Product Design as a Key to a Business System Perspective that Promotes Sustainable Forestry

Reine Karlsson[1*], Magnus Löf [2], Donald Huisingh [3]

[1]University of Kalmar, Department of Technology, SE-391 82 Kalmar, Sweden, reine.karlsson@hik.se

[2]Swedish University of Agricultural Sciences, Southern Swedish Forest Research Centre, SE- 230 53 Alnarp, Sweden, magnus.lof@ess.slu.se

[3]University of Tennessee, Center for Clean Products and Clean Technologies, 311 Conference Center Building, Knoxville, TN 37996-4134, U.S.A., dhuising@utk.edu

[*]Correspondence can be directed to this author, as the primary contact.

Abstract

A sustainable business system should uphold a core value linkage between customer interests and business operations and their foundation in natural and human resource values. However, in many industrial economies, companies in the established business systems, all too frequently seek to obtain the natural and human resources at lowest short-term costs while paying little or no attention to the long-term sustainability of the natural and human systems upon which their sustainable livelihood is dependent.

This paper presents an innovation approach with the objective to create higher market value for hard-wood products and to increase system effectiveness by helping to enhance the multiple uses of forests. One objective is to use the entire eco-system and product design as essential elements to bring more resources into the forestry-based business system. This should serve as a strong catalyst to build greater motivation for sustainable management of the entire system. The resources are used to support development of sustainable, diverse-species forests and local, regional and global businesses, and thus, help to develop an improved, sustainable forest system as an integral component of more sustainable regional development. One part of the innovation system advancement is opportunity based learning in collaboration with entrepreneurial business developments.

The innovation system is designed to increase the supply chain efficiency and effectiveness and to promote business development of new forest-based products and services with higher added value. The mutual involvement of landowners, municipalities, enterprises and customers is needed to assure sustainability on social, biodiversity and business levels. The value enhancement has a basis in creation of company images and a market perception that more clearly highlights the valuable feeling of being in contact with the treasures of nature. One tool to highlight the interconnections is storytelling. The innovation system has a foundation of expertise in established forest-based businesses. The present development phase is designed to support transformative innovations through promotion of further development of the forest-based business system to produce higher added value and to enable a more sustainable forestry and thus a more sustainable society.

Keywords: integration; renewable resources; innovation system; hardwood product system, sustainable regional development

Introduction

Forests and timber based businesses produce a significant part of Sweden's balance of trade; that is 110 billon SEK or 14% of Sweden's annual export value. The main timber based industries use spruce as a base for pulp, paper, and construction wood. For a number of decades, Sweden has invested heavily in development of the pulp and paper industries and the forestry research has focused on production of softwood for those industries, as indicted by publications in Table 1. Most of the forestry research and development have been focused on Scots pine and Norway spruce.

The South part of Sweden has had a large portion of agricultural land. This region has had a considerable number of small saw mills and furniture producing companies. However, during recent decades, there has been a structural development so that the timber-based business system is now dominated by large softwood industries. Today, Southern Swedish forests are 79 % soft-wood, and 19 % hardwood, see Table 1. A considerable part of the forest land is owed by small private land owners.

Table 1. Timber volumes and relative amounts of research per tree species

	Beech	Oak	Ash	other	Alder	Aspen	Birch	Spruce	Pine
Standing volume	2.0	3.2	<…….	3.9	…….>	1.9	9.9	49.4	29.7
Se. Publications	3.6	1.7	0.3	3.4	1.6	2.3	3,4	39,6	44.1
Int. Publications	8.8	8.9	2.2	6.3	4.3	2.1	9.0	29.1	29.3

Row 1; Standing volume of timber, % by species 1998-2002, in the South part of Sweden, (Götaland), other = other broad-leaved (*National board of forestry, 2006*)
Row 2 & 3; Research publications 1990-1999, % /species in Swedish and in total in International scientifically related literature. (*Löf, 2001*)

The Swedish Base of Forest Related Knowledge and Organizations

This paper focuses on an innovation system approach that is being used to mobilize and focus diverse kinds of forestry related knowledge through more explicit linkages to entrepreneurial and intrapreneurial business developments. The goal is to produce higher value added from hard- and soft-wood, as well as from other forest related products and services, in order to help make Southern Swedish forests and communities more sustainable. While we focus upon both hard and soft-wood related entrepreneurs; our special focus is upon the hard-wood chain because less systematic attention has been given to that part of the regional development efforts.

Sweden has a recent history of a multifaceted variety of forest and wood related knowledge and local business traditions. During the twentieth century a large part of the Swedish research and industrial investments were made within forest related subject areas. The forest related part of *the Swedish University of Agricultural Sciences* was started in 1914 and during more recent decades, Sweden has been a development leader in pulp and paper technologies.

The Swedish Society for Nature Conservation was started in 1909 and in 1972 Stockholm, Sweden hosted the first major *United Nations Conference on the Human Environment*. Some

examples that illustrate the present situation; *Växjö University* has a research profile in *Forest Industry Production Systems*. *The Swedish Governmental Agency for Innovation Systems* has a priority area in research on *Wood Manufacturing*.

The *Wood Center* in Nässjö is promoting market-oriented wood industry development and renewal. *The Broadleaf Program* at the *Swedish University of Agricultural Sciences* is a forest research project 2003- 2009 that focuses on eight noble tree species Ulmus spp., Fraxinus excelsior, Carpinus betulus, Fagus sylvatica, Quercus spp. Prunus avium, Tilia cordata and Acer platanoides. Furthermore there are numerous networks and for example *The Forestry Research Institute of Sweden, SKOGFORSK* is pursuing demand-driven applied research and *SP Trätek* is working as a collective research and development resource for the Swedish timber and wood manufacturing industries.

The Innovation System Approach

Our new innovation approach is designed to lift the value level for the total forestry-products and services supply chain, by linking development of higher customer value to forest developments. It is a commercially based development approach designed to ensure a more sustainable forestry system and sustainable regional development. The '*Innovation System for Sustainable Forestry*' **(ISSF)** is designed to ensure higher market values for a multifaceted variety of wood based products and forest based services. **ISSF** is designed to become a leading example in line with the UN objective to change consumption and production patterns (*The Marrakech Process, 2006*). The primary focus is on transformative, innovative business developments in collaboration with life-long educational initiatives.

The most explicit goal is to enable enhanced use of the best pieces of the timber, the fillets as the Wernerträ manager described them, see also Wernerträ Figure 5, to produce higher added value, and simultaneously to coordinate this with system optimization to enhance the utilization of all parts of all kinds of timber from many more species.

Another aspect of the system is to improve the utilization of bio-energy through logistic business system optimization, to make better use of more of the timber and other parts of the trees, because forestry based fuels are preferable from sustainability point of view. (*Mills et. al. 1991* and *Sanden et. al. 2005*) The overall, long-term vision includes innovative business development by supporting the societal appreciation for not only the physical products they can derive from forests but also through appreciation other kinds of 'nature's services' that forests provide such as provision of habitats for diverse species, air quality improvement, water quality and quantity management and provision of places for human habitats and recreation.

A basic objective of **ISSF** is to promote support to *"Make the winners"*, in contrast with the traditional financial venture capital funding system that tends to only try to *"Pick the winners"*, which was highlighted recently in the local media (*Mickos and Karlsson, 2006*).

Opportunity Based Learning

The next step is to promote entrepreneurship through courses where learning is realized through work with development of real companies in parallel with university related education. This could be described as problem based learning (PBL) on entrepreneurship. However, the core of

innovation is to search for opportunities and a possible path forward, rather than digging into problems, i.e. Opportunity Based Learning.

The innovation school focuses on entrepreneurship that fosters the new market-based business logics, with product and system design as key to higher added value (se also Fig. 4 below). Each entrepreneur is to be supported by at least one of the companies in the innovation system and is to be supported by a personal mentor, in addition to the formal/informal courses.

The support for the entrepreneurs is organised in a Tripe Helix manner; with:

- companies that facilitate the entrepreneur's entrance into the business system and that help to arrange investment resources in exchange for partial ownership;
- societal support for the innovation system's activities and their interconnections to societal development interests such as sustainable forestry;
- University involvement in competence development through research and education.

The innovation school management is coordinating the process of acquisition of innovative ideas. Some ideas are entered by potential entrepreneurs in collaboration with companies. The other entrepreneurial candidates, ideas and companies will be matched so that each preliminary selected idea is matched to a potential entrepreneur. From that point on, the selected person is the one that has the main responsibility to promote the idea and then an innovation school board will make the selection of the entrepreneurs that will be admitted and supported. The innovation school concept is designed to promote innovative company development projects in forestry related businesses and in regional sustainable development in Southern Sweden.

Innovation System Goal Levels

The evolving **ISSF** is designed to function at the following levels:

1. Enhanced forest system resilience and reduction of risk through increased reliance upon biological, ecological and cultural diversity;
2. Enhanced market awareness and appreciation of sustainability oriented investments and through building upon the human value of substantial connections to nature;
3. Enhanced regional business resilience through support of diversity and entrepreneurship;
4. Expanded development of new material products and materials with a higher value added;
5. Optimization of the business system to enhance the effectiveness and to obtain more revenue from each area of forest land/decade in a sustainable manner;
6. Strengthening of a system for knowledge development and for enhanced ITC utilization for documentation of tacit knowledge, actor coordination, indicator establishment and continual improvement;
7. Achieve cost reduction by increasing system efficiency, e.g. optimization of logistics and energy usage for drying of the timber.

'Sustainable forestry' is a relevant concept at all of these levels. The preservation of biodiversity

challenge is obvious at level 1. However, actions at all levels will create strong driving forces for investment in sustainable forestry as part of sustainable regional development.

The **ISSF** approach is designed to promote forest and wood related business developments. This includes new hard and soft wood products, as well as architecture, design and wood based construction materials development, new business solutions that enhance efficiency and effectiveness. This includes a more sustainable energy supply and usage, and use of forests as a basis for e.g. leaf extracts, health products, production of wine, mushrooms, berries and many advanced forest-based chemicals.

Additionally, nature's services provided by forests, such as wildlife habitat, aesthetic benefits, air quality improvement, water purification, flood abatement and carbon dioxide fixation are essential benefits provided by properly managed forests. All of these parameters as well as the beautiful wood-based furniture that can be produced from hard-wood can provide value added through elevated human enjoyment of close relationships to sustainably managed forests as integral to sustainable regional development.

In a societal system's study of oak, Ek and Johannesson (*2005*) highlighted that the recreational health value has the same magnitude as the timber value and that forests also provide several other regional values.

> The County of Östergötland is rich in oak and broadleaved tree habitats, both forests and wood-pastures with scattered trees. This gives a special character to the landscape; it has high natural, cultural and aesthetic values. The oak-rich landscapes have a special place in the hearts of the people from Östergötland and for many; an oak pasture with grazing animals is the very image of a healthy, living countryside. (*Ek and Johannesson, 2005*)

Ek and Johannesson suggest a multi-purpose management for making the oaks an even greater asset for nature conservation, historical and aesthetic reasons, recreation and tourism as well as for the economic potential through forestry and grazing.

The Southern Sweden Forest-Based Businesses

The logging and lumber logistics' actors in Sweden have strong business links to the dominant softwood timber industry actors (*Anonymous, 2005*). A large part of the timber is transformed to pulp for paper or are exported as planks with a fairly low added value. The goal with the new business logics is to create a more diverse forestry based business system that, in total, generates higher human value in concert with sustainable forestry.

The supply chain in a forestry-based business system is illustrated in Figure 1. Currently, it is mainly the softwood flow that has been industrialised in a market pull perspective. The Southern Swedish hardwood business activities have lower quantities and are more tied to production push material flows. The business tradition has been that, the supply of hardwood logs is dependent upon the harvesting activities in the softwood forests which also produce hardwood logs in seasons related to the softwood logging seasons and ventures. To some extent; this can be rectified by elucidating the advantage of market pull and by ICT for interconnection along the

supply chain so that the loggers have up to date timber-demand data.

The sawmill companies that have survived are more and more customer-oriented in a way that they seek to minimize stockpiles and only saw hardwood based upon orders, i.e. they aim for a just in time flow. To some extent they still have to saw and store dried timber due to specific conditions for hardwood (drying time for oak is for example 90 days from freshly harvested wood to 8% MC in a drying kiln) and due to the timber logistics described above.

One actor in **ISSF** is the Wernerträ saw mill that is drying its hard-wood in kilns and working on production of higher value added products, as well as in the establishment of market pull business logic. **ISSF** is promoting enhanced cooperation among the numerous small actors, aiming for new market-based business logic for an integrated hard-wood and soft-wood forestry system of Southern Sweden.

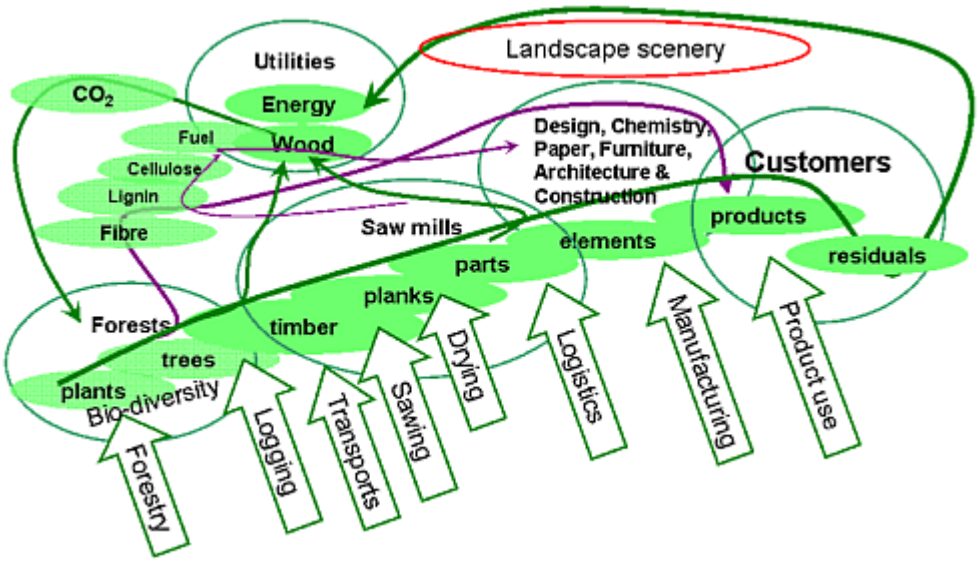

Figure 1 A forestry based supply chain material flow and business system

The 2005 Winter Storm - Gudrun

In January 2005, Southern Sweden was hit by a storm; that storm-felled 80 million cubic meters of wood. Approx. 98 percent of this volume consisted of Scots pine (Pinus sylvestris L.) and Norway spruce (Picea abies L. Karst.). Consequently, Southern Sweden's volume of sawlogs of spruce increased from 689 million m^3 in 2004 to 2 470 million m^3 in 2005. The average prices fell from 425 SEK/m^3 to 266 SEK/m^3 (Sawlogs of spruce, 2006). The storm mainly affected mature forests. Due to the millions of fallen trees, blockage of the roads and breaks in the power and telephone lines, numerous people and businesses had extensive problems for several weeks after the storm.

Traditionally and until the storm, the forestry and timber based businesses provided safe and sound local employment for countryside people. The scale of the storm damage resulted in extensive employment of workers from other countries, partly due to their lower salaries. In the

near future local forestry related employment risks to be low for a number of years. This is a very significant factor in many regions of Southern Sweden. The impacts of the storm resulted in numerous financial and mental consequences. Many forest owners lost a large part of their forests, i.e. the result from their life's investment of work and engagement. Both old and young people were depressed; consequently there is a risk that their motivation to invest in proactive forestry management may deteriorate. However, the problems with the after effects of the storm also built a sense of local fellowship. This can be utilized as a *'wake up call,'* to raise awareness about the need for proactive, system-wide action (*National Board of Forestry, 2006*).

The global development challenges and the unsettled situation mean that there is a need and potential for the establishment of a new, sustainable forestry stewardship system.

The Forest Stewardship Council Mission

The Forest Stewardship Council (FSC) aims "to promote environmentally appropriate, socially beneficial, and economically viable management of the world's forests." (*FSC Mission, 2006*), defined as:

> "Environmentally appropriate forest management ensures that the harvest of timber and non-timber products maintains the forest's biodiversity, productivity, and ecological processes.
>
> Socially beneficial forest management helps both local people and society at large to enjoy long term benefits and also provides strong incentives to local people to sustain the forest resources and adhere to long-term management plans.
>
> Economically viable forest management means that forest operations are structured and managed so as to be sufficiently profitable, without generating financial profit at the expense of the forest resources, the ecosystem or affected communities. The tension between the need to generate adequate financial returns and the principles of responsible forest operations can be reduced through efforts to market forest products for their best value." (*FSC Mission, 2006*)

Although FSC certification is becoming widely recognized, there is a difference between those goals and the way forestry management is currently performed.

Sustainable Forestry is Gaining Ground

In a recent textbook on environmental science Withgott and Brennan *(2006*) stated that sustainable forestry is gaining ground. The book's perspective is that "forestry, today must balance the central importance of forests as ecosystems with civilization's demand for wood products." The concluding remark in the forest management section is that; "Sustainable forestry is more costly for the timber industry, but if certification standards can be kept adequately strong then consumer choice in the market place can be a powerful driver for good forestry practices for the future" (*Withgott and Brennan, 2006*). This view is common in Sweden.

Global Competition

Under current globalization processes, markets place severe pressures upon companies to become and to continue to be internationally competitive. This often means that they must compete with companies that produce their goods and services in countries where the workers earn one to two Euros per day. Within this context, companies seek to perpetuate their positions of power by outsourcing, succumb to hostile takeovers, or go bankrupt. In this context, if the total business system succeeds in getting the basic resources for very low prices that are far below the levels needed to ensure their sustainable management, the basic human and natural resources become worthless.

This is a major challenge for sustainable development of renewable resource systems like forests. If the trees are perceived as valueless or of relatively low value, how shall land-owners and society *'at-large'* develop and implement the processes and incentives for planting and managing forests so that they can obtain a sustainable yield, not only of timber, but also of the many other services that a healthy, diverse forest provides?

There is an urgent need for ecological forest management expertise. However, the situation may be inadequate if certain "experts", businesses and authorities use the sustainability argument to make money and increase their own influence by promoting work with the problems that they themselves highlight. This risk applies to projects that deal with sustainable forestry, in an analogous way as for pollution control technology, as discussed in the following section.

It is a dilemma that it is easier to be noticed when one takes action as forming a "fire brigade". But, to enable sustainability there is a need to develop systems to steer clear of "fires", for example to establish types of forestry practices that avoid devastating effects from storms. There is a need to promote action to develop front-end solutions. The Swedish authorities' sustainable forestry approaches, thus far, tend to focus on legislation for protection of old forests and dead trees, from a bio-diversity protection perspective and from a perspective of limiting allowable harvest.

There is less public interest in forestry-based business development and sound cultivation of forests for the future. This is analogous to how the heightened consumer awareness of accumulated industrial wastes led to regulatory actions to reduce waste, and that the resulting increase in costs for regulatory compliance by end-of-pipe pollution control approaches tends to constrain profits and that this may counteract prospective investment in prevention oriented cleaner production approaches. (*Schley and Laur, 1996*) This indicates the complexity in using regulations such as waste taxes and nature conservation to promote front-end improvements. Consequently, there is a need for life-cycle perspective and innovative, systems approaches.

From End-of-Pipe Costs to Transformative Renewal

It is essential to establish a unifying perspective where end-of-pipe analyses and traditional environmental science knowledge are utilized in concert with other kinds of knowledge to provide insight, guidance and drivers to make a transition to more proactive, preventative, front-end production, product and system developments. As a term for this refinement and

transformation of knowledge, Figure 2 uses the term *Knowledge Management.*

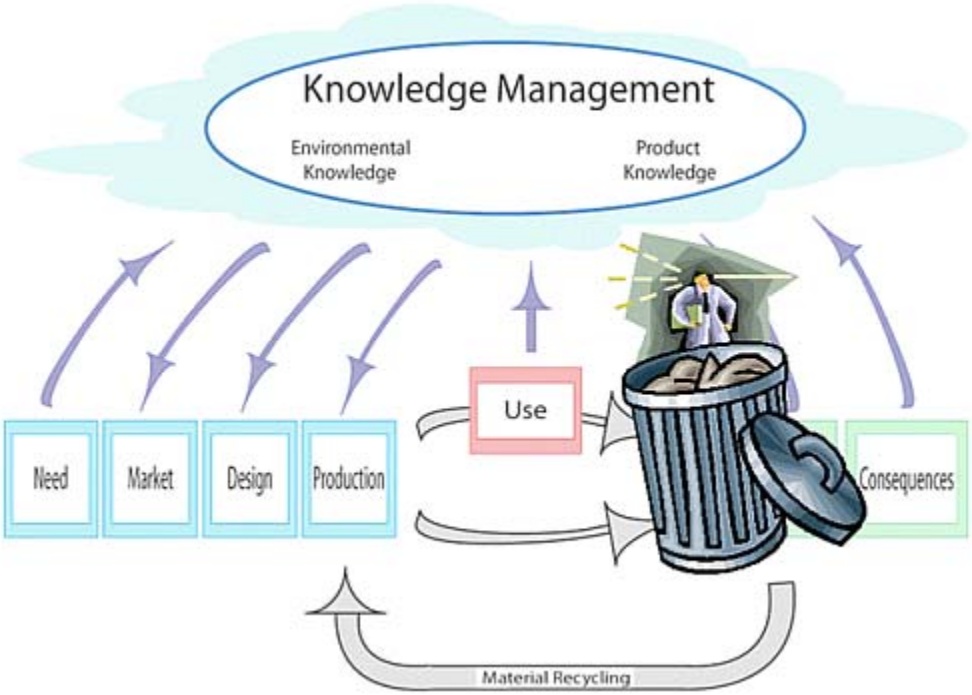

Figure 2 A product life-cycle view from needs to consequences, with material recycling (at the bottom) and "immaterial recycling" and learning (the upper side of the figure). One main aspect is to clarify how environmental knowledge can be made more useful for companies in their proactive sustainable business development.

Figure 2 illustrates a pile of waste at the use/end-of-pipe location. From that position, one may look in two different directions. Firstly, there is an obvious need to decide how to manage the waste and about the possible consequences for nature and society, i.e. end-of-pipe analyses and waste management developments. Secondly, in a prevention-oriented, cleaner production and long-term perspective, it is more important to consider why there is so much material that is so problematic and has such low value, and how these materials can be reduced through developments in the preceding life-cycle steps. This approach to system development will help researchers; forest owners, business people and society build systems that are more effective throughout the entire consumption and production system by providing guidance for front-end and system-wide improvements.

Integration of Production and Nature Diversity Interests

The results of the 2005 winter storm created new interest in the possibility and necessity of integrating the timber industry's production goals and the ecological nature conservation goals, into sustainable management of forest and forest product's systems. While there is no clear consensus at this time, in the aftermath of the storm, an opening towards concerted proaction is that those two goals are now being discussed simultaneously, in the same rooms, at local meetings. A reinforcing background interest is that Sweden's Prime Minister has decided to make a serious attempt to cut Sweden's dependence on fossil-fuel based crude oil by 2020

(*Statsministern vill stoppa oljeberoendet, 2006*).

In Sweden, forestry or alternative uses of the land are a major source of renewable energy and consequently, it is obvious that there are strong sustainability oriented development motives to increase the productive use of forests. Those discussions are building a cognitive tension, a creative abrasion (see below) that provides a driving force for transformative rethinking for the development of new, holistic forest product-service systems.

A transformative process to achieve sustainable success is dependent on awareness of the need for change and internalization into personal missions to make front-end changes, within the company's core business. (*Karlsson et.al., 2004*) It takes more than lecturing on environmental facts to build such confidence. "The sustainability challenge contains a need to rethink, at a level that may be quite frustrating." (*Karlsson et.al., 2000*) It is not only a question of balancing social, economic and environmental concerns, it is also fundamental to think about how humans learn and understand and why people decide to do, and to not do various things, (*Zadek, 2001*), see also below.

Leaders, Visionary Catalysts and Consensus Building for Renewal

To bring about the transformation to a more constructive interaction between proactive business development and sustainable forestry interests, there is urgent need for visionary leadership. There is also need for collaboration and for persons that are active as change agents. This is essential to support transformative change.

Maccoby (*2003*) describes how strong leaders are important in periods of revolutionary change. There is also a need for readily understandable framing/systems to catalyze thinking that enable numerous persons to understand and to become committed to the core driving forces. Key persons in this system can serve as *brokers* between different communities of practice (*Wenger 1998*). For such a system to function optimally, there is need for persons that have knowledge about, and acts as *brokers* between, the companies' and the academic cultures. Such a *broker* must understand the different ways of learning, what companies want and how to integrate and build upon academic rigor and effective dissemination of knowledge, e.g. about system's approaches to sustainability knowledge. The **ISSF** system promotes open dialogue among relevant stakeholders with the objective of building consensus of vision for sustainable forest management as integral to regional sustainability. Additionally, fostering and supporting long-term commitment and empowerment to implement the visions are essential.

The Sun as a Conceptual Framing

In explaining the development of his own scientific thinking, the Nobel Prize laureate Feyman, describes (*Feyman, 1999*) how his father interacted with him as a child. In relation to the concept of energy, he illustrated the basis for the development of his own way of thinking by describing that when talking about how a toy dog moves, his father said that; "It moves because the sun is shining". This resulted in a series of questions from the winding up of the spring, through energy in food and ending with the energy from the sun. This form of dialogue with children promotes systems thinking. From various pedagogic perspectives, it is important for learning to have a conceptual platform of experience to start form, a foundation where words and concepts have the same meaning.

It is important to build a shared understanding with a foundation in something significant and irrefutable. One way to explain new and abstract concepts is to work with storytelling. According to Brown et.al. *(2005),* societal integration can be improved when people "grasp the innovative potential of knowledge ecologies, where there is creative abrasion and the social construction of joint understanding. Countries, regions and companies that understand this will flourish; those that don't are in for a hard time." (*Brown et.al. 2005*) The dialogue with the sun as an unchanging point of reference illustrates a wide and apparently unquestionable framing that Fayman's father used to create a creative abrasion.

The sun is definitely important for forests, and so is biodiversity. But still none of these framings provide direct conceptual guidance for why the forests are being managed in the way they currently are. Zadek (*2001*) provides a conceptual reframing that is relevant for such considerations. He starts by noting that the conventional wisdom is to show sustainable development with the environmental, social and economic aspects as three interlocking spheres. Secondly, he continues by noting that the human society lies wholly within the natural environment and that economy is a tool that is used in human societies. Consequently, he shows a literal visualization where the economic sphere is a part of the social that in turn lies entirely within the environmental. Thirdly, he emphasises that "sustainable development is an entirely human, or socialized, conception." It is humans that understand or do not understand, and care or do not care. Consequently, Zadek's concluding cognitive visualization of sustainable development shows the social as the major, basic sphere that includes a smaller sphere with environmental, economic and financial aspects.

The process that controls the progression of how most Swedish forests develop has its driving source in something like Zadek's cognitive visualization. To a large extent, the selection and nurturing of plants is governed by what humans do and do not do. Of course, many plants will hardly grow up to anything valuable if inappropriate choices are made, i.e. if the forest is mismanaged. But still, it is human action, or lack of action, that causes different results. The sun, climate, soil and husbandry all influence the growth rates of all plant species. Biodiversity aspects are certainly important. But still, those fundamental aspects are interpreted by humans, who understand or do not understand, and consciously or unconsciously decide to care or to not care.

Currently, the only factor that seems to be considered by most forest based businesses is the short-term economic profitability. The decisions about forest management are based on financial analyses that are often made by experts that are working, more or less directly, for the established, in Sweden spruce based, industrial businesses. Consequently, there is a serious risk that the driving motivation comes from the interest to have an abundant supply of timber for the existing industries in the short-term and that no or little attention is directed to long-term sustainability.

The Use of Business Science Competence - Sustainable Development

Is there a basis for sustainable development work in leading business management theories? Among environmentalists, the modern business paradigm is often interpreted to be totally non-sustainable. For example, the statement; "*The business of business is business*", made by General Motors, President Alfred T. Sloan, Jr. in 1923, has often been interpreted to have a single-

minded focus on (short-term) profit. However, Sloan's framing for the statement supports interpretations such as: "*To be sustainable, what a company has to do is to use the present profit to develop new business opportunities*."

More recently, when explaining competitive advantage; Porter argued that, "*those companies which are able to achieve competitive advantage – that is, above-average performance in an industry sector – are able to reinvest this additional profit into the activities that created the advantage in the first place…*" (*Trott, 2005*). This is a serious message; because, what was it that created the advantage? It was not the profit of present activities, but the creation of the present business system based upon past profits. 'The activities that created' here means the inventions and innovative development that built the business system.

This implies that business management theory includes conceptual tools for transformative renewal. However, there is always a risk that an established organisation is inclined to promote continuation with the already established products, businesses and habits. It is obvious that incompetent companies have limited ability to develop themselves in competitive way. Christensen (*1997*) has highlighted that even very competent companies try to continue with a linear progression on the development path that they have invested in, as illustrated by *Business as Usual* in Figure 3. To achieve sustainable development, it is necessary to be able to envision new possibilities to solve old and new problems and to take on the challenge to change one's path of development.

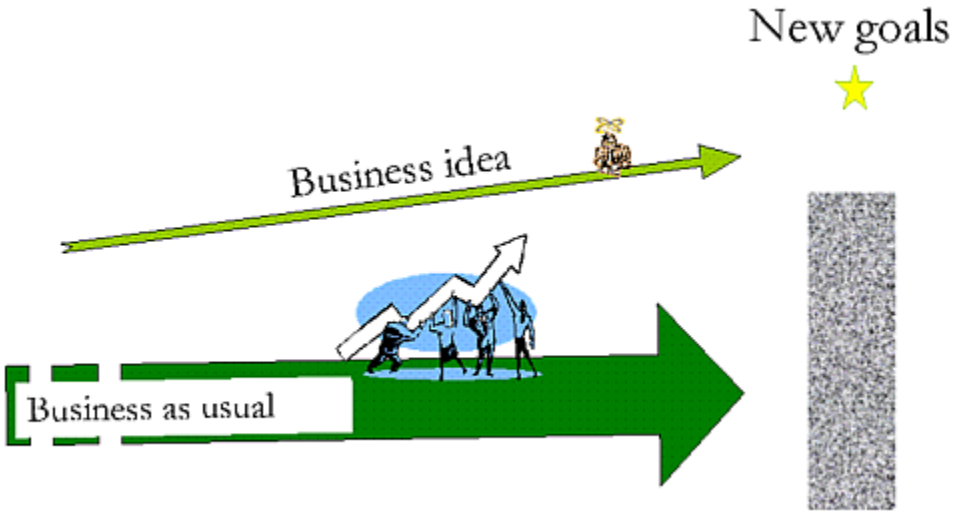

Figure 3 Transformative developments as a way to business renewal, to make a turn from the linear path of "business as usual" growth, which is bound to hit some serious wall, sooner or later.

It is difficult to make transformative changes, also for the very competent. However, it is possible to combine some conceptual framings from innovative business management with the renewal oriented sustainable development ambitions.

Design – Development of Resources

The value of a resource has material and non-material bases, related to the knowledge about and 'value placed' on the different kinds of matter. The material aspect has its primary foundation in nature, whereas the non-material aspects are humanly created resource aspects. The most explicit aim in EcoDesign (*Karlsson and Luttropp, 2006*) is to combine the creation of added value with reductions of environmental loads and to reduce the consumption of resources in such a manner that all can be sustainably produced and consumed. In the literature, it is less clear if and how the subject area EcoDesign relates to beautification of the environment and utility enhancing resource developments that improve the sustainability potential for human quality of life.

In environmental assessments, the use of raw-material resources is accounted as consumption of resources from nature. The resources tend to be perceived as if they have always existed in nature, and raw material values are associated with the availability of concentrates of the needed kinds of atoms. In addition to physical properties, the resource values are also dependent on human knowledge about the respective kinds of matter. "Resources are not, they become" (*Gregori, 1987*) (*Karlsson, 1998*), e.g. iron ore became a resource when the Stone Age people learned to make use of iron. Consequently, it is possible to further enhance the stock of resources. Design could take a clearer role as a driver for developments that make more renewable materials more useful as humanly valuable resource supplies.

Until recently, the business situation of the Swedish timber market is that there has been limited interest in hardwood for a number of decades and the Swedish forests have become dominated by cultivated coniferous softwood species. Many Swedes consider hard-wood trees to be more beautiful and sustainable, e.g. for diversity reasons. Furthermore, the desire for individual and exclusive wooden artifacts could once again become a sound market for a diversity of beautiful and functional hardwood products, from many species of trees.

Sweden is one of the places where hard-wood is a diversified renewable raw material resource. Simultaneously, the diversity of trees also contributes to a better biodiversity of other flora and fauna, improved quality of air and water quality and more attractive recreational values. The long-term, material supply capacity and environmental qualities are dependent on sustainable forestry.

Design – Enhancement of the Value of Forests and of Forest Products

The design, production and marketing of attractive hardwood products can catalyze elevated customer interest and motivate investments in hard-wood related businesses (See Fig. 4). Such customer interests and business capabilities can increase the value of hard-wood trees and make them more interesting for forest land owners to carefully nurture. In this way, a higher market value for hard-wood would lead to a higher future content of hard-wood trees in the forests. Such market-based mechanisms can give a stronger promotion for biodiversity development than when only working with the conservation approaches thought to 'protect the scarce species'.

Narrowly focused 'conservation' approaches tend to result in economic skepticism against hard-wood amongst land-owners because if allowed to grow, these trees may become interesting conservation objects that in turn cannot be harvested, even if they are near to their natural life's end. To avoid this, farmers' invest time and money in mono-cultures of coniferous forestry, by eliminating young hardwood trees.

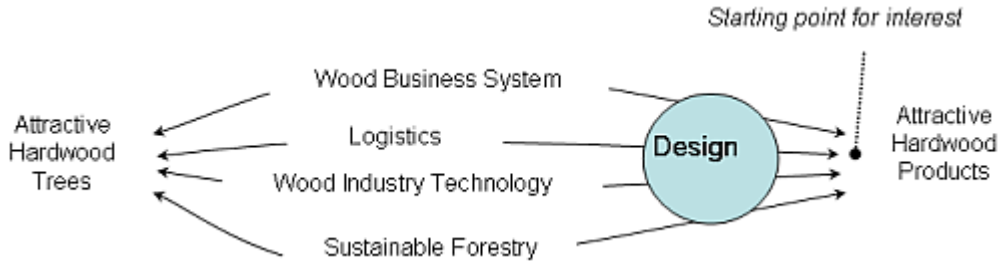

Figure 4 Customer preferences for hardwood and Design as initiators for value adding business developments and enhancements of hardwood resource values.

Figure 4 has one base in a market-based perspective, as suggested by (*Barabba, 1995*); where developments have their main starting point in the market pull. In the older production push perspective, the conceptual starting point for thoughts about significant developments would usually focus upon new technical possibilities and production capacity. In the market of today, it is the appraisal of potential customer interests, in certain areas, that is the key criterion for decisions about where further business development investments are made. Barabba suggests a market-based approach which integrates serious consideration about where the company has its most qualified expertise.

Product design in relation to customer interests has always had a development promoting role. Drawings and material manifestations have a potential to trigger a clearer communication among the actors in the supply chain. EcoDesign ought to promote development of "wider" more effectual communication channels, including clearer links to developments of the resource stock for the future, as demonstrated by sustainable forestry in Fig. 4. However, when looking at today's monetary resource values; a high raw material price is often an indicator of scarcity, i.e. a low sustainability potential. Still, high prices for essential raw materials are a good way to promote improved forestry husbandry for sustainable production and consumption.

The hard-wood trees are an important constituent of sustainable forestry. **ISSF** is designed to promote development of systematic knowledge about sustainable forestry and development of a diversity of hardwood related businesses. This innovation approach builds upon product design as key in the "systems thinking" that builds a conceptual linkage between value-added hard-wood products and the positive valuation of hard-wood trees. This ambition includes value enhancing development of the total supply-chain that enables the higher customer values through manufacturing, wood, and timber and forestry management. In this context, improvement of the market image of wood products includes remaking a genuine connection to nature, as well as using the wide assortment of unique wood properties for building materials and furniture.

At the customer side; this product design perspective is being used to support an increase in the product's market values. In the business system development; the visualization of the present and potential customer values for wood is being used as a motivational factor for forest owners. One basis for the trustworthiness of this message is that it is communicated by companies and persons that are established in and trusted by their local communities.

Training for Transformative Thinking and Action!!

An important element in sustainable development is that there must be a sound and well

supported process of change, transformation and renewal as well as a readiness for quantum jumps. We should not get caught up in recycling but move ahead to reusing and rethinking. As McDonough stated in the inspirational film *The Next Industrial Revolution* we should not get caught in trying to handle and reduce waste. (*The Next Industrial Revolution, 2001*) He suggests that, the level of ambition ought to be to try to get rid of the concept of "waste." Basically, we should think in terms that all outputs ought to be valuable "food" for some other system. We should think so that we can look beyond how the system presently works. There is a need for mental training to develop the ability to rethink what we are doing.

One aspect of the challenge associated with the transformation to a more sustainable path of development is that the main sustainability considerations have to be described in a readily understandable form. Writing is an important tool for comprehension of what is going on. "If people know what they think by seeing what they say, then the variety, nuance, subtlety, and precision of that saying will affect what they see, question, and then pursue." (*Weick, 1995*) One common limitation of pre-industrialized production systems was that there was comparatively little refined, written material about the technology and how the business systems worked. In recent decades, the Swedish industrialization and research on forestry based business has focused on soft-wood, and there has been less advanced writing in relation to hard-wood forestry processes. This caused a limitation in the present ability to make sense of how hard-wood businesses were developed and can be developed in the future.

When looking at Figure 3 in relation to the possibility to use analysis and modeling to clarify the need and advantages of transformative initiatives, there are several challenges:

1. **Economic bias:**
   The established soft-wood *'business as usual,'* system efficiency has been optimized during several decades, whereas much less investment has been made in hard-wood and bio-energy, which means that there is a bias in comparisons of economic measures from optimized and much less developed system aspects.
2. **Status, power and influence:**
   Many business leaders and experts in the *'Business as Usual'* system have status, power, financial resources and societal influence.
3. **Ability to rethink in concert:**
   There is limited explicit knowledge about the potential of a more diversified forest-based business system, which makes it more difficult to analyze, communicate and judge its business potential.

Points 1 and 2 are difficult enough, but point 3 poses an even larger obstacle. It is not easy to conceptualize the possible market-driven relations between the design side of a new business system and its multi-stage connections back to forestry management and to communicate about the potential business system advantages in a comprehensible manner.

A Systems View on ISSF

When reviewing the Swedish innovation thinking and ISSF, in relation to forestry-based businesses, one fundamental aspect is the selection of perspective regarding the need for development. What level of change is essential? What is it that is required to achieve sustainable

competitive advantage?

The discussion about the value of business management theory, e.g. Sloan and Porter, highlights some leading business expert's interest in transformative change. The message about the importance of innovation that bridges the differences between different generations of technology and also between different generations of market thinking is severe. At a basic level; it is not a matter of quantity and efficiency, rather quality and effectiveness. It is a transformative way of thinking that Ackoff described as follows:

> The measure of a society's economic growth is the quantity of resources that it makes or helps make available for use, that is, the standard of living it provides. In contrast, development has to do with how well resources can be used and created in the pursuit of objectives. It has to do with what one does with what one has. It is better reflected in quality of living than in standard of living. It has to do with increases in an individual's or group's competence, which is a mental property; growth has to do with increases in physical properties, quantity. … ***Development is a matter of learning, not earning***. *(Ackoff and Rovin, 2003)*

It is difficult to measure such qualitative mental property. This highlights a need to develop a common vision for a new innovation system; for this, it may be effective to use descriptive stories, (*Brown et.al. 2005*) and Figure 5. It is not sufficient to communicate only in terms of analysis and aggregated numbers. There is a need to build and connect to human motivation.

To promote engagement in transformative developments, we try to use conceptual foundations such as those presented in, "*The pleasure of finding things out,"* (*Feyman, 1999*) and "*The existential pleasure of engineering."* (*Floorman, 1976*). When trying to make transformative things happen we find interesting aspects in concepts such as **Flow** *(Csikszentmihalyi , 1992)*, **Synchronicity** *(Jaworski, 1996)* and **Presence** *(Senge et.al. 2004)*. The story presented in Figure 5 indicates how an earlier local Swedish author highlighted active, independent creativity.

It is Pleasant to be "Present" in a Sustainable Forest

In addition to the diversity of beautiful products; sustainable forestry also contributes to a more multifaceted nature and regional business development. A landscape element of hard-wood trees improves the ecological biodiversity and makes the landscape more living and attractive for various recreational purposes and as a place for living. It can be very pleasant to be present in and meeting the quilt of beauty of such a natural treasure. One cultural element that contributes to the constructive use of systems thinking in local dialogues about the human merits of sustainable forestry is that this initiative was started in the region that was the home of Astrid Lindgren (Fig. 5) and Carl von Linné.

Linné was "a Swedish botanist, physician and zoologist who laid the main foundation for the modern scheme of biological nomenclature." (*Carolus Linnaeus, 2006*) He is also considered one of the fathers of modern ecology and one of the most famous Swedes ever. There are numerous local Linné activities (*Carl von Linné a knowledge project, 2006*). Linné improved the basis for sense-making of nature and the perspective in Lindgren's stories; see Figure 5, supports

conceptualization of sustainable entrepreneurship.

Storytelling and Odd Characters

Astrid Lindgren “was a Swedish children's book author, whose many books were translated into over 70 languages and published in more than 100 countries. She grew up in Småland, Sweden. Many of her books are based on her family and her childhood on a little farm.”(*Astrid Lindgren, 2006*) Lindgren’s books communicate a love for nature in, the Vimmerby countryside lifestyle and a love for her characters.

Lindgren's best-known characters are independent and unconventional, such as the untidy Pippi Longstocking and Emil with his pranks. They broke the tradition where children behaved well, and appealed to the little anarchist living inside every child.

One of Lindgren’s characters is Emil in Lönneberga (Emil on Maple Heights). Emil is a boy who lives on a farm. He is a good-natured person, however very active and causes a lot of nuisance, in particular to his father who often got furious about his mischief. Emil is then locked into the farm’s ‘snickarbo’ (carpentry tool-shed). During each lock up in the tool-shed, for a mischief, he used the time to carve a small wooden figure. Emil was very creative with his carvings and his other activities.

Emil often had good motives for his activities and some of his temporarily frustrating activities often resulted in very positive long-term effects. For example, he wasted money at the market buying seemingly stupid things that later proved to be very useful, in other, more important ways, than initially expected. For example, a large wooden bread-spade became very useful to calm people down during a big fight at the cattle market. At Christmas time Emil “wasted” all the food that had been prepared for a fine dinner by inviting all the poor people in the village to a party. As an adult, the story says that Emil became the chairman of the community board. As a story character, Lindgren’s Emil is somewhat similar to the Wernerträ sawmill manger, Egil.

Egil is doing a number of things that deviate from the traditional business norm. He stresses that it is unwise to make paper pulp from furniture quality hardwood timber, also when pulping is the most economic use according to the generally accepted price structure and logistics. He also argues against the need for pressure impregnated wood by emphasising that Oak increasingly is also being used in earth contact parts of play-ground equipment. Egil tells stories about how the quality of this wood enables long-lasting earth contact utilization without use of non-natural pesticides. At the value added side, Egil stresses that the use of Oak means that, when a child runs a splinter into a finger there is less reason for worries. Another product area is that; Wernerträ is working with moisture tight consumer packaging for shopping mall sales of pieces of kiln-dried handicraft wood, with a moisture content adapted for Swedish indoor climate product use. Carpentry with such wood may promote creativity and give long-lasting outcomes.

A famous person from Småland that started with then unconventional wood-based business ideas is Ingvar Kamprad, the father of IKEA. There are numerous stories

about Kamprad and those are a part of the IKEA image.

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Figure 5 Narrative stories as a tool to enhance the common understanding as a base for transformative work, i.e. to build bridges between different communities of practice.

Linné contributed to a more structured language for dialogue about the species in nature. Lindgren's characters were living close to nature and her stories highlighted the importance of engagement. The nurturing of plants in a sustainable forest may be perceived as a way to build a personal monument for the future, while ensuring a sound economic, ecological and ethical basis for the short-term and for the long-term. Some **ISSF** actors use storytelling as a tool to envision the human value of substantial connections to nature and to regional sustainable development.

A Basic Challenge for Transformative Development

There is always a need for experimentation with transformative business developments, in particular if a company's or region's business development has been following a linear path of quantitative development for a long time. From global competitiveness points of view it is serious if there is little development in a regional branch of industry. It may be even more serious if much money is spent on developments that are misperceived to be advanced and prospective, but that in reality are tied to a linear track of "business as usual" (Figure 3) without a truly market-ecosystem-community based system designed to create new, value added products, services and sustainable societal values.

Conclusion

There are great opportunities for multipurpose use of forests to meet several kinds of highly valued interests, through combined use of different kinds of knowledge and management systems. **ISSF** is designed to support transformative innovations through promotion of further development of the forest-based business system to produce higher added value and to enable a more sustainable forestry and thus a more sustainable society.

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