VINNOVA REPORT
VR 2017:06

Why manufacture in Sweden?

Strengths and best practice - a summary of "Flaggskeppsfabriken"

BIRGITTA SÖDERGREN

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Author: Birgitta Södergren
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Vinnova - develops Sweden´s innovation capacity for sustainable growth

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Vinnova's vision is for Sweden to be a world-leading country in research and innovation, an attractive place in which to invest and conduct business. We promote collaborations between companies, universities, research institutes and the public sector. We do this by stimulating a greater use of research, by making long-term investment in strong research and innovation milieus and by developing catalytic meeting places. Vinnova's activities also focus on strengthening international cooperation. In order to increase our impact, we are also dedicated to interacting with other research financiers and innovation-promoting organisations. Every year Vinnova invests about SEK 3 billion in various initiatives.

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Preface

Sweden is a strong industrial nation with many successful and innovative industrial companies. Such companies manage to renew and reclaim production and products as the conditions change. They have built Sweden's prosperity and are important for the future.

This report deals with change management and development and is a short version of the book "Flaggskeppsfabriken – Styrkor i svensk produktion" (Flagship Factory - Strengths in Swedish Production). It is a book that is the result of a project in which ten highly competent companies with production in Sweden together identified strengths, exchanged experiences and best practices.

The report focuses on the companies' efforts to continuously improve work and organization. The good examples presented are about achieving efficiency in day-to-day work and about successful change work.

Abilities to handle change work and development is of crucial importance for todays' companies. Not least considering the opportunities and challenges that digitalization, automation and artificial intelligence imply. Within industry, constant renewal of skills is needed, as well as a willingness to collaborate across borders to develop sustainable and pragmatic solutions.

Vinnova has contributed financially to the project, as part of the efforts to contribute to the development of Swedish industry. But the project had not been possible without the participants' commitment and the great generosity when sharing experiences and best practices.

Vinnova in December 2017

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Why Sweden? Strengths in Swedish manufacturing

Findings from a collaborative study together with 10 leading companies

Why manufacture in Sweden? What areas of strength have made it possible to run efficient and profitable industrial production, in spite of the relatively high cost level? This question was explored in a collaborative project, called "The Flagship Study". Ten leading, multinational companies, all with manufacturing plants in Sweden, met regularly in a series of workshops during 2012-16. The project was a collaboration between the largest union, IF Metall, and the employer's Association of Swedish Engineering Industries (Teknikföretagen), with support from Sweden's Innovation Agency (Vinnova).

In this summary, six components of strength, identified in the Flagship study, will be described. Less hierarchical structures, with a high degree of teamwork and employee participation, open information sharing, informal cooperation, and attitudes of trust and responsibility, are some of the characteristics. There is also long history of integrating new technology in the production, and a front position in health and security. Highly skilled employees, a focus on continuous learning, and broad involvement in change initiatives are some other cultural features.

In general, the identified characteristics are likely to be of special advantage in complex production, with high degrees of customization, change and innovation.

The ten companies participating in the Flagship Study[1] were: **ABB** in Ludvika, **Alfa Laval** in Lund, **AstraZeneca** in Södertälje, **Bombardier** in Västerås, **Electrolux** in Mariestad, **Haldex** in Landskrona, **Sandvik Coromant** in Gimo, **Scania** in Södertälje, **Siemens** in Finspång and **Toyota** in Mjölby. From each company a team of production managers, union representatives and HR managers participated in a systematic sharing of experience.

Most of the participating manufacturing plants are lead sites or centres of excellence for new, specialized, and/or highly customized products. They work constantly with product innovations, transformational change, automation, and development of the production system. The production processes are complex, with unique core competencies, advanced materials and high-end technologies.

At the same time, these (and many other) manufacturing companies in Sweden constantly have to cope with the disadvantages of high wages, a peripheral geographical position, and a small home market. But in spite of these drawbacks, and in spite of many companies' outsourcing strategies, several global (and Swedish) companies continue to invest in Swedish sites. The

[1] In Swedish: "*Flaggskeppsfabriken – styrkor i svensk produktion*" (Vinnova Rapport VR 2016:07), https://www.vinnova.se/publikationer/flaggskeppsfabriken/

manufacturing plants in the Flagship study have existed for many decades, in a tough global competition. They have transformed, innovated and stayed profitable. So, obviously, they are doing something right.

About the Flagship study

The quest carried out during the Flagship study was: what can we learn from these companies? Can we identify strengths, which can be further built on to sustain a good production climate in Sweden?

The Flagship participants agreed to contribute with their experience and best practice, during a series of workshops. The dialogues were documented in detail and analysed together with the companies. Three core methodological principles were followed[2]:

1 *Multi-perspectives* during the workshop dialogues, with representatives from management, unions and HR.
2 *Gemba – see with your own eyes.* Each workshop was hosted by one of the companies, with study visits, cases and input for the dialogue.
3 *Share concrete examples.* Bring your work methods and tools – not general principles.

The approach, thus, was to analyse and learn from what actually works *well* in the participating companies. Studies, that in depth explore the root causes behind positive phenomena, are quite unusual. But there is a lot to be learnt. Not only "best practice" but also "hidden practice" can be discovered and transplanted into other contexts, once it has been put into words. To learn from strengths gives a good basis to build on for future development, both for individuals and organizations.

However, this "positive bias" does not mean that problems should be swept under the carpet. On the contrary, the participants were the first to share difficulties and problems, and acknowledge the need for further improvements.

The work model – a "honeycomb"

Six elements of strength were identified from the study. These were compiled into a model in the shape of a "honeycomb" (see Figure 1). The shape of the model illustrates that the elements are interrelated and mutually reinforcing. The six identified strengths are:

1 Structures
2 Attitudes
3 Informal Cooperation
4 Competence Development
5 Ability to Change
6 Technology Integration.

[2] The methodological approach is further described in "*Flaggskeppsmetodiken*" (Vinnova Rapport VR 2016:08), https://www.vinnova.se/publikationer/flaggskeppsmetodiken/

Each of these strengths is briefly described below. A full report (in Swedish) can be downloaded from Vinnova, including examples and further problematizations from the workshops[3].

Figure 1: The honeycomb

The combination of these elements can be regarded as special, or even typical, for the organization culture in Swedish production plants, (even if the elements of course also might be found in other countries). But is important to remember that, at the same time, a lot of other corporate and industrial praxes and principles are at place in the companies. As in every other multinational company there are global evaluation and control systems, KPI:s, quality programs, project management principles, supply regulations, norms for standardized production, etc. These aspects will not be described in this summary.

[3] *"Flaggskeppsfabriken – Styrkor i svensk produktion"* (Vinnova Rapport VR 2016:07), https://www.vinnova.se/publikationer/flaggskeppsfabriken/

1 Structures – less is more

> ***"We don't maximize structures. We chose smart, simple structures and focus more on a sense of ownership and involvement"***
> (Quote from workshop dialogues)

The first identified strength in the Flagship study concerns the use of organizational structures. Hierarchies are flatter than in comparative productions units in other countries, i.e. fewer hierarchical levels. Responsibility is often as decentralized as possible, close to the operations. To make too many decisions at the top of the organizations is seen as less efficient, and so is bureaucracy.

To enable fewer levels, the Flagship companies organize for teamwork wherever possible. Work teams are often responsible for a broad set of tasks, including operations and improvement/ change activities. A coaching leadership style is encouraged, with a focus on creating enabling conditions and supporting groups in their work.

The companies frequently use "lean-inspired" standardizing work structures, but at the same time changeable and flexible when the situation so demands. Structures should support, not get in the way of innovation and change. Therefore, structures are seldom cut in stone, but allowed to vary, depending on the purpose with the operations. New work structures are often borrowed from the outside, and adapted to local conditions.

The importance of "degrees of freedom" or space in organizational structures was underlined. Structures should be clear, but not too rigid. Less is more.

2 Attitudes of trust, engagement and responsibility

"Tell me and I forget. Teach me and I may remember. Involve me and I'll learn"
Benjamin Franklin (1706-1790)

The second strength identified in the Flagship study refers to people's attitudes or mind-sets about work. The participating companies were careful to underline that no set of attitudes can be valid for every single workplace or person in an organization. But still some common characteristics can be found, rooted in the work climate and organizational culture that have been built for long periods of time.

The characteristic workplace attitudes in the Flagship companies are closely related to trust: Involvement and engagement are relatively high. Most people expect to participate and be listened to, which opens up for early problem identification and problem solving. Open information sharing is encouraged, rather than information on a "need to know-basis".

Low prestige and relatively low power distance create a basis for dialogue. Leaders can listen and are open for feedback. Employees can take initiatives, come up with ideas or share knowledge, also outside their team or department.

There is a strong sense of responsibility at all levels, to achieve agreed goals or results and meet customer demands. "Promises should be kept" and "we work until the problems are solved" are mind-sets that often characterize the work climate.

Values related to business ethics and fair play, as well as environment, health and safety issues have high priority and are subject to constant dialogue.

Although attitudes are hard to measure, the participating companies see them as a valuable asset, to care for and to build on. Attitudes have strong impact on how well work is done, on competitiveness, on the capacity for change. Structures can be ever so perfectly designed, but without human engagement they remain drawings on a paper. Or, as somebody put it: "Culture eats structure for breakfast".

Attitudes, in general, are formed within the human brain, through a constant process of interpretations of what is going on around us. At work, official visions, values or policies do play a part, but actual behaviours are far more important. Leaders are important role models, and so are colleagues, whom we might see most of the time. And most important of all is how every day's work is designed and carried out. The tasks we actually perform, will affect our attitudes much more than what we are told to do. What we say needs to be consistent with what we do.

3 Informal cooperation – a key to change, innovation and complex problem solving

> ***"It is a strong advantage in Sweden to be able to gather everyone in the same room. Managers, operators and experts. Suppliers and customers. Governmental representatives and researchers. Trades and employers. In many other countries this is unthinkable"***
> (American CEO, working in Sweden)

The third strength identified from the Flagship study is the ability to use informal cooperation to engage different stakeholders in complex problem solving or knowledge sharing, regardless of differences in skills or positions. Informal collaboration can occur either within or outside the company.

Informal cooperation has a long tradition in Sweden. It means meeting on an equal footing, being able to learn from each other, to contribute according to capabilities, and to take joint responsibility. Here two quotes from the flagship study:

> *"Informal collaboration means that you can have a dialogue and work together across organizational boundaries, with anyone with the right skills, regardless of their formal position. Managers can collaborate with employees. Employees can contact people in other departments. Specialist functions can interact without strictly following the chain of command."*
>
> *"Our long tradition of collaboration with the unions has created a ground for problem solving and early anchoring. Therefore, changes can often be made with much less friction".*

The "Flagship companies" shared many examples of how informal collaboration had increased competitiveness, from ad hoc teams to support the production, to collaborations with universities or schools in long-term research and education initiatives.

Informal cooperation affects competitiveness. It helps in early problem identification and enables pooling of competencies and perspectives. Change or innovation initiatives often get better support, if several stakeholders have had an early look.

Informal cooperation is also a way to resolve complex or "wicked" problems. "Wicked problems" are new situations, with no established solutions, which often give rise to unforeseen consequences. There are often multiple stakeholders, and the problem definition may differ depending on who is looking. Informal collaboration does *not* replace clear and well-functioning formal organizational structures, but can be an important resource when expert solutions are scarce, or, as somebody put it "when we need to do something important, but do not yet know how".

4 Competence development – a basis for strategic change

> ***"Technical skills are extremely important to us, but maybe our most significant skill is the ability to handle complexity – to use systemic thinking, and understand how to work with change and development in an advanced production process".***
>
> ***" One of the reasons to produce in Sweden is the access to skilled, highly competent and experienced employees, and world class competence in production development. Other reasons are the good opportunities to collaborate with schools and universities about education and research".***
>
> (Quotes from the Flagship study)

Competence development is the fifth strength identified from the Flagship study. Since the participating companies represent complex production systems, with unique core competencies and high-end technologies, there is a constant need to recruit and develop skilled operators, leaders, projects managers and specialists. Technical skills are crucial, but equally important are social skills, change and innovation ability, as well as communicative and teamwork skills.

This situation is in accordance with findings from World Economic Forum, where it was concluded that the most important drivers for industrial change in the future are related to social skills:

> *"Overall, social skills – such as persuasion, emotional intelligence and teaching others – will be in higher demand across industries than narrow technical skills, such as programming or equipment operation and control"… … Cognitive abilities (such as creativity and mathematical reasoning) and process skills (such as active listening and critical thinking) will be a growing part of the core skills requirements for many industries.*
>
> (World Economic Forum, Global Challenge Insight Report, p 22)

Competence development thus is rapidly becoming a strategic ability. In the Flagship companies it is seen as important to focus *both* on technical skills *and* on an overall understanding of the company, its strategy, economic situation and market conditions. In addition to the skills needed for carrying out the work, it is seen as important that employees have a holistic view of the production system, with knowledge about the products and customer needs.

Most of the companies encourage multi-skilled work roles. Job rotation between different tasks, can be parts of such schemes, or job enrichment where teams or employees take responsibility

for improvements, quality, maintenance, logistics, change initiatives, special projects etc. On-the-job learning is seen as the most important arena for competence development. Leaders and operators are often involved as teachers or tutors to train newcomers, which also add to their personal development, since you learn a lot from teaching others. Other tools for competence development are career paths for operators or specialists, and leadership programmes.

Knowledge sharing between workplaces or plants is another key to competence development. Examples are networks for professionals, benchmarking activities or learning from successful projects. Other ways are to capture knowledge from people who has worked at other departments or in other countries. A Flagship participant concluded: “A learning climate is created when we assume that every part of the organization has something worth learning from, and that the experience of the person who went there is worth listening to”.

5 Ability to change through purpose, methods, and leadership styles

The fifth element in the "honeycomb model" is the capacity to change. Change is often associated with resistance, stress and failure, and the Flagship companies have also experienced many difficulties in change processes. But in this study we tried to pose the question the other way around. What can be learned if we take a closer look at circumstances that prevailed when change actually did succeed?

The ten companies have been through fundamental changes over the years, resulting in for instance new business models, redesigned production systems, large cost cutting programmes, or new opportunities in declining markets. And joint efforts with continuous improvements have contributed significantly to efficient production systems.

Among the shared examples of success factors for change, some common features can be noted: broad employee participation, structured methods for change, and leadership roles that support change. Here are some of the findings:

- The first key to change is a clear "Why" that explain the reasons for change. The reasons can originate both from the big picture (changes in markets and society etc.), and from the local workplace (e.g. how improved work forms affect other colleagues, or contribute to smoother operations).
- Another key is broad involvement. One of the companies gave an example of how the whole organization gets involved in a stepwise strategic dialogue, led by managers at each level. Ideas and suggestions from every corner of the organization are communicated back to management. Although this communication takes time (3-4 h per employee, twice a year), the experience has been that in critical situations, where rapid change has been needed, more or less every team or department has been ready to mobilize and contribute.
- A third key to change is a work organization that supports change, with clear roles, mandates, allocated resources and time to work with change or development issues. A principle used in many of the companies is: "everybody has two jobs – to perform work and improve it".
- Fourth, user-friendly principles, methods and tools help to clarify how to work with change. Some examples are: how to put together a team, how to use root cause analysis, how to film and analyse work sequences to identify problems, how to hold change meetings, how to measure effects from implemented improvement or how to document change activities. In some of the companies, special "change agents" or coaches play an advisory part to support change teams and leaders.
- Fifth, visualization is helpful to illustrate "before and after", visions and goals, or steps taken. Whiteboards near the workplace are often used, with pictures, drawings, diagrams, and checklists. Meetings often take place by these whiteboards.
- Sixth, almost needless to say, leadership is an important key to change. According to the participants' experiences it is important that leaders are present in the operations, and work closely with the teams. Leaders should have a supportive attitude, ask questions, listen and encourage ideas, but not take over the task. They should allocate time and resources, and encourage talented people to take on more

responsibility. Important is also to formulate interesting challenges in a way that stimulates problem solving and new thinking.

It can be noted that the ability to change draws on all the strengths in the ”honeycomb”. Examples are structures that provide space and support for new ways of working, attitudes that create trust and empowerment, competence development in the face of new demands, and informal cooperation that allows for broad solutions. Or as somebody put it: “Anybody can bring home new ideas or principles. But we make them work”.

6 Technology integration

> ***"We focus heavily on the technical challenges. But if you want the process to work really well, the key is to also focus on work organization, cooperation and participation".***
> (Quote from the workshops)§

The sixth strength, *Technology Integration* is about integrating new technology into the business. It is crucial to find a balance in the man/machine interaction, so that the best contributions from both people and machines can complement each other. The aim is to utilize the potential of the technology, while allowing employees to focus on what they do best: problem solving, development work, and running the operations. Technology interaction also includes high priority and a front position regarding health and safety issues, to ensure a healthy work environment and avoid accidents and occupational injuries.

Several components contribute to the strengths of technology integration. Firstly, the participating companies have a long tradition and experience, since many decades, of working with new technology and automation. There is also a long tradition of collaboration with the unions about work environment as well as about technology implementation.

Secondly, the competence level is high with most employees, specialists and managers, in terms of technical and engineering skills. Also, most employees have good knowledge of IT, mathematics, English, etc. An important success factor in technology integration is the ability to foresee the need for new skills and abilities, and work with competence development parallel to technology development.

Third, a front position in health and safety make workplace accidents few. A combination of ergonomic improvements and varying work tasks can help to improve working conditions.

The experience exchange between the Flagship companies showed that introduction of new technology works best when operators are highly involved from an early stage. Operators contribute to problem detection, specifications and provide valuable input into product design, development of new work routines, analysis and testing. Operators' early involvement is also important for the implementation process and for continued commitment after the change.

Another key to successful technology integration is cross-functional teamwork. New technology often has consequences that spread to other parts of the organization. Therefore, many problems can be avoided or anticipated through early collaboration across departmental boundaries, for instance between specialist or support functions such as product design, engineering, maintenance, supply, logistics, as well as with operator teams, customers and suppliers.

As stated above, soft skills are often involved when technology integration is successful. Of course, all the basic conditions must be in place, such as strategic considerations, requirements specifications, risk and impact assessments, financial calculations, etc. But a well-functioning interaction of technology with the ”human system” provides more effective implementation and, also builds strengths for future technological initiatives.

Conclusion: Build on strengths in times of change and transformation

The findings from the Flagship study indicate that the mutual interaction between the elements in the model create competitive advantages. The ability to change, high responsibility and broad participation, systematic competence development, and informal collaboration, plays a major role in complex problem solving, innovation and development in the companies. They create a competitive edge, especially for complex production, with lead positions in product and technology niches.

The study investigated and put into words some tacit knowledge concerning organization and management “beyond lean”. The model can be used in several ways: for reflection and dialogue in organizations, as an instrument for self-evaluation, or as a checklist for future changes, in operating efficiency as well as in digitalization and technological leaps. It can also be used in other types of organizations – other strengths might be added.

The purpose has not been to claim that the set of strengths above is superior to those in other countries. If similar studies were made in other countries, these would likely identify other areas of strength. Some of them would certainly be similar, but others probable quite different. It is valuable to learn from each other, but also necessary to respect the fact that surrounding conditions and local cultures are very important. Copying "straight off" can even harm a business. And it is often a better idea to encourage each other to work with and build on strengths, than to struggle with disadvantages that are difficult to influence. To build on strengths give advantages in a complex environment.

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06 NOVA – tools and methods for norm-creative innovation *(for Swedish version see VR 2016:03)*

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