

Copyright © 2012 Department of Production Engineering

All rights reserved. No part of this document may be reproduced, distributed, or transmitted in any form or by any means, including printing, photocopying, recording, or other electronic or mechanical methods, without the prior consent, written or spoken, from the creators of the document. For permission request, contact the responsible person at the addresses above.

TEKES – Uudistuva teollisuus -aktivointihanke

Competitive and sustainable production systems and networks

(KEstävän KEhityksen kilpailukykyinen ekotuotanto KEKE)

1.1.2010-31.12.2011

WP 2: Current state and needs of Finnish companies

Table of Contents

Introduction.....	2
Research methods	2
Finnish Manufacturing industry's views on sustainable development and production	3
Questionnaire survey	3
Workshops	8
Summary	13
References	15

Introduction

This work package aimed to clarify the current state and future expectations of Finnish manufacturing companies related to sustainable development and production, and to identify means for improving sustainability of manufacturing companies and production processes. The aim was to answer the following questions:

- What is the role and importance of sustainable development and related issues in companies' operations and decisions?
- What are the challenges of sustainable development and production?
- What are the means and motivation to realize sustainable development and production?
- What are the goals manufacturing companies aim to in sustainable development and sustainable production?

The results provide practical information on the current state, means and motivation for realization and objectives which the Finnish industry regards as relevant and useful in pursuing sustainable development and objectives. In more detail, the first question provides an overview and information of the current situation and expected future in industry by describing the role of sustainable development in decision making and operations. This also clarifies the starting point of the Finnish manufacturing industry's journey towards sustainable development and sustainable production. The second question identifies the current challenges and obstacles for sustainable development and production. This also gives better understanding for both the industry sector and academia where to focus research and development in the progress towards sustainability. Then, the third question identifies means for realizing sustainability in every day practices. Lastly, the final question answers what are the objectives of sustainable development and production from the Finnish manufacturing industry's point of view.

Research methods

The research methods used to collect the required data include literature review, workshops and a questionnaire survey. The main advantage of using a questionnaire is the ability to cover various aspects of a broad topic and to collect quite a large number of responses with reasonable effort. However, the challenge of a structured questionnaire is the limited ability to discuss and elaborate the responses. Therefore workshops that enable more open discussion and provide more detailed opinions were also carried out. Data collected using these methods covers the current situation, opportunities and challenges of sustainable development and sustainable production in Finnish manufacturing industry.

The questionnaire was based on an earlier study focusing on trends and possibilities of creating a sustainable future, carried out by the American Management Association (AMA) [1]. The benefit of using the same questionnaire is the possibility of comparing the two studies and related data sets. The questionnaire was sent to 50 companies that participated or had shown interest in the research project, and 70

KEKE WP 2: Current state and needs of Finnish companies		Date 24.4.2012
Prepared Mikko Koho, Mikko Tapaninaho, Jaana Kuusela	Email Mikko.koho@tut.fi	Reviewer Seppo Torvinen

persons working in various positions and functions filled the questionnaire. The questionnaire used a 5-point Likert scale where 1 means “not at all” and 5 “to a very great extent” to evaluate the sustainability and sustainable development related issues and alternatives provided. In the data analysis phase, the average value of the responses was calculated to define the rank and the importance of different issues and options. The questionnaire covered several areas and aspects, but four questions presented to the companies were especially useful and relevant for answering the research questions of this work package. Regarding the role of sustainable development in the Finnish manufacturing companies, the respondents were first asked to evaluate how well sustainability is considered and realized in decisions and operations, and then to identify the key business decision drivers today and in 10 years into the future. Then, two sets of questions focused on important qualities and barriers for building a sustainable enterprise.

The workshops conducted in the companies yielded detailed and in depth information of the companies’ views on sustainability, sustainable development and sustainable production. The workshops consisted of three phases. First, the participants were asked to list challenges and possibilities regarding sustainable development and sustainable production. Then they were asked to place the challenges and possibilities to a four-field matrix. The vertical axis of the matrix represented the importance while the horizontal axis represented time when the challenge or possibility is expected to be current. The axes were divided in two sections, the vertical importance axis into important and very important and the horizontal time axis into time intervals of 1-3 years and 4-10 years. The participants gave further explanation on the topics they had written on the first phase to give a better understanding of the issue. In the final phase an open discussion took place to comment and ask about the presented challenges and possibilities.

A total of 23 workshops were carried out in 21 companies. In the workshops 399 issues were mentioned. The presented issues were narrowed down to 91 issues by eliminating similar issues. The 91 issues were presented to a group of researchers for a workshop. In this workshop the participants were placed in three groups which all categorized the presented issues into different subgroups. An additional joint categorization was formed by all participants of the workshop which was a combination of the initial classification. This categorization is the basis of the framework used to present the results here.

Finnish Manufacturing industry’s views on sustainable development and production

Questionnaire survey

This chapter is mainly based on the questionnaire survey and it describes the current status and expected future role of sustainability in the Finnish manufacturing industry, and presents means for realizing sustainable development and production in companies.

Table 1: On a scale from 1-5, rate your company on the following questions

Table 1 provides insight into the current state of sustainability and related practices in the Finnish manufacturing industry. In general, sustainability is seen and expected to provide new business opportunities and markets to companies, but current level of implementation and realization of sustainability in companies and their operations is relatively low. Also from the production perspective, the current role of sustainability is not significant. The average scores for importance and role of sustainability in production, product design, purchasing and logistics decisions are around the neutral grade of 3. Only after sales, which can be linked to sustainable production and the aim to extend product life cycle, has a rather important role in the operations and business of Finnish manufacturing companies. The perspective that sustainability initiatives do not provide measurable results to a company summarizes the current status of sustainability and sustainable development in the Finnish manufacturing industry. As a conclusion, Table 1 can be interpreted so that sustainability has potential to provide business advantages to companies, but as the current level of implementation is low, further work is needed to implement sustainability related practices and to realize sustainable development and production.

Table 1 Current state of sustainability in Finnish manufacturing industry

Question: On a scale from 1-5, rate your company on the following questions

Issues	Rank	Mean
Sustainability offers our company a chance for additional business	1	3.90
After sales are a substantial part of our business	2	3.71
Sustainability is a key factor in our production	3	3.31
We promote green procurement and use recyclable packaging materials	4	3.30
Sustainability is visible in our marketing and communications	5	3.29
Sustainability is a major part of our product design	6	3.27
We actively follow our customers needs and values in sustainability	7	3.10
Do you believe that your organization is implementing a sustainable strategy?	8	3.07
We efficiently use the sustainable attributes of our products in sales and marketing	9	3.01
Sustainability is a key factor when making new purchase decisions	10	2.74
Is your organization seeing measurable results from sustainability initiatives?	11	2.72
Sustainability is a key factor when planning our logistics	12	2.71
Do you supply and/or review information that is used to develop sustainability-related metrics for your company?	13	2.44

KEKE WP 2: Current state and needs of Finnish companies

Date
24.4.2012

Prepared
Mikko Koho, Mikko Tapaninaho,
Jaana Kuusela

Email
Mikko.koho@tut.fi

Reviewer
Seppo Torvinen

Table 2 On a scale of 1-5, to what extent does each of the following items drive key business decisions for your company today and in 10 years?

Drivers	Rank	Mean (Current)	Rank	Mean (10 years)
Enhancing innovation for competitive advantage	7	3.81	1	4.49
Enhancing operational efficiency through energy and waste reduction	9	3.73	2	4.49
Increasing workforce productivity	4	3.94	3	4.46
Effectively addressing regulatory restrictions wherever we operate	2	4.13	4	4.43
Ensuring our workers' health and safety wherever we operate	3	4.06	5	4.39
Meeting expectations of investors and lenders	1	4.14	6	4.39
Improving our reputation/brand image with shareholders and the public	5	3.89	7	4.38
Increasing security for our employees, customers and the communities in which we operate	6	3.83	8	4.26
Reducing pollution and toxic chemical use and their effects on our employees, customers and the communities in which we operate	8	3.80	9	4.23

Table 2 presents the key business drivers currently and in ten years into the future, and hence provides more information on the role of sustainable development in Finnish manufacturing companies' operations and decision making. The most important drivers currently, i.e. meeting the expectations of investors and lenders, and addressing regulatory restrictions, can be regarded as general rather than production related business drivers. On the other hand, the fourth most important driver, workforce productivity, is clearly more of a production oriented issue. Of issues related to sustainable development and sustainable production, workers' health and safety was ranked high and regarded important, while reducing pollution, use and effects of toxic chemicals, and waste and energy use were given lower scores of importance. However, it should be noted that from the 25 issues presented to and ranked by the respondents, all these were in the top ten and hence regarded as relatively important business drivers. In ten years, the importance grows for each business driver presented in the questionnaire, and more emphasis is put on the production related drivers. The most important driver in the future, enhancing innovation for competitive advantage, can be linked to both production and product design. The need to and importance of obtaining skilled workers highlighted in the workshops can be connected to the important role of innovations and innovativeness in the future. Enhancing operational efficiency through energy and waste reduction, which is related to production, environmental friendliness and sustainable development, was ranked higher and more important in ten years than currently. This driver is an example of production-related sustainability initiatives that provide both financial and environmental benefits. Then, increasing workers' productivity is expected to be an important driver and objective for manufacturing companies also in the future. The current top business drivers, addressing regulatory restrictions and meeting investors' and lenders' expectations will be important also in ten years. This can also increase the importance and role of sustainable development, if legislation and restrictions focus more on environmental effects of products and production, and if lenders and investors put more emphasis on sustainability of a company and its operations. Ability to address regulatory restrictions, fulfil requirements, and obey legislation was also emphasised in the workshops as the participants expected the environment and sustainability related legislation to become tighter in the future. Furthermore, the differences in legislation between countries and continents were heavily emphasised in the workshops. Following current legislation in different market areas, which of course is a prerequisite for addressing restrictions and meeting legislation and requirements, was seen to be challenging and difficult. The companies are also forced to decide how to deal with, for example, less strict environmental

legislation and requirements in certain countries and areas. To conclude, the current and future key business drivers include both traditional drivers, such as productivity, and more sustainability related drivers, such as health and safety, as well as reducing waste, energy use and pollution.

While the two questions discussed above focused on the status and role of sustainable development in the Finnish manufacturing industry, the last two questions aimed to identify means to realize sustainable development and production. Table 3 shows the importance of different qualities for building a sustainable company or enterprise, and the current availability of these qualities in the respondents' companies. As is typical when significant changes or improvements are considered, top management support was rated as the most important enabler for building a sustainable company or enterprise. Furthermore, to realize sustainability within a company and in its operations, sustainability has to be an integral part in the company's or enterprise's vision, strategy and decision making. In keeping with these views, the literature review presented in Section 2.2. stressed that achieving and pursuing sustainability requires changes within the management of a company and placing sustainability into a central role in the company's vision, strategy and decision making. The respondents were also asked to evaluate their companies' current practices and qualities. In general, the average score for availability of practices and qualities was lower than that of importance of the practices and qualities, which indicates a need for improvement in the companies. Furthermore, the averages for availability of practices and qualities were close to the neutral value of 3, which shows that sustainability-related practices and qualities are neither at required level nor well-implemented in the Finnish manufacturing industry. This also indicates that the degree of implementing sustainable development and production and the role of sustainability in the companies surveyed is relatively low. This observation is consistent with the discussion and conclusions related to Tables 1 and 2 presented above.

Table 3: On a scale from 1-5, how important are the following qualities for building a sustainable enterprise, and to what extent does your company currently have these qualities?

Issue	Rank	Mean (Importance)	Rank	Mean (Available practices)
Top management support—The CEO, the chairman of the board, and senior management teams show public and unwavering support for sustainability	1	3.73	1	3.37
Centrality to business strategy—Sustainability is central to the company's competitive strategy	2	3.41	3	3.06
Systems alignment—The company's structure, systems, processes and culture are aligned around sustainability	3	3.40	2	3.19
Values—Key values related to sustainability have been deeply ingrained in the company	4	3.23	5	2.81
Metrics—The company deploys an array of rigorous sustainability measures	5	3.21	4	2.87
Organizational integration—Various aspects of sustainability are viewed holistically and integrated across the functions that have responsibility for them	6	3.17	6	2.73
Stakeholder engagement —The company reaches out to and involves a broad array of external and internal stakeholders around sustainability issues, including customers, suppliers, governmental and non-governmental organizations (NGOs)	7	3.09	7	2.63

Table 4: On a scale from 1-5, to what degree does each of the following issues hinder your company from moving toward sustainability?

Barriers	Rank	Mean
Lack of standardized metrics or performance benchmarks	1	3.56
Lack of specific ideas on what to do and when to do it	2	3.49
Lack of demand from shareholders and investors	3	3.46
Lack of awareness and understanding	4	3.41
Lack of demand from consumers and customers	5	3.38
Lack of demand from suppliers	6	3.21
Lack of demand from the community	7	3.21
Lack of demand from managers and employees	8	3.18
General risk aversion	9	3.00
Lack of support from senior leaders	10	2.89
Unclear or weak business case	11	2.84
Fear of competitors taking advantage of us	12	2.82

Finally, Table 4 presents the Finnish manufacturing industry's views on the barriers or hindering factors in a move towards sustainable development and sustainable production. The biggest barriers were seen to be the lack of metrics, lack of specific ideas of what to do and when to do it, lack of demand from shareholders and investors, and lack of understanding and awareness. Similar to the questionnaire results, within in the workshops, many companies expressed a need to develop and identify practices and means for more sustainable production. Related to measures and metrics, measures of worker health and safety were experienced as good and easy to adapt, but standard metrics to measure and to provide an overview of sustainability especially in production were considered to be lacking. Furthermore, the challenges and difficulties in measuring profitability, benefits and the return of investment of sustainability related initiatives and investments were also pointed out in the workshops. The lack of demand from shareholders and investors and also from customers was pointed out not only by the questionnaire responses but also in the workshops. The opinions presented by the workshop participants indicated that the cost of a sustainable solution is seen to be noticeably higher than that of a less sustainable solution, and the return on investment is seen to occur in too long of a time period for the sustainable solution to be chosen. The workshops and the questionnaire responses indicate that emphasis is put on competing with prices against the expense of sustainability of the product or operation. One possible solution for these was seen to be financial support and compensation from government to companies investing in sustainability. Finally, the lack of awareness and understanding of sustainability, sustainable development and sustainable production was highlighted also in the workshops. This is related to many aspects, for example definitions, objectives, practices and measures of sustainability. This clearly shows the need for more research and education on sustainable production and sustainable development.

To conclude, the results and discussion showed that sustainability is expected to provide new business opportunities and markets, and the importance of sustainability related issues in decision making and as business drivers is expected to increase. However, currently sustainability does not have a key role in the Finnish manufacturing industry, and practices related to sustainable development and sustainable production are implemented and available only to a moderate or low extent. Hence, there is clearly a need and room for improvement. Based on the results, top management support, centrality to strategy, and aligning systems around

KEKE WP 2: Current state and needs of Finnish companies		Date 24.4.2012
Prepared Mikko Koho, Mikko Tapaninaho, Jaana Kuusela	Email Mikko.koho@tut.fi	Reviewer Seppo Torvinen

sustainability are the key enablers to realize sustainable development and sustainable production in industry. On the other hand, research and development are needed to identify measures and benchmarks focusing on sustainability, and to present clear and concrete means and practices for improving production sustainability. Academia could also take a central role in improving and increasing awareness and understanding that is seen to support and enable realizing sustainable development and sustainable production.

Workshops

The chapter is based on the data and results obtained from the workshops. The results are divided to six categories:

- Product and Product Design
- Supply Chain
- Production
- Personnel
- Business
- Society

The challenges, means and motivations for realization and objectives of sustainable development and sustainable production in the Finnish manufacturing industry are presented for each of the categories.

Product and Product Design

Viewing sustainable development from the product and product design aspect, several challenges relate to products end of life management and life cycle assessment. Currently product design is not focused on the sustainability aspect of the product as much as the cost aspect. Products are often viewed as disposable and the current product recovery options are viewed as limited. Furthermore, designing sustainable products is regarded as more time consuming and often the qualities of 'green materials' are not comparable with the traditionally used materials. Also, issues such as reduction of noise and small particle emissions are hard to eliminate from the product without compromising the cost-effectiveness.

Solutions for overcoming these challenges are seen as developing a systematic product service and recovery strategy. Virtual design tools are seen as an important tool to realize sustainability in the products, in virtual environment many options can be measured, but further development of the design tools needs to take place before it will become a feasible solution for product design. Many companies are also evaluating alternative fuels to power their products and their effects on the emission and sustainability of their product. Companies in the Finnish manufacturing industry view product design as an important phase to have an effect on the products sustainability. Especially in products with long life cycles, the issues in the life cycle should be addressed in an early phase of the product design.

The objectives in sustainable product design in the Finnish manufacturing industry are seen as making products modular and updatable. Sustainability in product design

KEKE WP 2: Current state and needs of Finnish companies		Date 24.4.2012
Prepared Mikko Koho, Mikko Tapaninaho, Jaana Kuusela	Email Mikko.koho@tut.fi	Reviewer Seppo Torvinen

is viewed as better life cycle management of the product. Longer term objective for product design is to have an 'eco-product' for which a secondary life cycle can already be planned before the initial life cycle has begun.

Supply Chain

In many ways several challenges reside in the planning and operating a successful and sustainable supply chain in the Finnish manufacturing industry sector. Partners are often chosen based solely on the cost while other aspects such as environmental impact in the decision play a minor role. Often when a supplier is chosen the goods are delivered in relatively small batches over a long distance. Furthermore, modal transportation is not taking place effectively in the Finnish manufacturing industry. Another issue with the suppliers is that, especially when a supplier is chosen from another country, for example China, the origins of the part are not always made clear for the Finnish company. This raises several ethical questions by the Finnish manufacturing industry, such as worker safety and rights for collective bargaining, work conditions and child labour. The small and medium enterprises consider assessing sustainability in their supply chain operations to be expensive and the time for return of investment for the sustainable practices is considered to be too long to be profitable. Additionally, many of the companies are not sure how they need to address sustainability in their practices. Thus, another issue the companies see is the metrics regarding sustainability in the supply chain, often it is hard for companies to measure their supply chain from a sustainable aspect

The motivation for enhancing sustainability in the supply chain was expressed by the Finnish manufacturing company as a threat that some work might be outsourced to another country than Finland. The means to enhance sustainability in the supply chain are viewed as further collaboration between the companies. For the small and medium enterprises collaboration is considered as extremely important to address the sustainability regulations and issues in the future. Several companies also see committing to sustainability not only in own actions but in the whole supply chain. The companies selling the goods to the end customers see themselves as the operator to address sustainability and ensure that sustainable practices are being used. However, the pressure to be cost-effective is significantly hindering decisions in the corporate strategy to choose the sustainable choice. Several companies expressed willingness to be able to buy the sustainable services from a third party.

In the supply chain both long and short term objectives were presented by the Finnish manufacturing industry. A sustainable supply chain is viewed as short distance transports between the operators. Companies see that it is important for the operators in the supply chain to be located close to each other. Long term objective for supply chain is viewed as an eco-friendly industrial area where several operators of the supply chain are located and a third party would provide them with services regarding sustainability.

Production

In the production operations the biggest challenges lies in the finances and measurements. The Finnish manufacturing companies experience the costs of a sustainable investment to be far too expensive compared to the benefit gained.

Sustainability related investments are seen to be expensive bulk investments, therefore several companies are reluctant to carry out such large scale projects. Furthermore, the lack of knowledge and understanding in what to do and when to do it increases the reluctance to realize sustainable investments in the production and manufacturing processes and operations. In addition the lack of easily adaptable measurements for small and medium enterprises decreases the support for investing in sustainability. The companies in the Finnish manufacturing industry do not feel a standardized enough set of metrics and indices has been established to support smaller enterprises in realizing sustainability.

However, Finnish companies in the manufacturing industry see several benefits in investing to sustainability despite the lack of financial support. With these investments the companies can continue the production in the original location and achieve savings in the production costs. Hence, including sustainability within the bigger future projects is a more feasible way to realize sustainable development in the manufacturing and production processes and operation rather than initiating multiple smaller projects. The paradigm for sustainability in the production and manufacturing field by the Finnish manufacturing industry is to enhance the existing operations to be more efficient and adapting energy conserving equipment and processes in the factory. Several companies see energy recovery from the processes and the overall reduction in the energy use as a way to address sustainability. Increasing the reusability of the used materials and increasing the recyclability of the waste materials generated from the production and manufacturing processes is also seen as a mean to increase sustainability. In addition, the use of packaging materials was mentioned by a number of companies. Reducing the materials used for packaging directly reduces the capital spent on both the packages and transportation, smaller packages can be loaded more efficiently in the transportation and generate less waste. With digital manufacturing several advantages can be achieved in the production and manufacturing processes. With a virtual testing environment the sustainability factor of the planned changes in the production system can be thoroughly tested. The companies in the Finnish manufacturing industry supports automation as a solution to address sustainability, investing in virtual testing of the processes and operations increases the benefit gained from automation. However, realizing the presented things requires commitment from the companies. Currently the companies in the Finnish manufacturing industry aim for short term profits while the focus on the long term plans in the company's strategy and vision does not support realizing the investments. Hence, the companies have to commit themselves in the field of sustainability to realize sustainable production.

Finnish manufacturing industry sees that a sustainable production system can be described as effective use of available resources. As a short term goal the Finnish manufacturing industry aims to develop new production systems and enhance the existing ones to be more sustainable. Over a longer period of time several Finnish companies aim for an eco-factory concept. However, eco factory in Finland is considered to be out of reach especially for the small and medium sized enterprise industry.

Personnel

Commitment to sustainable development of the personnel is seen as one of the key challenges in the Finnish manufacturing industry. The interviewed companies expressed the lack of understanding the greater effect of everyone's actions to be a part reason for the lack of commitment. The reluctance for change is regarded to partially originate from the relatively high average age of the workforce in the Finnish manufacturing industry. Currently changing the mindset of the factory floor workers is seen as a hard task because of the unwillingness.

Companies in the Finnish manufacturing industry see countering the mindset issues is considered to be extremely important. The motivation for social sustainability in the company is to keep the skilled individuals within the company. Thus, companies consider the role of sustainable development to be important especially in recruitment. A number of companies expressed that younger generations consider the company's image as a big part of choosing their employer. For companies to get the best individuals they need to focus on how the company is seen in the public. To address the commitment issues the management plays an important role. The management has to effectively emphasize the importance of sustainable development to the employees. In the workshops several participants issued that the sustainable development related practices in everyday work are tedious and adds additional work for everyone but in good time and proper education of the staff the desired change is said to occur. In the coming years much of the workforce is retiring and the knowhow accumulated over their career is not kept within the company. Thus, the aging of the workforce is considered to be an important issue in the coming years and the actions taken to countering the issue are taking place. Companies have suggested on initiating a mentor-system to ensure that the knowhow is kept within the company and the important knowledge can be transferred from worker to worker. Furthermore, companies are increasingly addressing the ergonomics and wellbeing of the employees to lengthen their careers. Companies also struggle with how the assumed concept of career is experienced as continuous and promotion oriented. A suggestion from a workshop was to shift the paradigm of career to more cycle and trend oriented. The careers of the employees would become related to how well the business is going for the company. Guiding the employees to an alternative career within the company is a way to counter the big layoffs when the business is not doing well. However, the worker safety and health related issues are considered to be in good shape in Finland. Companies focus on preventing work related injuries and accidents by keeping track of occurred accidents and near misses. Additionally, the Finnish manufacturing industry sees the worker safety and health related metrics and indices to be easily adaptable and informative.

The Finnish manufacturing industry sees keeping the talented individuals within the company as the most important objective. Furthermore, the objectives related to personnel can be viewed as focusing on ensuring the health and safety of the employees. Objectives in the personnel related issues serve multiple purposes for the company. Hence, by focusing on these issues such as workplace ergonomics the work related injuries decreases. Decreasing the amount of injuries also keeps the workers at workplace and thus keeps the productivity of the company at high level.

Business

The challenges related to the business activity for the companies in sustainable development and sustainable production is the lack of information and demand from both the customers and the management. The company's strategy and vision is formed to meet the customer's requirements and demands. For most companies the external or internal customer does not demand sustainability related practices or information to the extent it would become business driver. The customers typically choose the product or equipment they buy based on other attributes rather than sustainability. Companies currently are also reluctant to make decision supporting sustainability as there is no demand for it, focusing the resources on the currently important demands from the customer are regarded as more feasible option. Furthermore, the lack of pioneer companies engraving sustainability deeper in the strategy and vision does not encourage the companies in the Finnish manufacturing industry to promote sustainability. Small and medium enterprises are reluctant to become pioneers for sustainable development and sustainable production as the effects of promoting sustainability without concrete demand for it from the customers can lead to loss of sales.

Motivation for realizing sustainable development and sustainable production should originate from the company's strategy and vision. However, the current metrics does not give the companies support to lead the change towards sustainable production and sustainability in the company's operations. Further development of standardized and easily adaptable metrics is required. Shifting the company's management model to support sustainability the metrics and indices should be standardized to allow evaluation of progress and benchmarking with other companies as well as setting goals. Majority of the customers do not value the sustainability attributes of the products as highly as the Finnish manufacturing companies wants them to. A number of companies experiences the Finnish brand to give an advantage in selling products which are supporting sustainable development. Furthermore, being the pioneer for sustainability in each industry sector can work as a marketing advantage. Focusing resources on tackling the upcoming challenges is experienced to become an advantage when planning for a longer period of time.

The Finnish manufacturing aims to realize business supporting sustainable development and sustainable production. The companies' objectives are to differentiate from the competitors by offering the customers a sustainable choice for the product. Engraving sustainable development and sustainable operations deep in the company's strategy and vision, the companies in the Finnish manufacturing industry expects to give the public a positive image of the company and its values.

Society

Society places a lot of pressure for the companies by instituting new and tighter regulations. Companies experience politics as both a driver for sustainable development as well as a barrier for business. The pressure to stay competitive with the increasing regulations is considered as one of the bigger challenges for realizing voluntary sustainability in the companies' actions. In addition, the costs of manufacturing a product in Finland compared to manufacturing in cheap labour countries are becoming more expensive. Furthermore, realizing similar practices in

KEKE WP 2: Current state and needs of Finnish companies		Date 24.4.2012
Prepared Mikko Koho, Mikko Tapaninaho, Jaana Kuusela	Email Mikko.koho@tut.fi	Reviewer Seppo Torvinen

Finland compared to a country with less strict regulations for emissions and waste management is not considered to be possible. The companies which have production in a cheap labour countries stated that there is no support in realizing similar regulations.

Overcoming these challenges is considered to be hard from the companies' perspective alone, hence companies state that support from both the European Union and the Finnish government is required. The current projects to support sustainable development are considered to be taking too much time before they are realized thus the pace for the change in the industry sector should be faster for them to be feasible for the companies. Furthermore, several projects, especially the projects in Finland, do not have a production oriented perspective and the focus is on the general level issues. Environment is currently experienced in too great extent, thus financial and social sustainability does not have the desired emphasis in the projects. The companies in the Finnish manufacturing industry see realizing sustainability as a joint operation with the governing bodies. The pace for the changes should be set in co-operation with the companies to ensure that it does not jeopardise the business by applying stricter regulations too fast. Certificates are currently experienced as a good way for a company to promote their actions for sustainable development. However, in the manufacturing industry the benefit of the certificate is not seen as important as in some other industry sectors.

Finnish manufacturing industry experiences the objects for the social aspect of sustainability as being able to generate jobs throughout the supply chain and supporting local production and manufacturing. However, co-operation with the governments and the industry is required in realizing this. A longer term objective for the Finnish manufacturing industry is to have a worldwide consensus of the regulations. In future it should not matter where the goods are produced and jobs are generated in places where the workers wish to live.

Summary

In this work package the aim was to clarify the current state and future expectations related to sustainable development and production in Finnish manufacturing industry. In more detail, the discussion covered the role and importance of sustainable development, and objectives, challenges and means related to sustainable development and realizing it in industry. Data was collected with a questionnaire and workshops.

The overview provided by the questionnaire survey shows that although the importance of sustainable development and sustainable production in operations and decision making of companies is expected to increase, it is not currently evident within the Finnish manufacturing industry nor have the companies adapted and implemented many sustainable practices in their operations. The current key driver of business decisions is meeting the expectations of investors and lenders, while 10 years in the future, more production and sustainability oriented issues such as increasing the workforce productivity and enhancing operational efficiency through energy and waste reduction will be emphasised. To realize sustainability in the

KEKE WP 2: Current state and needs of Finnish companies		Date 24.4.2012
Prepared Mikko Koho, Mikko Tapaninaho, Jaana Kuusela	Email Mikko.koho@tut.fi	Reviewer Seppo Torvinen

decisions and operations of manufacturing companies, top management support and the central role of sustainability in strategy and vision are important. Furthermore, practices and measures promoting sustainability need to be developed, and in general understanding and awareness of sustainability must be improved.

The workshops then provided more detailed information related to the research questions of this work package. The workshop results are summarized in six categories, product and product design, supply chain, production, personnel, business and society, and present challenges, motivation and means for realizing sustainability in industry. In product design the biggest challenges focus in the products life cycle assessment, thus further effort is required in this field. Virtual product design environment is suggested as a mean to realize sustainability in the product. The objective to address sustainability in product and product design is experienced as better life cycle management in the near future. Challenges in the supply chain to address sustainability can be considered as mostly financial. Currently being cost-efficient is more important than being sustainable. Therefore, the companies suggest further collaboration between the operators in the supply chain to achieve sustainability. The Finnish manufacturing industry aims to have short distance transportation in the future and working within close distance between the operators in the supply chain. Finances play a big part in the production operations and processes as well. The companies feel that the big bulk investments to address sustainability are often too expensive to realize, hence grouping the sustainability related issues in the future projects is considered as a more feasible solution rather than carrying out smaller projects. In the production operations and processes the industry aims for both energy and resource efficient production. In Finland the personnel aspect has been in high focus in the recent years with the challenge of aging workforce. The focus within the industry is to address the employee health and wellbeing to further lengthen their careers. However, the importance of other personnel related issues such as retaining the knowhow of the older workers within the company and changing the mindset of the employees to adapt sustainable practices. The companies in the Finnish manufacturing industry wishes to keep the talented individuals within the company and view personal talent as valuable asset for the company. Sustainability is not a big issue in the business oriented practices such as marketing for the company. The customers demand for sustainability is regarded to be a minor factor when making new sales. However, in future the demand for sustainability is seen to become an important part of the business. Companies in the Finnish manufacturing industry aim to strengthen their brand image by working in the forefront of sustainability. The societal aspect of sustainable development has been in focus along the personnel aspect. Currently the strict legislation place too much pressure especially for the small and medium enterprises to follow. Companies suggest that collaboration with the European Union and the Finnish government is required to set the right pace for realizing the sustainable practices. The industry's objective is to be able to provide jobs for people wishing to live outside the bigger cities.

The results and the discussion presented clearly show that great efforts and changes are needed to realize sustainable development and sustainable production in the Finnish manufacturing industry. The identified motivations and objectives indicate the

desired direction for the Finnish manufacturing industry, while the changes, challenges and barriers point out directions and the need for further work and development for both companies and academia.

References

[1] American Management Association, (2007): Creating a Sustainable Future: A Global Study of Current Trends and Possibilities 2007-2017.

The document is based on following conference papers:

Koho, M., Kuusela, J., Tapaninaho, M. & Torvinen, S. 2011. Finnish manufacturing companies' views on sustainable development and sustainable production. The 4th Swedish Production Symposium, SPS11, May 3-5, 2011, Lund, Sweden.

Koho, M., Tapaninaho, M. & Torvinen, S. 2011. Towards Sustainable Development and Sustainable Production in Finnish Manufacturing Industry. 4th International Conference on Changeable, Agile, Reconfigurable and Virtual Production (CARV2011), Montreal, Canada

Tapaninaho, M., Koho, M. & Torvinen, S. 2011. Current state and future expectations of sustainable development and sustainable production in the Finnish Manufacturing Industry. The 9th Global Conference on Sustainable Manufacturing, St. Petersburg, Russia