.

The analysis from an organisatory viewpoint caused the relations to become increasingly inflamed. For the first time in the networks history, the work and profit sharing division were to be refined and no detailed agreements of principles for doing this existed. In practice, the PM alone represented the principal company. The CEO of the manufacturing company represented his company. The PM also had to discuss the issue with his superiors, who had the final say in making the decision. For awhile it seemed that the situation could become permanently unsolvable and all the while the operative situation at the company # 1 got worse and worse. The changes on the technical level were defined, but on a business level an agreement could not be reached. Due to this, the network was reinforced with a parallel manufacturing company alongside company # 1 (company#2 in figure 2). Simultaneously, also an agreement on the changes in organisatory and business relationships was reached, as both parties caved in. A mutually satisfactory result was finally reached and, retrospectively, it can be seen that the effectiveness was significantly improved. So, while the episode was technically a success, it also scarred the relations between the principal and company # 1. Furthermore, it may have had implications on other relations in the network, though this was not visible in everyday life.

The major results of this case were: changes to component, changes to production process, changes in business relations, relations were inflamed, business and organisatory issues were discussed and preliminary principles for handling innovations were created. **The major characteristics of the case were:** it was an indirect process, the next step and rules were unknown advance, the discussions were primarily one-to-one (forums or meetings, for instance, were not used) and a facilitator was utilised from early on.

6.2 Case 2: Re-innovation regarding the material selection process

The main component manufacturer # 3 suffered from a patchy material (teak). The material was supplied by the principal's raw material stock. The principal delivered material for five boats in one batch. This batch was often complemented by a back order since the principal could not find certain special materials for five boats at a time. The component manufacturer then sorted out the material from the delivered patch for each boat. From the selected material four different components to one boat were manufactured. Three of the components were assembled at the principal's assemblage and one at the component manufacturer # 4. This practice worked well, with the exception of that the last boat of each batch occasionally suffered from having components manufactured from scrap materials and there was too much variation in the teak that was used. To overcome the problem, a change in the working processes was needed. The innovation process is illustrated in figure 4.

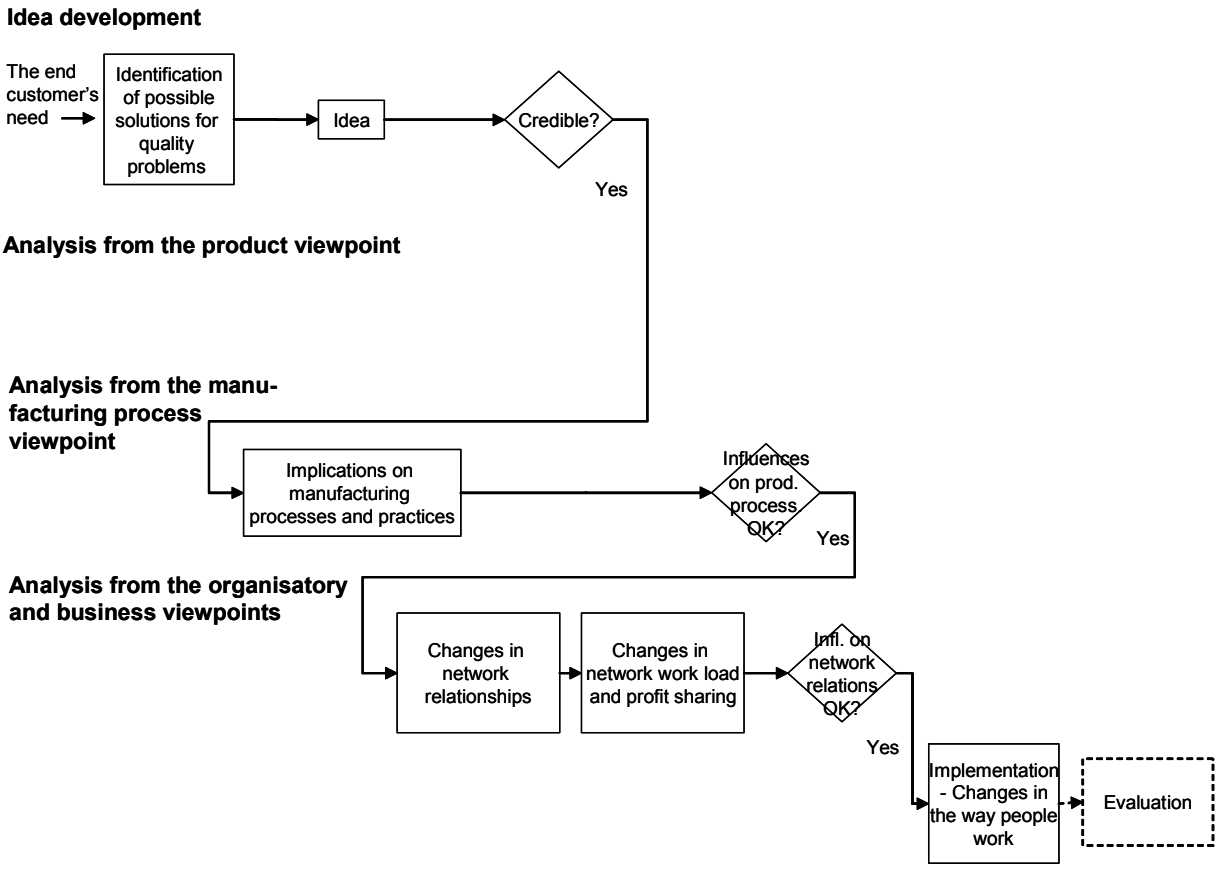

Figure 4. The innovation process in case 2: change in the working process and its implications on work sharing and business relations.

The **idea development** phase involved researchers who interviewed the CEO of the component manufacturer and the responsible worker at the principal. Based on these two interviews, the researchers constructed preliminary ideas for a solution on operative level. The basic idea was that materials should be selected and patched boat-wise already at the principal's. This would ensure that, for instance, that the teak in each respective boat would have similar grains and tone and that the third boat would no long be built from odds and ends. After that the ideas were documented and refined with the CEO of the company # 3, they were presented to the principal's project manager (PM) to assure him of the credibility.

This was followed by an **analysis from the manufacturing viewpoint**, which involved the CEO from the manufacturing company, the PM and the superiors from the principal's design and raw material supply department. Altogether 11 employees from these two companies participated in the meeting. The researcher functioned as an observer in the meeting. The users of the components (the main component manufacturer # 4 and principal's assemblage team) were not involved in the case because their work was not influenced by any means. During the meeting different potential solutions were discussed and finally agreed upon. The final decision followed along the lines of the idea presented in above paragraph. Due to a large number of participants, the meeting was quite long but because all the decision makers were present during the meeting, decisions could be made. Due to the manufacturing company having previous cooperation experiences with the principal, the atmosphere of the meeting was quite balanced and open, despite the fact that 10 out of 11 participants (plus one researcher) represented the principal. The uneven power distribution at the meeting might have locked the situation, had the participants been unfamiliar with each other.

Organisatory and business viewpoints were equally discussed at the meeting. In practice, the change in the working process was that the material selection and bundling was shifted from the component manufacturer to the principal. The extra work to the principal was considered minor, but the price changes were left open. This may yield problems in the future, if the issue for some reason is taken under consideration again.

The major results of the case: changes to the working process in regards to material selection and its effect on work sharing between the company # 3 and the principal, the previous material stock for five boats at the company # 3 was removed and thus invested capital reduced. The change in the working process solved the perceived problem and the solution was considered successful by all interest groups unreservedly. **The major characteristics of the case:** the process was straightforward and fast, the decision makers were involved in the process, the involved companies had a cooperation history, the facilitator was involved from early on in the process.

6.3 Case 3: A contradictory re-innovation regarding the product structure and the related manufacturing processes in the network

The production hours of the component manufacturing company # 4 were increasing whilst the principal assumed that learning would lead to a decrease in production costs. The issue was first exposed when the company # 4 expressed a need for better cost correlation. While the principal simultaneously wished to lower the price, as predicted when the production commenced. When the consultant and the manufacturing company's representative started to analyse reasons for increased production hours, they found two major issues. Some recent changes to production personnel had been made and this may added a few hours. More importantly, incremental undocumented improvements to the component had been made by the personnel at company # 4. These improvements were a result of needs that the system supplier # 6 had. The changes significantly reduced working hours during the supplier # 6's system installation but at the same time increased some hours for the component manufacturer # 4. The problem was that a product and a working process invention had been implemented without control and without taking the

network's business relationships into account. The holistic view was missing. Thus, the idea had risen from an internal customer but it was not acceptable for manufacturing company or the principal. In short, the **idea development phase** was somewhat uncontrolled and the emergent idea was implemented on the operational level before considering its influences on the working processes, the networked companies' relationships and business relationships. The process in case 3 is shown in figure 5.

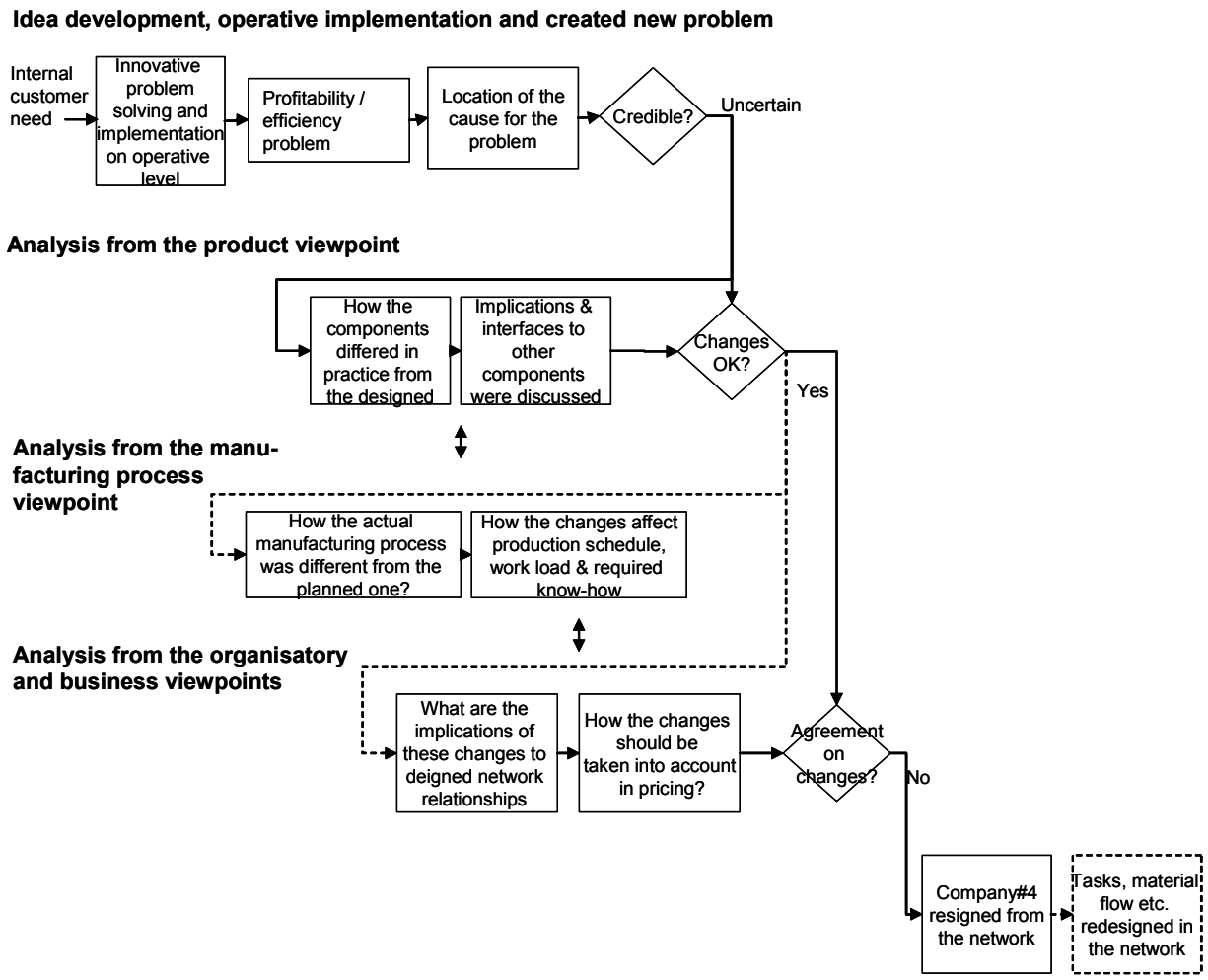

Figure 5. In case 3 the invention was implemented on an operative level, which caused problems on a holistic level and thus the work for a successful innovation continued.

The project manager (PM) from the principal's side discussed the issue with the consultant and the manager of the manufacturing company's workshop to find out the reasons behind the unexpected turn in production hours. At the same time, the CEO of the manufacturing company argued for increased payments due to extra work they were doing for the common benefit. According to him, the work was most efficient when done already in this phase. The PM became suspicious regarding whether these changes really were the cause for increased working hours. On operative level it was analysed how the **component had been changed** and what kind of implications it had to the **production processes** at companies # 4 and # 6. Technically everyone agreed on the rationality of the changes, but the implications it had on business processes (mainly profit sharing) were disagreed upon.

Different level meetings, which overlapped each other, took place in a seemingly unplanned order. Most meetings took place between the management of the component manufacturing company (mainly CEO) and the PM. The consultant was left in a difficult situation: the PM did not find the explanation for increased hours believable and the manufacturing company was afraid that the consultant could leak information to the principal and thus refused to continue analysis work with him. The CEO of the manufacturing company expressed strong concern for the proceedings of the negotiations: the viewpoints remained distant and no consensus was reached. Manufacturing continued throughout and at the companies were in a situation where no agreement was in force. The old agreement had expired and there were disagreements that hindered signing a new agreement. Since the situation was at a dead end, the CEO of the manufacturing company decided to leave the network. This lead to rearrangements in work sharing within the network: some work was redistributed to other companies and a new company

joined the network. The resigned component manufacturer continued with his own products that have quite a strong market position. The possibility for rejoining the network at a later phase was left open by both the principal and the company.

The major results of the case: the component which used to be manufactured by company # 4 was technically improved, which rendered a decrease in total production hours possible, and since company # 4 resigned the network, work was significantly re-redistributed. **The major characteristics of the case:** an emergent operative level solution was implemented without control, the process of systematically analysing the effects from multiple angles was cumbersome and proceeded slow, companies had no previous experiences of cooperation, the consultant did not enjoy the manufacturing company's confidence nor was he fully supported by the principal.

6.4 Conclusion of the cases

Cases # 1 and # 3 were clearly more toilsome than # 2 and in both these cases it was at some point feared that the idea could not be implemented successfully. Other common factors in #1 and 3 is that the innovation process was cumbersome, iterative and proceeded relatively slow. In these two cases the participants from the contract manufacturers communicated with the principal's project manager, who in turn took things forward with the other interest groups. Informing the contract manufacturers' contact stuff about the proceedings and the issues that ultimately hindered quicker implementations, was scarce. Also, the work and related profit sharing between the network companies caused a lot of confusion and dissatisfaction. In case # 2, the discussion was more open, which enabled direct interaction between interest groups. When

the decision makers had the opportunity to discuss and analyse the matter together, they could proceed straightaway and everyone was also aware of proceeding. This probably also made the process feel more manageable, though iterations actually took place in case # 2 as well.

In cases # 1 and 3, the toilsome process would probably have been helped along by some formal and agreed ways on communicating and taking the process further. Although the nature of an innovation process is iterative and the process does not proceed phase-by-phase, working practices for analysing and deciding on issues related to product, operation and organisation should be agreed upon. Furthermore, communication during the analysis and decision making should be commonly settled and planned in beforehand. To sum up, despite that the process is not straightforward, agreements on conduct in different phases should be developed, adapted and understood in advance. Case # 2 was the easiest one; the influence of already established relations between the companies and the open atmosphere which it creates in discussions and decision making must not be underestimated. Having a well established relationship with a previously created common trust helps managing the innovation process despite lacking formal methods and practices.

What distinguished cases # 1 and # 3 from each other is that the former was, despite the difficulties during the implementation, generally considered successful. The latter one was technically successful but from the perspective of the network organisation and business, the result was rather unpleasant. A part of the original innovation, trusty network relations, was damaged. This in turn had a negative effect even on the non-involved companies in the network. Companies started to think could this happen to them too.

In the cases a catalyst (consultant) had a central role in the idea-creating phase, when the preliminary idea was formulated in such a way that it could be explained to others (mainly to the project manager) and thereby taken into further evaluation and refining. The major characteristics of the cases are summarised in table 2.

Table 2. Summary of cases

	Successfull from network perspective	Failure feared at some point of the process	Process	Speed	Type of communi-cation	Level of communi-cation	Previous cooperation history
Case 1	Yes	Y	Iterative, phases overlapping	Slow: periods when seemingly nothing happened	one-to-one	Management	None
Case 2	Yes	N	Straight-forward	Fast: everyone involved were aware of proceeding	Forum	Integrated from manage-ment to operational	Active
Case 3	No	Y	Cumber-some	Slow: periods when seemingly nothing happened	one-to-one	Discrete from management to operational	None

7 Towards better non-programmed re-innovation management in company networks

In this chapter we present the central findings: what factors support managing (emergent re-innovations) in a company network. This also answers to the research question. Taking the network's standing point on recognised factors (what the factors mean in a production network) has novelty value and contributes on existing theories. The practical contributions of this study are that mechanisms and practices on how to manage innovations in the case network's future were implemented. These mechanisms and practices follow the lines of the central findings of this study.

During the operation, the challenges, problems and improvement ideas should be recognised. This requires encouragement, sensitiveness, understanding of other's work and a vision how the idea is taken further. Tolerance and respect for others' opinions is essential, together with the understanding of internal customerships. A catalyst or consultant may be needed to transform the underlying, weak idea into a strong and understandable statement that can be understood by others, one that convinces different interest groups and can be taken further. After recognising ideas, they are analysed, discussed and finally a decision about their implementation is reached. Success in this phase is supported by a common understanding of the analysis, decision making and benefit sharing principles and practices. A shared common understanding of processes, operation, product, organisation and their relations also support success in this phase. A strong participation, the sharing of information and an ability to show coherent mechanisms for analysis and decision making also yield trust, which further support success in the long run. Part of the understanding of principles is that issues, which should be discussed and decided when implementing the product, operation and organisation innovation, are commonly known and accepted.

These rigid principles and mechanisms should also prevent implementing the idea in an uncontrolled fashion (if it is of magnitude that can affect others' in the network). Also, the idea from a strategy viewpoint should be studied – especially if the idea is a non-planned emergent re-innovation. Despite the idea was on an operative level, it may have far-reaching effects, in addition to process and product, to companies' business relations and relations on the whole (even on personal level). The actual implementation of the ideas in an operative level is in turn more rigid, though not easy or straightforward, process. In the implementation, practices of a

proper management of development projects and organisational change can be applied. The implementation is a very challenging task, which must not be underestimated. The operative implementation is, however, out of the scope of this study. If we manage the cumbersome process of recognising an idea and refining it into so far that it is ready for implementation, we have already done a lot in turning an idea into an innovation. In figure 6, there is a management model that gathers together the central factors that support the successful management of the (emergent re-) innovations in production networks. The model also depicts some relations between these factors.

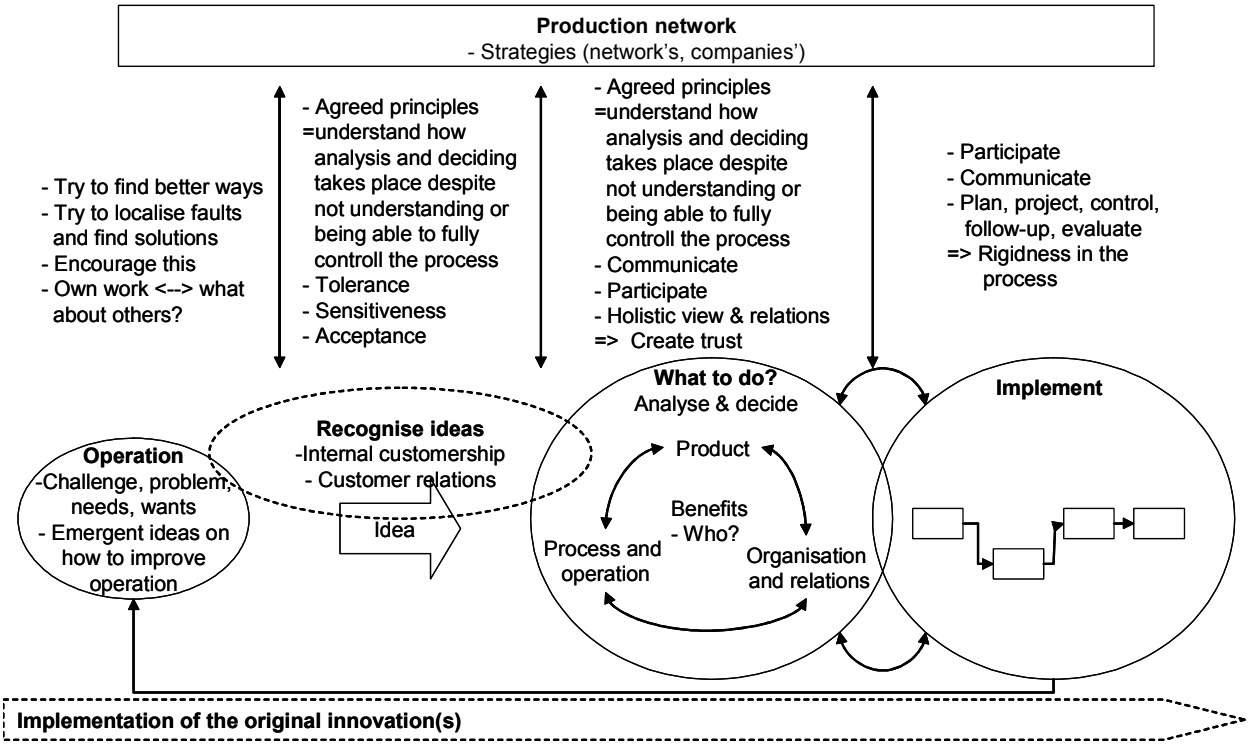

Figure 6. A management model of factors that support successful innovations in networks.

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