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Construire le schéma d'analyse du GERPISA

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A SUPPLIER'S CHOICE OF PRODUCTIVE MODEL

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During the 1990s, many scientific publications held that a correct representation of the industrial history of the 20th century was to place in to three distinctive phases. The first one is being characterised by "semi-craft" -production, then a phase of "mass production" and last a phase called "lean production". It was said to have appeared in the 1990s, first in Japan before diffusing across the rest of the world. This final phase was also said to have signalled the end of the so-called Taylorian division of labour, assimilated with a separation of design and execution. The MIT International Motor Vehicle Programme was advocates for this way of arguing, and invented a new buzz world: Lean production.

Management fads and fashions like LP are always replacing each other, and promoted with the same enthusiasm and lack of analytical framework from one fashion to another. This fascinating blindness makes it difficult to learn from the past. Every new concept are seen as potentially general and irreversible, and there is no attempt to examine the conditions that led to its birth or are necessary to make it spread wide out.

This has been the goal of the GERPISA network, to make possibilities to analyse further those kinds of questions. In the book "The Productive Models" the group provides an analytical structure that could readily inspire research into other sectors of activity. For the moment, the automobile sector is the only one to have been subjected to systematic investigation at a world-wide level. The perspective is to formulate an alternative to the single minded, universal framework that lean production stands for, and rather to show what conditions and choices that lead to a specific productive model.

GM is choosing a global "volume and diversity" strategy, among all different OEMs, first and foremost Saab, Opel and Vauxhall. This strategy makes it possible to have greater volumes on the invisible parts of the car. And for suppliers, this implies producing high volumes of identical products, a situation calling for a "volume" strategy. But in a high cost Norwegian context, another productive model than the Ford-model has to be chosen.

Out research question in this paper is the following:

When an OEM has made a choice of productive model; what restrictions are made for the supplier in their choice of productive model, and what implications do it have for the working conditions?

THE PRODUCTIVE MODELS

Boyer and Freysennet (2000) formulate six different strategies that lead to different productive models. The profit strategies can not be implemented with just any means that are available; the resources must fulfil each strategy's specific requirements. The strategies are:

- ✓ **The quality strategy** is characterised by profit margins based on products that are socially considered to be top-of the range of luxury goods.
- ✓ **The diversity and flexibility strategy** has profit margins based on products that specifically respond to distinct types of demands, and is characterised by rapid adjustments of costs to variations in demand.
- ✓ **The volume strategy** is based on economies of scale through production of increasing quantities of a standard model.
- ✓ **The volume and diversity strategy** is a combination of economies of scale for non-visible elements and economies of scope for visible elements.
- ✓ **The permanent reduction in cost strategy** is focused on cost cutting on all parts in the production. The strategy makes it possible to avoid taking technical, social, commercial or financial risks.
- ✓ **The innovation and flexibility strategy** has its profit margins based on innovative models that are a response to new expectations.

A productive model is a way to fulfil the different profit strategies as a compromise between product policy, productive organisation and employment relationship. The growth mode of the national income, the market and labour is taken into consideration.

For the quality strategy, there is no distinct productive model, but Volvo's reflective production and sociotechnical experiments are mentioned. For the "diversity and flexibility" strategy the Taylor model is mentioned, the Ford productive model is an answer to the volume strategy. The Sloan model is a way to fulfil the volume and diversity strategy, the Toyota model is an answer to the permanent reduction in cost strategy and finally the Honda model is a way to fulfil the innovation and flexibility strategy.

In this paper, we are going to discuss three of the models: The Ford model, the Sloan model and the Toyota model. The Ford model was developed during the first years of last century, further developed after the Second World War, and also implemented by Volkswagen. The model is only relevant when national income distribution is relatively egalitarian with homogenous social groups. The product policy is to offer a standard product at the lowest possible price to an entire population. The production organisation has to be highly centralised, sequentially integrated into continuo lines, mechanised and based on standardisation of elementary operations. The employment relationship is to offer unskilled workers a fixed wage not linked to performance.

The Sloan model has its roots in the 1920s, when General Motors saw that various segments in the American population would soon feel a need for social differentiation. Neither the "diversity nor flexibility" nor the mass production made it possible to meet this new challenge. At this time there excited two alternatives: Fords mass production of a single car model and other carmakers' manufacturing of many different specific models. General Motors found the solution by using shared parts for all non-visible components, and different for the visible ones. The Sloan model is particularly relevant when income distribution is nationally co-ordinated and moderately hierarchies. The product policy is to offer parallel ranges of models under different brand names, which share a large number of mechanical parts and units. The productive organisation must centralise strategic choices and decentralise responsibility for implementation at the divisional level, encourage competition between suppliers and production lines with buffer stocks. The employment relationship must ensure a regular growth in wages plus an extension of social benefits and career development. Boyer and Freyssenet claim that the Sloan model has a future in between different car makers through alliances or mergers and creating common platforms in that sense.

The Toyota model is based on permanent reduction on cost strategy that allows for increased profit margins even as the same volume, diversity and quality is being produced. The product policy offers basic models in different market segments with plan for constantly rising volumes. The productive organisation is based on just-in-time principles intended to reveal right away any problems that might prevent continuo flow. The employment relationships induces employees (and suppliers) to contribute to the permanent reduction in costs.

Our empirical data is from the co-operation between GM and its suppliers in the choice of productive models. We will return to an analysis on the connection between these, but first we will present the supplier.

THE SUPPLIER

The Raufoss group has more than 100 years of industrial history, starting with ammunition production in 1896. Raufoss Chassis Technology (RCT) is a part of the Raufoss group, and is developing and manufacturing hot, warm and cold-formed aluminium alloy chassis components for automotive industry. RCT has approx. 20 years experience in this market segment. Due to a larger contract with General Motors (GM), RCT has built a new plant in Norway and a similar one in Montreal, Canada. Start of production was January 2002 in Norway, and is scheduled to be June 2003 at the Canada plant. Both plants deliver to different GM plants. RCT manufactures front and rear wheel suspension as shown in **Erreur ! Source du renvoi introuvable.**. The plants are each designed to meet a capacity level of 1,4 mill. Front and 1,4-mill rear control arms. The manufacturing in each plant is organised in two fully automated manufacturing lines. All handling of the parts is automated trough robots and conveyors. There are 14 different assembled parts from 7 different suppliers in addition to the aluminium part. Extruded aluminium profiles are delivered from two different suppliers. Suppliers are located in Europe and USA. Even though there is only one customer, there are call off from 7 GM plants in Europe, and a similar number of plants in USA.

From its origin, the Raufoss group was organised and managed by taylorism and bureaucratic principles. By this we means an organisation with a number of levels and departments where tasks are narrowly defined, rational structured and organised into a logical

sequence. Management is doing all the thinking and planning, controlling recourses, task and information. In the new era, which started in the 80's, this organisational, managerial and technological concept was outdated in terms of being able to respond on demands regarding speed, quality and volume. Taylorism was not carrying the needed basis for building a robust and competent organisation.

Being able to build and develop this new way of organising work, RCT have had an interesting organisational development process. First of all the new technology, in terms of building two automatic production lines, creates a context demanding a new way of organising work. Second, the new production lines lead to the development of a team structure based on lean organisational principles. To respond to customer demands, the new organisation is dependent on knowledgeable operators working in teams, controlling resources and tasks based on real time information. The team members where trained in becoming multifunctional in terms of performing a number of tasks, and to be able to require outside assistant when needed.

The co-operation with R&D

RCT have in two strategic steps chosen new ways in organising and developing their R&D competence.

Firstly RCT have been a supplier of aluminium suspension arms towards SAAB for many years. When GM bought SAAB. To become a legitimate partner with a recognisable position SAAB had to demonstrate that they innovative abilities. More specifically they had to be creative and show that they were capable to develop new technological solutions to bring forward a development of their automotive models. RCT had through many years developed close relations with SAAB and in a sense acted as their development partner on suspension arms. In their new business setting as a part of the GM group SAAB approach RCT and asked them to join them in developing a new light weight front and rear suspension arm. This invitation and co-operation again caused RCT to come closer to the R&D department at GM. At a point in time the R&D engineers at RCT got in contact with their colleagues at GM.

This lead to a further development and R&D people at RCT joined in closely with GM engineers and continued to develop lightweight suspension arms in interaction with the OEM people. This relation, of course with other activities, created the necessary position for SAAB within the GM family. The yearlong relation between SAAB and RCT had paid off in an unexpected but important way for both partners. The development of the close R&D work between RCT and GM engineers brought RCT into a new position as development partner. In a classical sense RCT with an different component would not worked directly together with GM engineers and they would have at the best been and 2tier supplier. Suspension arms are of great security importance in terms of safely driving. This is probably the main reason for why RCT got this kind of a unique development position. In a sense they were classified as 1,5-tier supplier. The unique position and close relation pushed RCT to develop an aluminium solution for both front and rear arm. At the same time RCT had to take into account the fact that if they were to mass-produce this suspension arms if they at all would be considered as a supplier.

The unique relation with GM put RCT into a new strategic position and created new technological and competence demands both in terms of R&D and manufacturing. The relation with GM also opened up a new perspective in terms of the role that RCT could play within the automotive industry. RCT have experienced from past years in the automotive

business that it is characterised by rapid and dramatic changes. Another strong experience shows us that the industry is moving from blueprint work and control from OEM on suppliers towards alliances and high degree of knowledge sharing. And thirdly that there is an increase in specialisation among suppliers.

To be able to meet this changes and challenges RCT recognised that they had to increase their change capabilities become more flexible. To be able to do this they decided to work along three strategies. First they focused on core competencies and how to develop them and outsource and organise all other activities to increase the focus on the core competencies. Secondly they found it extremely important to decrease fixed costs and increase variable costs. In a sense this meant to create a lean organisation and to focus on manufacturing. And, thirdly they recognised the necessity and the benefits of developing alliances along complementary competencies.

This moved RCT to take a second important strategic choice. To be able to comply with this challenges and strategic choices RCT decided to co-operate with R&D through establishing a joint venture knowledge and development partner: Raufoss Technology and Industrial Management – RTIM. The owners are Raufoss ASA (66%) - the mothers company of RCT and SINTEF (34%), a large Norwegian R&D institution. RTIMs main goal is to be a unique technology and industrialisation partner, and to increase its customer's competitive strength and to improve the customers (RCT) legitimacy and visibility within the automotive industry. This vision of RTIM is met in two ways.

Firstly RCT would through this joint venture have flexible access to R&D competence within material technology. In terms of the product and its unique position as a safety component there are of course a number of material capabilities and process challenges to be solved. The volume strategy interwoven with the development of a lean organisation emphasised the need RCT had to integrate competence on logistics, human resource and particular on organising and management and on production systems. And this is the second emphasise within RTIM, namely the focus on industrial management. SINTEF as the third largest research institute on technology and technology management in Europe became of course the natural choice and the only Norwegian partner with all the complementary competencies inside the same organisation. Through its activities RTIM shall secure RCT and other companies within the Raufoss Enterprise access to relevant competence, and to gain access to international R&D network.

CHOICE OF PRODUCTIVE MODEL

The OEM's productive model

By using the platform concept for its new Vectra, Vauxhall and SAAB, GM has chosen a new version of the Sloan model, which is in line with GM's strategy for decades. As Boyer and Freyssenet describe, mergers and alliances between different car producers is a possible way to develop this model further. The Sloan productive model implies that up to a certain point of manufacturing and assembling all cars are more or less using the same standardised components. For instance are aluminium suspension arms identical in all versions of the new cars based on the Epsilon platform, which creates a huge demand for this kind of products both in Europe and the US.

But in GMs relation with its suppliers there is also some elements of the Toyota model. In their contracts with suppliers, GM wants fixed price reductions per component every year, which forces the supplier to work systematically with reductions of costs.

There are two important conditions for RCT when choosing productive model: A volume production of similar products in huge amounts on two continents, and a permanent reduction of costs to meet the reduces prises.

The supplier's choice of productive model

For RCT, this means that they will support a number of GM plants in Europe and US with the same suspension arms. To meet the challenge within the GM contract, RCT has to choose a volume strategy in some way. It is possible to do in different ways: Implement a sort of Ford model and move the production to a country with low level of wages is a possibility chosen by other Norwegian suppliers.

The national conditions in Norway are relatively egalitarian. The blue-collar wages are high, while the wages for engineers and other white-collar workers are low compared to other industrial countries. Because of these social facts, RCT has chosen to build a fully automated manufacturing line: Products are manufactured untouched by humans. One line is set up for front control arm, and one for rear. Front control arm has hot forging, machining and assembly as major process steps. There is still a need for operators on the factory, but fewer and in completely different roles.

The process starts with feeding pre-cut aluminium bolt which are pre warmed before it through three steps of hot forging gets it initial Y-shape. After forging the Y shape is processed through six steps of machining and through this process gets it final shape. The last step is assembling of the suspension arm. There are 12 different components that are assembled before the front suspension arm is done. From feeding the aluminium bolt to the final packing all handling and transportation is taken care of by either robots or by conveyer belts.

Manufacturing the rear suspension arms is easier. Also here pre-cut aluminium is used, but this time profiles are supported into a backing machine. Through six steps with pressing, forming, stamping and pinching the rear control arm are formed. Next the rear control arm is assembled before it's packed and shipped.

Being able to build and develop this new way of organising work, the automotive supplier has had an interesting organisational development process. First of all the new technology like building new automatic production lines creates a context demanding a new way of organising work. Second, the new production lines lead to the development of a team structure based on lean organisational principles. To respond to customer demands, the new organisation is dependent on knowledgeable operators working in teams, controlling resources and tasks based on real time information. The team members where trained in becoming multifunctional in terms of performing a number of tasks, and to be able to require outside assistant when needed. The whole plant is run by three shifts with 10 operators on each shift

With high average income, an automated line seems to be the only solution, if one wants to keep this kind of manufacturing in Norway. The technology is unique; such a product has never been produced in an automated line before. The process of implementing the line was extremely complicated, and the co-operation with R&D important in all aspects.

At the same time RCT is obligated from their contract to focus on cost reduction and quality performance to keep their margins. This was a well-considered choice: With high

investments in advanced technology, and few blue-collar workers. In comparison with other countries, Norway has expensive blue-collar workers, but relatively inexpensive engineers, which favours such a choice of productive model.

The consequences for working conditions

So far we have mostly described the technological challenges RCT is facing in terms of the product and the process. Being a relatively old enterprise with long traditions RCT has a well-developed management and organisational culture. The new way of manufacturing is radical different and puts new demands on how leadership and management is performed and how the new fully automated manufacturing lines demands a new way of organising work, a new competence and a new attitude towards work content.

The "old" RCT where in many ways classical in its way of manages and organise work. Firstly the manufacturing process where partly semi-automatic and partly manual. Operators did all assembling and packing, that is all manually performed.

The assembling was done in four steps. There was one operator in each step (all women) and through the day they switched between the steps, a rotation model. The assembling department was also responsible for packing and shipping. Machining was a semi-automatic process. This step required two operators in each shift. Each operator was responsible for two times two machines. The main job was to put components in, tool them, and take them out. This was performed according to a fixed routine. The hot forging sequences is more automated where a robot is feeding the machine, but every single components is manually checked visually before they are sent to the next manufacturing process.

Productivity in this way of organising work is equally to action. This means that operators in activity using their hands and the speed of their motions are the best sign of the present productivity. Such a way of "measure" productivity also demands a certain style of management. This focus leads to a management focus of keeping operators busy, to focus on making sure that everyone has enough to do. The "old" organisation is also characterised by several hierarchical levels, only within RCT with 20 operators there were four levels, and within the enterprise 7 hierarchical levels. The long history and the fact that they originally were making ammunition to the Norwegian Army has through decades also created a bureaucratic organisation, with norms, rules, procedures, systems and forms to be filled in for everything. Lastly the production has only been locally based and the number of parts has "only" been 1300 components per day.

In the "New World" with two fully automated manufacturing lines the RCT Company needs to develop a radically different perspective on how to run and organise work. In the new model operators are dedicated to literally monitor the different process steps. Their new tasks were to watch process parameters as time, temperature, and tolerances on screens and parallel watch the psychical process to see that everything works as it were supposed to do. This new setting creates three challenges regarding working conditions. First this puts an extremely pressure on creating meaningful job content. Secondly this setting requires highly skilled operators. The whole process depends on operators who are skilled enough to prevent and solve problem arising. Which quit simple means that the new model requires operators using their heads instead of their hands. The operators also need the responsibility and authority within the total manufacturing process, amongst many things to requisition necessary people when problems arise.

The change from a sort of Ford model from the early days to the new model based on volume production and reduction of costs was above all an improvement for working conditions. The jobs turned out to be less standardised, less manual and with improved demands for qualifications. The wages are still high and are not linked to level of production. This does not fit in the analytical scheme for the productive models, where both volume production and reduction of costs is linked to employment relations are based on either low qualification.

CONCLUSION

Our research question in this paper was to investigate the following:

When an OEM has made a choice of productive model; what restrictions are made for the supplier in their choice of productive model; and what implications do it have for the working conditions?

The restrictions were twofold. When GM made their choice of a platform strategy, the suppliers where to deliver in huge volumes to different car producers and they where forced to reduce prices every year. The supplier met this challenge by co-operating very close with a research and development institute, developing a production organisation adjusted to Norwegian conditions. Instead of choosing a Ford or Taylor strategy with manual work and production in Eastern Europe, they developed an fully automated line that made it possible to have the production unit in Norway and in Canada, because blue collar wages became a very small part of the total cost picture. This unique technological solution was possible because of their close connections with the research institute.

Moving from a manual type of work with low demands for qualifications and standardised tasks, the new system changed the work completely where the operators where to work with heads instead of hands. Instead of working individually, they are now organised in teams with responsibility for the whole production line of either front or rear suspension arm. The implications for working conditions then are positive according to the operators, but the need for increased knowledge and qualifications was steep at the time when the new line was ready to operate.

The discussion during the 1990s in automotive industry pointed strongly to a ”One best way” approach, especially linked up to the Lean Production-fad. It is striking to observe the similarity between this approach and the Taylor inspired ”one best way” in the beginning of the last century. Both fads argued that the car producers had no choice but to implement one specific approach to production organisation. Our experience when taking part in these discussions in the Norwegian supplier it that this One best way-thinking is strong, but supported by benchmarking techniques and labelled ”best practice”. In this thinking, a car producer should benchmark and implement the best from different companies worldwide.

The Gerpisa analytical scheme point in a different direction. A firm can theoretically choose amongst different profit strategies that have been enabled by the growth modes that are present in the places where the firm is operating. Of course, such choices can not be made freely. It depends on the product strategy that is already implemented, on other manufacturers’ profit strategies and on it’s domestic national growth mode and social circumstances.

But within the frame of these restrictions, different choices can be made. Even for suppliers, who have even more restrictions than the car producers, this case has shown that completely different choices are possible.