Innovation management

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Innovation Management

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(!)	Important information	(☕)	Example
(i)	Background information	(🔖)	Definition
(💡)	Stop and think	(✈)	Weblink
(📄)	Case study		

TABLE OF CONTENTS

CASE STUDY INDEX

1 BASIC ON INNOVATION

Yannis Kalivas, Fanianna Gkofa, Christos Rakovitis, Aleksander Tonkov, Velizar Petrov, Borut Likar

1.1 Learning objectives

The aims and objectives of the module are as follows:

- to build on the education and experience that each manager in the forest sector already possesses
- to enable managers to manage innovation processes with greater understanding in the forest sector
- to help managers to appreciate the breath and complexity of innovations
- to develop managerial skills that will enable managers to achieve success in the field of innovation management in the forest sector
- to enable managers to evaluate and plan innovations in the forest sector
- to allow individuals who are involved in innovations to contribute more fully to their satisfactory outcomes

After reading this module, you should:

- Have a better understanding pf the impact of the innovation on your company
- Appreciate the complexity of defining innovation
- Understand the different types of innovation and how to recognize them
- Appreciate many of the characteristics of innovation

1.2 Introduction

This module seeks to introduce participants to the issues that affect managers and owners of the enterprises in the Forest sector when they are attempting to undertake an innovation. Many management theorists suggest that innovation equates to the everyday running of an organization. The management of innovation should be seen as commonplace rather than a special function and all organizations should be credited with a need to behave innovatively.

1.2.1 What do we mean by innovation?

Just reflect for a moment to identify the greatest innovations of the last century. What is on your list of suggestions? What led you to put forward those particulars innovations? What do you feel makes them particularly innovative?

Click on the link below to read a few quotes which might help us decide what we mean by

innovation.

Innovation is both a necessary means and a desirable end for businesses in a fast moving global economy. It is about managing a process that delivers either new products and services to the customers, efficiently, effectively and faster than the competition, or about enhancing the delivery of existing products and services by process improvement. Generally innovation involves managing a complex mix of procedures in a context that often conditions the way the end result will be achieved.

Download:

[Statements about innovation](#)

1.3 Importance of innovation

Innovation is important to organizations in the forest sector because of:

- Competitive pressures and the need to survive
- The management of a firm or enterprise. Managers have to implement change, new processes and improvement in systems.
- The impact of innovation on organizational life.

Competitive pressure and the need to survive

Gary Hamel (1998), writing in the Sloan Management Review, suggests that *only those companies that are capable of recreating themselves and their industries in a profound way will be around a decade hence*. The warning is simple, innovate or perish!

Research in the fields of organisational management and marketing suggests that companies and organizations that use the innovation process to differentiate their own products and services from their competitors are twice as likely to be successful both strategically and financially.

Competitors often observe that innovative organisations represent a threat to them out of all proportion to the size or financial performance of the innovative organization concerned.

The impact of innovation on the organisation

As with most complex relationships, innovation is more, 'art than science' and outcomes tend to be both psychological and materialistic in nature. In any particular case, the 'outcomes mix' varies according to the nature of the innovation and the organisation undertaking it.

Outcomes from the innovation process

Tangible outcomes are outcomes which are observable and apparent. They include:

- Increased corporate success in measurable terms, such as the value of an organisation's shares, the general profitability and growth rate. The business tends to command a greater market share by virtue of market penetration and the number of new products and services that are made available to clients.
- Greater efficiency. A more structured approach to product and service development, with greater focus shown by both management and employees, increases the likelihood that the organization will improve its practices and processes in a way that will deliver effective changes and greater efficiency.
- Happier, more flexible and more productive employees. Employees in innovative organizations tend to feel more valued and to be more loyal to the organization, which tends to result in more flexibility, higher productivity, less absenteeism and a lower employee turnover rate.
- A more modern, high-tech working environment. Innovative organizations tend to modernize their employees' working environment and employ new technology to enhance the organisation's effectiveness and efficiency. This has a positive impact on employee's morale.
- Continuous improvement. When a product or service is innovative, the internal processes and procedures, which support the delivery of the innovation, tend to be both innovative and increasingly effective.

Intangible outcomes tend to be psychological in nature, at the level of beliefs and attitudes. They often outweigh the tangible outcomes and can include the following:
- Senior Managers tend to exhibit a high level of confidence in their own judgement. They tend to be willing to take risks, to speculate and sometimes to think the unthinkable.
- Employees tend to develop a profound interest in each other's ideas and opinions. This results from adopting an innovative attitude (i.e. one that is open, aware and questing for new or novel solutions to both threats and opportunities).
- An increase in team cohesion at project and organization level.
- A change in leadership style. Innovative managers tend to exhibit a leadership style that is founded on mentoring, encouraging and understanding.

Think about a recent innovation in your company. What to your knowledge were the intangible outcomes?

1.4 Definitions

Many attempts have been made to define innovation but few of these definitions capture the complexity and scope of the process of innovation. This section gives examples of some recent definitions that have been put forward by leading authorities in the area,

followed by our attempt at a comprehensive definition.

Dictionary definition

Innovation (Latin – innovare) : to make something new. (Oxford English Dictionary)

Opportunity exploitation

Innovation is a process that turns new ideas into opportunities and puts these into widely used practices. (Tidd et al, 1997)

Industrial Innovation

The technical design, manufacturing, management and commercial activities involved in the marketing of a new or improved product or the first commercial use of a new or improved process; (Freedman, 1982)

Changes in technological know-how

Innovation does not only concern itself with major advances in technology or the commercialization of ideas but it also concerns itself with the utilization of small scale changes. (Rothwell and Gardiner, 1985)

The entrepreneurs tool Innovation is the way that companies gain competitive advantage by approaching the way they do thing in the broadest sense and including new technology. (Porter, 1990)

Short and sweet

Innovation is the successful exploitation of new ideas. (UK DTI Innovation Unit, 1994)

The European Commission definition

The European Commission Green Paper on Innovation (1995) indicates that the term innovation is commonly used in two different ways:

• To refer to *the innovation process* itself (i.e. the process of bringing any new, problem-solving idea into use)

And

• To refer to *the result of the innovation process* (i.e. a new product, process, service or work practice). An innovation in this sense may be a radical innovation/breakthrough or a product, process or service improvement or an adaptation.

Definitions emphasizing the input to the innovation process

Rogers (1983) defines innovation as *an idea, practice or object that is perceived as new by an individual or other unit of adaptation.*

The ERSC Innovation Research Programme 1995-2000 had adopted this definition *Innovation – the successful exploitation of new ideas*.

Tom Peters in the Seminar Brochure for "Implementing In Search of Excellence" says

Innovation: simply a good new idea acted upon. It can come from skunk-works or champions, from associates or customers, from assembly lines or loading docks, from reception desks or boardrooms.

Kanter (1984) says simply that *innovation refers to the process of bringing any new, problem-solving idea into use.*

Definitions emphasizing the output from the innovation process

Smith and Ainsworth (1989) say that, in the broadest sense, *innovation includes the idea of invention and discovery, but goes beyond it. It is anything that provides usable, unique novel solutions to problems, opportunities or challenges – whether small or large. Some examples might be a new use for an old product; a new product from on-the-shelf technology; a novel marketing strategy.*

Rogers (1983) defines the innovation output as *an idea, practice or object that is perceived as new by an individual or other unit of adoption.* This suggests than an innovation is a cognitive interpretation with the user of the innovation being the judge as to whether the entity stands as an innovation in its own right against the individuals past experience. This makes evolution of an innovation subjective – innovation in the eye of the beholder.

Hard work not genius

Peter Drucker maintains that innovation is systematic and focused and requires new knowledge and a change in perception. He goes on to state that *Innovation takes (hard) work rather than genius.* (Drucker, 1991)

Our attempt at a comprehensive definition

The creation, development and introduction of new products/services or product/service components, or a new procedure or process for doing things to benefit one or more of the stakeholders in the organisation. The product/service procedure or process need not be completely novel but it must be new to the organization itself.

Try to define what innovation is in your own company. Is this the same as your own definition of innovation? If not, why not?

www.creativeadvantage.com/innovation-definition.aspx

http://innovationzen.com/blog/2006/11/17/the-definition-of-innovation/

http://www.providersedge.com/docs/km_articles/sample_definitions_of_innovation.pdf

http://www.businessdictionary.com/definition/innovation.html

1.5 Types of innovation

Higgins (1996) suggests that there are four types of organisational innovation :

- **Product innovation** (which results in new products or services or enhancements to old products or services)
- **Process innovation** (which results in improved processes within the organization – for example business process re-engineering)
- **Management innovation** (which improves the way the organization is managed)
- **Marketing innovation** (including the functions of product promotion, pricing and distribution).

The following notes have been prepared to explain more fully the four headings above.

1.5.1 Recognising innovation in products and services

How can the organizational observer recognize innovative behaviour, particularly with reference to products and services?

Most companies give implicit indications of the fact that they are attempting to change and improve the way that they conduct their business. They seek to keep waste to a minimum, they attempt to keep a tight rein on their cash flow and they undertake training.

Whilst the above activities are essential, the organisation which is consciously involved in innovation will have also a high degree of focus on innovation and a defined innovation process. The process will be recognized by the majority of the staff and management as an integral part of the corporate fabric.

The following features are characteristic of an organization that is involved in developing new products and services.

Scanning for ideas

- Ideas are the starting point for innovation. An innovative organization encourages its employees to scan for ideas for new products and services, both inside and outside the organization. Employees are 'enabled' to scan for novel ideas by acquainting themselves with the organisation's market place and changes in technology.

Strategy formulation

The innovative organization will be prepared to devote energy and time to formulating strategy.

The innovation of new services and products is an interactive process which requires a delicate balance of structure and flexibility.

Innovative organizations sacrifice the rigid command system to develop strategy which contains features such as:

18

- The innovation framework is clear and well defined and closely follows on from the overall business strategy
- The organisation's master strategy calls for innovation to be a strategic concept. Innovations are allowed to emerge but they have to comply with the core business thrust.
- Strategy is informed and not imagined. Concepts are tested and alternatives are investigated with different perspectives being considered during the decision making process
- Suppliers of components and subsystems are invited to become part of the strategy formulation process
- Leading clients are identified and knowledge is shared

Effective resourcing

The innovative organization will involve itself in correctly resourcing changes to products and services. Research and development is seen to be an important part of the future of the organization. Employees involved in research and development work towards a common goal and express a feeling of achievement, even if new products are not 100% successful in pre-sales trials.

Resources are not always vested in the team or organization. Some resources may only be available through external cooperation. This implies an ability to negotiate and innovate through partnerships.

Managing product innovation

Managing product innovation involves managing the structure and culture of the organization as well as managing external linkages and the innovation process itself.

New product development can be considered to be a funnel (Wheelwright and Clark 1992). The outline concept is squeezed into a detailed design that is further reduced through testing into the product that is to be launched.

The process refines and reduces risk of failure.

The funnel is very effective when working in cross-functional teams, where a danger exists that a project may become enhanced rather than refined.

Implementation

The implementation of a new service or product is accompanied by organizational acclaim in an innovative company. The acclaim is underpinned with a mixture of confidence and concern. Most employees will express confidence in their new product because their diligence and effort has led to concept ownership but they also feel concerned because they know that the innovation process is virtually endless.

1.5.2 Recognising innovation in processes and procedures

The processes and procedures of an organization are the support systems that enable the products and services to be developed, produced and delivered to the customer.

The recognition of innovation in processes and procedures is normally a matter of internal knowledge and experience of the way that the organization supports its business endeavours.

The innovation of processes and procedures requires an astute knowledge of the factors that affect product/service efficiency and effectiveness within the organization.

The following features are characteristics of an organization which is innovating its processes and procedures.

• Companies that are innovative have highly effective, non-invasive monitoring systems which continually alert management to changing circumstances and alterations in standards of delivery.

• Processes act as a firm base on which to built project plans, interdepartmental co-operation and the norming of behaviours.

• Process innovation is quite common in most modern organizations because it is entirely within the province of the staff and management to design, implement and monitor the necessary changes without reference to external influences. On the other hand, an organisation's first response to an external influence is to reposition its internal functions to meet the prevailing threat or opportunity.

• Employees in organizations that continually up-grade their systems can suffer from a surfeit of change. However, well-motivated and well informed staff not only readily adopt innovations but they often enhance the innovation by expressing their own opinions and co-operating fully both change and the implementation of new procedures.

• Clearly, process changes should be focused on supporting the broader strategy of the organization, developing competitiveness and giving sustainability.

• Innovations which involve processes and procedures can have both tangible and intangible outcomes and can be predominantly hard or soft in nature.

Hard process innovations normally use computers or machines and improvement can be observed quite readily (or example, a larger amount of output is achieved for the same or lower level of input).

Soft process innovations are more difficult to recognize as they involve people and their behaviour and their approach to both daily work and moments of crisis. The flow of work through a factory can be planned but employees can radically affect the success or failure of the plan.

Does your company exhibit any or all of the innovation factors that have been mentioned in this session?

Download:

[Four distinct stages to process innovation](#)

1.5.3 Recognising innovation in management practices

Cooper (1994) has put forward a six stage model representing an overview of the process which assists new product development. This process involves a link between the stages which Cooper calls "stage gates". These gates are controlled by Product Managers and Project Leaders. In all cases the role of the manager is to make decisions relating to the suitability of the product to move onto the next stage. The model illustrates the importance of the manager within the innovation process. This importance is over and above any skills or abilities that the manager has to promote or contribute directly to the innovation. Equal importance has to be given to the ability of the manager, external to the innovation process, to manage the resources and support systems that impinge on the process. The manager within an innovation environment has to undertake the following **functions** and **activities.**

- They have to assist and facilitate the change that is happening within the innovation process. This is done by giving both managerial and logistical support as the situation demands.
- Each manager has to understand and appreciate the strategy that is being followed. They have to disseminate the strategy to the work force and communicate changes, improvements and variations to the appropriate departments.
- Managers have to encourage early involvement and commitment to projects. The manager has to establish that their department has "ownership" of the innovation as a whole as well as the section that concerns them directly.
- Managers have to create and maintain an environment that is both open and motivational. In an organisation which gains a competitive advantage through the use of innovation management behaviours can be recognised that tend towards mentoring, and away from the dictation of orders.
- With closer working relationships comes a need for target clarity and performance indicators that give measures against which progress can be measured. Rewards are often dealt with by linking a proportion of the amount that is paid to the progress of the project.
- Managers take time to develop their subordinates and they also seek opportunities for personal development. Training is seen as an investment and not as a cost and learning is a habit rather than an infrequent event.

- Management careers within innovative organisations tend to show a marked difference from standard ladder climbing. The career manager may actually move between organisations in order to gain promotion. He or she may find that departmental changes suit them and they may move between disciplines.
- Successful managers of innovation are good leaders with a persistent nature and a willingness to take risks.

1.5.4 Recognising innovation in marketing and distribution strategies and techniques

In its simplest terms marketing and distribution concerns bringing the product or service to the attention of the buyer. This involves much more than just creating product awareness, it involves the creation of desire and ease of purchase and need satisfaction. The marketing and distribution process is becoming more sophisticated with the employment of greater levels of technology to assist with the analysis of primary data as well as the development of new delivery channels and in the right form.

Innovations in marketing and distribution break the normal pattern, but not in a way which offends existing and potential customers. We can recognise innovations because we realise the outcome has been to change the relationship with customers. Intel ran its "Red X" campaign to attract the attention of consumers, rather than their traditional approach of selling to PC manufacturers. The company Ben and Jerry's gives a free scoop of ice cream to mothers and expectant women on Mother's Day. The successful advertising slogan "Heineken reaches the parts other beers cannot reach" is said to have resulted from the visit of an executive to one of the breweries in some out of the way place. Other examples are: Tupperware, who developed the "party plan" method of selling, Direct Line Insurance Services (based on telephone sales) and Amazon Books who sell to customers exclusively via the Internet rather than face-to-face selling. These and other innovations have resulted from "thinking outside the box".

Innovation strategy in marketing, distribution and products can be divided into **four categories**, as described below:

Technological (New and novel products in an un-novel market)

Known customer needs are satisfied with novel products and services. An example of this is the use of film optics replacing copper wires in telephone systems. The result is an improvement in services and call clarity. The main marketing thrust would be express higher levels of performance. The innovation in this case is driven by the developer.

Differentiated (Existing products in an existing market)

In this instance the product and the market are relatively well known and the only way to differentiate between products is to use prices, packaging or product support.

Architectural (Existing products in a novel market)

The innovative marketer will attempt to encourage a new designation of customers to accept an established product or service by adoption on recombination. The marketing required to stimulate this change of perception is derived from knowledge of collaborations and product reformation-thinking sideways.

Complex (Novel products and services being introduced into novel markets)

The development of the multi-media machine or the IT integrated office has evolved by linking similar technologies to gain greater efficiency and variability. Marketing these products requires a high degree of imagination and intuition. Innovative marketing can be observed in the representation of a product or service or the degree of novelty that is employed in the way that a product is designed to attract the buyer's attention.

Think of a recent innovation in your organisation with which you personally have been involved. What type of innovation was it? Was it recognised as an innovation

(a) inside
(b) outside your company?
If not, why not?

http://scpd.stanford.edu/dtu/pdf_courses/Dealing%20With%20Darwin/CHAPTER4.pdf

1.6 Characteristics of innovation

Significant characteristics of an innovation include:

- Timing
- Radicalness
- Speed

Timing

The most novel idea may, by its very nature, sound the most ridiculous. Timing can affect both the contribution and the relevance of an innovation. For example, Galileo was forced to withdraw his belief that the earth moved round the sun, which was based on careful observation of sunspots and planetary orbits, because he had had the idea too soon.

All companies have a graveyard full of good products with poor timing. This may be the result

of the development process being convoluted. It may be a product "ahead of its time". Sometimes luck plays a big part in innovation. The fax is a classic example of a product which "took off" due to the UK's postal strike – it needed mass adoption to be useful and had the PC and the Internet been available earlier, it may well never have been a commercial success. A whole range of factors lead to the failure of many good ideas because of the impact of those factors on "time to market".

Degree of radicalness

Innovations can be classified as radical or incremental. Radical innovations tend to come about through a rationalist approach and aim to create large scale change (for example, the introduction of the National Curriculum in state schools). Incremental innovations emerge in a more organic fashion and create gradual, bit-by-bit change (for example, a programme of continuous improvement in customer service).

The radicalness of an innovation is not absolute but is a matter of perception. For example, research carried out by Andreau, Ricart and Valor (1997) in three Spanish organisations indicates that depth or radicalness (i.e. how we innovate) is one of the highly significant dimensions of process innovation – the other being scope (i.e. what we innovate). The researchers found that whilst the scope of a process innovation is relatively "absolute" and can be fairly easily classified as one of three categories (business processes, sub-process or task), the depth or radicalness of a process innovation is not absolute is a matter of perception i.e. an innovation is termed "radical" if it breaks the implicit hypothesis on which the old way of doing things is founded.

Radical solutions may well be an outcome of fundamental research. For example, biomedical products, replacement limbs and designer materials are areas where radical innovation is resulting from research. Often the theory has been known for a considerable time before applications are developed. Foresight initiatives in many countries are attempting to predict technology development, so as to help companies to spot new opportunities (for example the UK's Department of trade and Industry's Innovation Unit). Technology Networks are also being encouraged in many regions, bringing together universities, company research and development, small and medium sized enterprises and inventors.

Speed of innovation

Speed of innovation can be critical. Speed affects the cost, quality and timing of the innovation and ultimately its "competitiveness" and its success. Many organisations are not fast innovators, and those that have established innovation speed as a competitive advantage have had to overcome time-consuming policies and practices (Prahalad and Hamel, 1990). However, speeding up innovation is a complex process. *The worst way to speed up a company ('s innovation process) is trying to make it do things just as it does, only faster. The machinery, and certainly the workers, will simply burn out* (Dumaine, 1989). Kessler and Chakrabarti (1996) have developed a model of innovation speed that highlights the need to consider the following questions in conjunction with one another "When should we speed up

innovation?", "How can we speed up innovation?" and "What happens when we speed up innovation?".

Think again about a recent innovation in your copany with which you have been involved. How do you rate it in terms of:

- Timing?
- Radicalness?
- Speed?

In retrospect, could you have affected any of these characteristics of the innovation?

http://www.management.wharton.upenn.edu/klein/documents/ Tornatzky_Klein_1982.pdf

1.7 Innovation and R+D Support System

The following will introduce some basic support mechanisms offered by the European Union:

CORDIS Technology marketplace
IPR-Helpdesk
Gate2Growth
Business Innovation Centre network
Enterprise Europe network
Competitiveness and Innovation Framework Programme (CIP)
Trans-European support to rapidly growing companies

1.8 Further Reading

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More links and websites from different countries:

2 KNOWLEDGE MANAGEMENT

Yannis Kalivas, Fanianna Gkofa, Christos Rakovitis

2. 1 Learning Objective

In this module, you will get familiar with the notion of ***managing knowledge***:

You will learn what knowledge is and how it can be differentiated from data and information, how knowledge can be managed and how it can be effectively managed within an organisation and how the organisation can generate, codify and distribute its internal knowledge. Also covered will be how an organisation can overcome the barriers to improving its knowledge management capabilities and how it can improve that knowledge management capability.

After reading this module, you will be also familiar with ***importing knowledge from outside*** the organisation. You will learn how to absorb knowledge from outside, how to learn from the market and how to learn through alliances. Knowledge protection will also be introduced.

2.2 Introduction

In the following chapters we will analyse in depth the basic characteristics of Knowledge Management. The chapter will be divided in two main parts that will deal with the main elements that best describe what is meant by the term Knowledge Management, namely, you will learn about Managing Knowledge that includes the basic notions of data, information and knowledge, knowledge markets, internal knowledge generation and codifying and distributing knowledge and about Importing Knowledge from Outside that includes notions of knowledge absorption, learning from the market and learning through alliances.

2.3 Managing knowledge

2.3.1 Data, information and knowledge

Data

Data is a set of objective facts about events or activities, and within an organisation is

normally structured in some form or another. When a customer goes to a supermarket to purchase food, his purchases can be stored as data; what was bought, how much was paid, the time of purchase and the method of payment. The data says nothing about why the purchases were made on that day or that time of day, what (if anything) was going to be made from the purchases and when they are going to be eaten. If the purchases are made by credit card, data gathered by the act of purchasing by credit card can be combined with other data linked to that credit card to give a comprehensive statement of other purchases by the card holder, movements of the card holder and likes of the card holder. As well as being quantitative, data can be qualitative. Some believe that if enough data is gathered then decisions based on data will be easier to make. This is a false assumption as too much data can make it harder to identify the meaningful data from unnecessary data. Furthermore there is no meaning in data – it is simply a collection of facts.

Information

Information can be considered a message (Davenport and Prusak, 1998), usually in the form of an audible or written statement. It has a sender and a receiver and is meant to change the way that the receiver perceives something. Either hard or soft networks can disseminate information. A hard network has a solid infrastructure such as delivery vans, post offices and e-mail. A soft network is informal and can consist of a message left on a voice mail system or a note pinned to a wall. Information has meaning and data can be transferred into information in a number of ways. To convert data to information it can be:

Contextualised – we know the purpose of the data being captured.
Categorized – we know the units of analysis or key components of the data.
Calculated – the data may have been formally analysed.
Condensed – the data might have been reduced to a more concise form.

It is normally the receiver of the information who decides whether the information is useful information, or whether it is still simply data. It is of course possible that the receiver of the sender's knowledge might consider that knowledge to be just information.

Knowledge

Knowledge can be seen as having a broader, deeper and richer meaning than data of information. It comes about as a result of people's experiences, values, insight and contexts. It can be stored in formal systems such as libraries, documents and electronic media. It is stored also in the routines and process practices and norms of an organisation. Most importantly it is stored in the heads of the individuals who work for the organisation. Knowledge is not a concrete asset of the organisation of the firm. To convert information to knowledge it needs to be transformed through:

Comparison – how does the information we have about this situation compare to other situations that we have known?

Consequences – what implications does the information have for decisions and actions?
Connections – how does this bit of information relate to others?
Conversation – what do other people think about this information?
Two-thirds of knowledge is gained by face to face contact between people and the value of knowledge can increase with use as more connections are made during conversations.

2.3.2 Knowledge markets

Knowledge moves through organisations in the same way as currency circulates and organisations place a value on knowledge in the same way that they place a value on other resources. There are three players in the Knowledge Market: buyers, sellers and brokers.

Knowledge buyers can be seen as people who are trying to resolve complex issues that require complex answers. Knowledge sellers are people in an organisation who have a reputation for possessing substantial knowledge about process or subjects that others are interested in. knowledge brokers (gatekeepers, boundary spanners) make connections between knowledge buyers and sellers. They find out who does what and who knows what and they like to understand where to go for knowledge especially if it takes them outside of their own area of responsibility. Librarians can be seen as knowledge brokers as their role requires them to help people find the knowledge that they require in both a people-to-people context - "Have a chat with John Smith, he has been doing work in that area" and a people-to-text context - "You will find it in the Oracle Database". Knowledge brokers can also have an important role in translating the language of the Knowledge supplier to the language of the Knowledge user.

If the culture of an organisation inhibits the sharing or even acknowledgement of problems or of success, or inhibits trust, then it will be difficult to pass knowledge around the organisation. Knowledge can be passed on for a number or reasons. The Knowledge Supplier might wish to be thought of as a knowledgeable person, he or she might be expecting knowledge in return or they might just be doing it out of a sense of altruism. Although formal Knowledge Networks can help the Knowledge Market operate, the informal Knowledge Market can be vastly more efficient. In the informal network, people ask who knows what, who knows who and how useful is the knowledge that they have. This informal network grows as a result of chance meetings, discussions at the coffee machine or water dispenser. Some organisations have managed to encourage the informal network by setting places aside for staff to meet informally.

2.3.3 Internal knowledge generation

Dedicated resources

Organisations frequently set up groups or departments to generate specific knowledge. The

Library can be seen as one of these departments, the other being the R&D department. Some recent research (Coombes, 1998) appears to show that R&D departments are more effective when set up separately from the business unit. The rational behind this is that by separating the R&D function from other parts of the organisation it gives researchers the freedom to explore new ideas away from the constraints of profits and deadlines. Researchers can work on long-term issues rather than the short-term issues that they are required when dealing with customer driven requests. The problem that can arise though from a centralised R&D function is that it may be difficult to transfer the results of the R&D function to the wider organisation. To ensure that knowledge is transferred from the R&D function, explicit steps such as the transferring of researchers to the business units should take place. There should also be regular high level meetings that deal with evaluating and integrating new knowledge.

Fusion

Whereas the R&D approach relies on reducing the pressure and distractions that can stifle productive research, the generation of knowledge by fusion deliberately introduces complexity and conflict into the process to help generate more knowledge. Dorothy Leonard-Barton (*Wellsprings of Knowledge*) calls this "creative abrasion" and says that "innovation occurs at the boundaries between mind sets, not within the provincial territory of any one knowledge and skill base. Creative abrasion occurs when diverse groups of people are bought together to solve problems". Nonaka and Takeuchi (*The Knowledge Creating Company*) say that it is necessary to bring another people of different knowledge and experience to generate new knowledge. They refer to Ashby's Law of Requisite Variety and describe the productive conflict of creative abrasion that produces creative chaos. The complexity and diversity that is brought to bear on a problem should match or be at least proportional to the complexity and diversity of the problem under consideration.

Adaption

By instilling a sense of crisis into an organisation as an environmental act, it can be possible to instil a sense of "Adapt or Die" into the organisation. When an organisation is successful it is difficult to get it to see and understand the changes in its external environment. "Without the spur of a crisis or a period of great stress, most organisations – like people – are incapable of changing the habits and attitudes of a lifetime" (*John McDonnell of McDonnell Douglas Corporation*). *Wellsprings of Knowledge* talks about the core competencies that become the core rigidities that keep companies on the "well-worn and successful paths" that ultimately lead to an organisation's failure.

Networks

Knowledge is also generated by the self-organising networks that over time might become more formalised. Although it can be difficult to codify the knowledge that is generated within

these networks, these networks nonetheless produce new knowledge for the organisation.

Common factors

All efforts that produce new knowledge need adequate time and space to devote to knowledge acquisition and development. Space means libraries, laboratories, formal meeting areas and informal meeting areas such as the coffee machine. Much of the space might be electronic, but meeting places are required as two thirds of all knowledge is passed in a face-to-face environment. It must also be realised that knowledge generation and gathering is an important activity for business success and the process can be nurtured. Although knowledge generation is difficult to measure, the destruction of the knowledge generation infrastructure, by downsizing, re-engineering or redundancy (some say they all mean the same thing) can severely limit the capability of the organisation to generate and exchange knowledge and to build on the experience of the past.

2.3.4 Codifying and distributing knowledge

The aim of codification is to put the tacit knowledge that resides within the organisation into a form that makes it accessible to those who need it.
The Four Principles of Knowledge Codification are:

- Decide the business goals that the codified knowledge will serve.
- Identify the knowledge that exists in whatever form that will help achieve those goals.
- Evaluate the knowledge for usefulness and appropriateness for codification.
- Identify a suitable medium for codification and distribution.

Tacit knowledge

Tacit knowledge, that which is held by an individual, and includes that individual's hunches, feelings and experiences is almost impossible to codify – try explaining in detail how you play tennis. A manual skill cannot be written down but it can be videoed and the knowledge can also be passed on in person sometimes over a period of time, much like a master craftsman with an apprentice.

Mapping knowledge

A properly designed database or "map" can be drawn up to show who has what knowledge and where people can go to obtain that knowledge. This map can be pictorial or textual and effective use can be made of hypertext prompts to make the map effective. Organisations that carry out this method of mapping usually start off by asking employees what knowledge they have and where they get it. They then stitch together a "map" that shows where knowledge resides. Unfortunately a central "map" cannot deal with a situation where an individual may not know about a subject, but might know someone who does.

Mapping technology

Computer technology can help make knowledge maps work. The availability of Lotus Notes

and Web browser/intranet systems and the capability of hypertext languages have made the generation of effective knowledge maps relatively straightforward. Although computer technology can enable a knowledge management project it is recommended that resource expenditure on the hardware and software be kept at less than 30% of the cost of the budget or the project will turn into an IT project and not a knowledge management project. As well as mapping text through the use of tools such as Groupware and Hypertext, it is possible to model knowledge and experience through the use of dynamic and static models.

Politics

Everybody would like to think that their knowledge is the most important and those who claim to have the most important areas of the map. If knowledge is important to an organisation, then the position of a knowledge holder on the map will signify status. Though, in a knowledge-sharing organisation, the high status goes to those who *both hold and are willing to share* their knowledge.

Knowledge transfer

The best way to transfer knowledge is to hire clever people and let them talk to each other. Give people time to think and allow them to have conversations. Everyday knowledge transfers come about as a result of discussions, the brief chat in the corridor or a few words over lunch. These everyday knowledge transfers are part of organisational life but are local and fragmented. To successfully transfer knowledge is a difficult process and requires a number of different strategies. One of the most effective being the transferring of people between the R&D function and the other business functions. Secondments to other parts of the organisation or to suppliers and customers are also methods of transferring knowledge. Japanese companies frequently transfer managers into different functions so that managers gain an understanding of the entire development and production process.

Knowledge fairs

Some companies set up Knowledge Fairs for their employees where different parts of the organisation set up booths where they can discuss with other employees the work they are doing. The whole idea of the events is that they are unstructured forums for participants to ask questions and discuss issues. These events seem to work better than the events that are packed with formal meetings and seminars as they give people time to talk.

Culture of knowledge transfer

Organisations that seem to be able to transfer knowledge easily have suitable cultures. They encourage the building of personal relationships through face-to-face meetings and they provide the time to allow these events to happen. They ensure that status and rewards go to those who are willing to share their knowledge, not just hoard it. They make it explicit that ideas are there to be learned from whatever the status of the source – "the not invented here" syndrome does not exist. Knowledge sharing organisations also ensure that the vocabulary that is used by the departments is a common one, jargon is kept to a minimum, and where it is necessary to learn the language of another discipline then that training is given.

Technologies for knowledge management

With the advent of technology such as Lotus Notes, and organisation-wide intranets, it is becoming easier for organisations to store vast amounts of knowledge electronically. Retrieval of knowledge in this technological network is made easier by the use of search engines, thesauri and language translation software.

Implementing knowledge technologies

The goal of these technologies is to take the knowledge that is held inside people's heads and make it available to the wider organisation. Implementing a Knowledge Management Technology is more a cultural change issue than a technology implementation issue and Prusak (*Working Knowledge*) states that if the technology implementation takes more than 30% of the budget then it is an IT project and not a Knowledge Management project. The cultural issues that must be addressed include those of trust within an organisation, the structures that reward knowledge sharers rather than knowledge hoarders, the willingness to take on new ideas and allowing time and space for conversation among others.

Types of technology

Broad Knowledge Repositories consist of depositories of structured explicit knowledge that can be accessed by the use of relatively unskilled people making use of search engine technology, the Internet being a prime example. The drawbacks of this type of system include that it is difficult to judge the quality of knowledge that is provided and hence the users tend to have a low level of trust in the system. As well as having search and retrieval capabilities, an on-line thesaurus is a necessity. The aim of the thesaurus is to connect the terms by which the knowledge is structured with the terms employed by the searcher.

Focused Knowledge Environments are set up to allow the knowledge of a few experts to be tapped by a much larger group of workers. An ideal example being the insurance sales force who can do the financial planning that their customers need, without knowing much about financial planning. The user needs to engage in some sort of dialogue with the system, entering information and waiting for an answer. Real Time Knowledge Systems are used by well trained users when knowledge has to be transferred quickly such as in customer support or "help desk" applications. The users can be the experts, or the system can make use of case-based reasoning where the customer or individual requiring help can give an idea of the symptoms that their problem is exhibiting. Long-Term Analysis Systems such as neural networks can be used when time is available and the user is well educated or trained. They are heavily statistically based and have the capability of learning from previous solutions.

Despite the ease with which the technological aspects of these systems can be set up, it is the behavioural and cultural aspects of the organisation that will make the system succeed or fail. By getting these aspects right then the implementation of an effective knowledge managing organisation will be made easier. Identify the knowledge element that helps solve the

problem and implement the solution, and then show the business value of solving the problem.

Knowledge of customers is an important area for any organisation and a project that aims to improve this area should show quick results. Once you get these results, start telling people how good the results are. Other knowledge management initiatives should then follow. In a nutshell, the following recommendations make sense:

- The place to start is with high value knowledge.
- Start with a focused pilot project and let demand drive additional initiatives.
- Work along multiple fronts at once (technical, organisational, and cultural).
- Don't put off the main trouble areas until too late.
- Get help through the organisation as quickly as possible.

2.4 Importing knowledge from outside

2.4.1 Absorbing knowledge from outside

Dorothy Leonard-Barton (*Wellsprings of Knowledge*) highlights a number of areas where organisations must be efficient if they are to successfully absorb knowledge from outside the organisation and transfer it across internal boundaries. She refers to the need for managers to expose their organisations to a bombardment of new ideas and transfer those ideas through the setting up of "porous boundaries". Organisations need to be able to Scan Broadly, provide for Continuous Interaction, Nurture Technological Gatekeepers, Nurture Boundary Spanners and Fight "Not Invented Here" syndrome.

Scanning broadly

Organisations can gather a wide range of information from a wide range of areas, and because the quantity of information is so huge there is a higher chance of gaining the more valuable information. Many organisations consider technology scanning second only to R&D as the most important technology-acquisition strategy. The most successful organisations send delegates to any (even slightly) relevant seminar or conference, they use sales offices to pass on information on technological advances. They also post researchers abroad into research institutes and set up corporate research laboratories alongside Universities.

Provide for continuous interaction

Companies that successfully import knowledge continually go back to the source to ensure that they have understood the new technology and also have kept abreast of new developments.

Fight "not-invented-here"

The natural reaction of any organisation to new knowledge from outside is to reject it for a

number of reasons. There is often a belief that as the knowledge has come from outside it cannot be useful, or it is flawed for some (usually unspecified) reason. There is also a distaste at adopting someone else's idea rather than using a home-grown one. Resistance to new ideas can show up in a number of ways from the subtle one of re-testing components that have already passed the necessary tests and been certificated, through to unsubtle ones such as explicitly stating that an outsider's ideas are inferior. The Spanish have a saying "Well stolen is half done".

Evaluating technology

Knowledge and technology gained from outside is frequently incomplete from the point of view of the recipient and must be completed by the source, the receiver or both together. An organisation needs to be able to understand the technology it is looking to use and it is important that organisations can both assess technology potential, evaluate the expertise of the source and pin-point the location of the knowledge.

Assess technology potential

Organisations that are looking to absorb new knowledge should be capable of assessing that knowledge properly and it appears that the most successful technical joint ventures occurred when both sides had done considerable work on the area in question prior to collaboration. The area of collaboration chosen though should not be one of the core competencies of the receiving organisation.

Evaluate the expertise of the source

One of the critical issues regarding collaboration between two organisations is the degree of expertise that the organisations have in the area in which they are collaborating. A joint venture is normally set up to create a set of complimentary capabilities with each organisation providing essential but different capabilities. If either organisation is actually deficient in the capability that they bring to the arrangement then it is likely that the venture will fail. Although the match between GEP and Polymer Solutions appeared to be a good one, there was very little investigation into the required skills that each party wanted from the other.

Pin-point the location of knowledge

Where does the required knowledge reside? Does it reside in the equipment? Software? Hardware? Procedures? Or in the heads of the workforce? Too often the "due diligence" work necessary during a take-over or merger is done by the lawyers and accountants who look for the physical worth of a company and very little "due diligence" is done on the knowledge assets.

2.4.2 Learning from the market

Market research

Traditional market research, which is quantitative and qualitative in nature, is the preferred way for many organisations to consider new products. A different form of Market Research, one that Dorothy Leonard-Barton (*Wellsprings of Knowledge*) has called Empathic Design, has three characteristics that distinguish it from other qualitative methods. A design can be based on actual observed customer behaviour, is usually conducted through deep interaction between those who have a deep understanding of the firm's capabilities and potential users, and it draws upon existing technological capabilities that can be redirected or re-deployed to new products or markets.

Empathic design

Actual observed customer behaviour

Because the user is observed in situ, the whole user system is directly observable and the interaction between the user, the equipment and others can be seen.

Direct intervention

This occurs between those who have a deep understanding of the firm's capabilities, such as designers and engineers and the product users. Those with the deep understanding see first hand how the equipment is used and do not receive information from a market research function.

Technological capabilities

Observers of users might see potential uses for the firm's current capabilities that can be used elsewhere.

Other market research techniques

Other market research techniques include inquiry and the creation of new markets.

Inquiry

This occurs when the existing customer or customer set is targeted for an extension of a well-established product line. This is the province of traditional market research techniques.

Creating a new market

When neither technologies nor customers are certain, information must be gathered by extrapolating trends, imaging a possible future through scenario-planning or trial and error. The extrapolation of various trends can help developers attempt to foresee what customers will require in the future when those trends mature. Scenario-planning extrapolates trends in different directions to give different but possible futures and is designed to stimulate out-of-the-box thinking and to divert thought from a straight line. Peter

Schwarz (*The Art of the Long View*) talks about thinking the unthinkable and asking a series of "what if" questions to stimulate thinking. The final method of trial and error is used by many organisations that have products that have short lead times.

Other forms of learning from the market

Dorothy Leonard-Barton (*Wellsprings of Knowledge*) states that there can be said to be five generic situations for new-product developments: (1) user-driven enhancement; (2) developer-driven enhancement; (3) development inspired by the user context or environment; (4) new applications or combinations of technologies; (5) technology and market co-evolution or market creation.

User-driven enhancement

An improved solution to a known need – Explicit customer demands can drive technological improvements and new product development along known performance parameters for current products. Lower costs, more features or better quality are the parameters usually required.

Developer-driven development

A new solution to a known need – This requires potential users to translate their felt needs into a request for a particular solution. They may have a need, but they cannot imagine a solution because they don't know about the particular technology advance that could satisfy that need. A developer could see a current need in the market place and a developer might decide to delight customers with large leaps in performance that no competitor has attempted and no user requested.

User-context development

A new solution to an unexpressed need - Needs may exist for years before technical solutions can be made available but users will not be able to communicate that need in a manner that could guide product development to produce the technology.

New applications or combinations of technologies

A novel solution to an identified need – Developers take an existing technology that is well known in one area and transfer it to another area. An example being the adaption of Sonar technology used for hunting submarines and applying it to provide technology that can carry out ultra-sonic scanning of the foetus in the womb. Another example being taking the pump technology used to pump super cooled liquids through the cooling system of a nuclear reactor and adapting it to freeze food more efficiently.

Technology/market co-evolution

An evolving solution to an uncertain need – Technology has at times run far ahead of consumers and has resulted in the development of an application for a wrongly targeted

market. An example being the use of DNA sampling to establish paternity through blood samples, this not being the most obvious application.

2.4.3 Learning through alliances

Organisations can obtain knowledge from outside themselves by forming alliances of various degrees of formality with other organisations. More informal ways of obtaining knowledge can occur simply by talking to customers and suppliers and attending seminars in issues of interest. Collaboration between organisations occur for a number of reasons:

* to reduce the cost of technological development;
* to reduce the risk of development or market entry;
* to achieve economies of scale in production;
* to reduce the time taken to develop and sell new products;
* to increase the knowledge the organisation has in certain areas.

There is an increasing realisation that one organisation's peripheral technology is another organisation's core technology and the collaboration necessary to gain knowledge in certain areas is the area that this section will concentrate on. Collaboration can occur with universities, non-competitor and competitor companies, customers, supplies and consultants. When the decision to "make or buy" knowledge is being considered organisations need to consider two issues. Transaction costs which focus on the organisation's efficiency, and strategic implications which will include consideration of the organisation's future exploitation of the knowledge.

Forms of collaboration

These can include subcontracting, technology licensing, research consortia, joint ventures, innovation networks.

Subcontracting

This occurs when the supplying organisation can normally supply its own technology at a lower cost than it will take the receiving organisation to provide it itself. In the West these relationships tend to be of short term duration, contractually driven and with very little input by the supplier into the design process. In Japan, in contrast, the relationships tend to be long term with suppliers making a significant contribution to product development.

Technology licensing

This offers an organisation the opportunity to exploit the intellectual property of another organisation, normally in return for a fee and royalty based on sales. When a licence is sold, the licenser will normally lay down conditions under which the technology is licensed and will often require the buyer to give the seller access to any improvements in the technology. Benefits include lower development costs, less risk and faster product development times. Drawbacks include restrictive clauses imposed by the licenser, loss of control of issues such as

pricing, volumes and quality, and the potential costs of search, negotiation and adaption.

Research consortia

These normally consist of a number of organisations working together on a well specified project. The reason for this is to share the cost and risk of research into common areas. Competitor companies frequently collaborate in the development of pre-competitive technology, especially when state funding supports this type of research. Non-competitor companies frequently collaborate to learn from each others organisations' skills.

Joint ventures

These can be in one of two basic forms, a new company with ownership based on stock owned, or a contractual relationship.

Innovation networks

These tend to be informal groupings of organisations that evolve over a period of time with no contractual responsibility to each other. It is within the innovation network that the technology gatekeeper is especially important in the formal and informal role. The formal role being the one where he (or she) keeps his organisation aware of "what is happening out there", and the informal role being the organisation contact within the network.

Universities

An increasing form of collaboration occurs between the organisation and universities, where the university acts as an external source of technology. These relationships range from providing support for Ph.D. Students and finance for research, through to formal contractual research relationships.

2.4.4 Protection of knowledge

As well as obtaining knowledge from various sources, organisations need to protect their own intellectual property, and patents are the process by which this protection occurs. Patents are legal rights to concepts and ideas; they must be applied for in every country individual. They must also be new ideas and technically should not have been discussed by anyone other then the developers. While patent protection is a major way in which knowledge can be protected, it is worth remembering that a patent is codified knowledge. Codified knowledge is easy to locate; the easier it is to locate the easier it is to transfer. Tacit technology that is held within people's heads is the easiest to protect from copying and can be preferable to explicit patent protection especially where the technology has been developed in-house.

2.5 Additional cases

Mobil

The Oil Company Mobil has a culture that discourages behaviour that can be seen as bragging or broasting. This results in an efficient Knowledge Market as problem solvers do not feel able to advertise details of the problems they have solved.

Dai-Ichi

The Japanese pharmaceutical company Dai-Ichi has set up attractive rooms with refreshments where the research staff are encouraged to spend 30 or so minutes a day just talking

Matsushita

The consumer electronics company Matsushita combined teams from three different product divisions to develop a successful home bread-king machine. The machine required the knowledge of computer control held by the rice cooker group, the induction heating knowledge of the toaster from the coffee makers group and the knowledge of rotating motors from the food processors group

British Petroleum

British Petroleum has developed a very advanced Intranet and all personnel are recommended to put their personal expertise and as much knowledge as they can on their web pages on the Intranet. Sophisticated search engines are used that can allow searchers to find the knowledge or knowledge holder that can help with their problem.

Wood Processing Industry in Sala-Heby – A Pathfinder project
Arne Kullbjer
A group of 30 SMEs employing altogether about 400 people, located in a small region in central Sweden, joined with a purpose to establish a business association in order to respond more efficiently to their customers' – predominantly large companies and governmental institutions – needs. The business association would have good knowledge about the companies, how to make them competitive and how to use new technologies.
However, in order to further extend the association's performance, they decided to raise its ICT capabilities. The business opportunity was seen in Internet commerce and administration costs reduction through EDI (Electronic Data Interchange) solutions. Besides, the big companies and organisations should start regarding the SMEs as business partners and not only as suppliers of a product, which often is the situation. The SMEs can be flexible and can through quick interaction also adjust and change their delivery according to customer's needs. EDI is here an important technology.
The project was organised in right time as the big companies were in the process of implementing new purchasing methods, sending digital drawings etc. The association even managed to receive about 60.000 Euro from NUTEK, the Swedish Business Development Agency fond aiming to increase branch specific knowledge and IT-use through skill enhancement in the purchasing process and e-commerce.

The project was an example on how the competitiveness in small companies can be increased through involvement of quite simple but effective ICT tools. The administrative costs in the companies have substantially decreased with the EDI solutions implemented. The project has created more and better business opportunities and better competitiveness. No one of the SMEs can show any figures on how many more contracts being established or similar results, but they all agreed upon that without this project their competitiveness should have been on a much lower level.

2.6 Further reading

"*An investment in knowledge pays the best interest.*" By Benjamin Franklin
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3 CREATIVITY AND INNOVATION

Aleksander Tonkov, Velizar Petrov

3.1 Introduction

In an attempt to gain a competitive advantage, organizations are now focusing on enhancing their employees' creativity, and not merely developing their technical competencies and skills. In a changing world and economy, the role of creativity in the workplace is becoming ever more prominent. However not enough firms are fully exploiting the business ideas of their employees and are not making the most of their skills. Whilst firms may be encouraging creativity, the implementation and management of the ideas generated is lacking. Consequently, many companies are deemed to be falling short of their potential, creating an "innovation gap".

Organizations are finding that, as markets become saturated and competition gets stronger, it is increasingly necessary to find novel or innovative approaches to business problems and issues. They may look for this creativity in their staff or may even recruit new, more creative employees. This can help both the marketing of the organization by being seen to be creative and 'cutting edge', and it can improve productivity and efficiency by solving current problems or business obstacles.

Of course, the concept of creativity is an illusive one. How can one hope to enhance creativity if it is not first defined and measured? This article will provide an overview of the concept and ways in which it may be measured and enhanced in the workplace.

Creativity refers to the phenomenon whereby a person creates something new (a product, a solution, a work of art, a novel, a joke, etc.) that has some kind of value. What counts as "new" may be in reference to the individual creator, or to the society or domain within which the novelty occurs. What counts as "valuable" is similarly defined in a variety of ways.

3.2 Measuring Creativity

The concept of creativity may be delineated into three dimensions; the person, the product and the process.

- Person-based - there are many ways to measure or infer creativeness directly from an individual.

Personality Measures - Looking at certain personality traits or characteristics associated with a creative mind, e.g. intelligence, confidence, wit, originality, informality and tolerance to

ambiguity. However, psychologists have been trying to find the 'one' personality profile of the creative person for many years without any real solid evidence.

Biographical Inventories - The use of biographical data. For example, linking family and educational history to determine the potential sources of an individual's creativity, personal interests or hobbies that may indicate a creative mind, or even personal relationships.

Creative Ability - The direct measurement of creativeness by testing an individual with various established tests (for example, the "unusual uses" test, and other exercises in creative thinking or elaboration).

- Product-based - a more objective measure involving the assessment of an individuals previous work for creativity and innovation.

Process-based - an examination of the creative processes employed by an individual to come up with solutions to problems or design novel products (e.g. feelings experienced before/ during/after the innovation).

3.3 Enhancing creativity

All people have the potential to be creative but those who are recognised as being creative have a certain awareness or insight that others don't. Without the abilities needed to be creative, it is highly unlikely that someone will solve a creative problem. However, just because an individual has an ability to do something does not necessarily mean that they will do it. It is for this reason that employers resort to various techniques to enhance their employees' creativity.

DO IT, that was devised by Robert W Olsen in his book "The Art of Creative Thinking", is a structured process for creativity. Using DO IT ensures that you carry out the essential groundwork that helps you to get the most out of creativity tools. DO IT is an acronym that stands for:

- D – Define problem
- O – Open mind and apply creative techniques
- I – Identify best solution
- T – Transform

 These steps are:

Problem Definition:

During this stage you apply a number of techniques to ensure that you are asking the right question. This step concentrates on analyzing the problem to ensure that the correct question is being asked. How you can do this:

- Check that you are tackling the problem, not the symptoms of the problem. To do this, ask yourself why the problem exists repeatedly until you get to the root of it.

- Lay out the bounds of the problem. Work out the objectives that you must achieve and the constraints that you are operating under.
- Where a problem appears to be very large, break it down into smaller parts. Keep on going until each part is achievable in its own right, or needs a precisely defined area of research to be carried out. See Drill Down for a detailed description of this process.
- Summarize the problem in as concise a form as possible. Robert W Olsen suggests that the best way to do this is to write down several of two-word problem statements and choose the best one.

Open Mind:

Here you apply creativity techniques to generate as many answers as possible to the question you are asking. At this stage you are not evaluating the answers.

Once you know the problem that you want to solve, you are ready to start generating possible solutions. It is very tempting just to accept the first good idea that you come across. If you do this, you will miss many even better solutions.

At this stage of DO IT we are not interested in evaluating ideas. Instead, we are trying to generate as many different ideas as possible. Even bad ideas may be the seeds of good ones.

While you are generating solutions, remember that other people will have different perspectives on the problem, and it will almost certainly be worth asking for the opinions of your colleagues as part of this process.

Identify the best solution:

Only at this stage do you select the best of the ideas you have generated. It may be that the best idea is obvious. Alternatively, it may be worth examining and developing a number of ideas in detail before you select one.

The Decision Making Techniques section of Mind Tools explains a range of excellent decision making techniques. Decision Tree Analysis and Force Field Analysis are particularly useful. These will help you to choose between the solutions available to you. When you are selecting a solution, keep in mind your own or your organization's goals. Often Decision Making becomes easy once you know these.

Transform:

The final stage is to make an Action Plan for the implementation of the solution, and to carry it out. Without implementation, your creativity is sterile.

Having identified the problem and created a solution to it, the final stage is to implement this solution. This involves not only development of a reliable product from your idea, but all the marketing and business side as well. This may take a great deal of time and energy.

Many very creative people fail at this stage. They will have fun creating new products and services that may be years ahead of what is available on the market. They will then fail to develop them, and watch someone else make a fortune out of the idea several years later.

The first stage in transforming an idea is to develop an Action Plan for the transformation. This may lead to creation of a Business or Marketing Plan. Once you have done this, the work of implementation begins!

3.4 Creativity in organizations

It has been the topic of various research studies to establish that organizational effectiveness depends on the creativity of the workforce to a large extent. For any given organization, measures of effectiveness vary, depending upon its mission, environmental context, nature of work, the product or service it produces, and customer demands. Thus, the first step in evaluating organizational effectiveness is to understand the organization itself - how it functions, how it is structured, and what it emphasizes.

Amabile (Amabile, 1998; Sullivan and Harper, 2009) argued that to enhance creativity in business, three components were needed:

- Expertise (technical, procedural and intellectual knowledge),
- Creative thinking skills (how flexibly and imaginatively people approach problems),
- and Motivation (especially intrinsic motivation).

There are two types of motivation:

- extrinsic motivation – external factors, for example threats of being fired or money as a reward,
- intrinsic motivation – comes from inside an individual, satisfaction, enjoyment of work etc.

Six managerial practices to encourage motivation are:

- Challenge – matching people with the right assignments;
- Freedom – giving people autonomy choosing means to achieve goals;
- Resources – such as time, money, space etc. There must be balance fit among resources and people;
- Work group features – diverse, supportive teams, where members share the excitement, willingness to help and recognize each other's talents;
- Supervisory encouragement – recognitions, cheering, praising;
- Organizational support – value emphasis, information sharing, collaboration.

Nonaka (Nonaka, 1991), who examined several successful Japanese companies, similarly saw creativity and knowledge creation as being important to the success of organizations. In particular, he emphasized the role that tacit knowledge has to play in the creative process.

In business, originality is not enough. The idea must also be appropriate - useful and actionable (Amabile, T. M. (1998). "How to kill creativity". Harvard Business Review). Creative competitive intelligence is a new solution to solve this problem. It links creativity to innovation process and competitive intelligence to creative workers.

3.5 Fostering creativity

Creativity techniques are methods that encourage creative actions, whether in the arts or sciences. They focus on a variety of aspects of creativity, including techniques for idea generation and divergent thinking, methods of re-framing problems, changes in the affective environment and so on. They can be used as part of problem solving, artistic expression, or therapy. Some techniques require groups of two or more people while other techniques can be accomplished alone. These methods include word games, written exercises and different types of improvisation, or algorithms for approaching problems. Aleatory techniques exploiting randomness are also common. We will discuss this topic in the Idea creation techniques section.

3.6 Personality traits associated with creativity

3.6.1 Diligence

Many people who are famous for their creative output are highly diligent, often bordering on the obsessive. Creative people have an inner *need* to express their creativity. They can not keep their new idea inside their head forever, the idea needs to be born. In fact, many creative people would be creative, even if they were not paid for their effort or output, a situation that has lead society and managers to a frankly shameful exploitation of many of the greatest innovators in the history of mankind.

Not all creative people work long hours. In discussing the amount of time a creative person spends on work, it is important to reward productivity, not number of hours worked. Many times, a creative person will work a few hours and encounter an obstacle. Continuing to stare at the work is unlikely to produce a breakthrough. Experience shows that novel insights often come at unexpected times (e.g., while doing some mundane task, such as walking or in the shower).

In industry, it is common to see creative engineers working in their spare time, or working during evenings and weekends, on their "secret" project. If they asked their manager for authorization, the manager would likely say "No!", so the creative people keep their project secret until it is completed or it becomes clear that their concept will not work. Creative people *need* to express themselves through creative projects.

However, one should distinguish between a workaholic who puts in 80 hours/week doing *routine* work and a creative person who works long hours doing new things, often things that no one else thought could be accomplished.

Many people with unusually great creativity are ambitious, concerned with their reputation, and apparently need to prove themselves worthy. Their need to prove themselves worthy may come from experiences early in life in which other children, other students, etc. ridiculed or taunted them.

3.6.2 Stobborn

Being creative is extraordinarily difficult work that is essential to progress! And society seems to delight in making it more difficult by denying resources to creative people who need them. The way to succeed in spite of these artificially created burdens is to have some combination of the following character traits:

- persistent
- tenacious
- uncompromising
- Stubborn
- arrogant

3.6.3 Gender and eccentric

Gender:

It is well known that, as a general rule, men are more aggressive than women, owing to testosterone. For example, nearly all violent criminals are male. It may be that testosterone gives men an advantage over women in persisting, despite the disappointments and frustrations that are inherent in research. The subject of gender differences is complex.

Eccentric**:**

From reading biographies of famous scientists and musical composers, one common personality trait becomes clear: many of them are eccentric. Being eccentric does not imply that one is creative. Conversely, not all creative people are eccentric: some creative people have normal family lives and conventional values.

3.7 Additional reading

3.7.1 How creative are you?

This test helps you to think about how creative you are right now. Take it, and then use the tools and discussions that follow to bring intense creativity to your everyday work.

Instructions: For each statement, click the button in the column that best describes you. Please answer questions as you actually are (rather than how you think you should be), and don't worry if some questions seem to score in the 'wrong direction'.

	Statement	Not at all	Rarely	Some times	Of-ten	Very Often
1	Creative people should specialize in coming up with lots of ideas. Other people should then implement these.	☐	☐	⦿	☐	☐
2	If I have a problem, I allow myself to back off active problem solving, and I create some mental distance between myself and the issue.	☐	☐	⦿	☐	☐
3	When I'm coming up with ideas, I find myself using phrases like "we can't" or "we don't."	☐	☐	☐	☐	☐
4	I'm busy. As soon as I have a good idea, I move forward with implementation.	☐	☐	☐	☐	☐
5	I gather information from a wide variety of sources to stay current with what's happening in my field of work.	☐	☐	☐	☐	☐
6	I see problems, complaints, and bottlenecks as opportunities rather than as issues.	☐	☐	☐	☐	☐
7	When solving a problem, I try to rethink my current understanding of an issue to develop a deeper insight into it.	☐	☐	☐	☐	☐
8	I often ignore good ideas because I don't have the resources to implement them.	☐	☐	☐	☐	☐
9	I find problems and issues distracting. They cause me to lose focus on my real work.	☐	☐	☐	☐	☐
10	I'm confident that I can develop creative ideas to solve problems, and I'm motivated to implement solutions.	☐	☐	☐	☐	☐
11	I take time to investigate how things are working, even when there are no current problems.	☐	☐	☐	☐	☐
12	I always look for the causes of problems, so that I can understand what's really going on.	☐	☐	☐	☐	☐
13	I look for things in my environment to inspire me to find new interpretations of problems.	☐	☐	☐	☐	☐
14	I focus on issues that are important right now, preferring to worry about future problems as they arise.	☐	☐	☐	☐	☐
15	When gathering information about an issue, I explore solutions that have worked elsewhere in the past.	☐	☐	☐	☐	☐
16	When I generate ideas, I evaluate them and I quickly discard ideas that I don't like.	☐	☐	☐	☐	☐

Table1: How creative are you?

You can find more info on:
http://www.mindtools.com/pages/article/creativity-quiz.htm

3.7.2 12 ways you can express your creativity more powerfully in any workplace

- Use your values, interests, skills and aptitudes to express your unique perspectives, opinions and contributions.
- Take full advantage of the unique features of your personality to express your creativity in ways that are natural for you.
- Dress your body and your work space in ways that reflect your passion and energy.
- In what you say – either verbally or in writing – and how you say it, make sure you use word choice, vocabulary and communication style to showcase your uniqueness.
- Everybody works differently. Use your work habits, decision making and problem solving style to express who you really are.
- Everybody lives their lives differently. Use your personal habits, time management and outside interests to positively impact who you are at work.
- What are you passionate about? What kinds of things do you channel your energy into? What are you committed to? Take all three to work with you and put them to work for you.
- Every creative act begins with a conception. Make sure you capture your workplace brainstorms in concrete ways.
- Every creative act develops through an incubation phase. Make sure you put safe boundaries around your own creative work time so it doesn't get overwhelmed with other responsibilities.
- Every creative act ends with a birth. Make sure you help each project grow to its next level.
- Celebrate your beginnings and your endings. Mark the big moments and look for reasons to play.
- Know when it's time to move on? From ideas, projects and jobs? Then do it.

4 BUILDING THE FUNDAMENTALS OF A SUCCESSFUL INNOVATION MANAGEMENT

Vassilis Tsaggaris, Peter Fatur, Borut Likar

4.1 Defining innovation strategy and goals

According to the words of management guru Peter Drucker each organisation needs one key competence: innovation. Innovation is the process by which businesses improve their competitiveness and profitability by creating and/or adopting relevant new products and ideas. Innovations result in the development of new products and services, new features in existing products and services, and new ways to produce or sell them or a different approach to any other process within the company (Beerens et al., 2004, Vemuri et al., 2003, Gellatly and Peters, 1999).

Innovation management begins with defining the strategy and setting innovation objectives. Innovation strategy is a strategy of efficient answer to competition.

• Production strategy may focus on improving production flexibility, reducing lead times, improving working conditions, or reducing labour costs.

• Product strategy may centre on improving product quality, replacing products that are being phased out, or extending the product range.

Market strategy may focus on opening new domestic or foreign markets, or simply on maintaining current market share. Developing successful innovation strategies is often difficult, which explains why many firms choose not to do so, even though the benefits of innovating are widely understood.

The scope of innovation can be quite varied. Activities ranging from automation of order taking to developing hydrogen-powered automobiles are broadly considered innovations. Specifically, the most important innovations *goals* are the following:

• Increase added value for customers
• Reduce product/ service cost
• Increase innovation hit rate
• Improve product/ service quality
• Increase development efficiency
• Increase rate of product/ service introductions
• Shorten time to market
• Develop new product/ service categories
• Create new business models

4.2 Building the appropriate organisational environment

A vital step in the development of an innovative organisation is building an appropriate organisational environment (Ideachampions, 2006, Beerens et al., 2004, IPENZ, 2002, IWP, 2003, Flynn et al., 2003, Baker, 2002). The term organisational environment is closely related to the organisational culture.

4.2.1 Culture of innovation

Culture is the sum total of values, norms, assumptions, beliefs and ways of living built up by a group of people and transmitted from one generation to another. *The culture of innovation* can therefore be defined as an organisational culture that values innovation, where there is implicit encouragement for staff to think differently, take calculated risks and challenge the status quo. What are its main characteristics?

- Leadership by visionary, enthusiastic champions of change
- Top management support and encouragement of creativity, both financial and psychological
- An effective communication system. Leaders share the business vision with their staff and empower them to optimise their potential in achieving the business goals
- Flexibility towards new thinking and new behaviour patterns. The creative organisation readily adapts to change and proactively searches for new opportunities
- Customer focus

A creative culture is outwardly focused, looking for ideas among customers, competitors, academe, suppliers, and even industries with a different focus.

The culture of innovation can be developed by:
- Selecting innovative employees,
- Training for creativity and innovation,
- Developing a learning culture,
- Empowering the employees,
- Setting up idea capture schemes,
- Developing managers to support the innovation of others,
- Making creativity a requirement of the job,
- Improving employee participation in decision-making,
- Having appropriate reward systems for innovation,
- Allowing risk-taking as an acceptable mode of practice,
- Encouraging investment in research and development,
- Benchmarking (actively undertaking systematic approaches to locate and assess good practice elsewhere in attempts to improve your own performance).

Obstacles that will need to be addressed if you expect to establish a sustainable culture of innovation:
- Lack of a shared vision and/or strategy,
- Innovation not articulated as a company-wide commitment,

- Lack of ownership by Senior Leaders,
- Constantly shifting priorities,
- Short-term thinking,
- Internal process focus rather than external customer focus,
- Focus on successes of the past rather than the challenges of the future,
- Unwillingness to change in the absence of a burning platform,
- Politics – efforts to sustain the status quo to support entrenched interests,
- Rewarding crisis management rather than crisis prevention,
- Hierarchy – over-management and review of new ideas,
- Under-funding of new ideas in the name of sustaining current efforts,
- Workforce workloads (i.e. too much to do, not enough time),
- Risk aversion (i.e. punishment for "failure"),
- Inelegant systems and processes,
- Analytical thinking ("data is God"),
- Absence of user-friendly idea management processes,
- Unwillingness to acknowledge and learn from past "failures",
- Inadequate understanding of customers,
- Innovation not part of the performance review process,
- Lack of skilful brainstorm facilitation,
- Lack of "spec time" to develop new ideas and opportunities,
- Inadequate "innovation coaching",
- No creative thinking training,
- No reward and recognition programs,
- "Innovation" relegated to R&D.

Google – Creativity sans frontieres

Borut Likar

Google is undoubtedly one of the fastest growing international companies of the past few years. An extremely simple logic lies behind a record 10 billion dollars in annual sales – making global knowledge accessible to anyone. With the latter Google has surpassed the fundamental philosophy of other Internet providers since its user is able to reach over 12 billion web sites simply by using Google. The support offered to such a possibility is a vastly spread network of over 200,000 high-capacity computers which constantly buzz all over the world. Google reaches into the areas of electronic mail, magazines, books, films, music and plenty more. Moreover, Google allows you to communicate, purchase, market, perform financial transactions and similar. Internet media advertising is one of the fastest growing activities given that it is likely to record 30 billion dollars in two years time – the largest portion of which goes to Google which has developed the most price-effective advertising. A reasonable question pops up, i.e. what drives this giant to always walk one step in front of the competition?

Beside the two founders – who with their vision and concrete ideas gave the company its basic orientation – one of the key tasks of the senior managers is an everlasting search of new ideas. The latter becomes evident once you enter the Company's main building Googleplex, which also hosts the headquarters of the company. Creative and hassle-free atmosphere, excellent wages, free of charge meals, technical and medical services for employees are only a few of the perks. Yet one of the most important "perks" proves to be the fact that the employees are allowed to use one fifth of their entire working time for their own projects. In doing so, the superiors present no obstacle since in such a way the Company expects fresh and unusual ideas which shall open new market prospects. Google managed to realised quite a few of such ideas in the past years. Allow us to mention just a few: the Internet services for blind and weak-sighted, a possibility to observe the earth from the air – as though as you had your own spy satellite.

The Company is well aware of the fact that the employees are the company's main "asset". The Company has thus created the following strategy:

"We hire great people and encourage them to make their dreams a reality. We believe in hard work, a fun atmosphere, and the sort of creativity that only comes about when talented people from diverse backgrounds approach problems from varying perspectives. Googlers have been Olympic athletes and Jeopardy champions; professional chefs and independent filmmakers. And whether you work at our headquarters in Mountain View, California, or in any of our locations around the world, we think you'll find Google a place where you can aspire to outsized accomplishments" (Google, 2006a).

Working environment which encourages innovativeness is closely intertwined with the corporate culture. An example of such connection is unquestionably the Googleplex, Google's world headquarters building. While not all Google offices around the globe are equally well-stocked, these are some of the essential elements that define a Google workspace (Google, 2006b):

Lobby Décor - Piano, lava lamps, and live projection of current search queries from around the world.

Hallway Décor - Bicycles and large rubber exercise balls on the floors, press clippings from around the world posted on bulletin boards everywhere. Many Googlers standing around discussing arcane IP addressing issues and how to build a better Spam filter.

Googler Offices - Googlers work in high-density clusters remarkably reflective of our server set-up, with three or four staffers sharing spaces with couches and dogs. This improves information flow and saves on heating bills.

Equipment - Most Googlers have high-powered Linux OS workstations on their desktops. In Google's earliest days, desks were wooden doors mounted on two sawhorses. Some of these are still in use within the engineering group.

Recreation Facilities - Workout room with weights and rowing machine, locker rooms, washers and dryers, massage room, assorted video games, Foosball, baby grand piano, pool table, ping pong, roller hockey twice a week in the parking lot.

Google Café - Healthy lunches and dinners for all staff. Stations include "Charlie's Grill," "Back to Albuquerque," "East Meets West" and "Vegheads." Outdoor seating for sunshine daydreaming.

Snack Rooms - Bins packed with various cereals, gummy bears, M&Ms, toffee, liquorice, cashew nuts, yoghurt, carrots, fresh fruit and other snacks. Dozens of different drinks including fresh juice, soda and make-your-own cappuccino.

Coolest stop on the tour – A three-dimensional rotating image of the world on permanent display on a large flat panel monitor in the office of the engineer who created it. What makes it special is the toggle switch that allows you to view points of light representing real time searches rising from the surface of the globe toward space, colour coded by language. Toggle and you can see traffic patterns for the entire Internet. Worth a trip to the second floor.

4.2.2 Some other measures affecting the organizational environment

Responsibility of innovation placed on all staff: while some roles will be more directly involved in innovation (e.g. research and development, product development) all staff should have a mandate to act innovatively within their roles.

Human resource system that develops and encourages staff to be innovative. This requires a dedication to training, education, mentoring and the rewarding of staff for innovative behaviours. Staff also needs time and resource allocations to stop and think about new ideas, which will not happen while they are giving 100% of their time to the daily routine.

Performance measurement system that measures the innovative pulse of a company. Simple measures that are often used include spending on innovation (often labelled R&D expenditure), new product percentage (number of new/changed products introduced this period as a proportion of total product numbers) and number of patents held.

Linkages with the marketing function: Understanding the customers, their needs, and the competition is critical for targeting resources to the innovation systems. The most successful innovators understand the customers needs better than the customers themselves. They are often able to identify and solve problems before the customer has realised that perhaps there is a problem, let alone thought about buying a solution.

Knowledge acquisition and management processes that constantly bring into the organisation new ideas, information, concepts and knowledge. This can range from simple things such as receiving trade, scientific, engineering and professional magazines, attendance at conferences and participation in industry networking forums right through to having a comprehensive research capability. Where knowledge is not readily available, polytechnics, universities and research institutes have the capabilities for developing it for you.

Intellectual property management systems that identify, protect, value, manage and audit the organisation's intellectual property (IP). This intellectual property is the new knowledge that arises out of the innovation process e.g. it may be a unique understanding of a production process that facilitates superior efficiency or design in a new product. Some organisations have difficulty in identifying their IP. One way of doing so is answer the question: what do we

know that our competitors don't and that we don't want them to know? Once identified, it needs to be protected or the competitors will find out! Protecting your IP can range from simply keeping it confidential, not only physically but also electronically (Trček, 2006) through to the more formal means such as trademark protection, patents and plant variety protection.

Collaboration with other organisations who can contribute to innovation processes. Most organisations cannot achieve best-practice innovation working in isolation. They need to work with research providers, tertiary education institutes, associated and support industries and even their own competitors. Clustering of similar organisations and their support industries is a proven tool for ensuring collective growth by sharing those parts of the innovation process where their interests overlap. This may require collective ownership of the IP that arises from that sharing.

Flexible, organic structure, which encourages team work and also acts as a stimulant to people to be more creative. Having an elastic business definition helps to ward against protectionist instincts and the organisation thus avoids subconscious defence against necessary changes. Management of the organisation should be directed to spend a significant amount of their time looking for opportunities outside the boundaries of the business they are managing.

Employees' motivation: motivating an employee means that he should feel his personal success at work, feel that he positively contributes to the company's goal, to feel responsibility corresponding to abilities, receive acknowledgement for his or her performance, feel that he acquiring new experience and develops his abilities.

Participative leadership style: managers focus both on the task and the subordinates and enable them to participate in the planning and decision-making process.

Have a fluid notion of organizational boundaries: It is not necessary to create all innovations internally. Partnerships can be a useful strategy to promote innovation. Also, in addition to development, acquisition can be an effective innovation strategy.

Manage the risk: Strategy should not be monolithic; it should be sufficiently varied to allow for organizational agility and flexibility. Remember that most innovation ideas will not pan out, so don't think big in terms of funding any one innovative idea. The strategy should be to fund a number of ideas. Low-risk experimentation is of key importance – invest in many ventures but start out small. Although most new ventures will fail, important learning can be acquired from each. Project risk must be distinguished from portfolio risk – the risk of any new project will be high but if there are enough innovation projects, the portfolio risk will be manageable.

Transform organizational strategy: Typical strategic planning is often antithetical to promoting radically innovative business models and strategies. Innovation cannot be held to a scheduled strategic planning timeline; it should be on-going. Also, strategy should not be restricted to the same set of top level decision-makers. Innovative strategy does not necessarily come from the top but too often not a word about contributing strategically appears in the performance criteria for anyone below the level of senior executive.

Other factors, as a systematic collection of all impulses that could lead to innovation, good team work, continued education of employees, the ability to finance the innovation activities.

4.3 Management of ideas

4.3.1 The goal of innovation

The goal of innovation is to create business value by developing ideas from mind to market. And it is, for most companies, tremendously difficult to achieve. Innovation isn't difficult because employees don't have good ideas. The world is awash with creativity and technological breakthroughs. Rather, myriad obstacles in the idea-to-cash process limit a company's ability to innovate. Rigour and training are required to overcome these obstacles. Seen as the creator of new value, innovation isn't hit-or-miss, trial-and-error lateral thinking, but a repeatable process (CSC 2005).

Idea management (hereinafter also IM) is a formalized mechanism for encouraging employees to contribute constructive ideas in order to improve organizations in which they are employed (Milner et al., 1995). Idea management encompasses planning, organizing, managing and control of the process of invention creation and their transformation into potential innovations and further into innovations in the widest range of employees – unprofessional innovators (Fatur, 2005). Idea management does not cause a rapid progress of the company yet it may importantly influence its competitiveness providing it is appropriately organized. It may also indicate the starting point of successful professional innovativeness, i.e. the innovativeness that assures the company the basis for survival and its competitive advantage.

Idea management focuses the creativity of employees on critical business problems and increases their participation in solving both line-of-business and "big picture", market and revenue related issues. Marsha McArthur, innovation manager at Bristol-Myers Squibb, one of America's largest pharmaceutical companies, used an idea management solution to help the company through a period of industry consolidation and widespread patent expiration on many "blockbuster" drugs. When a patent expires and an alternative generic drug enters the market, it is possible to lose 80 per cent of revenue in the patented drug line within six months.

In the past, innovation was defined largely by creativity and the development of new ideas. Today the term encompasses coordinated projects directed toward honing these ideas and converting them into developments that boost the bottom line. A new event, fact or idea emerges, and is sent for evaluation by those able to make the appropriate judgements, and guide the development of the idea. Does the idea embody the possibility for a new dominant design, service or platform? Can a project be constituted to manage the development of this initial "seed"?

Companies seeking new wealth need to look towards intelligence, and intangibles; and of course, people. Innovation and competence are locked in an inseparable embrace. According to Ridderstråle and Nordström, "This is the age of time and talent, where we are selling time

and talent, exploiting time and talent, organizing time and talent, hiring time and talent and packaging time and talent. The most critical resource wears shoes and walks out the door around five o'clock every day". They mean innovative people.

Encouraging innovative career development at Svea

Bernard Likar

The employees of a company are still its largest unexploited source for their further development and growth. This is particularly important in the wood processing industry which proves to be one of the most traditional and work intensive branches. Encouraging the development of competences as well as innovativeness of employees is probably one of the main tasks of development-oriented companies. The fact remains that companies may not be built exclusively on employees who have developed within the company, however, they are extremely important for the company's growth. The company needs to be able to detect the said potential at the very beginning of their employment, possibly even before the very employment, i.e. identify the talented individuals and actively support the development of their careers.

The possibilities of planned encouragement of employees' development may be presented with the example of the Slovenian furniture company Svea d.d.

The company decided to support a young technically talented student at an early stage of his education, and granted him a scholarship when he was still a secondary-school student. The said student, Mr. Srečko Baloh got familiar with the craft very early since his grandfather was a self-learned master of handicraft. He was able to work with and process the wooden and metal parts of buckets, barrels, carts as well as grain mills. The grandson was thus close to the both basic materials. He was deciding between the hot iron and natural wood and chose education at the wood technology vocational college which he combined with the practical training with a master cabinetmaker.

After the concluded apprenticeship, the company offered him employment. As a young technician he was faced with the work of a quality-control officer and standardiser as well as with the tendency that the things may go their own way unless we channel them onto the right track.

When facing a string of current problems that the individual positions within the company entailed, he managed to find a lot of possibilities to find solutions, to find a path to a better quality work and working atmosphere, with less effort and faster. He was following the idea that the effectiveness of a worker cannot be measured in the amount of his sweat but rather in the number of high-quality products.

After a decade of improving his skills on various positions and challenges within the company, the company offered him the position of a technologist. In that new creative environment he was able to do his utmost and was so promoted to the position of the development technologist and later to the head technologist. He was so able to upgrade his rich technical-operational knowledge by complementing it with his affinity to construct and

design and so brought his company a string of innovative and designer solutions for products which are now successfully placed in the market and bring the company awards at various innovation competitions.

With deliberate recruitment policy as well human resources management and training in the technical field and other fields, the company managed to make a leap forward as regards technology and innovation despite the difficulties which were a consequence of inadequate technological equipment, a heritage of past difficulties and adverse economic situation. The company has become the leader in its branch of industry.

4.3.2 Implementing the idea management

The organization of IM in the companies may be divided into three systems, namely the classical system, the supervisors-managed system and a combination of both. The *classical system* provides for the entire process to be managed in a centralized manner. The employees submit their ideas on improvements (i.e. "suggestions") in a written form to the central department or an individual who is responsible for processing employee suggestions within the company. The role of a line manager in this system is only partial or does not even exist (he/she may be receiving the suggestions and forwarding them to the central department or may only be informed that the suggestion was generated within his/her department – at times not even that).

On the other hand, the *supervisors-managed system* proves to be completely decentralized since the predominant responsibility for implementing IM is entrusted to line managers. The IM goals on the company level are delayered down to the level of particular department and the line manager remains responsible for their achievement. The employee submits a suggestion directly to his/her superior (verbally or in writing) who then decides upon its acceptance. Furthermore, he/she may upgrade the suggestion together with the author and his/her colleagues and delegates the person responsible for its implementation (providing the said does not exceed his/her competences), defines the amount of the award and also grants it. Very often the formal department operates as a working group and expresses its innovativeness pursuant to the group/team problem-solving principles. The central department (IM department) acts only as a coordinator, trainer, animator and motivator.

Modern trends in IM are abandoning the centrally-driven system and are beginning to introduce the supervisors-managed system (Fatur and Likar, 2006).

What are the main issues to be dealt with when introducing the idea management programme into an organization?

First of all, IM is a matter of the *top management decision*. But its decision and its declarative support offered to innovativeness are not enough – they must be followed by a strong *commitment* shown not only by words but also by concrete management's acts. Usually, the strategic role of IM is well-defined yet the problems occur at the implementation phase.

Innovativeness needs to be a declared *value* and has to be made a part of the companies' *strategic plans*. Then, the strategy needs to be turned into IM *objectives* which are defined not only at the company level, but also at the level of every individual department (organisational unit, work group). *Objectives* have to be defined as per contents and value

and set with consensus of all the organizational levels. This means that the responsibility for reaching them at the company level has to be devolved upon middle and lower management. Namely, the objectives in IM may only be reached on the base levels, i.e. among employees working at the lower organisational levels. The results at the company level can only be a sum of results recorded by individual department. In the event the latter fails to have any objectives set, its results may not be expected and accordingly also the results of the company as a whole. Of course, if the set objectives fail to be reached, the management has to demand appropriate measures to be imposed.

Low level of top management's awareness as regards the importance of innovativeness leads to a low level of awareness at the subordinate organisational levels. Unlike other aspects, the aspect of goal setting remains the top management function. Communication system, organisation, employee development and similar may be established and developed by the IM department regardless of the level of interest demonstrated by the top management. Yet the same does not hold true for the aspect of goal setting. Setting goals and objectives and providing means for reaching them remain a direct responsibility and concern of the top management.

A company should appoint a person responsible for IM – an *idea manager*. Reputation and power of the personality are particularly significant as to the position held by the idea manager. In principal, innovation is voluntary activity of the employees. Therefore, the idea manager should use not only his formal authorisations but also his informal power if he wants to encourage the employees to be innovative. In the companies with supervisors-managed system or combined system, idea manager proves to be a reputable person who not only implements formal processing of submitted suggestions but also holds a role of leader, mentor and consultant. In the classical system idea manager is merely engaged in formal processing of suggestions, looks after their implementation and calculates the amount of award granted to the innovator – which are tasks that do not require a large amount of personal power and reputation.

Both the management and employees as well as evaluators have to be appropriately *trained*; the subject of training is not only the procedures (IM process execution, evaluation of ideas) but also the contents (creativity techniques, team work). Attention should be paid to the *creativity techniques.* Formal frames, which encourage ideas submission and enable their processing and implementation, are only a part of the story. These frames enable a certain level of creativity and consequently innovativeness within the company. Employees are offered a possibility to be creative. Nevertheless, the creativity of each individual is limited. In order to surpass its fundamental level, creativity needs to be "pulled" out from the individuals as well as teams. This means that management should no longer be passive and awaiting for the ideas to be generated yet use various tools and techniques which shall help employees to be more creative.

Companies must be aware of the high importance of *suggestion implementation*. Idea which remains unrealised is worthless. In order to avoid comments given by the workers, i.e. "he received an award, we got work", companies may transfer most of the implementation work onto inventors that are personally interested into implementation of their ideas, thus willing to contribute their efforts in this field. Throughput time (time elapsed from suggestion

submission to its implementation) as one of the key elements of efficient IM system still holds great reserves. Successful companies are able to implement the process from invention (idea submission) to innovation (idea implementation) fivefold faster than average ones.

Communication between the author of suggestion and IM department proves to be a very delicate field since it involves personal interests of the individual. Satisfaction of the individual innovator and his interest in future cooperation depends on the form of communication which the idea manager was able to establish. In case the suggestion is unfoundedly rejected or, even worse, if the suggestion is lost somewhere in the procedures and without any feedback given to the author, the author shall most definitely decide to discontinue any further cooperation. Unsatisfied individuals shall suppress the innovation climate more effectively than the most efficient information system may create it. However, the most favourable answer given to the author is definitely the fastest possible implementation of his suggestion providing it proves to be justified.

The company should strive to integrate the awards granted to innovations into the salary and wages system. Connection of the IM with other systems introduced by the company is of extreme importance for its vitality. Only when the IM becomes an integral part of company's life, it shall grow to be self-evident. And when it becomes self-evident, it shall operate spontaneously without any consideration that huge amount of energy needs to be invested into its safeguarding.

According to most of criteria the supervisors-managed system proves to be more successful than classical system. A recent study (Fatur, 2005) shows that the proportion of inventors (i.e. employees who submitted at least one suggestion in the period of one year) in the entire structure of employees is threefold higher in the supervisors-managed system than in the classical one. Suggestion throughput time (time elapsing from the submission to implementation) is twofold longer in the classical system than in supervisors-managed system. Supervisors-managed system prioritises mass engagement before the quality which brings suggestions with smaller economic savings yet these deficiencies disappear due to a much higher number of suggestions submitted. In comparison to the combined system, the supervisors-managed system brings almost twofold higher economic savings per employee and almost fourfold when compared to classical system. Therefore, restructuring of existing classical centrally-driven systems proves to be the next logical step to be made by the companies which have failed to implement it so far.

4.4 How to overcome resistance

A manager or company owner trying to implement a change, no matter how small, should expect to encounter some resistance from within the organization. Resistance to change is a normal reaction from people who have become accustomed to a certain way of doing things. A critical component of any successful project is to overcome resistance to change deriving either from employees or senior staff. Without the acceptance of user, any process improvement is doomed to fail. Therefore, proper anticipation and understanding the approaches to various resistance tactics is essential to success.

Generally speaking, a comprehensive change strategy is comprised of three critical areas:

- Content (what is changing for example the structure, the systems, the technology)
- Process (how the change will be planned, designed and implemented)
- People (those impacted by or participating in the change)

Employee resistance can be generated by each of these three areas, either from negative reactions to the content of the change, how the change is being handled (process), or from intra-personal dynamics that occur naturally in all people. Which of these areas is causing the resistance is very important, because how you might resolve the resistance will depend on what is activating it.

4.4.1 Employees' resistance

The employees resist change when they perceive the direction of the innovation change is wrong. They do not accept the change because they feel it is bad for either them personally or the business. But this kind of resistance is healthy, and it could be a good thing. There is always the possibility the change to be wrong. Perhaps the employees know something the leaders of the company do not know. Employees are often closer to the customer or the operations and very well could have information the managers can't possibly possess without talking to the employees.

Employees usually resist the process of change when they:

- don't feel included in it or don't have their needs or interests represented,
- don't feel informed or adequately communicated to about it,
- perceive the decision-making process driving it as unfair,
- feel overwhelmed by the number of change activities taking up time and resources necessary to do their "real" work, or
- feel they can't succeed in it because of inadequate expertise or training.

Managers who lead innovation change using a command and control style often provoke this type of resistance due to misunderstanding the impact their change process plans have on the people who must carry them out. These managers often create change efforts that are full of inadequate communications, low participation, minimal local control and insufficient training.

This type of resistance often occurs when senior managers rely on external consulting firms to design their innovation change solution, the content of what needs to change. This relies on the fact that these firms, who are very competent at the content of change, usually don't understand the people and process dynamics of change. Therefore, many of their practices cause resistance without them even understanding this.

Resistance occurs in all employees' levels, from the CEO to the line worker. In fact, the initial stages of transformation efforts often include weeks or months of meetings where senior executives work through their own resistance. These meetings are often discussions about what needs to change in the organization, why it needs to change, and how it will change. These debates often include significant political posturing as executives try to maximize their own organization's individual gain from the change. Once all this gets resolved, senior

management announces the change effort to the organization, as if they have always been aligned. Unfortunately, when employees do not automatically accept the announced change, the senior managers immediately label their behaviour as resistance and are dismayed that it exists. All humans resist change, it is natural and it should be expected. And it must be accounted for in how company plans, designs and implements its innovation change efforts.

4.4.2 Techniques for overcoming resistance effectively

One efficient method for overcoming resistance of company's human resources through innovation change is education and communication. Employees can be informed about both the nature of the change and the logic behind it before it takes place through reports, memos, group presentations, or individual discussions.

Another important component of overcoming resistance is inviting employee participation and involvement in both the design and implementation phases of the change effort. People who are involved in decisions understand them better and are more committed to them. This was already discovered by Eisenhower. Instead of giving simple orders to his generals, he used to seek different ways of performing important tasks. He tried talking to them, convincing them and tried to get their approval for his idea. He knew that the generals would carry out the task which they believed in much better than simply complying with his orders. During these kind of persuading Eisenhower sometimes discovered that he had been wrong. As a consequence many of his ideas were rejected or amended to make them better than the original one – which would have been implemented without reservations.

Another possible approach to managing resistance to change is through facilitation and support. Managers should be sure to provide employees with the resources they need to make the change, be supportive of their efforts, listen to their problems with empathy, and accept that their performance level may drop initially.

Some companies manage to overcome resistance to change through negotiation and rewards. They offer employees concrete incentives to ensure their cooperation. Other companies resort to manipulation, or using subtle tactics such as giving a resistance leader a prominent position in the change effort. A final option is coercion, which involves punishing people who resist or using force to ensure their cooperation. Although this method can be useful when speed is essential, it can have long-drawn-out negative effects on the company.

Resistance to change is inevitable and everyone experiences it to some degree. Leaders must be prepared to manage this aspect of change effectively in order to help the organization move quickly from resistance and denial to acceptance. Bateman and Zeithaml (1990) identified three steps for managers to follow in implementing organizational change:

1. Diagnose the current state of the organization.
This involves identifying problems the company faces, assigning a level of importance to each one, and assessing the kinds of changes needed to solve the problems.

2. Design the desired future state of the organization.
This involves picturing the ideal situation for the company after the change is implemented, conveying this vision clearly to everyone involved in the change effort, and designing a means of transition to the new state. An important part of the transition should be maintaining some

sort of stability; some things – such as the company's overall mission or key personnel – should remain constant in the midst of turmoil to help reduce people's anxiety.

3. Implement the change.

This involves managing the transition effectively. It might be helpful to draw up a plan, allocate resources, and appoint a key person to take charge of the change process. The company's leaders should try to generate enthusiasm for the change by sharing their goals and vision and acting as role models. In some cases, it may be useful to try for small victories first in order to pave the way for later successes.

Additionally, the content of company's innovation change must be planned while *keeping the people impacts and the process elements in mind*. The best way to ensure that company's process of innovation change will be accepted and positively supported by its employees is to include employees on company's change project teams and bring them face to face with the external pressures to change. Staff can be energized to participate in a change initiative if they understand how their work contributes to the company's success.

You could always *engage change leaders from your own staff*. People who "own" and drive the change can serve as role models. A clear best practice is to identify the leaders early and encourage them to drive the changes. Some will have influence because of their positions or titles; among them will be early adopters and resisters of change, and both will affect the way people around them think. Others will be in the cultural center of the organization. Still others are leaders not because of their titles or positions, but because of their connections and ability to persuade or influence others.

Do not forget to provide employees with the same type of opportunity the senior managers had to resolve their own resistance. As with the executives, the other employees should also have the opportunity to discuss and challenge the change issues and be asked for their input. Not all of what they want and feel will be accommodated, of course, but the act of asking, listening and considering their input will greatly reduce their resistance. This can be handled in large group meetings, work teams, or one-on-ones, with the information generated channelled directly back to the change leaders in charge.

Trimo's "complete solution"

Miloš Ebner

Trimo d.d. is a provider of complete solutions in the area of prefabricated steel buildings, steel structures, facades, roofs, containers and sound-insulation systems, located in Trebnje, Slovenia.

*For many years Trimo has been investing into the development and thus also systematic growth of innovative spirit as an important part of the expansion strategy on the international market. Trimo applies the **concept of "complete solution"** as a significant part of the differentiation strategy that distinguishes Trimo from the rest of the competition which in the majority "only" produces construction products. This means that Trimo starts its*

process chain with a strong development which is enhanced with technical consulting and design, while the production is sustained with assembly and service at the other end of the process chain. All these components enable Trimo to design solutions which prove to be optimal not only in the field of production or project solutions but also in the field of assembly and maintenance. Furthermore, feedback obtained at the assembly, maintenance as well as technical consulting, which holds a constant contact with the architects and clients, offers an important source of information to the R&D Department on what the customers want, where the possibilities for improvement are and what the trends and expectations of the architects are.

The R&D Department in Trimo is in charge of not only the development of new products/ services/processes and improvement of the existing ones but also of disseminating "the innovative spirit" within the company. Among others, Trimo's R&D Department encompasses so-called "**module knowledge specialization**" in which individual researchers are in charge of following the latest trends and discoveries as well as the state of technology in particular areas, such as ecology, alternative energy sources, noise protection and similar. These individuals are obliged to collect, select and disseminate the said information among their colleagues within the company. Moreover, development projects include not only the researchers from the R&D Department but also individuals who possess specific knowledge necessary for implementing individual development projects. In such a manner, dissemination of knowledge within the company is ensured as well as the ideas collected from people who also in praxis deal with a specific problem.

Beside the **Management**, which defines the input strategic policy and controls the final results on the global level, there are two other key bodies that actively cooperate in the development process – the first being the **Development Council**, which is composed of the Design and R&D Director, the Head of Marketing, Commercial Director as well as the Technical
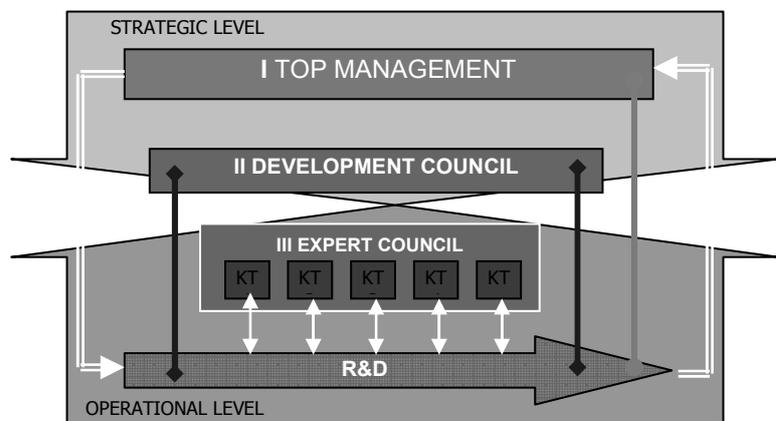
Director, and which acts as some sort of intermediary link between the strategic and operative level of decision-making. The Development Council deals with the key input suppositions of development project, such as the product concept, preliminary market analysis, preliminary business plan, etc. and confirms key milestones of development projects, i.e. purchase of technology, confirmation of trail batch and similar. The **Expert Council**, which is composed of key people from all parts of the process within the company, such as the Production, Purchase Department, Logistics and Dispatching, is a body to which all members of the project development team are obliged to present all milestones of the development project and they also need to consult with the said body about possible implications to their part of the process. As a result, well-timed incorporation of all parts of the company into developing a new product is thus ensured.

*Trimo encourages innovativeness and enables generation of new ideas through several parallel channels. The first one is institutionalised through the **development process of new products** – which defines that information or ideas on new development projects provided by the commercial network, technical consulting, marketing department, developers and the Expert Council – are collected on annual basis. These ideas are then profiled through the market needs analysis. The needs are defined on the basis of customer questionnaire, market analysis, technical and economic and social trends, analysis of the competition and other prospect lines of industry as well as regular annual meetings with architects, suppliers, strategic clients, etc.*

*The other channel of collecting ideas, which are primarily generated by the employees, is though the so-called "**Idea Basket**" which enables employees to rapidly and without any administrative work submit their ideas on possible development projects, namely directly via the Internet where they may later also follow the "fate" of their suggestion (whether the latter was accepted, what its current status is, etc.) Customers and business partners may submit their suggestions via Trimo's web site. Trimo's web sites are designed is the way which enables efficient exchange of information, documents and other data among all employees. The said system further contributes to better dissemination of knowledge within the company and thus indirectly helps towards generating new ideas.*

*In order to »hunt« for ideas, Trimo applies also some other tools, such as for example the "**Continuous improvement process**" or "**CIP projects**" – as often referred to by the employees. CIP projects are indented for collecting ideas on making small and medium improvements, mainly improvements to concrete products. It is extremely important that the suggestion, which is usually submitted by a group of employees, includes expected saving – which is also closely followed after the improvement has been implemented. Beside practical prizes for minor improvements, the employees are given also concrete financial awards for suggestions offering higher financial effect.*

*Trimo cooperates closely with the external business partners at the idea collection and the development itself. As a result, Trimo organises the **theme gatherings** or workshops with major suppliers at least once a year where opportunities for improvements and challenges in the forthcoming year are reviewed and potential cooperation in joint development project are arranged. Furthermore, meetings with architects and designers are frequently organised at different locations where Trimo presents its products and development plans for the future. Opinions and suggestions offered by the designers and architects on the existing and also future or potentially interesting products are collected during the talks and on the basis of surveys. External architects, designers and industrial designers are regularly invited to join the teams which work on particular development projects – not only in the process of setting and testing of idea concept of the product but also its operative development.*

*Trimo strives to include **research centres** into its development projects, such as the universities and research institutions at home and abroad. Consequently, Trimo holds regular annual contracts on cooperation with quite a few universities and institutes in Slovenia and abroad. In 2005 Trimo thus cooperated in the development of its products with more than 25 faculties and institutes of which more than 40 % came from abroad. Beside these research centres Trimo engages also individuals and companies which possess necessary knowledge*

and which are directly incorporated into Trimo's teams where they cover particular expert areas – there were more than 30 of such partners in 2005.

Strategic partners (clients) are intentionally incorporated into the development processes. The said partners (clients) are met on regular basis where development activities are reviewed and coordinated. Development priorities are thus adapted to these partners' (clients') suggestions and needs. What's more, strategic partners are incorporated into particular development teams which develop products that reflect their needs. Hence, Trimo accomplishes that particular new products are designed in such a way that they already have first known users when entering the market. As a result, the risk of failure or higher entry costs is minimised.

So-called *Key Files* are intended for improvements in the processes and intradepartmental cooperation in the process of TQM. Key Files are run by the TQM promoters within the particular departments who collect the so-called costs of non-quality, follow key value drivers and who suggest the opening of new Key Files on the basis of colleagues' suggestions submitted at the regular TQM meetings as well as establishment of intradepartmental teams which should search for appropriate systemic solution. Key CIP projects and Key Files are regularly presented to the General Manager, namely by the project leaders at the Board of Directors Meetings.

Trimo also publishes a tender called *Trimo Crazy Idea* whose purpose is to encourage unconventional, unburdened, and different way of thinking among the employees. The tender ensures that those who are capable of thinking differently are no longer a burden but an important part of the innovative spirit of the company – as written in the annual tender carrying a motto: "I dare – thinking differently!" A significant difference between Trimo Crazy Idea and other tools for collecting employees' ideas is that Trimo Crazy Idea is not necessarily useful for Trimo in the near future. The selection criteria encompasses factors such as an open way of thinking and an efficient presentation – all with the purpose of encouraging unconformable way of thinking as a value. At the end of the year, namely at the New Year's Party, an award is granted for the Craziest Idea. The award itself is also slightly unusual – the last being a trip for two people to Kennedy Space Centre in Cape Canaveral, Florida and a one-day course for astronauts.

Beside internal awards Trimo has been granting also international *Trimo Research Awards* for the best graduate, masters and PhD thesis. The tender is published annually in Slovenia and some other European countries and is intended for any scientific work which in any way relates to the areas covered by the company Trimo. Most of the works come from the area of architecture, civil engineering, mechanical engineering, information technology, economy, law, management and similar. Beside being published in media and special collection of scientific papers, the prize-winners are given a special awards and financial prize. Alongside

developing cooperation between the company and universities located in the markets where Trimo is already present and increasing the awareness among the students and professional public on these markets, one of the fundamental purposes of these awards is to encourage transfer of information, knowledge and ideas between Trimo and external research centres which operate in the fields interesting for Trimo and support cooperation between the most promising students and Trimo. More than 130 awards were granted in the last five years, with almost a quarter of all prize-winners having cooperated with Trimo in one way or another after the awards were granted.

*An important source of information on modern trends and market needs are also regular international **Trimo Architectural Awards** which are granted every two years for the best architectural solutions using Trimo products. Analysis findings on these trends are directly incorporated into new development projects and thus also into new products of the company Trimo.*

As regards all these activities which are carried out internally and externally and whose sole purpose is to increase the level of innovativeness within the company and thus increase the efficiency of the development process, it is important to understand a fundamental Trimo's philosophy that acknowledges the innovativeness as a complex, mutually intertwined process which incorporates different final segments (employees, suppliers, architects, strategic customers, etc.) that only together attain critical mass which enables the establishment of innovative spirit within the company and that is organically incorporated into the everyday performance of the employees.

4.5 Assessing the innovation process

4.5.1 Measuring innovation

To understand if an organisation is successful in its adoption of innovative work practices and pursuing its innovative strategy they must measure innovation performance. Essentially, if an organisation is being innovative then they have embraced change. Consequently, their overall business indicators should reflect a positive performance. A stable business performance would suggest that the organisation is simply maintaining its relative position to the external environment (maintaining a reactive stance). A downward performance might be explained by uncontrollable factors such as interest rates, GDP and so on, however this only serves to disguise an organisation's lack of internal capabilities to monitor its external influences and respond accordingly. Thus, an innovative organisation should see improvements on all business indicators, especially over the mid- to long-term.

The following sets out some ways of measuring innovation performance along the four types of innovation explored above. Combined these represent a means for measuring the success of a firm in embracing innovation.

Input innovation – requires assessing the performance of an organisation to seek out and

provide new resources or source of resources, together with new knowledge.

- Number of technology licenses bought – will provide a means for determining the extent to which a firm explores and utilises technology developed by other organisations.
- Number of collaborative agreements signed – will measure the degree to which an organisation is extending its value chain into the supply side of the business, and collaboratively working with suppliers on innovations.
- Ratio of supply value to number of suppliers – will indicate the degree to which an organisation is embracing supply relationship management, insofar as the key suppliers supplying the bulk of input materials.
- Investment in business intelligence – will show the degree to which an organisation seeks data about its external environment as input into innovative activities.
- Number of linkages with universities – as a means of determining a potential source of new information.

Process innovation – requires measuring the performance of all activities within the organisation to determine if continual improvement is being adopted. These measures need to include the structure, process, people and culture.

- Span of control index – measures the degree to which an organisation is introducing flexible, autonomous work structures.
- Number of supply-chain collaborations – indicates the degree to which a firm has adopted innovative network organisation structures.
- Cost of quality measures – internal failure, external failure, prevention, appraisal – provide a measure of the quality associated with the service or product 'production' process.
- Cost of sales performance – can indicate whether the 'production' processes are constantly being improved to reduce overall costs.
- Cost per innovation – provides a guide as to whether the innovation introduction process is, in itself, being innovated. That is, that the cost of brining new innovations on-line is reducing.
- Number of innovations undertaken by size – to gauge whether the organisation is constantly innovating and has a range of projects underway.
- Investment in process innovation as a percent of process costs – will measure the degree to which process innovation is encouraged.
- Human relations measures – absenteeism, turnover, morale – measure the effectiveness of human resource management activities.
- Cost of human relations function as a percent of total expenditure – to indicate whether innovative human resource management is becoming integral to the organisation.

New product innovation – refers to changes to existing products (minor and significant) as well as the introduction of entirely new products. To ensure that the innovation pipeline continues to yield a progression of innovations, the following performance measures are required.

- R&D expenditure as a percentage of sales – indicates the level of commitment that an organisation has to innovation.
- Market research as a percent of sales – to indicate the degree to which an organisation actively seeks data about customers' needs.

- Number of research programs – to ensure that too many projects are not undertaken simultaneously thereby stretching resources too thin.
- Mix of research programs – to ensure that the organisation is investing in a range of innovations (short- and long-term; high and low risk) to increase the success rate and have a continual flow of innovations entering the market.
- Number of product innovation introductions – minor, significant, major – will measure the outcome of research programs.
- Product innovation progression rate – per innovation type – will monitor the effectiveness of the innovation process to allow for the removal of blockages, thereby minimising cycle time.
- Number of patent applications and approvals – while patents do not signify viable commercial projects, innovative organisations will be developing proprietary intellectual property that must be protected. A further measure might be the relationship between patents such that a firm is developing a web of patents to protect a field of inquiry.
- R&D expenditure per patent – can measure the efficiency of the research process and allow benchmarking against competitors.
- Percentage of sales from new products – to determine the level of return from innovation to an organisations financial success.
- Number of licenses issued for new technologies – provides a measure of collaborative arrangements with customers and partners, and that intellectual property developed by an organisation might be utilised by other organisations.
- Number of collaborative agreements – customers and partners – provides an insight into the value web of an organisation.

Strategy innovation – can be measured by an organisations growth; that is, that innovative strategies have enabled the organisation to grow. Growth is an essential element in Kaplan and Norton's (1992) Balanced Scorecard.

- Sales – indicates whether the demand for an organisations products or services is attracting more customers as a result of innovative activities.
- Profitability – will provide insight into whether the organisation is undertaking innovations in such a way as to improve its overall business performance.
- Return on assets – to determine the organisation's ability to generate a return on its investment.
- Market share – will provide data as to whether an organisation is growing relative to its competitors.
- Market value – provides a measure of the market's perception of the organisation and its ability to be innovative.

In sum, innovative organisations require constant feedback, not only from the external world and the influences that impact its performance, but data relative to its performance per se. Such indicators enable strategies to be developed, tailored or new programs devised.

4.5.2 Scorecard to assess enterprise innovation capabilities

Another methodology, presented herein, helps organisation to assess its own innovation and to improve its understanding of innovation.

The capacity for continuous innovation requires the integration of management processes (Markič, 2004). In "Reaping Value From Knowledge and Innovation" (Young, 2001), Gartner described how continuous and leveragable innovation depends on the integration of strategic, human capital, knowledge, innovation and intellectual capital life cycle management processes within and across enterprises. We refer to this integrated system as the *innovation value chain*. The good news is that, for most enterprises, these processes – components of the innovation value chain – already exist. The bad news is that these processes may be immature and they have almost always evolved in isolation, leaving value chain participants blind to the others' needs, interdependencies, capabilities and opportunities. These conditions undermine the enterprise's ability to innovate.

The key to growing innovation is to optimize the overall performance of the value chain by improving the components themselves and the links between them. This requires an understanding of the theory of constraints, which is based on the implicit assumption that all systems are comprised of individual steps that perform a value-added function, which ultimately results in some kind of outcome. Traditionally, each step would be optimized separately; therefore, some would work faster or with greater reliability than others. This results in one of three conditions:

- Bottlenecks, where work from faster preceding steps piles up before a slower one.
- Shortfalls, where steps beyond a bottleneck are idled, waiting for bogged-down work in progress.
- End runs, where preceding steps are circumvented to speed up the process, which results in inconsistency and unreliability.

Given these conditions, outcomes are only as reliable and as fast as the value chain's weakest step or component. To optimize a system such as the innovation value chain, leaders should focus on the identification and incremental resolution of the poorest performing component and its adjacent links, proceed to the next when the worst is resolved, and so on. Doing anything else is a waste of time and resources because it will not improve outcomes.

Gartner's innovation scorecard (see Table 1) is a simple tool for facilitating the identification of an enterprise's weakest component and links in the innovation value chain (Gartner, 2002). Once the primary weakness is identified, remedial action can be taken to resolve it.

Innovation Value Chain Process Component	Yes ~ Pts. 5 Usually ~ Pts. 3 No/Don't Know ~ Pts. 0
Strategic Management Vision, values, mission Strengths and competencies Business drivers and strategies Leadership	Are failed experiments regarded as a source of learning? Are business processes such as R&D explicitly focused on core competencies or stated business objectives? Does the enterprise systemically encourage, explore and reward creative thinking? Are strategic partners evaluated in the context of innovation capabilities and processes? Are business unit leaders and partners held accountable to strategic innovation objectives?

Table 2: Gartner's innovation scorecard

Innovation Value Chain Process Component	Yes ~ Pts. 5 Usually ~ Pts. 3 No/Don't Know ~ Pts. 0
Human Capital Management Strategic sourcing Recruitment/retention Performance mgmt. Continuous learning and development	Does the enterprise consciously hire creative, adaptive staff? Are workers expected to continuously develop and stretch provided the opportunity to do so? Is work performed in interdisciplinary, cross-organizational Do mechanisms exist to retain and exploit human capital economic turmoil, in the event of mergers and acquisitions, relationships? Are human resources required and encouraged to share information?
Knowledge Management Information capture, synthesis, sharing Creative communities Continuous learning Relationship mgmt.	Do skills systems exist for identifying, growing and allocating experts? Do collaborative systems for information analysis, knowledge capture and sharing exist, and are they actively utilized? Do workers consistently indicate the information and tools available to them actively assist, rather than hinder, their performance? Are sources of knowledge and innovation (organizational and individual) and their outputs known, nurtured and systemically monitored? Where strategic partners are integral to business process execution, do workers have ready access to cross-organizational data, knowledge, information systems and personnel?
Innovation Management Competitive intelligence R&D Collaborative systems Learning	Are downstream, non-R&D organizational units regularly consulted as potential sources of leveragable innovation? Does the enterprise regularly monitor patenting activities of competitors, partners and key customers and use that information to help shape innovation and business strategy? Is there an explicit process for discovering, evaluating and funding potentially leveragable innovations throughout their development life cycles? Do tools and processes exist for data mining, information and knowledge repositories for potential opportunities? Are the capabilities of existing or potential partners considered in determining which innovations to pursue?

Table 2: Gartner's innovation scorecard—continuation

Innovation Value Chain Process Component	Yes ~ Pts. 5 Usually ~ Pts. 3 No/Don't Know ~ Pts. 0
IC Life Cycle Management IC asset and portfolio mgmt. IC valuation Global value extraction policy IC protection	Does the enterprise attempt to describe and quantify the value of its intellectual assets and are the results made public? Is a strategic organization tasked with maximizing the financial return of the IP portfolio on a continuous basis? Are non-native industries, countries and markets continually assessed in evaluating an IP asset's potential? Does the enterprise proactively consider adopting business strategies in the context of its asset portfolio, even if exploiting certain assets would take them outside their core competencies or business-value proposition? Does the enterprise include process and business practice innovations in its IP management practices?

Table 2: Gartner's innovation scorecard—continuation

This scorecard is designed to assess the process components themselves, as well as their integration with preceding or following steps. It also considers the increasing role of strategic relationships. For any given process component, a subtotal score of 18 to 25 indicates strong positioning; a score of 11 to 17 indicates reasonable positioning, with the need for some further refinement; a score of 0 to 10 indicates an exceptionally weak link in the value chain. Component scores should be compared, and those with the weakest ratings should receive the most immediate attention to optimize innovation outcomes. If most or all of the component scores are in the moderate (11 to 17) range, then one of two conditions exist:

- The enterprise's performance in relation to the scorecard's questions is actually unknown, and responses were made based on surmise or on anecdotal evidence.
- Any positive positioning in terms of adding value to innovation is purely accidental.

In both cases, deeper investigation into the performance of the value chain components should be conducted and the scorecard assessment reconsidered in advance of any attempts to reengineer or more-deeply integrate component processes. If two components appear equally dysfunctional, management can design specific measurements to obtain a more-granular understanding of relative weaknesses or make an informed judgement with regard to the relative cost and effect of improving one component instead of the other.

4.5.3 I-model – An innovation assessment tool

There are also somewhat different approaches towards systematic analysis of innovation performance benchmarking. One of the systematic in-depth analyses is developed within the EU framework of Leonardo da Vinci (Innovation model) which discusses the following topics:

- strategic aspects of encouraging innovation (strategic, managerial and fundamental organisational aspects)
- goal-setting and assessing of results (as regards organisation, time and innovation watch)

- organisational culture and climate (creative atmosphere and related relations and systemic measures)
- human resource management (related to knowledge and skills for managing innovation and implementing innovative activities)
- organisation of idea management generated by employees (mass inventive activity)
- idea generation techniques (seeking possibilities for improvement, for generating solutions and solution check)
- appraisal system (monetary and non-monetary recognition)
- role of managers (as an important instrument for encouraging innovativeness)
- innovation co-operation (with university, suppliers, consumers, competition)
- identification of factors hampering innovation activity
- innovation expenditure (including R&D) within the organisation and in cooperation with outside colleagues.
- effects of innovation (indirect effects such as intellectual property, new market product, market share, production flexibility, effects on health and environment…, direct effects: savings and financial effects owing to new products and services…)

On the basis of individual questions, the aforementioned areas are assessed and we may thus establish opportunities for potential improvement. The praxis clearly indicates that harmonised activities on individual areas bring the most optimal business results, which means that no distinctive discrepancies prove evident.

4.6 Further reading

Articles:

- Dialogue on the Effects of Disruptive Technology on Firms and Industries, Andy Warhol
- Ko bi vztrajali le pri kockah, jih ne bi bilo vec (Slovenian), Mišo Renko
- Management commitment for successful suggestion systems, Andrew E. Marx
- The Innovator's Dilemma as a Problem of Organizational Competence, Rebecca Henderson
- Thinking beyond the box, Geoffrey C. Lloyd

Links:

http://enchantedmind.com/html/creativity/attributes.html

5 INNOVATION MANAGEMENT PROCESS

Arancha López de Sancho, Carmen Dominguez, Amaia San Cristobal Macho, Pablo Vidal Álvarez, Federico Martire

5.1 Learning objectives

In this module, you will get familiar with the innovation process, its phases, and the main elements you must take in account to manage innovation. Develop innovation process is not an easy undertaking, but a demanding initiative. Innovation do not come by chance, it responds to a studied and planned work, which arises from a firm commitment to evolve new concepts, products, services or ways to develop our professional activity.

After reading this module, you will be familiar with:

- what does the innovation process involve
- basic knowledge of the key elements to manage innovation processes
- the environment of innovation systems
- the relevance of a good organisation to develop innovative activities
- some European programmes to support innovation

5.2 Introduction

Innovation is the creation or developing of new and more effective processes, services, products, technologies, as well as the successfully assimilation and exploitation of them. Innovation helps to improve economic growth, social development and business competitiveness. Inside enterprises or companies, innovation is linked to useful changes in competitiveness, productivity, efficiency, effectiveness, access to markets or management.

Innovation management appears as an essential management tool, able to contribute significantly to the success and development of the company or organisation.

In this module, some key points of innovation processes and innovation management are presented. They provide a concise approach to the main elements you must know to develop an innovation strategy in your company, as well as useful guidelines to look for more information in the field of innovation

New ways to understand innovation

Innovation is changing every day, and there are a wide range of examples and types of innovation adapted to achieve specific goals in a concrete environment. Moreover, there are many ways to define how to interpret the innovation and what should be the key points to be

focused. Find new approaches to innovation below.

Open Innovation

Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. [This paradigm] assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology.

Chesbrough, H. (2006): *Open innovation: researching a new paradigm*

Eco Innovation

Eco-innovation is the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organisation (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives.

Kemp, R. and Pontoglio, S. (2007): *Workshop conclusions about panel survey analysis and definitions of eco-innovation*

5.3 The innovation process

The objective of innovation process must be focused on the use of the available resources in the institution (material and immaterial resources), to increase and improve the creative processes to obtain new knowledge and original and feasible ideas.

5.3.1 Stages of innovation

Regarding to the innovative process, it is possible to define key stages, as a route to achieve progresses for the innovation. However, it be taken into consideration that innovation is a multicausal and not-lineal phenomenon, which is defined as a result of a wide range of links, interactions, cycles and feed-backs.

Attending to these considerations, we can draw 5 main stages in this process, summarized as follows:
- Find a opportunity
- Definition and redefinition of the opportunity
- Idea creation (methodologies)

- Idea selection
- Implementation

Finding **new opportunities** may involve: periodic review of external and internal opportunities of the organisation, establish the proper communication channels (in order to "hear" the opportunities), develop methodologies to identify trends and insights, using of utility maps…

Internal Opportunities	External Opportunities
Parallel stages of production	Elements to add value
Task combination	New niche market
Reduce inventory and waste	Increase clients
Combine efforts	Increase buying of current clients
Providers review	Revolutionary ideas
Review use of components and packaging	Harness the potential of product and services

Table 3: Internal and External Opportunities

To **redefine the opportunity**, it is necessary to describe and analyze the opportunities and possibly related problems, identify limitations, develop criteria to find solutions, consider alternative options, research new specifications or carry out an exhaustive diagnosis of the opportunity (or problem).

In order to maximize the creative potential of the problem solving group, the **idea generation** activity should be collaborative in nature. This can be accomplished in many ways. Idea management and innovation process management often provides collaboration tools, while facilitators of brainstorming and other ideation events should promote collaborative idea development.

If at first, the idea is not absurd, then there is no hope for it.

Albert Einstein

There are several methods to **select ideas**. Instead of basing selection on arbitrary decisions, it is recommended to apply a set of business criteria to the idea and rank how well the idea meets each criterion. If an idea achieves a sufficiently high ranking, either as is or through additional modification, it should be developed further.

Ideas that have passed successfully testing and development criteria, are ready to be **implemented**. Now, you can integrate the innovation into your ongoing routine, production activity, etc.

5.4 Managing innovation

Innovation is driven by the ability to identify opportunities and linkages, to see interactions or connections between two or more (seemingly) isolated facts, and to take advantage of them. Sometimes, the process to innovate is more complex than we can expect at the beginning, and a quality, effectiveness and efficient management of the process will increase our possibilities of success.

To manage this process it must be taken in account the following aspects:

- Planning (Innovation Plan)
- The process of innovate (see chapter 1.4)
- The management of innovation projects and technology
- How to finance innovation
- Competitive intelligence, technological watch and benchmarking

5.4.1 Planning

Innovation process is based on detect potential innovations, process these signals and develop the capacity to change and take advantage of them. Once you have processed, assimilated and selected the most significant of them, they must be concatenated in a strategic plan. The strategic plan will define the better way to achieve the desirable situation.

Diagnosis →

Current situation

Current customers

Current technology

Strategic Plan

Strategic objectives →

Desirable situation

Future customers

Future technology

Figure 1: Strategic plan

A strategy defines where you can be within reasonable period of time. If the goals are determined to be reached in the closest short-term, the strategic plan can become obsolete quickly. Besides this, if the objectives are determined for the further long-term, likelihood of use non adequate information will increase.

5.4.2 Management of innovation projects

Project management

The discipline that deals with organises and administrates resources in order to complete all work required in the project within scope, time and cost defined.

Project management helps to ensure that:

- Projects are supportive of overarching strategic objectives of the company and of development partners
- We are improving the scope and performance of the project
- Optimize time and cost project objectives
- Standardisation
- Projects are feasible, meaning that objectives can be realistically achieved within the constraints of the operating environment and capabilities of the company
- Improve and optimize future planning

Think about the last **innovations** developed in your company. Any of them could be improved using proper methodologies for project management? What do you think about the importance of a good planning and designing of the innovation processes? Is innovation = improvisation?

5.4.3 How to finance innovation

In addition to the usual financial resources available in the company, it is possible to access to various grants, subsidies and other instruments that some public bodies and institutions provide.

Financing instruments:

- Subsidies (European, national and regional and local programmes)
- Credits
- Participative loans
- Venture capital
- Tax incentives

Respect to European Union, it is remarkable to take in account two funding programmes for the innovation and one European innovation network:

Seventh Framework Programme (FP7)

http://cordis.europa.eu/fp7/understand_en.html

Competitiveness and Innovation Framework Programme (CIP):

http://ec.europa.eu/cip/index_en.htm

EUREKA

http://www.eurekanetwork.org

5.5 Managing the context

5.5.1 Environment

Innovation is not an isolated process, the interaction among the stakeholders shapes the outcome of the innovation process. The environment of the innovative enterprise is formed by universities, specialized technical training, scientific and researcher community, common funds of knowledge, human resources, internal effort and policies, and support of public administrations and other organisations.
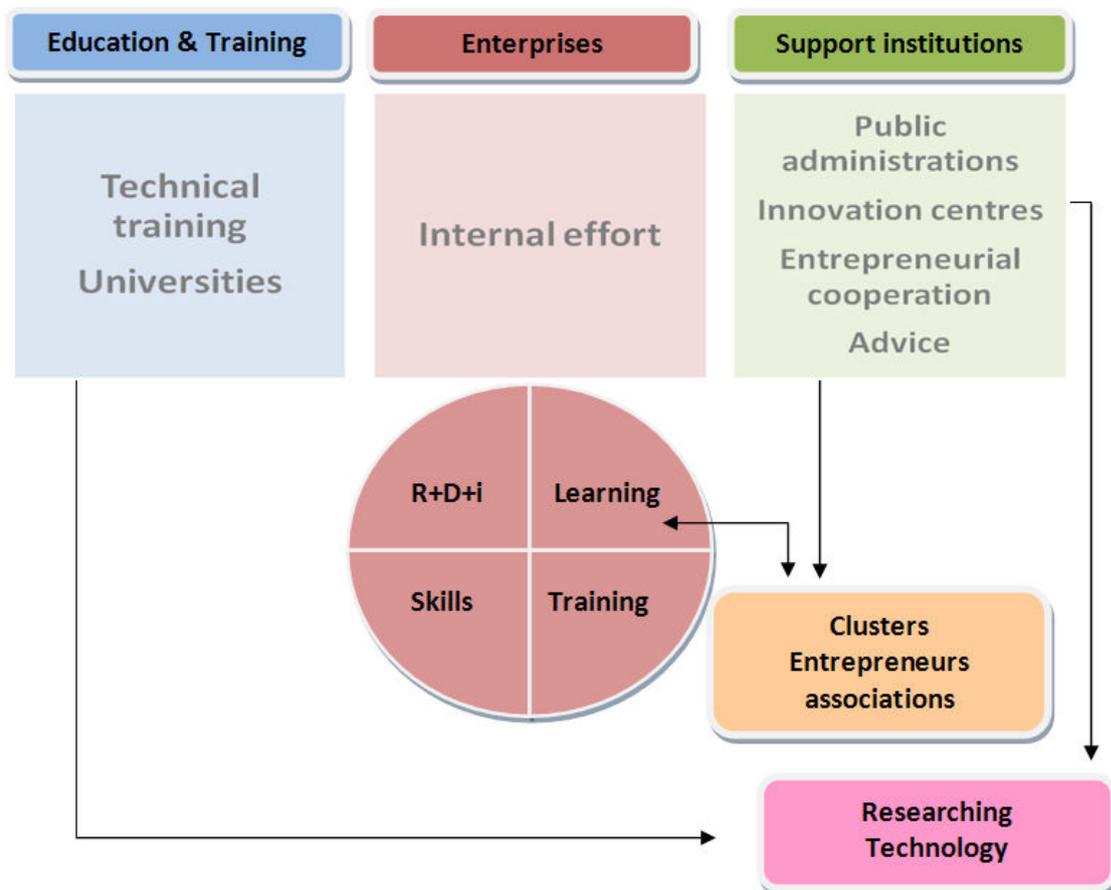
Figure 2: Environment of the innovative enterprise

Nevertheless, there are other factors with significant importance in the environment of an innovative enterprise, as innovation policies of national/local/supranational governments, macroeconomic and legislative context, communications infrastructures, financial institutions, access to markets, or industrial structure and competitiveness conditions.

5.5.2 Organisation and innovation

The innovation is found to be based on strategy, is dependant on effective internal and external linkages and requires enabling mechanisms for making change happen, in a supporting organisational context. The social component of the innovative company is considered strategic for the organisational change. The influence of the social context will determine acquisition of knowledge processes and the learning paths. Besides this, the strategy, financing and organization of innovative enterprises, are a dynamic and interactive process, resulting in learning.

The source of long-term and inimitable differences among companies is organizational differences, especially differences in abilities to generate and benefit from innovation, rather than differences in the management of particular technologies. A good organisational performance will be (in addition to an appropriate strategy) one of the best ways to develop an innovative process. It means that the company must successfully connect innovation an organisation in the following fields:

- Generate immaterial and material resources for developing new products/services/technologies
- Develop process and structures able to solve problems in the innovation process and connect innovations with business opportunities
- Incorporate innovation as a main component of the company's strategy

Innovation does not occur by chance, some organisations facilitate innovation, whereas others do not promote it. But it is not possible to define with exactitude infallible rules for the innovation, though it is possible to draw some organisational behaviours which help innovative processes:

- Small organisations could develop more potential than big ones
- Communication channels must be fluent
- Team works must be dynamics and able to incorporate different views and approaches
- Methodologies and process must be flexible
- The location to develop the innovative process is important
- Too much rules could be prejudicial to innovation

5.6 Additional cases

Self evaluation questionnaire

This self evaluation questionnaire is a simple self scoring one to allow you record your own perception about innovation in your company or organization. Please, indicate how much you agree with each of the statements below (from 5, I completely agree, to 1, I disagree).

Download:

Self evaluation questionnaire

5.7 Examples

Case study iPhone

Innovation in product: iPhone One of the most famous cases of innovation in the last years has been the iPhone. In this particular case it is possible to distinguish both types of product innovation: introduction of new products and improve existing products. As a new product, the iPhone was a revolution, a new concept in the field of new technologies. The iPhone has started a new era into the telecommunications; it is more than a telephone. Phone calls stopped to be essential in the phone to be just part of it.

iPhone is a real computer, but also you can make calls. But innovation does not end, Apple has continued improving the product. To offer new services and to cultivate the loyalty of the customers, the company is continuously developing new applications (free and paid apps): browser, maps and compass, games, access to social networks…

6 NEEDS ANALYSES

Arne Kullbjer, Borut Likar, Urška Mrgole

6.1 Learning objective

A well performed innovation process is closely linked to the needs of potential users. A technically brilliant and original product will not be useful (not an innovation) if nobody asks for it. This module deals with qualitative and quantitative tools for the need analysis supporting the invention-innovation chain.

Tools for finding the needs are different and the chapter presents a brief background on some of them like questionnaires, SWOT-analysis, On-line tools, Focus groups and Technology watch methods incl. a subchapter Searching via internet. A reader can find a method description, methodology of using it, expected results and some practical tips for its application as well as some examples from praxis.

6.2 Introduction

Innovation is closely linked to needs. However brilliant and innovative a product it will be of no use if nobody asks for it. Innovation is also related to design and sustainability. If we do not foresee sustainable development using renewable resources, low energy etc there is no need to develop a product further. Design is an important factor taking the interest of the end user of a product into account.

Extensive background information about end users needs is important before even thinking of developing a new innovative product. Tools for finding the needs can be very different and here we will just give a brief background on some of them like questionnaires, SWOT-analysis, On-line tools, focus groups and technology watch methods.

6.3 Questionnaires

Most of us have probably responded to different types of questionnaires. This is however not equivalent to the construction of a questionnaire where your intention is to get responses and adequate answers to your problems and the items you want to investigate. Many questionnaires include simple and short questions which fail to be carefully prepared and there are just too. This is mostly not effective and takes a long time to answer for the best results. If too ambitious, many questions not being applicable, the response could be low and the results not as representative as they should be.

It is important to exactly define the information you need and not go beyond these borders even if tempting. Define and write a clear objective to get the scope of the survey and then make a draft of the questionnaire. If you have settled your objectives then it is easy to define the exact items planned to be measured by the questionnaire.

A reference group or colleagues could be consulted. You could also use a small group of responders, who you know very well, to get an input from their reaction on the draft version of the questionnaire.

6.3.1 Type of questions

Open questions where the responders are expected to give written answers are easy to construct but also often tend to give less response than other type of questions. Of course you could include some questions of that type to get further information from some of the persons responding. If you expect many responses to the questionnaire it might create problems in the process of evaluating the responses. Be careful.

Try to make the questions as objective as possible. If you make a scale where the respondents are expected to choose between a number of boxes and numbers to choose, make it as conform as possible through questionnaire. One example can be seen in Table 4.

Rate the questions from 0 to 5 according to the following chart:

0	1	2	3	4	5
Don't know/ N.A.	Strongly disagree Rarely	Don't agree	Indifferent	I agree Quite/ Enough	Strongly agree Easily
	Never No	Not often	Some-times	Almost always	Always Yes

Table 4: Scale for closed type of questionnaires

Such an approach makes it easier for the respondent to fill in the questionnaire. It could also be discussed if there should be a middle-point where you do not take any positive or negative response to the question. This procedure would be a way to force the respondent to take a standpoint.

Questions like "Yes-No" and "Multiple choice" might be needed to include into the questionnaire.

Important to keep in mind at all time is;
- All questions should be coherent with the well defined objectives of the questionnaire
- All questions should enable answers from the respondents

- All questions should produce answers you really need
- All questions should be easy for the respondents to understand

A nice, attractive layout, professionally printed, is important. Such a serious approach will make the response rate higher.

6.4 Online tools

It is of course possible to provide the questionnaires on-line over the Web. Many commercial websites are available where you can create the survey, conduct it on-line, make the analysis and download the results which could be presented in different forms/software. Just search the web for on-line surveys and you will find many such examples.

The on-line questionnaires and services offered by them are naturally of interest as they might analyse and present the data in a convenient form. But they could go even further and suggest actions as a result of the analysis.

Example: One example is a project, eCASME (2004), coordinated by University of Limerick which has developed a tool for Training Needs analysis where the training (or Competencies) is broken down into sub components to specify training needs into detail. From this a training plan is generated to individual employees. The training plan specifies a method to allow companies to generate their own training content where possible (Devetak, 2002).

The result of the analysis is an individualised training plan per employee specifying content required for a training program. One further development of it could be to offer on-line training compiled from "Learning objects" that exactly matches the need of the employee. In principle all could be generated on-line and offered to the employee. This point has not been reached yet, but it is not an unrealistic future vision.

Example: Another example is the project COMBAT. This being a co-operation of eleven partners based in eight different EU countries. As part of the Leonardo da Vinci umbrella they have developed a methodology that guides companies step by step in the most effective and efficient training for their personnel. As part of this project a number of tools were developed:
- competency analysis
- assessment of workers at the workplace
- training needs analysis
- training plan development
- training delivery

These examples cover training need analysis, but they also give views on how much further

you might go with on-line tools compared to the paper based questionnaires. We will probably see more of these types of need analysis tools not only making surveys but also providing solutions to the results analysed, and why not make it a part of the innovation process when new products are being developed.

6.5 SWOT analysis

SWOT-analysis is a tool where you can find out your own Strengths and Weaknesses as well as looking for Opportunities and Threats you face now or will face in the future. It is a simple method but nevertheless quite powerful to help you understand your business and how to act in the future.

The SWOT analysis is often presented in a worksheet or diagram with four boxes according to Table 5. In the diagram you can write down Strengths, Weaknesses, Opportunities and Threats.

Strengths	Weaknesses
Opportunities	Threats

Table 5: SWOT analysis diagram

Strengths and Weaknesses are considered to be internal to your business or organisation while Opportunities and Threats are more depending on external factors. It is of course also possible to try to analyse your competitors through a SWOT-analysis even though you probably do not have all data available to be sure how correct the analysis is.

6.5.1 SWOT analysis - steps

There are of course a number of questions you could write down the answers for in this diagram and after that try to make an analysis.

- Several criteria's could be placed in more than one of the boxes and could for instance both be a Threat and an Opportunity.
- Try to make the analysis not too big and complicated, just finish up not exceeding 4-10 sentences in each box.
- With a good analysis you can focus to decrease threats and take advantage of your business opportunities.
- You might also make an SWOT analysis on a personal basis to identify your own opportunities and threats.

Examples on criteria are shown in Table 6.

Strengths	Weaknesses
Advantages of your business	Improvements needed
Your capabilities	What to avoid
Experience and knowledge	Capability gaps
Marketing	Cash flow
Innovative aspects and possibilities	Quality
Resources	Market penetration
Price	Missing resources
Opportunities	**Threats**
Opportunities you think you have	Obstacles
Market	Competition
Production innovation	Cash-flow problems
Technology innovation	New technology threats
Geographical expansion	Key staff
Trends you could foresee	Market changes
Strengths that could be opportunities	

Table 6: Examples on criteria in SWOT analysis

6.6 Focus groups

The method of focus groups is often used for planning, marketing and/or evaluation of a product or a service especially during a development phase. This is a possibility to strengthen the process of new innovations within a company.

The focus group could be chosen to collect information and to check out your assumptions while being in an innovation process. They could also get involved in the marketing process and definition of the market.

If you want to establish a focus group it is important to be very clear with the purpose/ objective of the group and to define the questions to be tackled and answered to. The members of the group should be well prepared and have a good understanding of the purpose, be given background material etc.

After a preparation time of 1-2 months there will be a session where the focus group meets in a convenient location for maybe one day. During that session a facilitator will lead the discussion and keep it at all time focused on the objectives to gain most possible output from the group. After the session it is important to analyse and document the outcomes.

The focus group should not be very formal and exact, it is more essential that the members of the groups are comfortable with the situation, especially during the session when they are supposed to give their contribution and answers to the questions defined. Choose a nice surrounding with good support during the meeting.

6.7 Desk research

Desk research is as the term suggests a research you can do at your desk using a computer. This term is mainly used as an expression when trying to define customers and market to your product, and the competition you are facing.

Internet is nowadays the main source to find and to use published information.

To make desk research you must know what you are looking for and understand the quality of the material you find. Correct information is essential. It is easy to find material on Internet, but the problem arises when using a search engine you receive an enormous amount of links. Which ones are the most interesting? To make an analysis of the market or the competitors related to a certain product will probably take several days. The analysis takes time and even though being careful it is easy to leave out key issues within the material.

The quality aspect needs a lot of experience. You need to look for how the information has been gathered, and if the website seems to be reliable. As to the market analysis you often get only small pieces from different sources needed to evaluate and to put together to get the proper overview and understanding.

During desk research always bear in mind where and what to look for, quality and selection of necessary information. It is easy and tempting to get into directions beyond the scope of the research but try to keep your focus during the whole process.

6.8 Technology watch

6.8.1 The purpose of technology watch

Technology watch encompasses establishing the state of research and technology in international scale. We wish to establish what has been done in a specific field of technology or which the guide criteria of development are.

Type of data	Sources of information	Level of applicability for enterprises
Development guide criteria of states, EU, USA and similar	governmental documents official state web sites, EU – e.g. CORDIS	strategic decision-making of enterprise
R&D projects (current) – universities, institutes, commercial research laboratories	specialized databases (national, EU – 6 & 7 Framework Programme, Marie Curie and similar) publications at scientific conferences	strategic decision-making sources of knowledge and ideas for enterprises with leading strategy
R&D projects (concluded) – universities, institutes, commercial research laboratories	specialized databases (national, EU – 6 & 7 Framework Programme, Marie Curie and similar) publications in scientific and expert journals reports of R&D groups and national as well as EU tenders	strategic decision-making sources of knowledge and ideas for enterprises with leading strategy
Patents	specialized databases on granted patents (Espacenet, USPTO …) patent representatives	strategic decision-making sources of knowledge and ideas for enterprises with leading strategy
Enterprises – commercial offer	enterprises' web sites and other materials specialized databases (yellow pages and similar) fairs, exhibitions	strategic decision-making sources of knowledge and ideas for enterprises with
Experts' analyses	specialized databases tailor-made production	strategic decision-making sources of knowledge and ideas for enterprises with tracking or leading strategy
Other info	macroeconomic reports, financial statements of enterprises, stock exchange data, news and similar	strategic decision-making sources of knowledge and ideas for enterprises

Table 7: Technology watch

Knowledge on the state of technology proves to necessary due to rapid development of technology and globalisation effects, that is to say not only in the development of new products and services, selection of material and components, purchase of development and production equipment, logistics as well as following the competition as regards the development but also their marketing activities. The results of analysis serve also at managerial decision-making on new inventions and of course strategic decisions of the management.

6.8.2 Independently or with a help of an expert

Overview of the state of technique is performed mainly by large enterprises themselves, while small and medium-sized enterprises may order the analysis from the qualified institutions. As regards the quality the prices range between a couple of thousands and some ten thousands of euros. A good analysis may be performed only by a well-qualified expert – generalist, who knows the method of work and payable databases at his disposal and by cooperating with experts from concrete fields (universities, faculties, consultants, senior managers and similar). The work is mostly performed via Internet since the latter may prove to be a valuable source of information if used deftly. In recent times, even professional information agencies collect a significant part of the information they require on Internet. According to some data more than 80 % of information is collected in such a way.

The work is carried out in numerous stages. In order to obtain appropriate information, the problem needs to be clearly defined otherwise the right information may be hard to select among a great number of obtained information. This phase is followed by information collection – outside experts may be brought in if thus proves necessary. After this phase, filtrating is essential together with organising of obtained data as well as their analysis. This is followed by the preparation of basic report and the presentation to the contractor. Paying regard to contractor's comments, additional data collection is carried out followed by analysis and preparation of final report.

In praxis, the results prove to be considerably more useful to the contractor if the latter continuously cooperates during the work since the research is oriented and directed according to the needs of the contractor.

It is worth mentioning that some enterprises perform part of this process on permanent basis. They follow different Internet or other resources, visit fairs, exhibitions, and expert conferences. They are at least partly familiar with the competition and suppliers of technology and equipment. Yet the praxis indicates that systematic analysis on the basis of new and considerably more in-depth approaches including experts may represent the enterprise value added which is used to their benefit during the business process.

6.8.3 Searching via internet-general use

General browsers may be used for independent substantiation of the state, such as Google (www.google.com), Altavista (www.altavista.com), Hotbot (www.hotbot.com). Yet we may also use special type of browsers which try classify more or less successfully the hits according to technological-entrepreneurial nature. Examples of the said browsers are www.search4rss.com, technology.monster.com.

It is furthermore advisable to have a look at the web sites which specialise in following technological development. Perfect information of course cannot be found but you may find performed comprehensive studies, papers, reviews, assessments and similar, which partly comply with your area of interest. Thus documents (researches) on technology development in the field of e-learning, nanotechnology, new technologies of screens, optical telecommunications and similar may currently be found on www.primetechnologywatch.org.uk.

It is also worth highlighting more challenging databases such as Dialog (www.dialog.com) which deals with the filed of entrepreneurship and finances (over 14 million American and international enterprises), chemistry, energy and environment, food, patents, medicine, pharmacy, technology and similar. The use of the said databases is demanding and above all not cheap.

Particularly useful are databases collected within EU information service (http://cordis.europa.eu) (CORDIS – Community Research and Development Information Service). Numerous databases on R&D work may be found under the heading "Database and Web Services" which is financed by the European Union. Moreover, the said web site also offers browsers of partners for R&D work, databases of programmes and projects and similar.

 When browsing for literature, search and purchase of literature via Internet bookstore Amazon.com (www.amazon.com) proves to be popular. Amazon.com has been followed by other bookstores such as Barnes&Noble (www.barnesandnoble.com). The purchase of books may be made easier by checking the table of contents of the book and sometimes reading the purchasers reviews of the book.

6.8.4 Searching via internet patents databases

The Internet offers numerous browsers of patents databases yet only a few are free of charge. The browser of the American Patent Office USPTO (www.uspto.gov/patft) and the browser of European Patent Office (ep.espacenet.com) prove the best in praxis (Figure 3). The former enables browsing through American patent files which is necessary for a serious investigation, while the latter enables reciprocal browsing through European (EPO), international (WIPO) and Japanese patent database.

Figure 3: The result of enquiry in EPO

The result of a simple enquiry in EPO patent database describes technical solution for a wooden beam (wood* AND (beam OR pillar)). As clearly evident, the enquiry obtained more than 422 hits, which are far too many for detailed reviewing, and the search shall need to be limited more precisely. Furthermore, it is worth establishing that the patents files for solving a concrete technical problem are numerous. Which is of course bad since it indicates that many things are already patented yet also good because very often a particular niche may still be found for protecting our own technical solution (EPO, 2006).

By using a browser, we often obtain many hits which meet our searched series of items. Numbers of patents, date of issue and the name of the patent are written out. By clicking on the number of patent, we may obtain basic information on the patent, including the abstract, listed literature, a list of patents onto which the patent in question relates, as well as the patents which mention the said patent. All of the aforementioned makes our further search easier since we can easily find all required patents with one good "hit". Beside the already described, the patent includes the classification into which the patent was classified. By clicking the basic classification of the patent, we obtain all hits of the patents which include the said classification and a list of related classification at the same time.

Information on technology development is thus numerous on the Internet, all we need to do is take some time and thoroughly "browse" as well as "winnow chaff from grain".

6.9 Summary

This module deals with qualitative and quantitative tools for the need analysis supporting the invention-innovation chain. Tools for finding the needs are different and the chapter presents

a brief background on some of them like questionnaires, SWOT-analysis, On-line tools, Focus groups and Technology watch methods incl. a subchapter Searching via internet. For further reading, we prepared some additional materials (see Further reading).

6.10 Further reading

Links:

- http://www.health.auckland.ac.nz/hrmas/resources/questionnaires.html#content
- http://ecasme.amt.ul.ie
- http://www.mindtools.com/pages/article/newTMC_05.htm#business
- http://www.businessballs.com/timemanagement.htm

Book:

- Lawrence G. Fine (2009): The SWOT Analysis: Using Your Strength to Overcome Weaknesses, Using Opportunities to Overcome Threats

7 IDEA CREATION

Cyril Chovan, Silvia Medova, Vassilis Tsaggaris, Peter Fatur, Borut Likar

7.1 Learning objective

In this module, you will get familiar with some simple and more sophisticated ways of creating good ideas that your business may require. A good idea has a potential to develop a new product, process, service or an entirely new business. A good idea may be a solution to a problem you have in mind. Also a problem itself can be hiding a good idea. Identifying a problem (of your customer, for example) is often a good part of the solution that your customer will be glad to buy. There is no creative business without a starting idea. Therefore, idea creation is a crucial step in the innovation chain of your company.

After reading this module, you will be familiar with:

- different sources of ideas you may have available,
- knowledge on the most used techniques used to create ideas (brainstorming, brain writing, Gordon's technique, fishbone diagram and six thinking hats).

7.2 Introduction

Ideas come from people we know, stories we hear, the work we do, our interests, our opinions and our experiences. Some could help you get ahead at work, improve your business operations or even make your fortune. Business ideas are all around you. Some business ideas come from a careful analysis of market trends and consumer needs; others come from luck. But how can you find a source of ideas and knowledge?

You could start by examine your own (or personnel's) skill set for business ideas. To find a viable business idea, ask yourself, "What have I done? What can I do? Will people be willing to pay for my products or services? Do I have the skills to develop this idea?"
It is also essential to keep up with current events and be ready to take advantage of business opportunities. Keeping up with current events will help you identify market trends, new fashions, industry news – and sometimes just new ideas that have business possibilities.

Observation of the market is another source of generating ideas and can lead to invent a new product or service. The key to coming up with business ideas for a new product or service is to identify a market need that's not being met. Ask yourself, "How this situation could be improved?" Ask people about additional services that they'd like to receive. Focus on a

particular target market and brainstorm business ideas for services that that group would be interested in.

Another opportunity appears at changing existing products or services by adding value to an existing product or improving an existing product or service. You might also add services, or combine the product with other products. What business ideas can you develop along these lines? Focus on what products you might buy and what you might do to them or with them to create a profitable business. There are very few products (or services) that can't be improved. Start generating business ideas by looking at the products and services you use and brainstorming ideas as to how they could be better.

Ideas and suggestions from current customers could be also a source for developing an idea. You could use Customer Feedback Forms with simple questions on what they are expecting from your product/service, what other services they would like to receive etc. Gather their answers and discuss them with your partners and start exploring if any of these ideas could be a marketable product or service.

We all live in the world in which it is sometimes more important to identify the 'right' problem rather than to solve one. Naturally, if a problem appears we tend to ask a lot of questions which produce even more answers. As a result, we work with lots of ideas and can easily get lost or diverted from the core problem. Therefore, in order to remain on the right track one must start by asking questions in a more systematic and controlled way.

There are several idea generation techniques available which vary by the degree of their scientific complexity. This chapter, however, focuses on the ones that are most efficient in terms of everyday business use. We will take a closer look at techniques such as brain storming, brain writing, Gordon's technique, fishbone diagram and six thinking hats. They are among the most popular ones because of their simplicity and efficiency not only in generating but also in organizing ideas.

Of course, there are hundreds of other techniques or variations to these:

http://www.mycoted.com/Category:Creativity_Techniques

Make it simple

When Ford Corporation was almost ready to start production of the new truck, they posted its drawings on the walls. Employees were asked to comment, writing right on top of the

drawings, on the design and manufacturability. They received over 300 ideas they implemented in three months.

These design changes helped this truck be such a success. One idea shows how simple this can be. One worker asked, "Why do we always put the bolts in the truck bed from the bottom? I have to stand in a grease pit and hold a heavy bolt gun over my head. Sometimes I get tired and let a couple of trucks go by while I rest. Why can't we put the bolts in from the top?"

Of course, the answer was, "We've always put them in from the bottom." No one could even remember the reason. Now they put them in from the top, no more grease pit, no more missed bolts.

From: Godfrey, A. B. Creativity, Innovation and Quality. Juran Institute, Inc.

7.3 Brainstorming

Brainstorming involves creating an atmosphere in which people feel uninhibited and free to propose the sort of wild and improbable solutions to problems that often point to the best course of action. The technique requires some practice and skill to use effectively but is not difficult if certain guidelines are followed.

Brainstorming refers to the process of liberal generation of a large volume of ideas from a number of participants by encouraging each of them to volunteer their creative inputs one at a time in an atmosphere free of criticism and judgment from other participants.

In general, there are two basic forms of brainstorming – structured and unstructured. The unstructured brainstorming encourages participants to give ideas as these come to their mind, whereas structured brainstorming provides certain rules that participants must follow in order to make the gathering of inputs more orderly and evenly distributed. Practical experience show that the latter is more efficient.

It enables to collect ideas from all team members about a certain topic, issue, or problem in an organized manner; encourages team members to be more creative and be open to new or non-traditional ideas; prevents dominant team members from controlling the output of the team's idea gathering efforts; and promotes synergy among team members by letting them build on each other's creative thinking. The 'structured' process is also ideal for use by teams that are new to brainstorming sessions, since unstructured brainstorming may be difficult to handle under certain situations.

The notion of brainstorming as an idea generating technique was pioneered by Alex Osborn, an advertising executive, as a way to think of as many ideas (good, bad, or both) as possible (Cory and Slater, 2003, Osborn, 2003, Robbins and Coulter, 2005).

In 1941, a team led by Osborn coined the term "brainstorm". Finding that conventional

business meetings were inhibiting the creation of new ideas, Osborn proposed some limited rules designed to help stimulate them – rules which would give people the freedom of mind and action to spark off and reveal new ideas. According to Osborn, "Brainstorm means using the brain to storm a creative problem and to do so in commando fashion, each stormer audaciously attacking the same objective." Brainstorming was presented in 1948, in a book called "Your Creative Power". Osborn developed this technique to encourage original and spontaneous thinking among his employees and to produce the maximum number of new ideas.

7.3.1 The brainstorming process

Structured brainstorming basically consists of the following steps (Brainstorming, 2006)

- State the central brainstorming theme in a question form and write it down where every participant can see it (e.g., white board or flipchart). Ensure that all the members have a full understanding of the question, since they cannot provide answers to it if they don't. Try to optimize the manner in which the question is written by having a couple of members paraphrase it with the objective of improving it.
- Let each team member have a turn to give his or her input as answer to the question. Start with any team member and proceed to the next in seating arrangement, either in clockwise or counter clockwise direction. If a team member cannot think of any input when his or her turn comes, he or she simply needs to say "Pass", and the next member gets the turn.
- Write each input in large bold letters on the board or flipchart as it is given. During these brainstorming rounds, nobody is allowed to criticize an input, no matter what. The facilitator simply writes down the input on the board or flipchart using exactly the same words used by the input giver. This encourages the members to open up and keeps the input gathering in a continuous fluid motion.
- Repeat the brainstorming rounds until everybody says "Pass" in the same round. This indicates that the ideas of the team have already been exhausted.
- The last step is where the team members are required to "sanitize" the inputs. Review each of the listed inputs for further improvement in the way it is written and maximize its clarity. Now is the time that other team members can ask the input giver what he or she actually means by his or her input. Discard all inputs that are duplicates of another input. Similar but different ideas must be preserved on the list, though. Very often this phase of idea evaluation or "sanitizing" is performed separately with a slightly different structure of group members.

The brainstorming can be very effective as it uses the experience and creativity of all group members. When individual members reach their limit on an idea, another member's creativity and experience can take the idea to the next stage. Therefore, group brainstorming tends to develop ideas in more depth than an individual can do. Where possible, participants in the brainstorming process should come from as wide a range of disciplines as possible. This brings a broad range of experience to the session and helps to make it more creative.

To run a group brainstorming session effectively, it is recommended to do the following:

- define the problem you want solved clearly, and lay out any criteria to be met;
- keep the session focused on the problem;
- ensure that no one criticizes or evaluates ideas during the session. Criticism introduces an element of risk for group members when putting forward an idea. This stifles creativity and cripples the free running nature of a good brainstorming session;
- encourage an enthusiastic, uncritical attitude among members of the group. Try to get everyone to contribute and develop ideas, including the quietest members of the group;
- let people have fun brainstorming; Encourage them to come up with as many ideas as possible, from solidly practical to wildly impractical ones. Welcome creativity;
- ensure that no train of thought is followed for too long;
- encourage people to develop other people's ideas, or to use other ideas to create new ones.

7.3.2 The analysis of ideas

Once the brainstorming session is over it is then necessary to perform thorough analysis. As all the ideas are scattered all over the white board/flipchart, it is recommended to put them all into one electronic list. With the ideas stored electronically you can easily restructure them and send them to other people by email. Technically, the brainstorming session is over at this point and the analysis or evaluation process has begun. It is important to make this distinction. Brainstorming is only the generation of the ideas. When you start to analyze the ideas you are not brainstorming. However, brainstorming without analysis is pointless.

The analysis of the ideas can be done individually or in a group. Sometimes, the group can be the same group who did the brainstorming or even better, it can be the dedicated group of colleagues who will eventually be implementing the chosen ideas. Because it is best to have "external" people in the brainstorming session it is often the case that the group which analyzes the ideas is a different group to that which produced them.

Even there is a group analyzing the ideas it is always helpful to do an initial sort-out to remove duplicates and remove ideas which are really impractical. This removal should be based on valid physical criteria such as cost, time and physical laws. However, one should be very cautious and should not remove any remotely possible solutions at too early a stage. The remaining ideas can be then clustered into various matrixes or groups (depending on the session's goal).

For example, they can be divided into the following three lists:

- Excellent – definitely will work and can be implemented immediately.
- Interesting – will possibly work or may require further analysis to decide if it will work.

Needs more investigating. May work in the future.

- Useless – will not work.

Depending on the lists it is possible to plan and implement the excellent ideas and to investigate the interesting ones. This is where the management and leadership skills are necessary.

Shut up and eat your M&M!

One of the most widely used techniques to open up an organization to new ideas is brainstorming. This simple technique frees up people to contribute without criticism. It helps break down quickly the fear of sounding stupid, of having one's idea picked to pieces. It also allows us to quickly build on other ideas.

An easy way to introduce this idea into company discussions comes from Armstrong International. Their problem was simple: How were they going to get people to accept new ideas? The solution was to hand out M&M chocolate candies. The team manager handed everyone entering a meeting an M&M. Then he told them:

"You are allowed one negative comment during the meeting. Once you make that comment, you must eat your M&M. If you don't have an M&M in front of you, you can't say anything negative."

"It was great! Instead of being threatened by new ideas, people supported them. Anything negative was instantly met with a joking "Shut up and eat your M&M."

From: Godfrey, A. B. Creativity, Innovation and Quality. Juran Institute, Inc.

7.4 Brainwriting

Brain writing is a technique very similar to brainstorming. There are many varieties, but the general process is that some/all ideas are recorded by the individual who thought of them. They are then passed on to the next person who uses them as a trigger for their own ideas. The method can be carried out in several different ways such as

- Brain writing pool,
- Brain writing 6-3-5,
- Idea card method,
- Brain writing game,
- Constrained brain writing, etc.

7.4.1 Brainwriting pool

Each person, using post-it notes or small cards, writes down ideas, and places them in the centre of the table. Everyone is free to pull out one or more of these ideas for inspiration. Team members can create new ideas, variations or piggyback on existing ideas.

7.4.2 Brainwriting 6-3-5

The name brainwriting 6-3-5 comes from the process of having 6 people write 3 ideas in 5 minutes. Each person has a blank 6-3-5 worksheet (see Table 8).

Everyone writes the problem statement at the top of their worksheet (word for word from an agreed problem definition). Then they write 3 ideas on the top row of the worksheet in 5 minutes in a complete and concise sentence (6-10 words). At the end of 5 minutes (or when everyone has finished writing) pass the worksheet to the person on your right. You then add three more ideas. The process continues until the worksheet is completed. At the end there is going to be a total of 108 ideas on the 6 worksheets. These should be thoroughly assessed and analyzed.

	Idea 1	Idea 2	Idea 3
1			
2			
3			
4			
5			
6			

Table 8: Brainwriting table

7.4.3 Idea card method

Each person, using post-it notes or small cards, writes down ideas, and places them next to the person on his or her right.

Each person draws a card from the neighbours' pile as needed for inspiration. Once the idea has been used, it is passed on to the person on the right along with any new, variations or piggybacked ideas.

7.4.4 Brainwriting game

This method is set in the form of a light-hearted competitive game. Creativity methods normally avoid competition because it tends to be divisive. However, as long as the game atmosphere is fun rather than overly competitive, and the facilitator ensures that there are no significant losers, the game format might be useful, particularly in training contexts where

winning and losing are likely to be less of an issue and both can be used to provide teaching material.

The game takes a little longer than some other brainwriting techniques. However, on the other hand, a very little facilitation skill is needed. The structure should be as follows:

- Display the problem statement, and explain that the winner of the game is the one who devises the most unlikely solution.
- The facilitator sells each group member an agreed number of blank, serially numbered cards at, say, 10 currency units each, pooling the money to form the prize. Each group member signs a receipt that records the serial numbers of their set of cards.
- Members try to think of utterly implausible solutions, writing one per card. The cards are then put up on a display board.
- Members now have 15 minutes to silently read all the solutions, and to append to them (on further un-numbered cards or post-its) ways in which they could be converted into a more practical way of solving the problem (so reducing that ideas' chances of winning).
- Each member then has two votes to vote for what s/he now considers to be the most improbable idea on the numbered cards. The idea that attracts most votes wins the pooled money.
- Form two sub-groups, give half the cards to each, and give each group 15 minutes to develop six viable solutions from their cards.
- Each sub-group tries to "sell" their ideas to the other sub-group.
- Everyone comes together and agrees on the best ideas overall.

7.4.5 Constrained brainwriting

On a number of occasions it is necessary to constrain ideas around a pre-defined focus, rather than ranging freely.

The versions described here use the standard brainwriting pool technique, but bias the idea generation by using brainwriting sheets prepared in advance.

- Present starter ideas: The leader initiates the process by placing several prepared sheets of paper in the pool in the centre of the table.
- Private brainwriting: Each group member takes a sheet, reads it, and silently adds his or her ideas.
- Change sheet: When a member runs out of ideas or wants to have the stimulation of another's ideas, s/he puts one list back in the centre of the table and takes one returned by another member. After reviewing this new list s/he has just selected, s/he adds more ideas.
- Repeat until ideas are exhausted. No discussion at any stage.

Kill the "Not invented here" syndrome

Another impediment to fast innovation is the belief that we must create all ideas ourselves. We have a major emotional roadblock to stealing ideas.

We have been taught for years that this is wrong. We must have original ideas. As children we're taught stealing is wrong. But in business that's not always true. You should "borrow" unpatented ideas from the best people and companies you can find. It's an efficient way of satisfying your customers.

The "if it's not invented here we won't use it" syndrome can be fatal. There's nothing wrong with swiping an unpatented idea if the idea will help you do a better job serving your customers.

As AT&T became more competitively challenged in the early 1980s and began working hard to change the culture in order to quickly develop and introduce new products into the market place, this NIH syndrome became a burden.

One lab then created a wonderful way to break down this barrier to creativity and innovation. They created a new award, the "thief of the month." Each month they would honor the individual or team who stole the best idea from somewhere else. These "thieves" would be pictured in the Bell Labs News with a story describing how using these ideas accelerated the development process and reduced unnecessary redundant work.

From: Godfrey, A. B. Creativity, Innovation and Quality. Juran Institute, Inc.

7.5 Gordon´s technique

Gordon technique is another method used for generating ideas and decision-making. It is closely related to brainstorming and many people think that it is a variation of the famous technique. The main difference is that the moderator of the group knows the exact nature of the problem under consideration while the participants do not. Leader starts the group discussion and presents the true situation only when the participants are close to a satisfactory solution.

7.5.1 Key points of the method

The fundamental point of this method is that participants are kept in the dark in order to generate more ideas and suggestions from the very beginning of the session and avoid generating the "solution" very soon.

The first and most difficult task of the leader is to select a topic for discussion. The subject must be closely related to the problem at hand, but its exact nature must not be revealed. Usually, this subject will be a physical principle which is related to the problem that must be solved.

Gordon believes that there is danger in a typical brainstorming session of a participant becoming convinced that one of the ideas he has proposed is the best possible solution to the problem. Consequently, participant may cease producing additional ideas, and devote his / her energies to defending and selling his "creation". On the contrary, Gordon technique avoids this danger since there can be no best solution proposed for a problem that has never been stated.

Additionally, leader does not provide any specific towards a specific problem and participants discuss broadly, talking about the problem but never getting anywhere. Although it seems time wasting, the beneficial point of this technique is that participants usually cover aspects which it would never discuss them if they did know the specific problem.

The following problem situations are examples of how this technique works:

- The problem is one of seeking solutions to the parking problem of a large city. The group leader could start the session by asking participants to discuss ways to "store things".
- Assume that the problem is to design a new roofing system. Thus, the group leader might have the group discuss "enclosures" or "ways things are enclosed."
- The problem is to review procedures for washing windows, so the group leader selects the topic of "removing dirt." This process may produce some unusual approaches which otherwise may not have been associated with the problem at hand. It is well to remember that these leads are important since they direct you toward the final solution.

7.6 Fishbone (Ishikawa) diagram

The fishbone diagram can help to structure the process of identifying possible causes of a problem. Its possible causes are presented at various levels of detail in connected branches, with the level of detail increasing as the branch goes outward. An outer branch is a cause of the inner branch it is attached to. Thus, the outermost branches usually indicate the root causes of the problem.

The diagram encourages the development of an in depth and objective representation ensuring all participants keep on track. It discourages partial or premature solutions, and shows the relative importance and inter-relationships between different parts of a problem. The Ishikawa Diagram is employed by a problem-solving team as a tool for collating all inputs (as to what are the causes of the problem they are addressing) systematically and graphically,

with the inputs usually coming from one of the techniques of idea creation. It enables the team to focus on why the problem occurs, and not on the history or symptoms of the problem, or other topics that digress from the intent of the session. It also displays a real-time 'snap-shot' of the collective inputs of the team as it is updated.
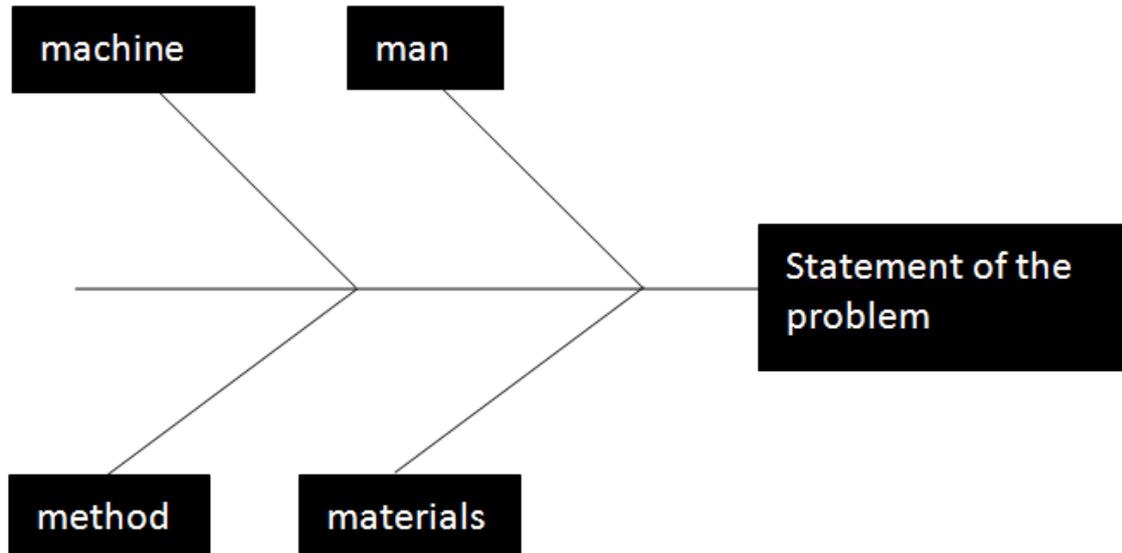
Figure 4: Fishbone (Ishikawa) diagram

7.6.1 The process

The method is ideally organized over a number of meetings, enabling the team to become deeply immersed in the problem. Fresh suggestions regarding possible causes can arise during the break and members are more likely to forget who originated every idea, thus making subsequent discussions less inhibited.

The procedure should be carried out as follows:

- On a broad sheet of paper, draw a long arrow horizontally across the middle of the page pointing to the right, and label the arrowhead with the title of the issue to be explained. This is the 'backbone' of the 'fish'.
- Draw spurs coming off the 'backbone' at about 45 degrees, one for every likely cause of the problem that the group can think of; and label each at its outer end. Add sub-spurs to represent subsidiary causes. Highlight any causes that appear more than once – they may be significant.
- The group considers each spur/sub-spur, taking the simplest first, partly for clarity but also because a good simple explanation may make more complex explanations unnecessary.
- Ideally, it is eventually re-drawn so that position along the backbone reflects the relative importance of the different parts of the problem, with the most important at the head end.
- Circle anything that seems to be a 'key' cause, so you can concentrate on it subsequently.

Experienced users add more branches and/or use different categories, depending on what would be more effective in dealing with the problem.

There are many ways to interpret the Ishikawa Diagram. The fastest and simplest way to do it

is for the group to choose the top five causes on the diagram and rank them, using their collective knowledge and any data available. The selection of the major causes may be done by voting or any other process that allows the group to agree on the ranking. The selected causes are then encircled on the diagram, with their ranks written beside them. The team may then investigate these causes further and use problem-solving techniques to eliminate their occurrences.
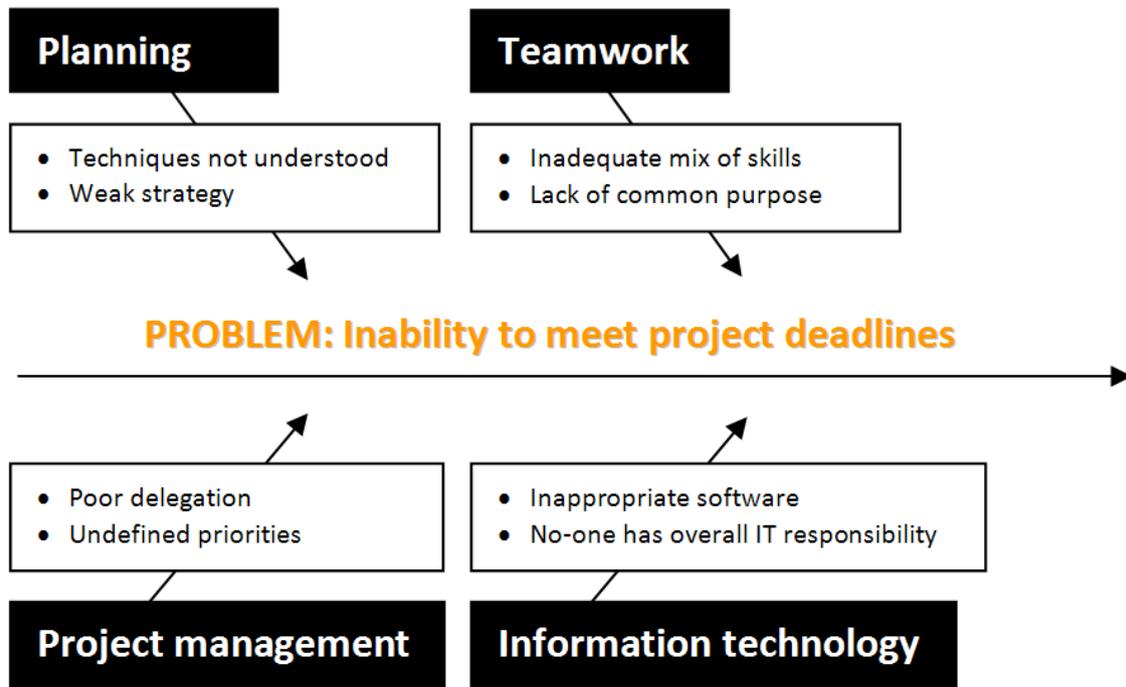
Figure 5: Example of using Ishikawa diagram

7.7 Six thinking hats

Many successful people think from a very rational, positive viewpoint. This is part of the reason that they are successful. Often, though, they may fail to look at a problem from an emotional, intuitive, creative or negative viewpoint. This can mean that they underestimate resistance to plans, fail to make creative leaps and do not make essential contingency plans. Similarly, pessimists may be excessively defensive. Emotional people may fail to look at decisions calmly and rationally.
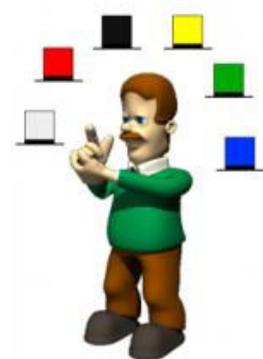
If you look at a problem with the 'Six Thinking Hats' technique, then you will solve it using all approaches. Your decisions and plans will mix ambition, skill in execution, public sensitivity, creativity and good contingency planning.

'Six Thinking Hats' is a technique used to look at decisions from a number of important perspectives. This forces you to move outside your habitual thinking style, and helps you to get a more rounded view of a situation.

Six Thinking Hats is a good technique for looking at the effects of a decision from a number of different points of view. It allows necessary emotion and scepticism to be brought into what would otherwise be purely rational decisions. It opens up the opportunity for creativity within decision making. The technique also helps, for example, persistently pessimistic people to be positive and creative.

Plans developed using the '6 thinking hats' technique will be sounder and more resilient than would otherwise be the case. It may also help you to avoid public relations mistakes, and spot good reasons not to follow a course of action before you have committed to it.

7.7.1 How to use the tool

You can use Six Thinking Hats in meetings or on your own.

How does it work?

In meetings it has the benefit of blocking the confrontations that happen when people with different thinking styles discuss the same problem. Each 'Thinking Hat' is a different style of thinking. These are explained below:

White Hat: With this thinking hat you focus on the data available. Look at the information you have, and see what you can learn from it. Look for gaps in your knowledge, and either try to fill them or take account of them. This is where you analyze past trends, and try to extrapolate from historical data.
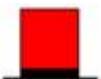
Red Hat: 'Wearing' the red hat, you look at problems using intuition, gut reaction, and emotion. The red hat allows the free expression of feelings, intuition, hunches and emotions without apology and without explanation, there must never be any attempt to justify or give the basis for the feelings. The red hat asks a person to express his or her feelings on the subject at this moment in time, it gives full permission to a thinker to put forward his or her feelings on the subject at the moment.

Black Hat: Using black hat thinking, look at all the bad points of the decision. Look at it cautiously and defensively. Try to see why it might not work. This is important because it highlights the weak points in a plan. It allows you to eliminate them, alter them, or prepare contingency plans to counter them. Black Hat thinking helps to make your plans 'tougher' and

more resilient. It can also help you to spot fatal flaws and risks before you embark on a course of action. Black Hat thinking is one of the real benefits of this technique – many successful people get so used to thinking positively that often they cannot see problems in advance. This leaves them under-prepared for difficulties.

 Yellow Hat: The yellow hat helps you to think positively. It is the optimistic viewpoint that helps you to see all the benefits of the decision and the value in it. Yellow Hat thinking helps you to keep going when everything looks gloomy and difficult.

 Green Hat: The Green Hat stands for creativity. This is where you can develop creative solutions to a problem. It is a freewheeling way of thinking, in which there is little criticism of ideas. A whole range of creativity tools can help you here. Under the green hat, we put forward alternatives, seek out new ideas, modify and change suggested ideas, use provocations and movement to produce new ideas, generate possibilities

 Blue Hat: 'Blue Hat Thinking' stands for process control. This is the hat worn by people chairing meetings. It is concerned with defining the problem and what is being thought about. It also concerns with: Outcomes, Conclusions, Summaries and what happens next. Blue hat is the organizer of the thinking process.

7.7.2 Example

 The directors of a property company are looking at whether they should construct a new office building. The economy is doing well, and the amount of unrented office space is reducing sharply.

As part of their decision they decide to use the 6 Thinking Hats technique during a planning meeting. Looking at the problem with the White Hat, they analyze the data they have. They examine the trend in unrented office space, which shows a sharp reduction. They anticipate that by the time the office block would be completed, that there will be a severe shortage of office space. Current government projections show steady economic growth for at least the construction period.

With Red Hat thinking, some of the directors think the proposed building looks quite ugly. While it would be highly cost-effective, they worry that people would not like to work in it. When they think with the Black Hat, they worry that government projections may be wrong.

The economy may be about to enter a 'cyclical downturn', in which case the office building may be empty for a long time. If the building is not attractive, then companies will choose to work in another better-looking building at the same rent. With the Yellow Hat, however, if the

economy holds up and their projections are correct, the company stands to make a great deal of money.

If they are lucky, maybe they could sell the building before the next downturn, or rent to tenants on long-term leases that will last through any recession. With Green Hat thinking they consider whether they should change the design to make the building more pleasant. Perhaps they could build prestige offices that people would want to rent in any economic climate.

Alternatively, maybe they should invest the money in the short term to buy up property at a low cost when a recession comes. The Blue Hat has been used by the chair of the meeting to move between the different thinking styles. He or she may have needed to keep other members of the team from switching styles, or from criticizing other peoples' points.

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7.8 Additional cases

Idea creation on the basis of needs analysis

Borut Likar

A Slovenian insurance company wanted to develop new products that would not only enrich their offer but also represent a cornerstone of their offer in the forthcoming decade, which would be primarily oriented towards the youth.

The background to such approach is the joining to the EU and related social changes as well as market economy. Due to many reasons the insurance company engaged a group of young people in their search for new solutions. Primarily, the insurance company decided to take on such a group due to the fact that young people prove to be far more creative than the older ones and less burdened with their knowledge on the existing solutions. Furthermore, young people tend not to restrain their search for new ideas due to their unawareness of restrictions on implementation, which the insurance experts are well aware of. Last but not least, young people also represent potential users of insurance services and are well-familiar with their needs. The insurance company undertook the challenge with the idea creation techniques, namely brainstorming and brainwriting. After two sessions, the group of young people created more than two hundred ideas, out of which quite a few perfectly reflected their basic demands (orientation towards the youth, consideration of their life styles, Internet applications, differentiation as regards the social factors and similar). Since the project is still under way, concrete ideas may not be disclosed. However, after a detailed analysis of the course of their creative work, the insurance company discovered that certain restraints were met as regards the defined principles of the aforementioned idea creation techniques. Since the problem is

identified, the solutions most frequently fail to be original given that the participants are familiar with the existing insurance products at least partially – creative suggestions thus loose their originality.

In order to avoid the aforementioned restraints, the insurance company started thinking of benefiting from the potential of Gordon technique. Creative session of the said technique is NOT based on searching for solutions to an identified problem. As a result, unusual and also very original solutions may be expected. Nevertheless, the challenge was not tackled with the Gordon technique yet its principle was applied in the following way: in the first phase, the question was paraphrased, namely "What young people are concerned about?" During this activity the participants of the brainstorming activity (or brainwriting) did not actually know that the subject of the activity is insurance business, i.e. they were not familiar with the basic problem. The participants were thus reflecting on their health, studies, employment, social aspects and similar. The results were not concrete suggestions related to the insurance offer yet a couple of main areas were defined in which the young people see or suspect potential dangers as regards their future. Some of these areas are still uncovered by the insurance companies and thus represent possibilities which the developing insurances may cover. In the second phase, some concrete suggestions for a new insurance offer were sought for the aforementioned fears also by applying the idea creation techniques. In comparison with the initial approach, the final suggestions were considerably more original and applicable!

7.9 Summary

In this module, some ways/techniques of creating ideas were presented. In spite of their common aim, each of them is characterized by its own advantages and disadvantages. A manager's task thus is to pick the one that works best in his/her concrete situation. Obviously, some experimentation and training is required. For additional methods, take a look at the "Further reading" or the following link.

http://www.mycoted.com/Category:Creativity_Techniques

8 IDEA SELECTION

Borut Likar

8.1 Learning objective

The presented module tackles various techniques of idea assessment and selection. This phase is one of the most critical phases of invention-innovation chain. Taking the wrong decision, next phases are leading to wrong solutions or products, which is often connected with enormous expenses.

A reader can find a method(s) description, methodology of using it, expected results and some practical tips for its application as well as some examples from praxis. Beside individual methods, a final decision is essential. Also this last phase which is based on input information on one side and experience, personal character, intuition on the other will be presented.

8.2 The need for invention assessment

The phase of idea assessment and selection is one of the most critical phases of invention-innovation chain. The praxis demonstrates that inventors or companies' managements frequently fail to consider its value precisely enough. They thus continue with development and the phases which follow while the costs increase dramatically. Only when they introduce the product on the market, the deficiencies arise. Consequently, it is essential to have numerous ideas at the disposal, out of which only the most promising may be selected on the basis of extremely strict criteria (Figure 6).
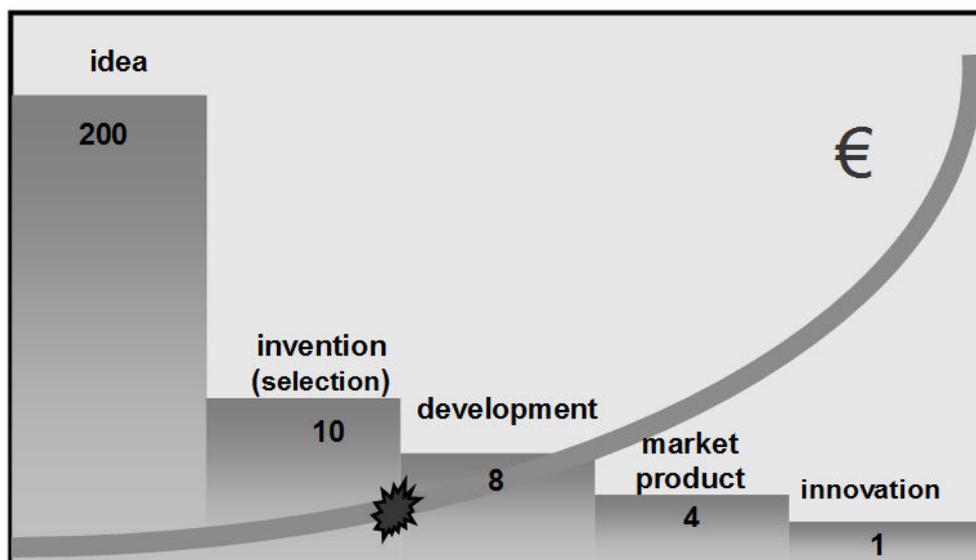
Figure 6: Development of idea to innovation

Only a few ideas prove to be inventions, even fewer become innovations. Among many ideas only a small part passes over to the phase of development and production. Among all technical novelties which have already appeared on the market, only a quarter of them "survived". It is thus necessary to have as many ideas as possible at our disposal in order to select the best.

8.2.1 The need for assessment

A constituent part of every presentation of a new idea, suggestion, technical improvement or potential innovation is a business plan with financial expected costs assessment or evaluation of anticipated expenditure and revenues as well as other effects. Beside the financial plan, other elements also need to be taken into consideration, especially the elements which cannot be financially evaluated or demonstrated in figures. Due to the complexity of the matter, each novelty needs to be regarded comprehensively from various aspects which are specific as regards the type of novelty, market, company, competition, and especially as regards the staff which are company's main "asset".

Firstly, an assessment group needs to be selected which should as a rule be composed of representatives of various profiles. The aforementioned should be experts with analytical skills and knowledge in the fields which are to be assessed.

To begin with the assessors need to set down the criteria on the basis of which the ideas shall be assessed. In case the ideas are many, they should initially be grouped according to their contents. After a short review, proposals, which are inspected from every important point of view, are short-listed in accordance with the criteria.

Preparation of plans and setting of financial and market forecasts are hard to be avoided. Yet we need to realise that it is just a matter of hypothesis which very often prove to be based on shaky grounds. Therefore, we cannot expect that the result or presupposed economic impact is any more precise than the forecast. All financial, market and other forecasts thus need to list and take into consideration all hypotheses! The most frequent unknowns in novelties are related to unknowns in technologically demanding development and assessment of the market. Incorrect assessments have buried many impatient entrepreneurs.

Numerous methods of invention assessment have been developed for economic application. Due to multi-layered nature of the problem or numerous aspects triggered by each invention, it is impossible to define strict rules according to which individual novelty could be assessed. In some cases clear and comparable mathematical measurements may be applied while others require less exact methods, which are based on subjective criteria.

8.2.2 Categories of invention

Categories of invention as regards their economic effects. So-called *closed-type system* encompasses improvements introduced within a closed system which means that we are familiar with all parameters of the system and may thus forecast the effects of the invention.

Typical example of such type are innovations where by changing the existing process (for example production) we are able to save raw materials or energy, improve workers productivity, increase production capacities and quality of the products, reduce number of rejected units, claims, stock, and flow time, and similar.

The other type of inventions is related to so-called *open system* – unknowns prove to be too many in order to forecast the effects accurately. The assessment of the results proves to be too unreliable since the number of unknowns increases with a level of novelty.

The example illustrates the introduction of new global mass video system which has visible advantages in comparison to the competition yet also some deficiencies and higher price. Almost at the same time, many new producers appear on the market. At the beginning the buyers are still distrustful, only the most daring decide for the purchase.

It is widely known that after a certain time a standard is formed which squeezes other products out of the market. Which system shall become a standard is still unknown in the phase of development, and depends on the quality of the product, competition, market, multinational companies that produce video media, political factors… After the standard is accepted, a successful company gains larger market share and higher profits (at least in the first phase when it is the only one present on the market), yet the others incur greater loss. Only the most successful company has been able to turn an invention into innovation.

8.2.3 Effects may not be financially defined

By innovating, we follow development. When we follow the development enforced by a stronger competition, we only follow the said competition and thus preserve our market share. When failing to do so, our market share starts decreasing gradually. A more precise assessment proves impossible.
Results are long-term. Example: by innovating, the company builds positive image (contemporaneousness, trust in the company and its products is established, the buyer is prepared to pay more) which indirectly and in the long run influences on the business results.

Opening of new posts. Innovation fails to bring considerable profits yet represents a new possibility of recruitment. This is particularly important in case of self-employment and in regions where employment is hard to find.

Results are related to further development. The basic idea is great yet not necessarily applicable. Providing the company succeeds in developing the basic idea to the phase of useful value via creating new ideas, the original idea shall be successful.

Results are not directly financial. Such example arises with ecological awareness of inhabitants living in the proximity of thermo power plant. They put forward claims for cleaning devices. From financial point of view, the investment represents clear costs yet it depends on the company's innovativeness what these costs shall amount to. They are financially compared to the costs of ending the operations, and similar.

Improved flexibility of production. Example: Automation in automotive industry greatly increases the adjustability of producer to individual wishes of buyer namely at lower costs. Market share thus increases and delivery times are shortened due to the possibility of modifications implemented on production lines. Consequently, a return on capital accelerates. This is only a part of advantages brought by automation. Some parameters may be assessed directly while others not (Likar, 2001).

8.3 Numerical sensitivity analysis

In particularly within the closed type systems with known parameters, the exact calculation gives the final decision a particular importance. The final result of the calculation, being positive or negative, does not necessarily mean that the invention shall prove to be all-round successful or not. It primarily illustrates the financial side by taking into account the parameters regarded during the analysis.

8.3.1 Process simulation

The process is run in the following manner: firstly, a model is designed – all fundamental elements of the process are defined and correlations are established and expressed in the form of equations. In case of a simple process, the aforementioned equations enable a calculation. We should also be aware of the fact that the aforementioned data are hard to be obtained. In case we wish to know what proportion of energy out of entire production is related to tempering the springs, the data need to be measured or the company should have an exact cost management in place – which most of the companies fail to have!

Example: Factory of springs, which are used as a component of industrial scales, decides to introduce novelty into its production. So far existing annual production costs amount to €150,000 with 200,000 units produced annually. Due to the process of tempering the energy costs per unit prove to be relatively high and account for 1/3 of all costs. Proposed novelty relates to the process of heating and cooling, while the calculations show that by introducing an invention, the said costs would lower the energy consumption to only 40% of currently existing consumption. The modification requires additional investments in the amount of €3000. Moreover, changeable costs would rise to €0.03 per unit produced.

Let us define all fundamental elements which influence the decision:
- annual production costs: €150,000,
- annual production: 200,000 units,
- energy costs per unit: 1/3 of all costs,
- energy consumption decreases by 40% with the introduced modification,
- assets required for modification: €3,000,
- additional production costs per unit: €0,03.

+ + + +		- - - -	
Production price per unit	€150,000 / 200,000 = €0.75	Assets needed for modification	€3,000
Energy costs	€0.75 * 0.33 = €0.25	Additional production costs	€0.03 * 200,000 = €6,000
Saving of energy per unit	€0.25 * 0.6 = €0.15		
Total	**€0.15 * 200,000 = €30,000**	**Total**	**€9,000**

Difference in profit = €21.000 >> investment is justified

Table 9: Comparison of costs arising from eventual innovation

The correlations among individual parameters are shown; left column demonstrates savings arising from innovation while the right column shows the costs related to the said innovation.

A simple calculation enabled us to establish that the investment in development and implementation of invention proves to be justified. Many different options need to be inspected in praxis and only the worst case scenarios considered.

It is a fact that some parameters (for example development costs) fluctuate by more than 100% without any particular damage. There are also some parameters existing – in particularly in less innovative segments (bread production and other basic necessities) where even the smallest modification causes extremely unfavourable financial changes. Such case may be simulated with demonstrated model. If we decided to lower for example the selling price, lower profits would be incurred while the sensitivity to modifications would increase dramatically.

8.3.2 Sensitivity analysis

It thus proves reasonable to perform also so-called sensitivity analysis and check what the modification of certain input parameters brings. Demonstrated example encompassed sensitivity analysis of a part of possible scenarios which are listed in Table 10.

Alterations of input parameters	Difference in profit	%
Additional production costs per unit increase by 100 % (from €0.03 to €0.06)	is reduced by	29
Energy costs per unit are reduced by 35 % (from 33 % to 26 %) due to price reduction	is reduced by	50
Energy consumption is reduced by 61 % due to modification	is reduced by	50
Energy consumption is reduced by 82 % due to modification	the same	0
Assets required for modification increase by 300 % (from €3,000 to €9,000)	is reduced by	29
Energy costs per unit account for 15 % of all costs, assets required for modification amount to €10,000	loss amounts to €2,500	12

Table 10: Results of sensitivity analysis

Profit is shown as regards different input parameters. An extremely simple example was demonstrated which was easy to calculate (due to simplicity, Excel was used). However, when there are more data, the process of model design is the same yet the appropriate computer programmes need to be used for calculation; often tables prove to be sufficient (Excel, QuattroPro and similar). In such a case more complicated relations may be included in the model as well as time and quantity variable parameters, for example monthly fluctuations of prices of electric energy, changes in quantities sold as a consequence of increased market shares, decreasing of production price as a consequence of increased quantities produced (rebates obtained at the supplier for purchasing larger quantities), and similar. There are also some professional software programmes which simulate more challenging cases.

8.4 Effectiveness assessment by introducing questions

8.4.1 Characteristics of the method

The method systematically processes various aspects of innovation project as regards the entire company and its interaction with the environment. In this case not only the critical hypothesis prove to be important but also all the others which would be influenced by the introduced invention; also those which have positive effects. The more thorough questionnaire is, the more comprehensive picture is obtained.

8.4.2 Main aspects of problem processing

Selected problems may be systematically processed from many different, and particularly essential points of view, while the basis includes the following aspects:

Strategic aspects reflect: harmonisation with the company's vision and strategic objectives, company's image, social and ecological policy, harmonisation with actual possibilities and similar.

Economic aspects are related to: anticipated costs and benefits (cost/benefit), risk, possibilities of financing and resource provision, market management, opening of new markets, competition and similar.

Main **technological aspects** which need to be tackled relate to: general technological development, number and importance of core problems, relations to other projects, application of knowledge in other projects, level of industrial protection and protection of other intellectual property, availability of fixed and current assets.

Long-term *timeframe aspects*should also be taken into consideration. Regardless of the wishes and short-term needs, which we would wish to obtain with eventual innovation, the effect of the said innovation shall be present also after many years. An example of negative long-term effects may be presented with the costs of nuclear power plant decommissioning and radioactive waste disposal. While on the other hand the development of ecological engines proves to be an example of positive long-term effects. Whoever fails to implement such improvements shall pay higher taxes and decrease its market share.

The advantage of this method is that the problems are tackled comprehensively. The questions encompass aspects which cannot be demonstrated numerically. Another advantage is that higher number of colleagues may be attracted to cooperate.

Beside the advantage, the aforementioned method has also some disadvantages. Many different standpoints are gathered in a simple way; however the processing of the said proves to be complicated. The reason lies in the fact that the opinions frequently conflict and the analysis is lengthy due to descriptive answers which do not allow simple comparison (Likar, 1998).

All things considered, collection of numerous answers is recommended which should subsequently be regarded according to appropriate statistical process. This may only be a "consolidated text" of opinions or a summary of all answers, or a combined method of answer evaluation, which is presented in the "Assessment of key success factors".

8.5 Assessment of key success factors

This method focuses on those factors which are the most important for success (Key Success Factors or KSF) and on the basis of which the ideas are evaluated.

The more precise the selection of factors is, the more comprehensive picture is obtained. Similar to the method "Assessment with questions", the answers frequently turn out to be of subjective nature and collection of many answers is thus recommended which should then be appropriately considered.

The first step is the selection of the most important factors. It is important that they are selected before the beginning of the assessment process. Individual factors are weighted with factor 0-1 (poor-excellent) according to their importance and the mean value – its potential usefulness (values 0-5) is established for each of the ideas. Selected factors and weights need to reflect the objectives which we wish to reach by introducing our invention (for example higher motivation of employees, lower number of claims and similar) and actual situation in the company (the price shall be an important factor in case we have poor financial resources).

Example: The company which records relatively well standing financial position wishes to change its strategy and become a leading company in the segment of panelling girder. In the framework of a new strategy we wish to develop a new market product, for which the idea already exists. Novelty needs to be patented since high value added is expected as well as an entry on foreign markets. Our research and development department fails to have enough apt staff. The existing production programme shall be topical only in 2 years time.

Many ideas are available as a result of one of the techniques of idea creation and we wish to assess the aforementioned ideas. However, the criteria need to be defined firstly (Table 11).

Assessment Criterion	Ccriteria Criterion description	Weight (0-1)
K1	efficiency of the solution for concrete product (good solution means high value)	0,7
K2	long-term fulfilment of strategic objectives of the product (good solution means high value)	1
K3	price (high price means poor solution and low value)	0,4

Table 11: Assessment criteria

According to the selected criteria and weights (Table 11), we decide on a joint R&D project – we have plenty of time, we expect the establishment of long-term cooperation, and the project shall be financed by the EU.

Idea assessment Idea	K1 1-5	W1 0-1	K2 1-5	W2 0-1	K3 1-5	W3 0-1	Total K1+W1 + K2+W2 + K3+W3
Find a connection with the university and order a development which shall take more than half a year and which shall be relatively expensive.	5		2		2		6,3
Apply for a joint 1 year R&D project which shall be EU financed and is expected to bring solution to problem	5	0,7	4	1	5	0,4	9,5
Send our employee to obtained further education at the university	2		4		4		7
Purchase a licence which solves the same problem in a different manner	5		1		4		6,1
Lease a commercial service from the company which has a technical solution for the concrete problem	5		2		3		6,7

Table 12: Assessment results

8.6 Forecast techniques

8.6.1 Trend extrapolation

The technique is based on presumption that a certain technology shall develop with the same trend or mathematically speaking congruent to the shape of the curve as it did in the past and shall thus continue also in the future. The technique is valid for various types of curves; however, the forecast is only reliable in stable conditions. This means that the trend shall surely change with the influence of unforeseen factor and the extrapolation shall not forecast it.

The aforementioned may be avoided by combining the method with other methods and by altering the results of the extrapolation accordingly. Typical example is the development of civil aviation. Civil aviation has been developing on the basis of military aviation findings. Knowledge on the speed of military planes has enabled the predictions on the speed of civil planes for many decades since the latter has followed the speed of military planes after a certain time.

8.6.2 Delphi technique

This technique was developed with a purpose to surpass the weaknesses of methods, for example extrapolations of trends which are based on the principle of individual member assessment who most frequently negatively influence the objectiveness of the work with their personal views.

Persuasive individuals often influence on the decisions of others. Furthermore, the authorities regularly influence on the group members with their incorrect conclusions. Delphi technique eliminates the aforementioned problems to great extent. In some aspects, it may be compared to a difference between brainstorming and brain-writing. The latter eliminates the influence of individuals' opinion and authority.

Delphi technique is composed of the following phases:

- first phase: problem description with a questionnaire being sent to all group members;
- second phase: answers are analysed while the members are informed on all "average or mean" answers and asked to reconsider the said answers. The members whose answers exceptionally deviated are asked to explain their opinion (they might have additional information or substantiated opinion, or just an inaccurate opinion);
- third phase: answers analysis from the previous phase together with an explanation of extreme standpoints are again sent to participants who are asked to reconsider and send an answer.

If the answers remain inconsistent, the phases may be repeated.

The technique proves to be one of the most widely spread techniques of forecasting and is thus appropriate for assessing inventive and development solutions where the effects of eventual innovation shall be long-term and hard to forecast (for example potential market successfulness of mobile telephone sets with a possibility of picture transmission). Like in brainstorming, we need to be careful when selecting group members and questions (Likar, 2001).

Nikas – winning market share by the new product development

Eugenia Kanellakopoulou

Nikas is a leading food company in Greece, with a focus on processed meat. The company was founded in 1971 and was run as a family-owned business until 2004, that a professional management was introduced and undertook a serious restructuring effort, focused both on streamlining operations but on setting an aggressive growth strategy.

The management decided to implement this strategy by increasing the company's leading market share with aggressive introduction of new products and their focused marketing. Exploiting the strong brand visibility from its core business—processed meat—that the company enjoyed in Greece, Nikas started entering new niches in the Greek food sector by launching new products such as frozen foods (pizza), cheese products and fresh meat.

Within these efforts, Nikas developed a modern Parizaki with good taste & high quality standards. It is addressed at young people and company's expectation is to become young people's favourite. The new product was launched to the market on Mid September 2005 and gained market leadership in less than 6 months.

For the 2005 nine month period, Nikas' consolidated turnover increased by 7.8 % compared to the corresponding period of 2004, mainly due to the introduction of new products such as "Sto Piato", Parizaki "Filaraki", pizza and cheese "Ek Domokou". Currently, as much as 32 % of the company's sales derive from these products, something hardly imaginable in a traditional industry of food products.

So, the managements' efforts proved to be successful and Nikas today has been transformed into a corporate entity with an international orientation and is set to become a dominant player in South Eastern Europe. Nikas' goals for the next years are set on achieving organic sales growth of more than 10 % annually through constantly offering innovative products and strong support of the Nikas brand name.

8.7 Other methods

Beside the aforementioned methods of assessment and selection of ideas, there are also many others, for example:

- methods for exact simulation of business processes (also in the form of computer programmes),
- SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis – see detailed description in Chapter 3 "Need analysis tools supporting innovation",
- comparative method with a help of matrix or a method of comparing in pairs (non-numerical method of idea assessment, where each idea is compared to all others),
- decision-making tree (an analysis of various scenarios),
- Pareto's analysis (focusing on core elements according to the formula 80% – 20%),
- Ishikawa diagram or fish bone diagram (related primarily to the definition of problem) – see detailed description in Chapter 4 "Techniques of idea creation",
- multivariate analyses (which support a comprehensiveness of analysis by interlacing numerous aspects and their quantification)
- and others.

It depends on the type of a problem, availability of data and requirements on the precision of result which of the methods we opt for.

8.8 Final decision making

8.8.1 Influential data acquisition

An important aspect before the phase of idea assessment is collection of data. It is particularly important since all the following implementations, calculations and comparisons are based on the collected data. The principle is similar to cooking. The quality of dish depends on the input ingredients. Even the best of chef cannot make a delicious pie from rotten eggs and apples. Even the most careful baking and final decorating of our pie cannot leave a good impression. It is similar with data. If they prove to be inconsistent and inaccurate, the final results shall prove to be just as imprecise.

Objective data are a result of standardised procedures of data acquisition and processing. The results are repeatable and independent from the collector. The objective resources are for example measurement results, official reports of an institution, undisputed opinions of experts and similar. Such results represent firm grounds for further analysis. In the phase of data collection, we often try to use reachable data from the so-called secondary sources. These data are of internal nature and have been collected earlier and processed for our own needs. These may be data gathered during similar projects or those which relate to regular operations (accounts, stock, production, costs) (Kotler, 1996).

Expert data from books and journals also prove to be most valuable. Yet type of source needs to be taken into consideration. Reviewed sources are the most reliable. The data gathered from the daily newspapers are frequently attractive yet less useful. Beside the aforementioned three sources, the organisations prove to be an important source of data since they collect data systematically according to particular fields and update them periodically – they may be obtained via specialised databases, which are often payable.

8.8.2 Making final decision

When assessing the effects of invention, we need to pay attention to all aspects, not only firm facts but also "soft" data and various opinions which cannot be expressed in figures. Reliability of data also needs to be considered together with data selection and knowledge on the characteristics and limitation of individual methods applied. The decision is of course left to a person who shall decide on the basis of facts, knowledge and experience. If the scales fail to tip on any side, the intuition, person's character, anticipation, well-considered boldness and other characteristics prove to be the most important. The data gathered in the American surveys on problems of competitive capabilities of companies show that economic data can explain only a half of these problems while the other half is presented by non-economic effects (Likar, 1998).

On the long-run an analytical approach towards solving problems in the decision-making process presents a step towards more reliable results as previously offered by a mare manager's instinct. Many years of experience have shown that the sixth sense of an average manager may be a source of many mistakes. (Smith and Reinersten, 1991).

8.9 Summary

The presented module tackles various techniques of idea assessment and selection. Firstly the need for invention assessment was presented along with numerical sensitivity analysis, followed by presentation of assessment with questions, assessment of key success factors and forecast techniques. Beside individual methods, a final decision methodology is presented. For further reading, we prepared some additional materials (see Further reading).

8.10 Further reading

Links:

- http://cordis.europa.eu/aoi/article.cfm?article=406&lang=EN

- http://www.mindtools.com/dectree.html

Book:

Harold A. Linstone and Murray Turoff (eds), 1975: The Delphi Method: Techniques and Applications (http://is.njit.edu/pubs/delphibook/index.html)

9 IDEA DEVELOPMENT

Vassilis Tsaggaris, Borut Likar, Urška Mrgole

9.1 Learning objective

This module deals with the idea development process. In case of small, incremental inventions there is no need for professional R&D support. But many ideas request a professional internal R&D supported idea development phase, which will be presented. Also some other models of know-how acquiring and technology transfer will be presented, e.g. R&D outsourcing, National and European research programmes.

A reader can find basic forms of R&D, its properties and financial aspects connected to the topics. Some practical tips regarding the usage of R&D forms and partner selection could be found. In addition some examples from praxis are shown.

9.2 Own research and development activities

Research and experimental development (R&D) comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications (Frascati, 1992).

No general guidance can be given on managing R&D and defining the R&D tasks because the work to be done varies greatly with the type of company and its circumstances. Some of the work is reactive to events, but most is concerned with creating the future, and this must necessarily start with decisions about where the company wants to go and how much it wants to invest in trying to create technology that it will be able to own and use to the exclusion of others.

In almost all industrial companies R&D is considered as a vital department that contributes to sustain and grow of a company's businesses. Within firms, decisions about the magnitude and nature of R&D performance are mainly guided by consideration of economic returns. Studies show that the rates of return of R&D to firms, although difficult to measure precisely, are high and that returns to society, from lower cost, improved, or new products and services, are even higher.

According to R&D strategic significance on company's structure, the work undertaken by company's own R&D department could be categorised as:

- *Incremental R&D* is work intended to bring about a definable modest improvement in a

particular product or a process
- *Radical R&D* is work which promises to produce a new product or process
- *Fundamental R&D* is work which is not intended to produce a specific business benefit, but is intended to produce scientific and technical information; this information might for example lead to a decision to try to develop a new line of business
- *Compliance work*, which is undertaken to meet environmental or other legislative requirements
- *Customer support work*, in which R&D staff work on the problems of existing products

According to OECD definition (Frascati, 1992) the term R&D covers three activities: basic research, applied research and experimental development.
- *Basic research* is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.
- *Applied research* is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- *Experimental development* is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed. R&D covers both formal R&D in R&D units and informal or occasional R&D in other units.

9.2.1 Human resources and efficient management

Naturally, firms will usually engage in R&D only when the results are appropriable and offer rates of return exceeding those of other available investment options such as acquisition of new machinery, advertising and marketing investments, or asset purchases.

Thus, managers of R&D must develop methods for integrating R&D into business operations, while simultaneously ensuring that the necessary research is accomplished. That means they must translate R&D results into terms that business managers can understand and support. Furthermore, R&D managers must establish procedures for selecting, planning, executing, and transferring R&D effectively, while at the same time nurturing a climate that promotes creativity. Therefore they must educate R&D people about using their skills for the company's benefit, while preserving the excitement of discovery within their organization.

Human resources are the principal asset in R&D work. They comprise people with different skills and levels of training who are involved in a wide range of activities. Qualified scientific personnel are the key component of an R&D establishment and they must be supported by technicians, specialist services and engineering facilities, and they must draw on many external contacts.

Like any other aspect of a business, carrying out research and development into new products, services or business processes needs efficient management. It is essential R&D and

business managers to work together in managing R&D, to ensure that R&D people are creative and able to manage their projects effectively. R&D shouldn't isolate itself from business functions, and business shouldn't let R&D isolate itself. This allows company's manager or owner to reduce the risks of failure and allow as many ideas as possible to come to fruition. Company leader should make sure staff involved in research and development understands the business' overall strategy and what is commercially realistic. It is becoming important to build close working relationships between marketing, research and development teams.

Joinery manufacturing

Arne Kullbjer

Joinery industry in wood processing sector is defined as the combination of wood with other materials. One of the important sectors for this is windows where wood and aluminium is combined to give a better performance of the windows. One thing is that they are better withstanding the weather and also do not need to be repainted etc. as most of the visible parts on the outside is covered with aluminium. They also have a better thermal resistance.

The problem Swedish producers in the industry were facing was how to make the production as efficient as possible, as the idea of aluminium cover of wood constructions is old but not as easy to implement in complicated constructions such as windows. Obviously, the solution has been found in close cooperation with the aluminium producers.

This type of windows is now very well established and widely used on the Swedish domestic market, but the majority of products are exported, not only to countries having cold weather, rain etc but also to those with hot climate where this type of windows proved to have an excellent performance as well.

The cooperation of two different sectors, wood and aluminium industry, enabled development of new technologies that resulted in new products which more or less dominated the market in a short period. The window segment of wood processing industry in Sweden is now dominated by two companies Elitfönster and SP-fönster (Fönster = Windows) with a turnover on 200 Million Euro.

9.3 External sources - technology transfer

9.3.1 National and European research programmes

Participation in European and national R&D projects is a good opportunity for businesses to gain advanced knowledge. A company participating in a project could offer its current knowledge and expertise on specific project tasks and get a benefit from the experience and know-how of the other consortium partners to other complementary fields.

EU has developed a range of services for enterprises in order to facilitate their participation in common European projects and national initiatives. Cordis (http://cordis.europa.eu) is the official Community Research & Development Information Service where interest parties could find all the available and foreseen initiatives and business opportunities partially funded from EU. Also, Cordis has an extended database of partners (http://cordis.europa.eu/partners-service) that facilitates partner search either in the context of EU-funded Research and Development projects or within a broader search for technology-orientated partnerships.

http://cordis.europa.eu

9.3.2 Outsourcing

Outsourcing is the delegation of non-core operations or jobs from internal production within a business to an external entity that specializes in that operation. Outsourcing is a business decision that is often made to reduce costs or focus on competencies. Outsourcing is usually preferred for undertaking tasks and business functions such as data analysis, research process, information technology operations, engineering design, medicare, legal support services and software development.

The main advantage of outsourcing lies in the fact that it helps companies lower costs, stay ahead in the competition and concentrate on their core competencies by spending time and efforts at them.

On the other hand, the company that outsources can get into serious trouble if the service provider, subcontractor refuses or is unable to provide business due to bankruptcy, lack of funds, labour etc. In addition to that outsourcing requires the control of the process being outsourced to the service provider. Thus the company may loose control over its process. However, we should stress out that both supporters and criticisers of outsourcing agree that a company should outsource only the non-core competences.

Consequently, if R&D is not a core competence, a crucial function of your company, it is recommended to find a subcontractor to perform the related to R&D business tasks for you. Hence, you should make an extended market research to find a reliable and experienced partner and minimize the risks that outsourcing bears.

9.3.3 Selecting a business partner

One determining factor of a project success is the quality of the partnership. Selecting business partners is as essential as project planning. No matter how well a project is broken down on different tasks and activities, it will not be successfully implemented if the collaborating bodies are not reliable or expert in their business field.

When selecting partners, financial viability and work experience the potential partners bear are essential components. Try to gather as much information as possible and if possible take recommendations on potential partners from others you can trust.

Building new knowledge in the University-Industry cooperation

Janez Kopač

Recent years have shown a sign of a real need for cooperation between technical faculties and production companies. Intense production within the Slovenian environment has been performed mainly in the automotive industry. The said industry is further divided into two characteristic areas. The first one is mass production of automotive parts with the batches from 100,000 units to one million and more. This production encompasses material processing, such as Al-alloy, grey casting and steel. Value added per unit amounts from one to a few euros, however, multiplied by a number of units in the batch, the value of production may reach sky-scraping amounts. The second characteristic area is tool-making where high-quality three-dimensional engravings are produced and which make a part of the model for injecting Al-alloys or plastic, i.e. products produced for automotive industry. The future shall bring emphasis to mass production – processing of products made of grey casting.

Modern flow of information and connections enable companies to swiftly find providers who are able to solve the problems which they face in the production process. Regardless of the excellent knowledge on the grey casting as a basic material of automotive parts, numerous technical problems arise during the processing when new modern materials are introduced into high-speed cutting.

The present article describes the connection among the experts within a company where the processing is performed and the Faculty of Materials and Metallurgy as well as the Faculty of Mechanical Engineering in Ljubljana.

In order to review the problems and the research, experts on working material and cutting tools, processing machinery and cutting technology were involved. After having studied the reasons which caused the mistakes occurring during the working process, a new "recipe" was drawn up indicating which tool and which parameters should be applied to improve the working process. Special emphasis was given to the time of working process which should not be prolonged. Innovative suggestions were implemented as regards not only a new cutting geometry of the tool but also considerably altered parameters of cutting.

When preparing all the anticipated and necessary novelties and approaches to the working process, the testing was first preformed on the samples. After having analysed the precision of measurements, assessment of new products, which were produced according to the new – innovative – technology, was performed and compared with previous products. The results

proved surprisingly positive from two points of view: the required and higher quality of the product as well as the precision of measurements were achieved. Moreover, considerably shorter time of technological working process was achieved.

After introducing the new technology into the regular working process, all three partners engaged in another analysis, i.e. management of implementing the innovation. The objective was to establish the advantages of cooperation and thus warn about certain deficiencies and faults. There was a need for establishing the reasons for such a long response time, i.e. the time from the point when the idea was created to its introduction into the production. Administration and initial arrangements in particular (such as order forms, drawing up and concluding a contract, signing a contract) proved to have contributed to the longer implementation time. At the same time, the appropriate providers and key persons need to be defined, who have the possibility to act innovatively and also implement the idea. Yet it was discovered that problems arose when an umbrella contract needed to be drawn up.

At the moment one of the biggest shortcomings of academic institutions remains the organisation of ordering process which does not run according to the system "top down" but the individuals, i.e. researchers from the faculty make arrangements with the contractor individually and independently. This is also the reason why the companies started establishing their own R&D institutes. These institutes need less time to respond to company's needs since they activate all their knowledge and time to solve the problems which occur in the company. Academic structure is primarily dedicated to training and only the remainder of time is dedicated to solving problems arising in the industry.

Finally, it may be established that the relations between the academic institutions and production companies may prove to be very successful. It ensures innovativeness and modern approaches. However, it may sometimes be too slow given that it imposes on companies to create their own expert teams which on the other hand may also prove to be an advantage since thus established connection enables transfer of experts with Masters and PhD degrees into production companies.

9.4 Summary

This module deals with the idea development process; e.g. internal/professional R&D and some other models of know-how acquiring. A reader can find basic forms of R&D, its properties and financial aspects connected to the topics. Some practical tips regarding the usage of R&D forms and partner selection could be found. In addition some examples from praxis are shown. For further reading, we prepared some additional materials (see Further reading).

9.5 Further reading

Links:
- http://www.frompatenttoprofit.com/
- http://www.inventorfraud.com/marketanalysis.htm
- http://cordis.europa.eu/marketplace/

Article:

Stanley F. Slater and Jakki J. Mohr (2006): Successful Development and Commercialization of Technological Innovation: Insights Based on Strategy Type (http://leonardopublic.innovation.si/6.Idea%20development/Successful%20Development%20and%20Commercialization%20of%20Technological%20Innovation-%20Insights%20Based%20on%20Strategy%20Type.pdf

10 ENTREPRENEURSHIP AND BUSINESS PLANNING

Arne Kullbjer

10.1 Entrepreneurship, creativity and innovation

10.1.1 Implementation of ideas

Before we look more into the development of a *business plan*, which is always needed when implementing a new innovative product or service, let us just define the differences and relations between entrepreneurship, creativity and innovation.

The most important thing to the entrepreneur is to use the outcome of a creativity and innovation process to solve problems and to make it available on the market. *Creativity* is the process of developing new ideas and to find new solutions while the *innovation* is the process of applying new ideas to solve problems and to give new business opportunities. Creativity and innovation are in this sense very closely related and form an integrated part of entrepreneurship.

Creativity is something open almost to anybody to learn how to develop. It concerns how to behave and to work in different situations, and how to use the correct part of the brain. This is also the reason why all people within an organisation must be involved in and take part in the development of new ideas and innovations. The entrepreneurs are special people in the organisation that enhance and take care of the creativity within the organisation through employees and to some extent also of themselves.

The entrepreneur can stimulate the creativity in many different ways in encouraging people, by tolerating mistakes and giving support etc. but also in being open minded, recording ideas etc.

10.1.2 Strategic management

A strategic plan needs to be developed to show how the new innovation is secured to be valuable on the market, and to recognize competition from others. It is essential to find out if the new innovation could create a competitive advantage on the market, otherwise it will not be worthwhile to continue even you possess of the "best innovation" ever made.

The process of the strategic planning needs to be made in different steps. The strategic plan should be quite short and easy to understand and needs employee involvement.

Below are listed some steps/items that should be included and considered when forming the strategic plan;

- A mission statement is the most important step. This is the vision of the new innovative product or service that has been developed.
- Competencies/resources needed for the product.
- What are the strengths/weaknesses/opportunities/threats? SWOT analysis.
- Competition from others?
- Success and failure factors? Which is/are the most important success factor(s)?
- Goals and objectives of the business opportunities the new product/service can create.
- An action plan that is related to the strategic plan and that gives a more concrete description of actions to be taken, time plan etc.

There are probably also other items that need to be considered depending on what product/service to be taken to the market.

The strategic planning should not be seen as a one short process but more as an ongoing process where the responsibility lies on the entrepreneur within the organisation.

10.1.3 Marketing, business and financial planning

An important part of the business plan is the *marketing plan* that actually focuses on the expected customers and their needs and willingness to accept the product/service. The marketing plan should be based on a market research to give a view of the market of the product/service offered.

The market research must not be complicated but needs to show what you want to know and to collect and analyse data from different sources available. Need analysis tools can be used, but even other available data. The result should give a clear picture of the customers to the product/service.

World Wide Web must then be mentioned as an important tool for marketing. Presence and visibility on the web at an early stage are important factors for any new product/service offered. An extended number of customers make Internet search to find new products and services. It is thus of great importance to make the tool attractive, easy to navigate etc to give a quick message to the customer using this tool to find a product or service.

A *financial plan* is crucial to the success of the new product/service. It is not only to define the need of new financial means or other economical support but also to show how it could be profitable in the long run. How are income related to expenses? Will the new product or service create cash flow problems during its life cycle? When will the break-even point occur? Will it happen when the company starts to make profit on the product/service? The financial plan could be presented in different diagrams that could later on be compared with actual results and adjusted when needed.

10.1.4 The international entrepreneurship

Global or international are leading words for most business nowadays. To the large number of companies it is not enough to stay domestic but at the same time it is not easy to get established on foreign markets.

There are many obstacles such as visibility, currency problems, local representatives,

licensing, different political and cultural barriers etc.

The visibility is of course again possible through the World Wide Web, but how to approach other problems? In most cases you cannot exclude the foreign market but must accept it and tackle the problems it causes.

E-commerce is now creating new business opportunities which connect producers, sellers and customers through technology independent of national borders. E-commerce is a tool the entrepreneur must take into consideration when executing the market plan and overall business plan.

The Manna Culinary House

Nada Matičič

This best practice example encompasses a comprehensive and multidisciplinary approach in designing the "Culinary House Manna" in Trnovo, Ljubljana.

The creation of the Manna concept fuses together with its slogan "heavenly dishes on earth", which takes the work of the creators into designing a concept of the culinary offer with a story. This was achieved with interdisciplinary approach that encompassed cooperation of different branches of design which contributed to the optimal solution of integrated image of the venue and its culinary offer.

Starting-point and inspiration for the created ambience as well as the created patterns, selection of colours and wall paintings are the paintings made by the painter G. Klimt (1862-1918) who was one of the leading artists of the Viennese Art Deco. Uniquely drawn up concept thus intertwined the cooperation of architects, an interior designer, an expert on feng shui, a textile fashion designer, a painter, a visual communication designer and at the very end of the project also a decoration designer. On the basis of the plan designed by the architect and the interior designer, the existing building obtained a thematic concept of a new integrated image, ground plan rearrangement of rooms with a new layout, setting and selection of equipment, tables, chairs, floors, lighting and textile patterns. The freshly designed concept of patterns (flower motif) and colours may thus be admired on all fabrics (tablecloths, place-mats, covers, chair upholstery, cushions …). The said concept is also used for the flooring in the form of carpets which create different atmospheres in different rooms. The pattern – flower

motif is repeated again on the copper fence, various décor and glass. Fashion designer used all the aforementioned when designing waiters' and cooks' uniforms.

Integrated graphical corporate image (logo, business cards, menu, web sites …) also reflects the concept.

Carefully selected furniture, antique pieces of furniture, mirrors and paintings as well as Murano lights give the place the desired image.

The presented concept of a trendy restaurant is not a novelty in our environment yet it enables unique solution which places a particular ambience and its contents among designer masterpieces. After the success experienced by the interior and integrated image of Manna among its customers, it may be established that such type of carefully-planned and expert-grounded links enable prolific and successful work of the entire designer segment. Manna is also a good example in praxis, i.e. the future of Slovenian design lies in creating unique products – ambiences or only products in smaller numbers which can so remain exclusive.

10.2 Business plan development

10.2.1 General aspects

If you do not have a clear business idea and a new product/service to offer the market then it is of course not easy to make a successful business. In such a case business idea needs to be firstly developed, then tested and in the end financed in order for us to create a realistic and viable business plan.

Very often a *reference group* or management group needs to be established including persons with different backgrounds and experience, well suited to the new product/service developed. If extra means are needed to finance the new product one of the most important things is a good business and marketing plan. Most investors, within or outside the company, often have very high demands to feel sure the investment will in some way be profitable. The reference group is in this respect very important.

Most new business ideas need to be developed in several phases, one likely model would be:

- Further development of the innovation business idea
- Business plan development
- Production start-up

Further development of the innovation and business idea is to analyse and to document the product and the possibility to produce it, market and sell it.

Business planning is crucial for showing and working out how the new business will be organised, how marketing will be done, management, implementation, risks and threats and last but not least how financing and resources could be obtained. It is important to create an overview of the realisation of the new product, try to find different scenarios. Production, marketing and target group for the product are important aspects. What are the risks and threats when you prepare for entering the market with the new product?

The last phase is to *start the new production/service* and to establish the business on the market according to the planning. From this phase it is more important to look at issues like management, establishing production line, visibility and advertisement, market issues, threats and further development of the product or new products.

10.2.2 Business idea

Most of creative thinking and new innovations are done by persons who have some experience from the industrial sector which the new product/service is related to. But the innovation and the business idea is worth nothing if it is not developed in cooperation with other actors.

The "idea" must be analysed before implementation. Is it realistic and will the market swallow it? Does the product already exist? Are there others who have already developed this idea? There are many questions to be answered. A discussion with different type of people, experts, customers and other possible stakeholders must take place. Try to establish a reference group already during the development of the business idea. This analyse phase will not happen in one or two days, more likely is a time span of months or maybe a year, depending on how concrete and how high the risks.

The analysis should not result in very technical conclusions but more how "entrepreneur-like", telling how extraordinary the product is to the potential customers, how big the potential market is, how the product could be marketed and distributed. This is much more important to investors or those within or outside the company who have to supply the new product with capital.

The expression "innovation" that you have come across several times in this book is mainly used to define and to develop new products within the existing production and might also be marketed through existing marketing channels.

When developing new innovative products the customers are always in focus where the usability lowers the costs and/or other advantages for the end user. Always keep this in mind when you are developing the business idea.

The end of this phase should be a formulation of a business idea, which is simple to read and to understand and much focused on what you are going to establish. All people involved in this phase should read, scrutinize and give input to the business idea.

> **!**
> The business idea should contain the following information

- Type of product/service
- The need of the customer/target group
- What is the potential market?
- What is the innovative part of the product and how unique is it?
- Will it be profitable in the future?

The business idea should initially be kept secret, which might include writing agreements with

potential investors and other stakeholders. What about intellectual property rights and patents and other types of protection?

10.2.3 Marketing plan

An integral and important part of the business plan is the market plan. The market will not to 100 % be predictable but ought to be analysed and some kind of estimation should be established using merely common sense. The better you know your target group the easier it will become to predict their reaction to the new product/service. So the marketing plan should always start with a phase where you (1) *investigate the market*.

During this phase you might also look for possible competition and what your strengths and threats are in relation to the competitors. This could be done through a (2) *SWOT-analysis*.

Even if you do not meet with any competition for the moment you must always be aware that in the future similar products or products that can substitute your product, using better price/performance, can arise. There will always be opportunities to duplicate your business idea, being only a question of time and resources. Compare with what the Asian companies have done in car industry and electronics!

After this you are in a better position to choose and focus on the target group which is the main focus of your product/service. This is also called (3) *customer "segment"*, which you can concentrate on in the further marketing. The segmentation could happen due to many different criteria, young people, people living in own small houses, people interested in fashion, etc. It could be geographical, demographical, buying style or situation influenced, and is of course dependent on if you are offering a industrial product or a consumer product.

The success of an innovation often depends on if the segmentation has been done, and that the marketing and production are not coherent with the target group of the product.

(4) *Positioning* is another important aspect as concerns your success in relations to competitors. You must offer a unique possibility to the customer segment you target, it must be improved, have a good visibility, and be something extra and attractive. The customer should easy discover the usefulness and feel comfortable with the product.

Now you are in the position to produce a (5) *marketing strategy* which includes concrete information about the product, costs, marketing and distribution. The marketing strategy is often mentioned as the 4 P in marketing, *Product, Price, Promotion and Place*.

The *Product* is a description of the product and if it is adapted to the special segment you are targeting. The *Price* is dependent on the strategy you follow, low price to easier take a market share or high price to make a bigger profit from start. The *Promotion* is how you communicate with customers through advertisement, media communication, Internet, exhibitions, telemarketing etc. The *Place*, P number four in the marketing, is how the distribution of the products to the customers will be done. It can vary a lot through shops, franchising, post, Internet orders etc. E-commerce is getting more and more important to the selling process as a whole, orders, invoicing, payment, distribution. This does not however exclude other types of marketing by other means, but the buying and distribution is handled through Internet.

Dell is a good example using this strategy. They advertise their products through different kind of media but the purchase happens mainly on Internet and their products are assembled once they have received the order and directly being delivered to the customer.

The marketing plan should give answers to questions like the *size of the market, growth and also about the competition*. Which market share is realistic to expect from this analysis? If the product is a brand new one, then it is more difficult to analyse the customers and the customer segment..

10.2.4 Business system

When there is a marketing plan it is important that your organisation is ready to deliver the product. The process within the organisation/company is called *business system*. This is mainly a description on how the internal work should be coordinated. It also takes into account if the product should be totally produced by you or made through subcontractor(s). One of the most important aspects to consider when designing the business system is what you plan to do within your company and what are you going to buy/subcontract.

The business system should take into account following aspects;

- Development (which includes creativity and innovation given focus in this book)
- Marketing
- Logistics
- Production
- Distribution
- Customer follow-up

Business systems nowadays are very often supported by integrated software systems, offered by special software companies taking all these aspects into account. Anyhow, the general business system must often be transferred to the own situation and adapted to your own product(s). When doing business with other companies, for instance as subcontractors, it is getting more common that you do this through other software specialised for *Business to Business relations*, often referred to as *B2B*.

10.2.5 Organisation

Organisation has to do with people in the organisation/company. It is important to make a simple and easy structure of responsibilities. Already at the beginning, when you organised the reference group or management group for the new product/innovation, you discussed competencies required for different parts. As a minimum you need at least persons responsible for *Production and Logistics, Marketing and Economy*. Probably also some kind of administration is needed to handle the new product or service offered.

The organisational aspect also includes decisions on where to establish the new business, whether it should be in a new company or organisation or just stay within the organisation where the new innovation was made. How big part of the production should be done by you,

and how much should be subcontracted? Would it possible to establish a partnership with other companies on a win-win basis? On the other hand it could be risky if the partner in some way fails to fulfil his obligation through not delivering their parts of the product.

10.2.6 Management

We have already mentioned that a reference group or management group is important for the success of the new business.

The management group is the one who can support in all different tasks that have to be solved, from technical problems, economy, marketing and organisation. For investment needed in the new innovative product and business the management group is crucial.

The management group should be a well composed involving people that can work effectively together, and who have complementing competencies and contacts. It is important that they all share the same vision.

The competence profile should be carefully considered to include persons covering all types of competence needed, like financial, marketing, techniques, production etc.

The reference or management group should be established as early as possible in the business planning process. If needed it can be complemented or exchanged with other persons during its life cycle, but the continuity is also an important factor, and that those who really are devoted to the new product also should be involved in the whole process.

10.2.7 Implementation

When the Business idea and the marketing plan are decided upon you need to make a working plan which can be divided into different working packages (Figure 7). Working packages define tasks, responsibilities and deadlines as well as describe sequential and parallel activities. Contents and time milestones need to be included since they very often relate to larger, completed packages. A delay in one work package could influence on several other work packages and the project as a whole. A Gantt Scheme is the normal way to proceed, and there is software available to assist in the construction of the Gantt scheme. MS Project is one example.

Demonstrates basic tasks and subtasks, anticipated starting and final data, time envisaged for activities, data on feasibility of the assignment and graphical presentation of tasks and interrelations (Visio® 2002).

Try to make the Gantt scheme as realistic as possible. Overly optimistic planning or pessimistic planning could have a negative influence on the project. Available resources are crucial both in the aspect of man power, economy and equipment. Overly optimistic planning might create resource problems and overly pessimistic planning might result in delivery problems on a growing market.

ID	Task Name	Start	Finish	Duration	% Complete	2000 Aug	2000 Sep	2000 Oct
1	Find New Offices	8/1/2000	8/14/2000	10d	100%			
2	negotiate lease	8/14/2000	8/16/2000	3d	100%			
3	architect plan	8/22/2000	8/22/2000	0d	0%			
4	**begin buildout**	**8/24/2000**	**10/2/2000**	**28d**	**0%**			
5	structural	8/24/2000	9/21/2000	21d	0%			
6	interior design	9/22/2000	10/2/2000	7d	0%			
7	move furnishings	10/5/2000	10/11/2000	5d	0%			
8	install IT equip.	10/12/2000	10/20/2000	7d	0%			
9	move in	10/23/2000	10/23/2000	0d	0%			

Each task in a Gantt chart occupies a row in the chart frame. When you type task names in cells in the **Task Name** column, task durations are represented as task bars in the area under the timescale.

Figure 7: Simple Gantt Scheme

10.2.8 Risks

Try to make a risk analysis and include it into the business plan. Risks are events that might occur in the future. Thus they cannot be exactly presented. Typical examples of risks are related to unforeseen reaction of the market, competition, subcontractors unable to deliver the required work, technical problems etc.

In the business plan this is often handled in the way that starting from the presented plan you make a best case description and a worst case description. What will happen if selling becomes much lower than expected?

Your business plan should answer questions about risks and how you will handle those risks if they happen and how they influence the business. What will happen in the worst case scenario?

10.2.9 Financing

If you made a solid business plan it will probably also be possible to see how much financing you need and when you can expect to reach break even and make profit on the product. The financing could of course be found internally in the company or happen through different external financing sources like banks, private loans, and national or international sources etc.

Even though the financing is secured there could still be problem regarding cash flow. You have to pay much money during the first phase of the project and will generate no incomes. In the business plan you must include an analysis of cash flow. The capital to generate the new business will probably not be fully available at the very beginning.

!

The Business plan should as a minimum include following plans;

- Estimated results and balance sheets
- Cash flow analysis
- Long term analysis up to and after the financial breakpoint when the product will generate profit.

Everything is made on estimations and worst case analysis should be included. Also a best case analysis could be made and presented in the same format to give an easy overview of the risks (and opportunities).

Try to make a calculation on return on investments, which is very interesting for external financing sources, especially if the plan to be highly involved in the future as owner or long term financing source.

10.3 Further reading

Invention City - how to sell an invention?

http://www.inventioncity.com/

11 INTELLECTUAL PROPERTY RIGHTS

Arne Kullbjer, Borut Likar, Aleksander Tonkov, Velizar Petrov

11.1 Intellectual property rights

The World Intellectual Property Organization (WIPO) defines intellectual property (IP) as "creations of the mind: inventions, literary and artistic works, and symbols, names, images, and designs used in commerce." More specifically, intellectual property refers to a broad collection of rights relating to such matters as works of authorship, which are protected under copyright law; inventions, which are protected under patent law; marks, which are protected by trademark law; as well as trade secrets, designs and other related rights.

It is important to note that these forms of intellectual property are very different and the protections afforded under them serve different purposes. Intellectual property relates to the results of created and RR work, new solutions, inventions, new technology or technological development, software, new design of industrial and other products and others. A part of aforementioned categories could be protected through copyright laws, patents, trademarks and industrial design. Any know-how involved in the product could of course also be kept secret within the company, through internal agreements, to others.

The needs for copyright and related laws have become more and more evident especially through the opening up of the Information Society. Music and software are examples on this. The intellectual property rights have changed over time but the main objectives have always been the same to encourage the inventing of new products and services to the benefit of the end-users. The word copyright is mainly used to protect the rights of writings or production by an author but nowadays also includes the software development. Copyright only protects the "expression" from the author and not the idea behind it. More and more products even in the mechanical industry nowadays have software included directly to the product or in the production of it which might be interesting for the company to protect.

Borders for marketing of goods and services are disappearing in a European and global market. Copyright based services and goods should be and are available and marketed especially within the European Community.

Intellectual property rights (IPRs) give the owners of ideas, inventions, and creative expression the right to exclude others from access to or use of their property for a certain period of time. International treaties and the laws of the various countries differ significantly in terms of the degree of protection and enforcement available.

The need for intellectual property rights and related laws is to protect innovative products and services and also to secure companies and persons on the investment they have made to be able to marketing and distributing them to end users not to be copied by others. The intellectual property rights are becoming increasingly important as they often cover huge

economical values.

On the other hand not everything can be protected as it should prevent the free competition on the market and the laws for intellectual property are in that sense very complicated and differ from country to country. Certain type of inventions, for instance results from academic research, can not be protected. Inventions that have not been protected could be copied and reproduced

Intellectual property and related rights are, as mentioned, based on national laws and legislations. Within Europe there is a tendency now to adjust the national laws and legislations through a common European legislation.

A typical example on the needs of intellectual property rights is when a company wants to market a new product based on some technical invention. The company wants the product to be exclusive and easy to separate from other similar products and also be protected as far as possible from reproduction by competitors. In that case the company could think of patenting the technical solution behind the new product combined with some protection of the design (based on artistic rights) as well as a trademark of the product. In addition some protection for the marketing of products, similar in form and design, could be secured through the marketing legislations available. It is for instance not allowed to market a product which is very similar in its design as another well known product to benefit from the good will that product might have.

Intellectual property rights have a growing economic importance and will in many companies be the most valuable asset. Most important issues of the intellectual property rights seem to be patent and trademarks, especially within hi-tech production like electronics, biotechnology and medicine production, but it becomes increasingly important in mechanical industry.

11.2 Patent

A patent is an exclusive right granted for a product or a process that provides a new way of doing something or offers a new technical solution to a problem.

A patent is regarded as a property right which can be issued nationally and/or in other countries where the company wants to protect its solution. The patent gives the company exclusive right to manufacture, to use and to sell the product within a limited time period (20 years; can vary from country to country). As it is a property it could be sold or licensed to others or be subject to contracts and/or other agreements. Once a patent is issued it is possible to make profit on it especially for the person(s) who is the inventor. The patent can not be global so it must be protected in the countries where you want to market and to sell the product. If there are many countries where the patent is needed, it might be a costly and administrative procedure. International Patent Application (PCT Application) exists, but it is

more a matter of an application system which will not give a global patent but a number of national patents.

11.2.1 Preconditions for patenting

It is not possible to reward a patent to every invention. An invention must, in general, fulfil the following conditions to be protected by a patent. It must be of practical use; it must show an element of novelty, that is, some new characteristic which is not known in the body of existing knowledge in its technical field.

This body of existing knowledge, called "prior art", could be checked using e.g. patent databases or general and technology-specific search engines. The invention must show an inventive step which could not be deduced by a person with average knowledge of the technical field. Finally, its subject matter must be accepted as "patentable" under law. In many countries, scientific theories, mathematical methods, plant or animal varieties, discoveries of natural substances, commercial methods, or methods for medical treatment (as opposed to medical products) are generally not patentable (WIPO, 2006).

The term "**patent"** usually refers to an exclusive right granted to anyone who invents any new, useful, and non-obvious process, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, and claims that right in a formal patent application.The patent is a government license that gives the holder exclusive rights to a process, design or new invention for a designated period of time. Applications for patents are usually handled by a government agency.

11.2.2 Applying for a patent

You have to apply for the patent through a special application procedure given by the national authorities responsible for patents and patenting. It must be written in a manner that a technical person in the field should be able to understand and to use the invention in research and development or in industrial production. In most countries it is possible to make a pre-application and after that has been judged and looked upon from the possibility to be rewarded, a final application will be made.

A normal patent application could in Europe be done in three possible ways:
* National patent application which can be rewarded by the national organization
* International patent application (according to the international patent application- PCT-system) which are sent to international organizations that have been given the right to handle these applications. At the end the national organizations in the country/ countries involved will be given the final reward.
* European patent application, where the European organization for patents, European Patent Office-EPO, could reward a patent.

The procedures are costly and take long time, often some years, and less than one year is very rare. Consulting organizations are the main actors on behalf of the company or individual that wants a patent. The more countries you want your patent rewarded in, the more costs you will have for consulting, translation and different fees.

Especially being a researcher it might be interesting to publish what you have discovered. Be careful here, a patent is in itself a publication describing the invention and in return you will be given a protection to non authorized use. If you publish it on your own first in a scientific journal or similar it will prohibit having it patented in most countries in the world. However it is possible to publicize the results if the publication does not give sufficient information so that it could be duplicated or manufactured from the information given in the article. Consult your national regulations in advance.

One important source for more information about patent is the IPR-Helpdesk funded by the European Commission which is a service free of charge with the aim of supporting creativity and innovation in Europe (www.ipr-helpdesk.org).

11.2.3 Patent protection abroad

As already mentioned it is possible to protect a product also internationally even if always coming back to national patent protection. The international patent protection (Patent Cooperation Treaty – PCT) or the European patent protection (European Patent Convention – EPC) represent an opportunity for an international protection.

PCT application

The Patent Cooperation Treaty (PCT) is an international patent law treaty, concluded in 1970. It provides a unified procedure for filing patent applications to protect inventions in each of its contracting states. A patent application filed under the PCT is called an international application, or PCT application. PCT is based on agreements between more than 100 countries. The main idea is that the application could partly be made through a single application and you need to define the countries where the patent should be issued.

The application could be done through the national patent registration office or, which often is the case, through the World Intellectual Property Organization (WIPO – www.wipo.int) in Geneva or the European Patent Office (EPO – www.epo.org). Application forms are available.

The PCT application process starts with an international search and gives the applicant a possibility to see what option there is to receive a patent. After that an examination is made by an expert who gives his opinion of the possibility to receive the patent. The international phase is then being followed by national phases in the countries where the patent is sought. The WIPO website gives more details about the PCT-application and the different time frames and phases.

Application for European Patent – EPC

The European patent is based on the European Patent Convention, EPC, which came into force in 1977. So far 36 states have become parties to the Convention and four states have made a separate agreement (the so-called extension states) to the effect that the European

patents are extended to cover them too

According to a European agreement it is possible to receive a patent covering 40 European member states of European Patent Convention as well as some other countries by filing a single application for a European patent. The application must include a list of countries where it should be designated and if being approved it will be validated in those countries. It is done through a translated version of the patent to all national offices. The European Patent will result in national patents in designated countries.

The application could be sent directly to the European Patent Offices in English, German or French languages. Application forms are available from the European Patent Office.

As in the PCT-application the process starts with a search to find out any obstacles to the patent. If the applicant wants to continue, then the assessment of the application will be done. When it is ready for approval translation is needed in the three languages; English, French and German. It will also be published in the European Patent Bulletin.

The European Patent is actually not a true European patent but a number of national patents. For that reason it still has to be validated in all countries which also will include translation to national languages.

11.3 Utility model

It happens quite often that someone has made some kind of simpler technical invention, but getting a patent is not possible (lower innovation level) or it would be too costly and time-consuming to make a patent application, especially this might be the case for SMEs or for individuals.

One alternative for making a patent application is to have it classified as a "Utility model". The utility model protects a technical invention that fulfils the criteria of novelty, invention and application, but the invention is more broadly defined than what is needed for a patent. The requirements regarding novelty differ from country to country.

A utility model is an exclusive right granted for an invention, which allows the right holder to prevent others from commercially using the protected invention, without his authorization, for a limited period of time. In its basic definition, which may vary from one country (where such protection is available) to another, a utility model is similar to a patent. In fact, utility models are sometimes referred to as "petty patents" or "innovation patents.

To receive a utility model protection is much easier and means more or less a registration procedure. A national body examines the requirements of the application and if fulfilling the requirements it will be granted as a utility model.

The time compared to an application for a patent is considerably shortened, and the process might take half a year or even less. The protection of the rights to the utility model is shorter

than for patents, in most nations it is about 10 years or less.

The utility model protection is valid only at a national level and so far not adopted in Europe, but the European Commission is working on the possibility of introducing it also at a European level.

11.4 Trademark

A **trademark**, **trade mark**, or **trade-mark** is a distinctive sign or indicator, used by an individual, business organization, or other legal entity, to identify that the products or services with which the trademark appears originate from a unique source, and to distinguish its products or services from those of other entities.

A trademark is different from copyrights and patents as it is a symbol or name or combination of name and symbol regarding a special product or service to make it well known and to differ from other similar products and services. A trademark can be registered or it can also be protected through the use of it so that a big part of the target group knows about it. No one will then be able to use the trademark or a trademark which is very close in its design.

The trademark does not include a time limit even though it should be registered again every ten year. But it could be repeated as many times as feasible.

All types of trademarks, of a product or others, should be possible to produce in graphical form. A question which has been much discussed is whether a sound could be registered as a trademark, and a decision has now been made meaning it can if following some basic rules. Trademarks could be registered in more than one country.

The use of trademarks is very important to all types of products and services, even if it not registered. Most companies but also organizations, associations and schools etc. use their trademarks at all time in their communication. The application of a European wide trademark covering all European countries could be made through the Office of Harmonization for the Internal Market (OHIM) located in Alicante.

11.5 Industrial design

Industrial design is the use of a combination of applied art and applied science to improve the aesthetics, ergonomics, and usability of a product, but it may also be used to improve the product's marketability and production. The role of an industrial designer is to create and execute design solutions for problems of form, usability, physical ergonomics, marketing, brand development, and sales.

An industrial design is the ornamental or aesthetic aspect of an article. The design may consist of three-dimensional features, such as the shape or surface of an article, or of two-dimensional features, such as patterns, lines or color. Industrial designs are applied to a wide variety of products of industry and handicraft: from technical and medical instruments to watches, jewelry, and other luxury items; from house wares and electrical appliances to vehicles and architectural structures; from textile designs to leisure goods.

New products and processes – innovations – are often results of R&D – Research and Development activities. These inventions are, as mentioned, protected through patenting. The development of new products could also be build upon the invention of new forms often mentioned as "design". It could be on an esthetical basis but also on the usability of the product depending on a certain design. The legislation concerning design is to protect the design of a product. As in the case of copyright this will be given to the designer and it will not be allowed for others to use the new design in their products.

Industrial design rights in the European Union are provided at both the Community level by virtue of the Community design and at the national level under individual national laws.

Registered Community design (RCD) is valid in all EU Member States, and the registration procedure of such a design is carried out by the Office for Harmonisation in the Internal Market (OHIM) with headquarters in Alicante, Spain. An RCD is valid in the European Union as a whole and it is not possible to limit the geographical scope of protection only to certain Member States.

The protection could be done at a national level or at European level through the Office of Harmonization for the Internal Market (OHIM).

11.6 Other forms of protection

Another way of protecting an invention or novelty is just to make it secret. The novelty could be hidden in a new product or a new production process can be kept secret within the company which is using the new process.

11.7 Case study

Intellectual property creates new market opportunities

Borut Likar

Small yet successful Danish company (A) was specialized in developing and industrial designing of office furniture. The company cooperated successfully with the Department of Industrial Design at the University. Numerous chair designs – ergonomically upgraded,

attractive design-wise and user-friendly – were developed through the cooperation in development projects which were supported and financed by the European Union. Not only were the said chairs made from ecological materials but were also easy to make. Since the batches were smaller and exclusive, the company together with the subcontractors launched a production of smaller quantities and marketed the products via the existing sales networks. The investments made into knowledge and fresh ides, which were regularly presented at the exhibitions and fairs, contributed to the positioning of the products among the high-price segment.

In his bachelor thesis one of the students developed an interesting form of a retaining beam used in construction. The subject was not directly connected to the company's activities yet the company decided to cooperate in the project due to a small investment and interesting product. The form of the product was original enough to be tested with computer program, which simulates static loading. Consequently, it was soon discovered with the help of experts in wood constructions that the beam meets all the standards using 10 % less material. The company patented the solution internationally (PCT application) with their own financial sources, which amounted to some ten thousand euro.

Given that the company's business strategy was oriented towards industrial design, the company decided to begin negotiating with a larger German company (B) on initiating business cooperation. The idea was that the company A implements the first phase of the production together with its subcontractors, while the company (B) undertakes the second phase of the project and marketing. Since the patent application was perfectly prepared, the developers (A) approached the negotiating process without any fear and thus also disclosed all other technical features. In consequence, the problems arose. All of the sudden the potential partners (B) started to be less cooperative yet not as far as their interest in the patent is concerned. As revealed later, the company (B) continued to search for other options on how to circumvent the patent and implement the entire business without the company A.

Since the company B was unable to implement its plan, they decided to offer a ridiculous compensation for the patent which the company A was not prepared to accept given the expected business results (value added EUR 0.3 million/year for the company A). Already animated dialogue between the companies exploded during one of their meetings when company B uttered the following threat: "It is true that your patent is well-written. Also the court shall probably rule in your favour.

Yet you need to be aware of the fact that this is a matter of international lawsuit, which tends to be expensive and related to expert opinion, lawyer's services, and international travel and similar. Our lawyers shall make sure that the proceedings are going to be long-lasting which shall increase the costs even further. We have checked your business operations and since you do not have 0.5 million euro of reserves earmarked for court proceedings, you will not be able to afford such lawsuit. We are thus offering you EUR 50,000 for the entire patent"…

They broke up the negotiations with that cynical offer yet the company A started to search for a new solution. Given that they had nothing else to loose, they established contacts with numerous new potential purchasers.

Among them was also a company (C) which was prepared to purchase the entire patent for EUR 0.3 million and pay out additional 0.7 % per each product sold. They also undertook the

entire production and marketing. Since the company C was an international company, the company B was forced to renounce to any attempt of extortion.

The company A thus successfully completed the business – especially thanks to perfectly prepared patent and fast reaction since the patent could probably fall through without any additional financial investment into its renewal. In less than three years the company A thus generated EUR 1.3 m.

11.8 Further reading

Weblinks:

http://creativityforlife.com/

What is Creativity – Brian Tracy (Video) - http://www.youtube.com/watch?v=l0deXiIQSF0

Creativity Motion Graphics (Video) - http://www.youtube.com/watch?v=n2DlOb7AfWk&feature=related

Creativity in business (BG)- http://www.bgstuff.net/biznes-i-pari/8827-креативността-в-бизнеса

World Intellectual Property Organization - http://www.wipo.int

European Patent Office (EPO) – www.epo.org

European Commission (Help Desk) - www.ipr-helpdesk.org

http://www.wipo.int/sme/en/ip_business/utility_models/utility_models.htm

http://cphlaw.businesscatalyst.com/articles/european-union-community-design-protection

http://www.dziv.hr/en/intellectual-property-protection/industrial-designs/industrial-design-protection-in-eu/

12 SUSTAINABLE INNOVATION

Arancha López de Sancho, Carmen Dominguez, Amaia San Cristobal Macho, Pablo Vidal Álvarez, Federico Martire

12.1 Learning objective

In this module, you will get familiar with the sustainable innovation process and the main elements you must take in account to manage innovation from a sustainable approach. The concept of eco-innovation and its benefits was introduced and developed in different chapters.

After reading this module, you will acquire specific knowledge of:

- what does the sustainable development involve
- what is the relationship between sustainability and innovation
- why sustainability and innovation are interdependent concepts
- what does eco-innovation involve
- different areas to develop eco-innovation
- the benefits for being an eco-innovative organisation

12.2 Introduction

Eco-innovation generates more than 3.4 million jobs in Europe, and the sector aims to be a key element to meet the environmental and global challenges of the next decades. However sustainability does not only involve environmental or green aspects, but social and economics, the so called three bottom line.

Sustainability is more than the conservations of the environment or the natural resources, it goes far, taking in account basic social and economic aspects needed to meet the present needs without compromising the future generations ones.

In this context, eco-innovation appears as a relatively new approach, focused in the green aspects of the innovative process, but also in social and economic issues and their benefits.

12.3 Sustainability

One of the most long-term challenges that the world faces is sustainable development. However, sustainable development is a difficult concept to define, which is continually evolving. One of the most used definitions referred to sustainable development can be found below.

Sustainable development *refers to development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

World Commission on Environment and Development, 1987 (also known as Bruntland Report) Related to this definition we can find cross references as *sustainability* concept.

Sustainability *refers to (a) use of the biosphere by present generations while maintaining its potential yield (benefit) for future generations and (b) non declining trends of economic growth and development that might be impaired by natural resource depletion and enviromental degradation.*

United Nations, 1997

Therefore, sustainable development and sustainability involves the conservation of natural resources for future growth and development. The main aim of sustainable development is to improve the quality of life of the people (at local and global level), while ensuring the feasibility of the environment and natural systems upon which all life is based.

But in general terms, we can consider that sustainable development has three key components. In the *World Summit on Sustainable Development in Johannesbourg* in 2002, these three aspects were named as the three pillars of sustainable development: **environment**, **society** and **economy**. Welfare is interdependent on these three categories, which are strongly linked among them. The viability and long-term economic growth depends on a rational and sustainable use of natural resources, as well as on the preservation of the environment. Furthermore, social welfare needs long term sustainability at economic and environmental level.

Figure 8: Components of sustainability

12.3.1 The sustainable enterprise

The sustainable enterprise supports sustainable development by providing at the same time economic, social, and environmental benefits. The company's responsibility should be focused to both stakeholders and shareholders. "Stakeholders" are defined as anyone who is influenced, either directly or indirectly, by the actions of the firm.

According to this point of view, the business entity should be used as a vehicle for coordinating stakeholder interests, and not only maximizing owner profit. At the end the organisation should be able to ensure financial benefits for the company, conservation of natural resources and respect to the environment, and social advantages for employees and local community.

12.3.2 The Rio declaration

The Rio Declaration on Environment and Development (United Nations, 1992), enhanced the definition of sustainable development with the establishment of 18 principles of sustainability.

[The Rio Declaration](#)

As is stated in the Human Development approach, and the main international organisations in the field of the development recognize (United Nations, World Bank…), development is more than economic growth. Regarding to this, to be sustainable, economic development:

> ➤ Can not overlook environmental issues or be based on the destruction of natural resources.
>
> ➤ Can not be achieved without an analogous development of social resources

> ➤ Must consider the needs of future generations
> ➤ Will involves the development and diffusion of more respectful technologies with the environment
> ➤ Must consider the needs of all species and the conservation of natural resources
> ➤ Must ensure to all people the same level of access to resources

Figure 9: Rio Declaration - Economic development

12.4 Innovation and sustainability

There is a strong connection between the sustainability of the companies and the sustainability of the system where they develop their activity. A more sustainable model of development depends on the contributions and doings of the enterprises. Moreover, the viability of the companie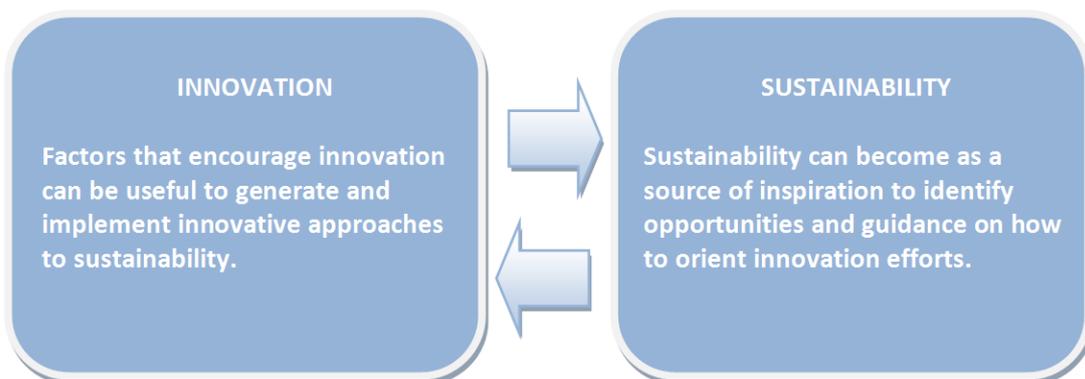s in the long term is significantly related to the incorporation of sustainability criteria to their management, strategy and business model.

Besides this, the future of the companies is also strongly linked with their ability and capability to innovate. Innovation represents an effective way to achieve strategic goals (as i.e. to develop competitive vantages).

Both innovation and sustainability suppose a new way to manage and carry out the activity and the philosophy of companies. Innovation demands more competences than those oriented to improve products and processes. Innovation involves creativity and initiative, experimentation, knowledge dissemination, collaboration among co-workers, etc. Sustainability involves the development of strategies and business models able to obtain results on the economic, environmental and social fields. Sustainability is not an obligation or legal requirement, but a challenge that offers several opportunities to the organisations.

INNOVATION

Factors that encourage innovation can be useful to generate and implement innovative approaches to sustainability.

SUSTAINABILITY

Sustainability can become as a source of inspiration to identify opportunities and guidance on how to orient innovation efforts.

Figure 10: Connection between Innovation and Sustainability

12.4.1 Goals and challenges for sustainable innovation

The main goals and challenges of sustainable innovation are the following:

- To fill market gaps, through the development of technologies, processes, products or services which take in account the need of the future generations and which are oriented to sustainable development.
- To carry out a transition in the technological and managing fields, focused on the incorporation of competitive sustainable approaches to the organisation activity, objectives and strategy.
- To improve resource efficiency and low consumption, as well as to extend the use of clean technologies.
- To promote a culture of innovation based on sustainability and develop the necessary skills and competences to adapt the activity of the organisation to sustainable criteria.

- Give solutions to global challenges such as renewable energy sources, health and an aging population or how to increase the participation of youth in the labour market and society.
- To promote the digital society in the development of enterprises and citizens.

12.4.2 Sustainable value

Sustainability adds a new framework to guide innovation efforts in order to create "sustainable value". Organisations needs to combine the present and the future as well as internal and external aspects related to the company. In this sense, companies must manage the current business for short term results and, in turn, create the technologies and tomorrow's markets to generate expectations of future growth. Additionally, they must be able to address domestic issues, for example, process improvement or development of certain skills while addressing external issues such as the satisfaction of stakeholders and identifying new business opportunities.

In this context success means to differentiate from competitors through developing a business model that will create value, and to appropriate a portion of it in a way accepted by the markets and the "business" environment. That success is based on the ownership, management and development of some resources and capabilities complying with basically three premises:

- They must be valuable,
- difficult to imitate and
- hard to replace.

Development of resources and capacities based on the establishment of new relationships with stakeholders will be an important asset to take in account. Internalize implications of sustainable development does not necessary lead to develop valuable resources and capabilities. But it is unquestionable that society is moving in the direction of requiring to the companies more sustainable behavior. All the technologies, capabilities and products (or services) are likely to be imitated or acquired before or after by our competitors. However this will be more difficult when these resources or capabilities are difficult to formalize, or when their development depends on the know-how and learning of the company, or when their construction were socially complex by involving many people inside and outside the company.

Sustainable value framework

As Hart & Milstein defines, there are 4th key dimensions for the creation of sustainable value, with associated business strategies, challenges and opportunities. They represents this framework as follows:
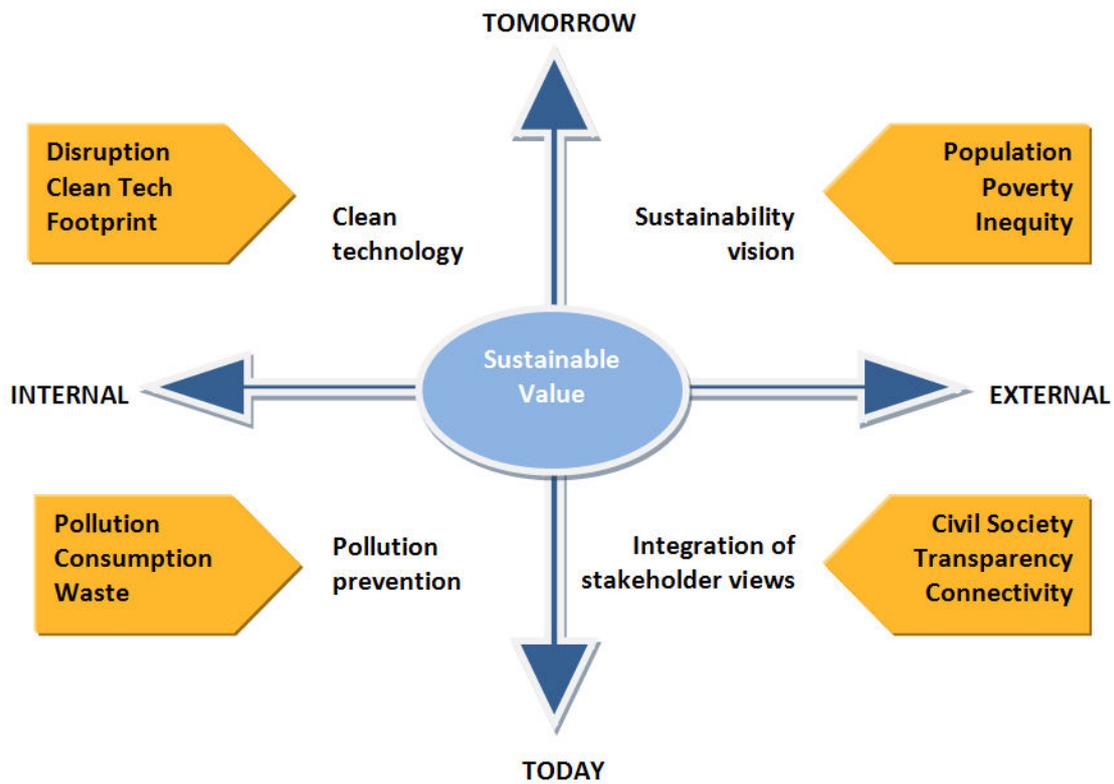
Figure 11: Creating sustainable value

Source: Hart, L.S. & Milstein, M.B. (2003): "Creating sustainable value", *Academie of Management Executive,* 2003 Vol.17 No.2.

Companies should be able to address domestic issues, for example, process improvement or development of certain skills while addressing external issues such as the satisfaction of stakeholders and identifying new business opportunities.

12.5 Eco-innovation

The idea of environmental innovation or eco-innovation is relatively recent, and it is referred to those innovations, products or processes that contributes to sustainable development. Although there is no generally accepted definition of eco-innovation it can be defined as:

Eco-innovative products, techniques, services or processes which aim at the prevention or the reduction of environmental impacts or which contribute to the optimal use of resources *relevant alternatives.*

European Commision

However it should be noted that the *scope of eco-innovation may go beyond the conventional*

*organisational boundaries of the innovating organisation and involve broader social arrangements that trigger changes in existing socio-cultural norms and institutional structures (*OECD, 2009)

Some companies and other private and public organisations have started to use environmental (eco-) innovation referred to the contributions of business to sustainable development, as well as complementary way to improve competitiveness. In this context eco-innovation could be defined as those innovative processes that produce a reduction of environmental impact and optimising the use of resources, indepently of the intentionality or not of that effect. When a new process is more efficient in the use of resources than other can be considered as an eco-innovation.

At the end, eco-innovation aims to promote the introduction of advanced technologies and sustainable approaches (including the non-technological ones). Besides this, the concept of environmental innovation entails new opportunities in the organisations, involving new stakeholders, activities and business and increasing the competitiveness. Thus, eco-innovation will be the key component to carry out the structural change that it will be demanded in economic, social and environmental field in the next years.

12.5.1 Eco-innovative organisations

As the same way we can define the concept of eco-innovation, it is possible to characterize the companies or organisations that develop and apply this approach in their daily activity. The European Commission, Eurostat and OECD defines Eco-industries as follows:

Eco industries are those *which produce goods and services to measure, prevent, limit, minimize or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. This includes technologies, products and services that reduce environmental risk and minimize pollution and resources.*

European Commission (2006)

Eco-innovators are those organisations or companies able to adopt processes, technologies, management systems, products or services which produce environmental benefits. Furthermore, we can divide these organizations in different categories, attending to how they introduce the environmental or sustainable innovations:

- **Strategic eco-innovators**: *active in eco-equipment & services sectors, develop eco-innovations for sale to other firms.*
- **Strategic eco-adopters**: *intentionally implement eco-innovations, either developed in-house, acquired from other firms, or both.*
- **Passive eco-innovators:** process, organizational, product innovations etc that result in environmental benefits, but where is no specific strategy to eco-innovate.

- **Non eco-innovators:** no activities for either intentional or unintended innovations with environmental benefits.

Source: MEI (Measuring eco-Innovation) project financed by the European Commission in under the 6th R&D Framework program Thematic Priority: Call FP6-2005-SSP-5A

Nokia, Eco-innovation in the last 10 years: http://www.youtube.com/watch?v=ylAr03ePuIc

12.5.2 Typology of eco-innovations

It should be noted than in an eco-innovation approach is especially important to be focused not only in a single product, process or solution, but in the whole value chain of the organisation, from the original conception of the innovation to the overall result and the appraisal of the final customer.

We can distinguish three main types of eco-innovation:

Products and processes

A **product innovation** is the implementation of a product or service with improved performance characteristics such as to deliver objectively new or improved services to the consumer.

OECD, Oslo Manual (2005)

Product eco-innovation refers to those products or services which their impact on the environment it is optimised during their production process. Products refers to both goods (with a different nature) and services such as new public mobility schemes or environmental services (i.e. waste management).

A **process innovation** is the implementation/adoption of new or significantly improved production or delivery methods. It may involve changes in equipment, human resources, working methods or a combination of these.

OECD, Oslo Manual (2005)

One of the main eco-innovation processes is the development and implementation of clean technologies (or environmental technologies as well). Some examples of these technologies are waste water treatment technologies, water supply, noise and vibration control, green energy technologies, etc.

Innovative eco products in Japan: http://www.youtube.com/watch?v=gGp540bIUuc&feature=related

<u>Organisational</u>

An **organisational innovation** includes the introduction of significantly changed organisational structures, the implementation of advanced management techniques, the implementation of new or substantially changed corporate strategic orientations.

<div align="right">OECD, Oslo Manual (2005)</div>

From an organisational view, eco-innovations involves the development of formal envrironmental management systems (EMS) and audit systems, chain management and chain management cooperation between organisations, pollution prevention schemes, etc. Some examples management and audit tools or solutions are EMAS and ISO 1400 family standards.

<u>Marketing</u>

A marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.

<div align="right">OECD, Oslo Manual (2005)</div>

Marketing innovation may include preliminary market research, market tests and launch advertising. The activities of market innovation must include an environmental approach, taking in account green aspects in the product promotion, packaging, placement or pricing (i.e. eco-labelling).

12.5.3 Eco-innovation mechanisms

Eco-innovation mechanisms are the way on how the organisations make changes to achieve innovations in product and processes, organisational and marketing areas through different alternatives:
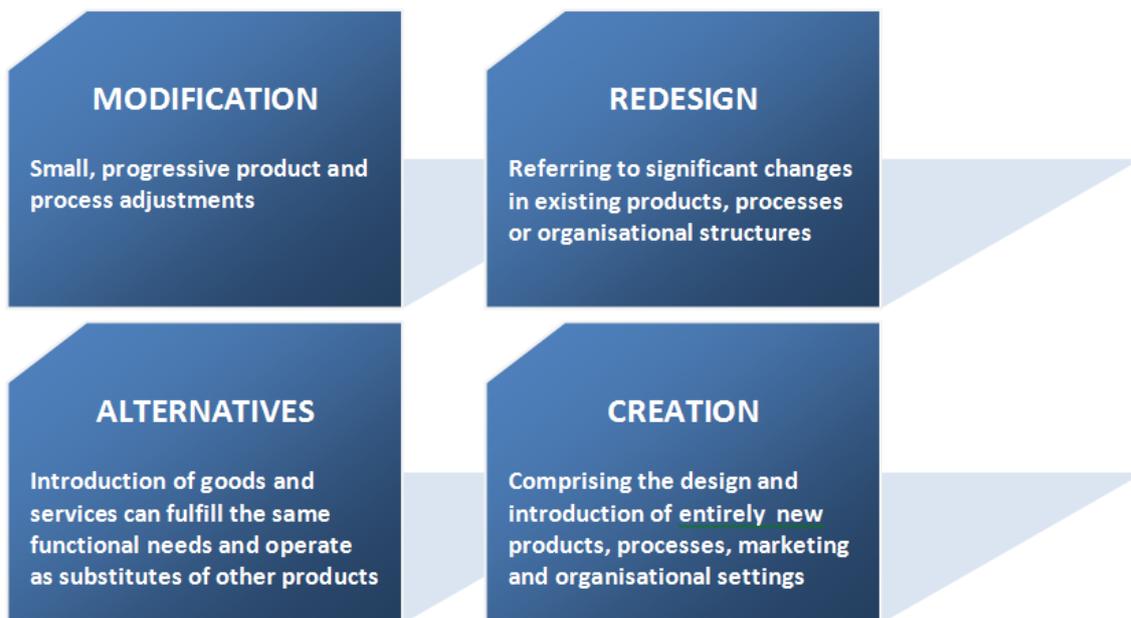
Figure 12: Sustainable Manufacturing and Eco-innovation: Towards a Green Economy

Source: OECD (2009): "Sustainable Manufacturing and Eco-innovation: Towards a Green Economy", *Policy Brief*, June 2009.

12.5.4 Eco-innovation benefits

Introduction of eco-innovation approaches can provide several benefits to the organisations and companies that have carried out their implementation. These benefits can be defined in terms of the three pillars of the sustainable development: social, economic and environmental.

Economic benefits
- Optimization of production costs through a more efficient use of resources and inputs.
- Reduction in the costs of waste management.
- Minimization of process and organisational costs.
- Development of a green image.
- New products and market gaps.
- Competitiveness benefits.

Environmental
- More efficient use of resources.
- Minimize the use of non renewable resources.
- Reduction of pollutant emissions.
- Reduction of waste production.
- Contribute to the sustainable development of your city/area.

Social
- Generation of green employments.
- Cleaner, healthier and natural working environment.
- Supporting sustainable social development.

Think about the last **innovations** developed in your company. Any of them could be considered as an eco-innovation? Why? What benefits have had these innovations for your company? And for your social and economic environment?

12.5.5 Getting funds

Funds at European level:

If you are a public or private body registered in the EU and your project proposes environmental solutions with a public dimension, go to the LIFE website to find out more about the EU's LIFE programme.

Your project focuses on energy efficiency or renewable energy. Go to theIntelligent Energy - Europe website.

Your project is at an early research or development stage, or has a high technology risk: Go to RTD FP7 website.

For further information visit: http://ec.europa.eu/environment/eco-innovation/getting-funds/index_en.htm

12.6 Additional cases

El **Naturalista**

El Naturalista is a Spanish company that produces shoes. Their products are characterized for being ecological, and respectful to Nature, and the company tries to be consistent with its philosophy reducing the environmental impact of their activities to the minimum.

Its innovations are developed in the field of the products (new concept of shoes) and in the development of new and green processes and technologies. One of its targets is to seek innovative methods of production such as the use of recycle and biodegradable materials whenever possible, semi-vegetable tanning or water-based glues. Also, El Naturalista give priority to those techniques which allow to reduce water consumption and do not affect food sovereignity.

http://vimeo.com/25019833

The policy of the company is based on the following points:

- Try to use natural materials
- Avoid using polluting substances and toxic products
- Seek to protect the environment
- Maximize the use of biodegradable and recyclable/recycled materials
- Pay fair compensation to providers and employees
- Promoted traditional forms of production
- Support the use of appropriate new technologies
- Operate with corporate transparency

The results are a new product which incorporates significant added value, brand image, efficient use of resources, contribution to environmental conservation, etc.

For further information: http://www.elnaturalista.com/en/home

12.7 Summary

In this module, some concepts and their relationship were introduced. Sustainability and innovation are two concepts straightly linked: sustainability depends on the contributions and technologic development of the companies and the long-term viability of those companies depends on the incorporation of environmental criteria in their activity. Thus, eco-innovation appears as a recently and powerful approach to be developed and improved in the next years.

For additional information, take a look at the "Further reading" section.

12.8 Further reading

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13 INNOVATION MANAGEMENT IN FORESTRY SECTOR IN SLOVENIA

Peter Fatur, Borut Likar, Urška Mrgole

13.1 Forest companies: Overview

The second most common type of land use in Europe is forestry. Forests and other wooded land cover 42% of the EU land area and are one of the most valuable multifunctional and renewable natural assets we have. Slovenia, preceded only by Finland and Sweden, is among the most densely forested Member States, whereas the least forested are Malta, Ireland and the Netherlands [1]. Unsurprisingly, wood is the most important source of renewable energy in Slovenia [2].

The forest area in Slovenia covers 1,253 hectares (data refer to the year 2010) which is as much as 62 % of the total size of the country. The area covered by forests is expanding; it has increased by 5.5 % form the year 1990 [3]. Recent EU data on the forest statistics show that Forests available for wood supply (FAWS) in 2005 reach 1,155 hectares while Forest and other wooded land (FOWL) reach 1,308 hectares which is 0.65 ha per capita (larger sizes per capita are recorded only in Sweden, Finland and the Baltic states; while Spain reaches the same level of forest per capita).

Year	1875	1947	1961	1970	1980	1990	2002	2005
Afforested area (1000 ha)	737	879	961	1026	1045	1072	1202	1217
Woodland (%)	36,4	43,4	47,4	50,6	51,5	52,9	59,3	59,8

Table 13: Changes in the afforested area in the period 1875-2005 [2]

Only 28 % of forests are owned by the state and local community. This number is expected to decrease to 20 % by the end of the process of denationalization, which makes Slovenia one of the EU countries with the lowest proportion of publicly-owned forests. Private estates are small, 2.6 ha on average, leading to little interest of forest owners to manage their property.

The governmental body responsible for forestry is the Ministry of Agriculture, Forestry and Food. In the field of forestry the Ministry shall provide for sustainable management of forest ecosystems and their comprehensive inclusion in other areas of space and residence. This includes also hunting and management of wild animals. Special emphasis is given on qualitative timber and adding value to timber products. Work of the Ministry is organised within three directorates, which perform tasks in key minister's areas. One of them is Directorate for Forestry, Hunting and Fisheries. Director General reports directly to the Minister [3].

The Slovenia Forest Service is a public institution, established by the Republic of Slovenia. The institution responsible for forest law enforcement is the Inspectorate for Agriculture, Forestry

and Food. Forestry Service is responsible for supervision of the implementation of Act on Forest and all regulations issued on the basis of Act on Forest. Slovenia Forest service performs public forestry services in all forests [3].

The Forest Development Programme of Slovenia, adopted by National Assembly in 1996, set out a national policy of close-to-nature forest management, guidelines for the conservation and development of forests and conditions for their exploitation and multiple uses. In 2007 Slovenian National Assembly adopted National forest programme and replaced previous Forest Development Programme of Slovenia. National Forest Programme [2] is a fundamental strategic document aimed at determining the national policy of sustainable development of forest management [3].

Slovenian forestry sector employs 2179 people (2004); the number has decreased by two thirds in 20 years. Together with other wood-related industries, the industry employs 20,000 people (Figure 13) [2].
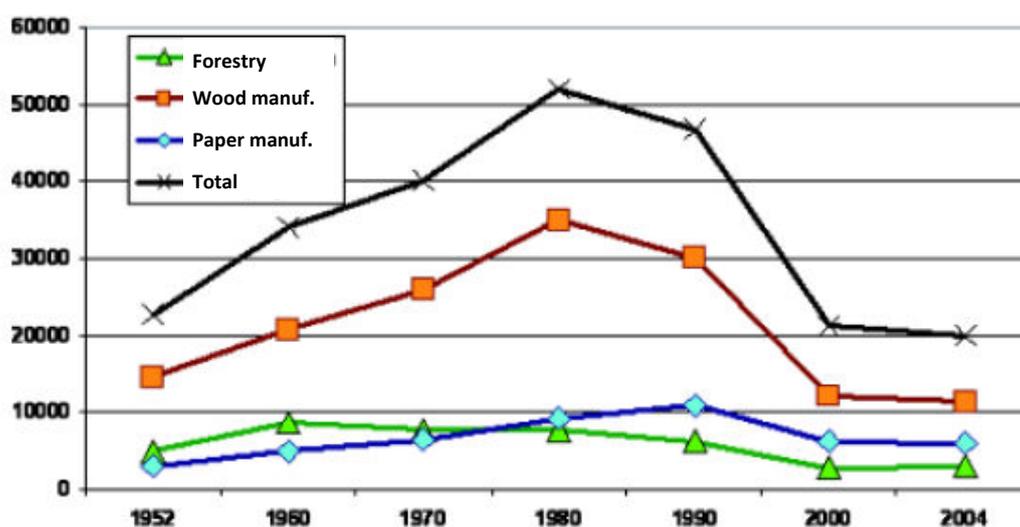
Figure 13: Number of employees in the forestry and forestry-related industries (1952-2004)

The Slovenian association of forestry reports 191 member enterprises, 89 out of them with no employees. 69 enterprises, employing 1619 people, were active in business. Their net revenues form sales reached 120 million Euro which is 0.19 % of total revenues of the national economy. Net revenues per employee reach 74,000 Euro (http://www.scribd.com/doc/40132587/2-Gospodarski-Pomen-Gozdnega-Sektorja and NGP 2007). The industries are dominated by small enterprises (Table 14).

Company size	Large	Medium	Small	Total
Forestry	5	5	59	69
Manufacture of wood and wood products	26	34	931	991
Manufacture of pulp, paper and paper products	7	10	83	100
Total	38	49	1073	1160

Table 14: Structure of forestry and forestry-related companies as per number of employees

13.2 National Innovation strategy: Policies and strategies for managing innovation

In spite of long lasting strategic discussions, the recent statistical indicators [4] show that the EU is still losing ground in business exploitation of knowledge and creativity to the United States and Japan. But the national innovation performances of European countries vary a lot as well. The Innovation Union Scoreboard (IUS) classifies Slovenia in the group of innovation followers [4] (Figure 14).
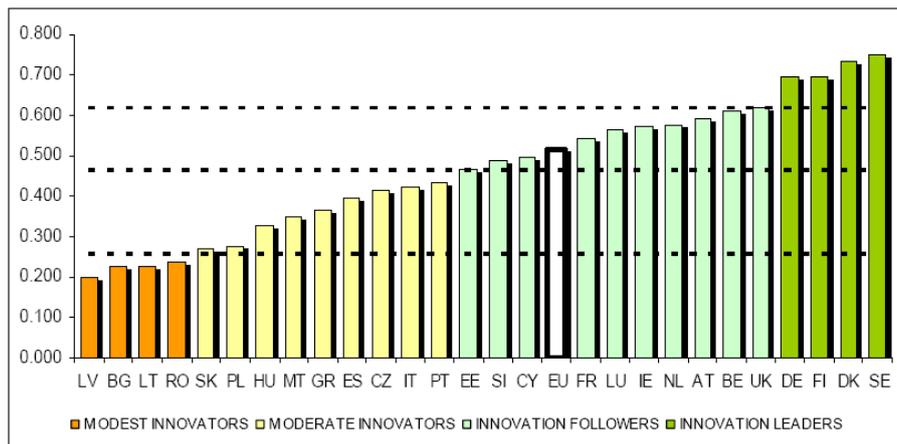

Figure 14: EU Member States' innovation performance [4]

Pursuant to the statistical data, 50.3 % of Slovenian companies prove to be active in innovation – which is on the EU average (51.6 %) but far behind e.g. Germany as the Slovenian major trade partner within the group of innovation leaders (79.9 %) (Figure 15).
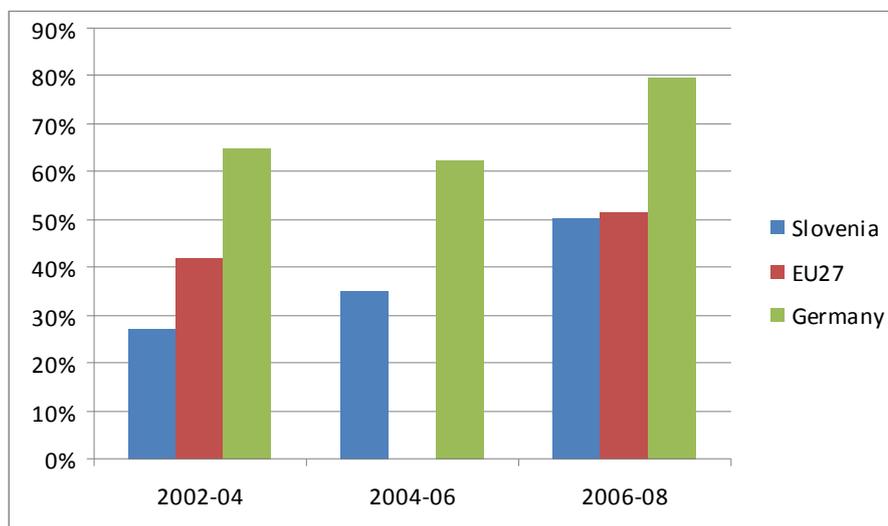
Figure 15: Share of companies active in innovation (SI, EU27, DE); various sources

What is more, an in-depth analysis noticeably shows that the situation regarding innovation in Slovenian small and medium enterprises (SME) is even worse where the large companies record approximately 50% more innovativeness as the medium-sized ones while the small companies even threefold less than the large ones [5]. (here it needs to be taken into consideration that an enterprise – regardless of its size – is classified in the statistical group of

innovative enterprises by introducing at least one new product. The latter thus represents a "statistical benefit" for large companies.). Apparently, Slovenian manufacturing needs an innovation push to stabilise its position in the group of innovation followers and start catching up with the group of innovation leaders [6].

The loophole between the knowledge-holders and economy is particularly explicit in the countries in transition; also in Slovenia [7]. Despite frequent outstanding research achievements, the path towards the industry is lengthy, and thus a great deal of research and development results remains in the phase of prototype or merely a published written work. Efficient and successful management of innovation and R&D work is undoubtedly one of the principal challenges of the Slovenian development process [8]. Slovenian supporting environment (ministries, agencies, development centres, information centres, venture-capital funds, technology parks, etc.) represents additional challenge since it still does not offer sufficient support to the innovation projects due to the frequently not well-harmonized and efficient operations.

As stated by the authors of the publication Okvirni metodološki priročnik od invencije do inovacije (Framework Methodological Manual from Invention to Innovation) [9], the development phases of products in the branches "wood, paper, printing" are low regarding the technological complexity. The share of R&D expenses in revenues (R&D share) in the branch Nr. 20 as per categories is: (a) sawn wood: 0.1 – 0.4 %; (b) veneer sheets as semi-finished product, modelled products made of disintegrated wood: <1 %; (c) engineering wood constructions: <2 %. Similarly can be observed in the R&D share in the branch Nr. 21: (a) cellulose: <0.1 %; (b) high-quality, additionally inward-processed printed matter, coated and smoothened papers: <2 %; (c) papers of the highest requirements: <4 %. The fact remains that lower R&D share in revenue consequently means proportionally lower value added per employee (VA): at R&D share of 0.1 % VA is EUR 7,580 – 50,250; at R&D share of 1 % VA amounts to EUR 21,400 – 70,700; at R&D share of 10 % (products with middle amount of research, e.g. digital central ISDN, laser printer) VA amounts to EUR 117,500 – 249,700; while with the highest R&D share (18 %; products with high contents of artificial intelligence) VA amounts to up to EUR 500,000.

In comparison with highly-developed economies, the absorptive capacity of the Slovenian economy is relatively small. It is all about the actual employment of the knowledge developed in academic institutions as well as other environments, particularly in the light of motivation to innovate and of the necessary knowledge (entrepreneurial, technically- technological, managerial) to successfully introduce novelties. Absorptive capacity means the capacity and readiness to accept, and creatively and profitably employ the knowledge and values, which are not directly developed in practice yet they are to be implemented therein [10]. Basis for a successful transfer of knowledge and ideas into economy are certainly the ideas/inventions themselves. In this connection, the relevant data on the number of patents per million inhabitants is essential. Slovenia still significantly lags behind the European average where 126 patents per million inhabitants were granted while only 22 were recorded in Slovenia.

Regarding the improvement of the supporting system for transfer of innovations/inventions into the Slovenian economy the following could be considered [11]:

- Slovenian supporting system including many institutions is not transparent, supporting activities are overlapping.
- Slovenian supporting system is still quite centralised, a stronger regional component would be essential.
- Better cooperation between companies on one side and universities and R&D institutions on the other is one of the key success factors – even though there is limited support, stronger support at mentioned activities would be highly appreciated. (information, preparation of project proposals, financial stimulation for innovative and R&D projects).

Stronger support of clusters and regional activities of economy would obviously result in further synergetic effects; e.g. the wood (not the forest) cluster is very active

The knowledge and willingness of the top management as well as employees is essential, concerning all the phases of invention-innovation chain – therefore education of all employees is the most important issue.

A detailed analysis on the National system of innovation in Slovenia has been recently done by M. Bučar et al.; below we emphasize the key relevant findings [12].

Slovenian innovation system has over the years evolved through complex relation-ship of relatively influential public R&D sector, increasing presence of business as the key investor in R&D and innovation and a search for optimal governance of innovation policy. In its ambition to secure the country long-term sustainable economic and social development, Slovenia is looking at the national innovation system with expectation to develop R&D and innovation capacities as important sources and determinants of economic growth.

With stable macroeconomic conditions and dynamic economic growth since 1997 Slovenia has made considerable progress in catching up with the EU both in terms of GDP per capita and labour productivity. Recent economic crisis has re-duced foreign demand, one of the main drivers of Slovenian economic development and economic activity declined sharply in late 2008 and 2009. The crisis has exposed several structural weaknesses, particularly the fact that Slovenia's GDP growth is overly dependent on low-technology industries and traditional services, which limit the competitive edge of its economy. A quick return to the trajectory of economic recovery and improvement of the population's welfare is therefore a great challenge for Slovenia, especially as the economic crisis severely affected the medium-term fiscal position and availability of sources of finance, and as the level of potential GDP also dropped.

In terms of R&D input indicators (the number of researchers, the amount of public R&D investment, and the high level of business R&D investment), Slovenia scores relatively well in comparison to the EU average. More problematic is the output side, particularly if measured by number of innovative firms, high tech export or the number of patents (EIS 2009). The level of research and development investment in Slovenia in recent years has been around 1.5 % of Gross Domestic Product (GDP) for several years now, with small oscillations, but under the EU-27 average. In the year 2008 the percentage was 1.66 % of GDP or 616.9 million

EUR for R&D, up from 1.5 in 2007.

Over the years, Slovenia has developed a rather complex scheme of institu-tions for R&D and innovation policy implementation, set up with the ambition to provide for as complete an innovation system as possible. Yet sometimes it seemed as if the main emphasis was more on the number of different instruments and institutions than on the quality of their work.

Slovenia has several measures to support R&D and innovation. The overall assessment of the current range of the support measures has to acknowledge their wide range and rather exten -sive coverage of different challenges. A closer look reveals overlapping and poor coordination, a relatively high level of user unfriendliness, especially towards the small businesses as well as other 'delivery' problems. So, instead of only design-ing new measures, Slovenian innovation policy should focus on streamlining the existing ones.

The problem with Slovenian innovation system often lies in details: the imple-mentation of the instruments is still subject to serious problems of efficiency of public administration and good governance. The already complicated process of budget negotiations and re-negotiations, which had often postponed the approval of support programmes and resulted in changes in the instruments, has been ad-ditionally complicated by the fact that many of the R&D and innovation measures are co-financed by the EU Structural Funds. This co-financing has brought con-siderable and welcome increase of resources, but with it also a need for improved coordination and transparency of policies and measures. For a small country, finding an optimal combination of various national and international resources to fund its scientific and technological development is essential, especially if the R&D and innovation is to contribute to its economic and social development. So far, the public R&D policy and the support for business R&D and innovation had little in common at the operational level.

Many of the challenges are of the structural character and therefore require a prolonged, stable and well-coordinated policy response. One of the areas where continuous policy attention should be focused, is the large seg-ment of non-innovative SMEs. The lack of interest in some industrial sectors for R&D and innovation, and especially SMEs in these sectors, is the results of sev-eral, sometimes conflicting reasons: from the lack of competition (certain serv-ices) to lack of financial and human resources in long neglected sectors, which were traditionally not considered as R&D important (like textiles, food process-ing etc.). In many ways, Slovenian R&D and innovation framework needs certain stability in terms of measures and instruments. This would give the companies a chance to get used to the offered support which is available to them on a regu-lar, sustained basis. It would provide an opportunity to analyse the impact of the measures over medium-term period and see where the barriers to their efficiency are most pronounced.

13.3 Innovation in target sector

In spite of a great economic potential of Slovenian forests, shown by the above data, the exploitation of this potential remains poor. The gross value added in roundwood production per hectare in Slovenia (€59.9 per hectare of forest) remains in the weakest third of the EU

member states (the neighbouring Austria reaches as much as €309.2 per hectare) [1]. In spite of the increasing trend of cutting, it remains below the optimal level (Figure 16) [2].

When discussing the improvement of competitiveness of the sector, we are inclined to think about many factors which all retain innovativeness as a common denominator. Yet the situation does not reflect only the problem in forestry industry but the entire Slovenian economy as well as the EU.
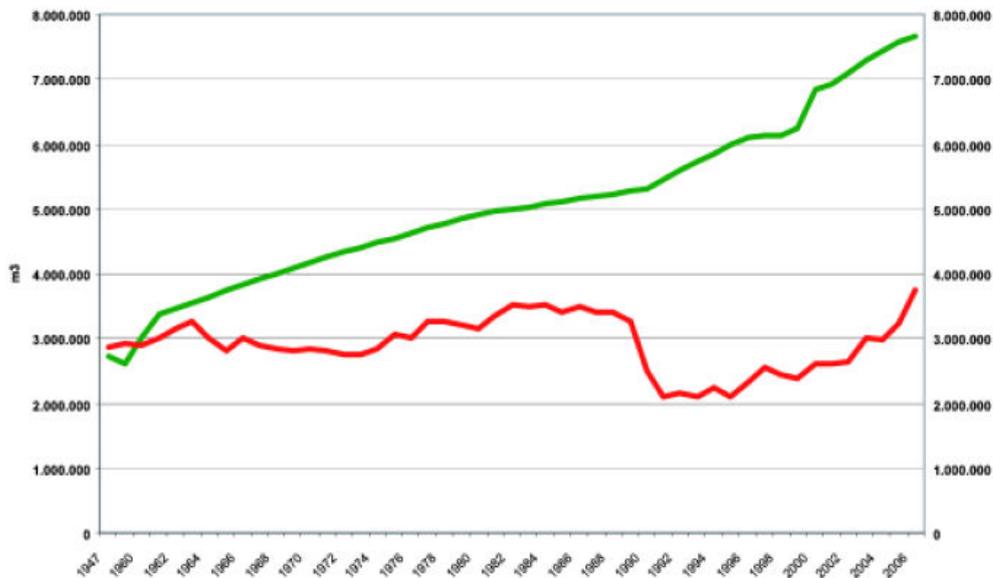
Figure 16: Yearly cutting (red line) and yearly growth (green line) in Slovenian forests (1960-2005)

The factors decreasing the economic effects of forests are connected to infrastructural, managerial and innovation deficiencies. NGP (2007) identifies the following major factors:

- Lack of forest roads, in particular in private forests
- Fragmentation of ownership (average property size is 2.6 ha only, usually further dispersed in several unlinked parcels)
- Poor interest and poor knowledge in forest management in the case of small owners
- Little on no link-up among the forest owners in performing forest operations
- Little or no joint efforts among the forest owners in the sales of the forest products
- Low level of innovation in marketing of other forest products (non-wood products) and services (e.g. tourism)
- Research in innovation and entrepreneurship in the field of economic effects of forests is not adequately focused.
- Little link-up among the wood-related industries (industrial associations, production chains, logistic flows)
- Little public consciousness on the importance of wood and, consequently, the wood

potentials not adequately exploited
- Too little value added in wood industry
- Low competitiveness of primary wood manufacturing and decreasing of its capacities.

Since the forestry industry remains among the least innovative in comparison with the other branches, its competitiveness requires that a company is prepared and capable to manage its own invention-innovation and also R&D processes. A prerequisite for such an activity is their understanding and comprehensive management of the processes. Nonetheless, we cannot neglect a fact that innovation is a complex process which fails to be mastered adequately by a large part of the Slovenian companies, not only in the industry under question. Economic entities strive to increase a level of innovation with various, mostly partial, approaches that frequently remain inefficient. The problem derives from the fact that the improvement of state relates to numerous factors which often represent a Gordian knot; where to start, considering all strategic aspects, defining the most important fields which call for improvements – defining key influential factors, implementing concrete steps, and similar. But primarily, the most important issue is how to approach the analysis and improvement of state systemically and systematically [13], [14]. The prerequisite is therefore a clear understanding which needs to be based on qualitative as well as quantitative evaluation of the most significant factors of innovativeness [15]. Hence, knowing which activities in company's operating are important for achieving innovativeness and consequently better economical results [16].

According to the statement made be the company LIP Bled, one of the largest and most successful wood processing companies in Slovenia, these issues have been unduly disregarded, partly due to the wood processors themselves. The slow adaptation of the Slovenian wood industry to the new market situations resulted in fall in demand and surplus in production capacities. However, the Slovenian wood industry still has its prospects. The EU market is enormous and the Slovenian wood industry with its own raw material base is one of the well established on the demanding markets of EU and USA [17]. Furthermore, according to the statements made by the CEO of the company Alples, the most successful furniture company in Slovenia, Slovenian wood industry has a promising future. New niche markets keep appearing that need to be exploited rapidly since only such actions ensure promising prospects. The latter are related not only to technology or production but also market approaches, raising brand awareness, offering after-sales services and similar. The Alples CEO believes that Slovenian wood industry with is raw material reserves, regional factor and tradition holds promising prospects for the future. He points out that an important factor of future development is an adequate development programme, additional training offered and new investments made in acquiring market shares [18]. Analogous conclusions have been reached in a survey carried out by the Association of Wood Processing Industry of Slovenia. As key factors, a survey asserts encouraging creativity, the need for further training and education in the field of wood processing profiles, management and marketing, cooperation with research institutions and university [16].

New EU markets and free movements of goods and services offer an opportunity of transfer of work or of the entire production into the countries with cheaper labour and raw materials. It is true that in the last decade after the collapse of the southern markets, Slovenian wood-processing industries whirl around in a vicious circle yet the examples of our neighbouring

countries (for example Austria in close cooperation with the Arab markets and production capacities of the Eastern Europe) as well as some Slovenian wood-processing companies prove that also these industries may be profitable. Here we should not overlook the role of the government which with its unsuitable and inflexible developmental-business supporting environment does still not provide the appropriate support to the companies with innovation and business potential. We believe that despite all the said, there are mechanisms in Slovenia and the EU which the companies can make a good use of [11].

In order to expand the economic effects of forest and the added value in the industry, it proves reasonable to expand the accumulation of wood and its addition through growth, optimization of infrastructure (forest transportation channels), planning of optimal wood extraction, inclusion of forest owners into forest planning, an increased use of forest for other economic purposes (hunting, apiculture, picking of forest fruits and other products, tourism and recreation) [2].

13.4 Additional cases

"Wooden Beam" - Analysis of the technological invention

Borut Likar and Janez Kopač

PRESENTATION OF THE PATENTED INVENTION
Idea of an I-girder developed from a concrete problem. The nucleus of the idea was the construction of a wooden beam, which is used above all for the roofings of all kinds. In a smaller wood-processing plant, which manufactures standard beams for roofings, they experienced continuous problems with tying-up the substantial amounts of funds necessary for logs of larger diameter needed for the production of beams; namely the logs need to be sawn at all four sides to obtain a square plan of the final product. And thus approximately 40% of a log is discarded. The objective was not only to manufacture beams from the logs of smaller diameter, which are also cheaper, but also to attempt to put the entire log into profitable use.

They developed the beam construction which meets the set requirements. According to the new method of beam construction, only 10% of the log is to be sawn off. The diagonal of the final product (I-girder) presents 1.3 of the entire diameter of the log, which the beam has been made from. Therefore the new construction method enables the manufacturing of I-girders of relevant size from the logs of smaller diameter, which are otherwise only used for the production of low-priced packaging – market product with low added value. The difference in added value between selling the packaging or the patented I-girders is approximately six fold (approx. 600%).

The company, with a couple hundred of employees, considered this problem and finally came up with a researched idea. The concrete idea emerged as a flash of wit and was not founded

on any calculations. In its initial phase, the draft of the construction was modelled with Lego bricks and it was only later that actual wooden models were made and tested. They also made concrete calculations and established that the product would be suitable for the mass-production and decided for patent application due to the attractiveness of the product and its novelty value on the market. They also started up the production.
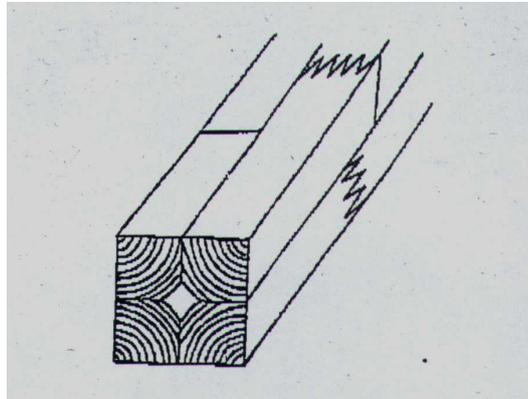

Figure 17: Presentation of beam gluing (I-girder)

Later they began with placing the product on the market – analysed the existing situation in the market segments interested in this product and they also forecasted future situation of the market; estimating the quantity of current and future annual consumption in those segments of market where the product has a possibility for a successful introduction; assessing the risk of introducing mass-production and the possibility of success; analysing not only the competition but also the selling and cost price of the latter and studying the product; forecasting in real terms the feasible market share of the company; envisaging the optimal technology and assessing the necessary capital investments [8].

METHODS OF ANALYSIS:
When analysing the project, we specifically concentrated on the elements closely connected to the invention-developing and technological phase as well as the transfer of the patent into the economic exploitation. In doing so, we shall discuss only those organisational, market and similar elements, which closely relate to the novelty.

Organisation
The company represents an important element for a successful realisation of the invention and its commercialisation as a novelty on the market. In the said case, the production and marketing were appropriately adjusted to the existing organisation of the company. There were some production limitations concerning the purchase of raw material – since the company uses only specific raw material for the production of I-girders, i.e. the wood which is cut down on the basis of concessions granted by the Slovenian Forest Service and which stock is limited. The capacity of the sawmill represents a bottleneck since it is also used for manufacturing some other products.

It emerged that the product is interesting for the market since they are able to sell more than they are able to produce even with the existing methods of marketing. In the light of market assessment, the potential market in Slovenia is 20 times larger than their existing market share and if they took over the market of prefabricated houses and roofings, the market potential would increase dramatically. Taking into account foreign markets where the

company is already present, the estimations predict a sale of a couple of hundred times more. Of course, this is not connected only with the increased production but also with increased sales – and other essential activities. Thus a question arises whether or not the existing approach is reasonable – despite the well-known facts, the organisation is not adjusting quickly and well enough to the market opportunities, but it is rather the existing production-oriented strategy of the company that dictates their development and their marketing strategy.

Evaluation of the Novelty
The I-girder represents a novelty in Slovenia yet it is necessary to take into consideration that this is a patent with shortened duration, and granted in Slovenia. With this type of application, a complete test is unnecessary. Nevertheless the applicant wanted to apply for the "real" patent but during the process of verification it was discovered that a similar patent had been filed in Germany. And thus the granting of the "real" patent was rendered impossible not only in Slovenia but also abroad. The applicant would be able to overrun the competition by a fast application which by all means would be meaningful as regards the nature of the product and its target markets.

Verifying the state-of-the-art technology through authorised European organisations generally lasts a few months, however, last year, a new possibility of verifying the state- of-the- art via international patent database has arisen for the inventors and innovators. Those are free of charge and available via the Internet (browser of the American Patent Office USPTO found on the website http://www.uspto.gov/patft/ or browser of the European Patent Office EPO http://ep.espacenet.com/). With assistance of the latter, the innovator may immediately check all the existing patents already in the period of formation and development of the solution and, thus save valuable time. Furthermore, the websites enable the author to obtain information on how a similar technological problem has been resolved by other authors, whereby it sometimes turns out that the same problem can be solved more effectively and considerably cheaper.

Substitutes
In the phase of development of an idea, it is also reasonable to check the eventual competition from various points of view. Firstly, we need to check what the potential competition has already been manufacturing and offering on the market. Here numerous possibilities are available: overview of the competition offer (specialised fairs, catalogues, websites, economic groupings and the like). The applicant realised that particular substitutes already existed on the market. These are mostly girders which are more expensive and suitable mainly for smaller constructions (combination of aluminium or plastic in combination with plywood).

It would furthermore be reasonable to additionally check the technological trends of development of girders with the same function – the eventual substitutes which are made from other materials. The state of technological development and therefore trends and projects in the field of fundamental and applicative researches should also be checked. In the field of construction sector under the 6th Framework Programme, there are some projects in progress within which certain alternative materials (Fibre Reinforced Polymers) and constructions are developed for the needs of the building sector.

Technology and Development
I-girder is designed primarily for supporting shuttering boards. As regards the mechanical

features, the tests were carried out at the Slovenian National Building and Civil Engineering Institute, and it was also proven in practice that the existing technology of manufacturing satisfies the demand. Developers compared adhesive and cohesive solidness also with the competition and the results were satisfactory. It is necessary to underline that the special standards have not yet been defined. The technology of the manufacturing has been adjusted to production capacities not only when it comes to cutting but also when it comes to the technology of joining (hot press).

In view of the precise knowledge about the mechanics and solidness, we may expect an improvement of persistence and resistance of a girder, glued together in such way. Shortage of material in the centre does not represent a bearing problem for the mechanics of solidness yet it is in a way a compensation element of dilatation. Correct combination and piling of the glued segments of a girder should be established during the production itself and with some additional tests. The bending of the girder may be compensated with optimal installation since the bending is frequently experienced with wooden beams [4].

Prospects of Technological Development
If the company entered the market of prefabricated houses and roof constructions, new challenges would arise. New technological approaches are required due to features such as: various other needed lengths of girders, their bearing capacity, weather conditions and meeting the standards, which are essentially harder to fulfil as at the I-girders of shuttering boards because of safety and time aspects. All this sets in front of the developers some new demands:

(1) Since the girders need to be longer, new technologies of processing and joining wood should be developed. (2) Demand for bigger transversal dimensions of girders mean the use of older trees with different characteristics of wood and consequently different technologies of production. (3) Additional challenge is represented by the differences in the wood itself (humidity, environmental conditions of growth and the like). Closely connected to the said is the technology of wood drying which has a great impact on the quality of girders and which should be improved. Also in this area, a few quality innovations have been made in Slovenia in the recent years. (4) Beside the already mentioned, the following problem has appeared when cutting a log into four parts. All four parts need to be as similar and smooth as possible before gluing. But if extra wood processing of any of the four parts is necessary (abstraction of material), the symmetry collapses. In the said case all the other parts of the log are discarded. Here emerges the possibility of computer support whereby the appropriate four parts would be found among a number of cut parts and then joint into a new I-grinder. (5) A long-term subsistence of the product should be ensured. (6) All the above-mentioned sets in front of the company new technological demands, however, the company does not have the necessary experience. The cooperation with some relevant knowledge-holders would be necessary. We also believe that the products could be additionally optimised by a better cooperation with customers in the phase of development.

CONCLUSION
With this remarkable idea, the company surpassed its existing competition in the wooden industry in Slovenia and granted itself some new possibilities of intense development. Unfortunately, the novelty has remained embedded in the existing organisation and its logistic, technological, production, marketing, organisational and other limitations

(technological-production strategy of the company). And thus according to our assessment, the potential of the invention has only remained partly exploited.

For a full exploitation of the market opportunity a radical change in most business activities would be necessary. Due to immense needs for additional development, some relevant R&D organisations would need to be included, and at the same time business activities would need to be adjusted – transition from the technological-production concept of the company into the company which is able to integrate inventions into their business strategy in such way that it would take an optimal advantage of the market opportunity and technological-production capacity. It would be reasonable to consider an organisationally independent unit which could exploit business opportunities and also all the potentials of the company. With appropriate development, a suitable purchase of raw materials should be ensured (from other parts of Slovenia or abroad) as well as solving any bottlenecks in their production with extra investments or through outsourcing.

13.5 Innovation management in the Slovenian forest companies participating in the iForest project

13.5.1 Introduction

In this report, we present the analysis of the state of innovation management in the Slovenian forest companies participating in the iForest project. As the participating companies were selected, a detailed snapshot of the situation within a company was made. The methodology was based on two input factors:

Primary data on company were obtained on the basis of survey questionnaire. The questionnaire was filled out by the top manager or another relevant person. Both objective and subjective factors were followed. The first ones are directly and objectively measurable factors (e.g. the number of administered suggestions, the evaluation of reduced costs due to introduced innovations and suchlike). Subjective factors are related to organizational aspects, innovation culture etc. that do not yet offer direct and objectively measurable results. The questionnaire was designed within the I-model project, on the basis of several methods: methodology for the evaluation of the state of R&D and innovation management (CIS 2001, Likar 2005), of the state of idea management (Fatur 2005) and a study of relevant literature. Main sets of survey questionnaire are as follows:

- basic demographic data of a company
- innovation expenditure
- strategic view of innovation
- innovation goals and objectives
- organizational culture and climate
- human resource management
- non-professional innovation / idea management

- idea generation techniques
- monetary and non-monetary recognition
- role of managers
- innovation co-operation
- factors hampering innovation activity
- effects of innovation

The results are represented by the answers on particular question as per different topics while on the basis of the results a basic descriptive statistics is performed.

Survey data were upgraded with a semi-structured interview focused on the company's management where the following topics are deemed as central :

1) Innovation

- Have you developed any innovation activity during the last 4 year? Do you know what the innovation is?
- How do you manage the innovation?, How do you perceive the innovation?
- Do you develop any measure/initiative/practice regarding to innovation in the company (new products – new processes – new markets?
- What methods do you use for dealing with innovation in your company? Are these methods useful for successful innovation activities?
- Do you know the different structures that support innovation in your area?
- Financing innovation, do you know the mechanism for financing innovation?

What are the main information channels for dealing with innovation?

2) Human resources

- Does the company use a human resources policy for improving the skills and qualifications of its staff?

The qualifications and skills of the company human resources are relevant for improving/ hinder innovation?

3) Training

- Does the company promote training activities for the staff?
- How do organize the training?
- Types of training, methodologies used for training activities.

Have you developed any specific training event related to innovation?

Assessment of the situation within a company is performed on the grounds of analysed data which will also serve as the basis for the preparation of materials in the subsequent phases of the iForest project. Triangulation of different sources of data may ensure also an appropriate validity of results regardless of the fact that the sample is small.

13.5.2 Analysis of the state

The number of companies taken in consideration is 5. All of them belong to forest

sector, with an average number of employees 122 and total employees 610. The largest company by employees has 375 people employed and the smallest has 14. Except for the one, all companies belong to the group of SME.

Here, we will consider the following factors related to innovation:

1. Strategic view of innovation
2. Innovation goals and objectives
3. Organizational culture & climate
4. Human resource management
5. Non-professional innovation / idea management
6. Idea generation techniques
7. Monetary and non-monetary recognition

Role of managers

Each factor has been expressed by a series of ststements and evaluated on 5-grade Likert scale (1=low; 5=high).

An analysis of factors (average value for all companies per each of the 8 factors) shows that some factors (Monetary and non-monetary recognition, Innovation goals and objectives, Idea generation techniques, Strategy) are less developed than others (Organizational culture & climate, Human resource management, Role of managers, Idea management) in the companies participating in the project. This may give us an indication of stress that shall be put on every area, both for training material preparation as well as for strategies' and operational plans' considerations.
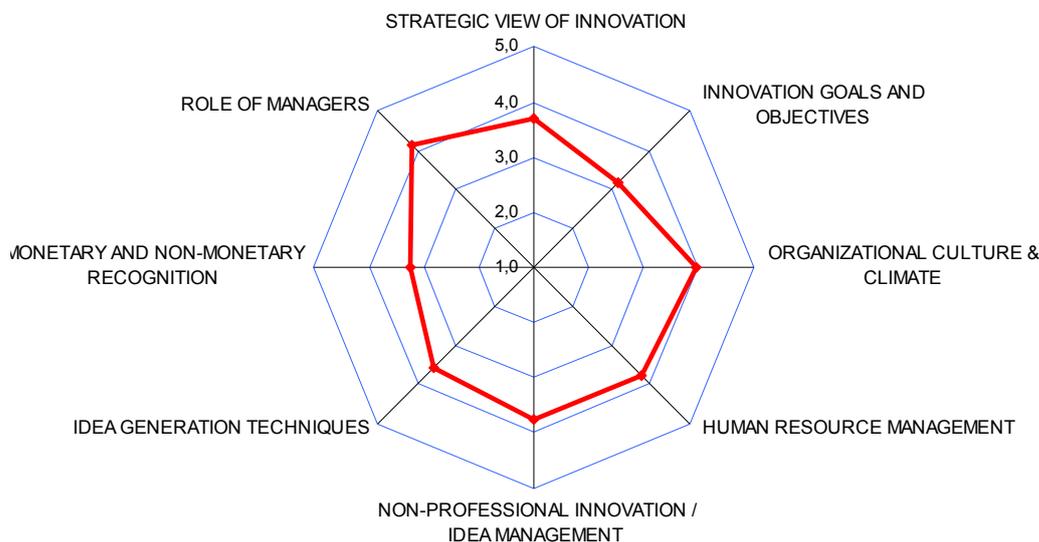
Figure 18: Analysis of factors related to innovation

Since the sample (the number of companies) is relatively small, results should be interpreted with care. However, they give an indication of situation and used along with the other tools developed (semi-structured interviews, EU and national analysis of the state) represent a useful tool for decision making.

In the second stage, we wanted to take a closer look into deficiencies that companies face regarding various aspects of innovation management. The survey revealed that the innovation stimulation activities among employees are rarely running systematically, they often rely upon the management's occasional inspiration only. However, managers only rarely suggest their subordinates to "formally" submit his/her good idea. In case the set innovation goals have not been met, sanctions are usually not imposed. The management has never been focusable trained for understanding and managing the innovation processes.

The strategic aspect examined systemic basis for the innovation management . A relatively high level of declarative support offered to innovativeness is characteristic for the companies under consideration. Innovativeness occupies an important position in these companies and on principle enjoys support of the top management. Innovativeness is a declared value and is made a part of the companies' strategic plan. In short, companies know why they pay attention to this area. However, they are facing problems when implementing the declared objectives. The statements which examine actual activities of the companies and not only their declared commitment to the innovation were valued considerably lower. It is definitely alarming that the aspect of "goals and objectives" ranked ultimate on the evaluation scale. This confirms the above conclusion that the strategic role of innovation is well-defined yet the problems occur at the implementation phase.

The field of innovation culture and climate is rated the 2nd highest among all aspects. The respondents mainly claim that creativity is expected within their company. There is every indication that we are slowly surpassing obsolete way of thinking that innovation is mostly dealt with by engineers and production. The employees of the companies are to an appreciable extent aware of the fact that creativity is a prerequisite of quality and efficiency of work. However, this does not reflect in their relations towards the colleagues. A creative co-worker is not (!) more valued than the one prone to routine (by the other co-workers). Again, values given to statements related to declarative attitude towards innovativeness ("is expected", "we are aware", "we appreciate") prove to be high, while those that examine actual activities which ensure culture and climate favourable to creativity are considerably lower.

Respondents believe that employees are being developed and trained yet the difference between successful and unsuccessful employees fails to be recognized. If such difference is not recognized, the motivation process shall not be triggered. The subject of training is predominantly the procedures, rather than the contents (creativity techniques, team work). Employees are thus offered an opportunity to innovate yet remain only partially provided with tools which help them seize the opportunity to the fullest.

The companies should pay more attention to the creativity techniques (the differences among companies in this field are particularly notable). Formal frames, which encourage ideas submission and enable their processing and implementation, are only a part of the story. These frames enable a certain level of creativity and consequently innovativeness within the company. Employees are offered a possibility to be creative. Nevertheless, the creativity of

each individual is limited. In order to surpass its fundamental level, creativity needs to be "pulled" out from the individuals as well as teams. This means that management should no longer be passive and awaiting for the ideas to be generated yet use various tools and techniques which shall help employees to be more creative. The aspect of creativity techniques is one of the fields which received the lowest values in some of the companies. What's more, the statement "We are systematically discovering open problems and making them public to find innovative answers" was one of the worst valued statements.

Non-professional innovation activities among employees are rarely systematically encouraged. And, if they are, the employees hardly ever well understand the procedure. The company's reward system doesn't enable the more successful employees to receive higher salaries and innovation incentives are not well integrated into the company's reward system.

On the other side, companies state that their employees are systematically encouraged to develop new knowledge and skills and to undertake new, more demanding tasks. Receiving feedback about one's proper work is not understood as criticism; they consider it rather as a learning opportunity. Other people's mistakes are not being blamed but considered as learning opportunities. All this is of course a good starting point.

Standard deviation of answers can also be seen as a significant indicator. Average of standard deviations of company responses under each factor show the differences in emphasis the companies put in developing particular aspects of innovation. Highest differences among companies can be found in innovation recognition (bonus) systems, while strategic view, innovation goals, idea generation techniques and managerial roles record similar levels in all the companies in consideration.
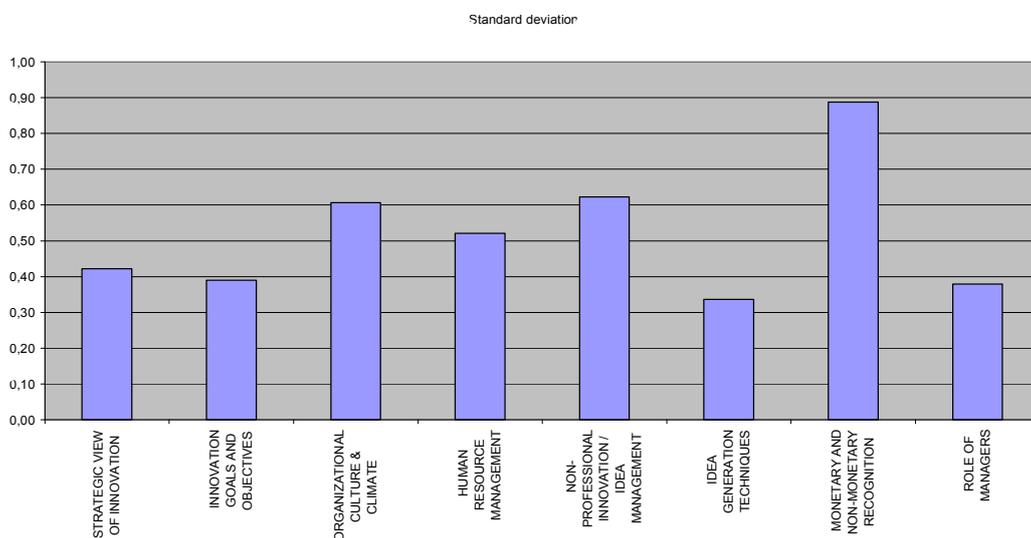
Figure 19: Standard deviation of factors related to innovation

Highest differences (i.e. standard deviation of responses among the 5 companies is

above 0,80) can be perceived in the following questions/statements:

- Innovativeness is one of the stated values of our company
- Innovation processes' organization is appropriate to enable the fulfilment of the set innovation goals and objectives
- We are implementing advanced management techniques within the enterprise
- When the given timeframe for the implementation of an innovation project has expired, the actual accomplishment is checked
- In case the set innovation goals have not been met, sanctions may be imposed
- Receiving feedback about one's proper work is not understood as criticism; we consider it as a learning opportunity
- The employees are aware that creativity is a prerequisite for an efficient work
- The employees trust their superiors
- The management staff has been trained for understanding and managing the innovation processes
- The submission of suggestions is allowed to any employee, including the R&D and management level
- It is uncommon for an implemented improvement to slip slowly back to the old track
- The employees understand the procedure (formula) for the suggestion bonus calculation
- We know and use different idea creation techniques (brain storming, fishbone diagram …)
- In case of any unexpected deviations from usual procedures within the work process, we carefully analyze the causes
- We keep asking ourselves, which of the activities could be omitted without consequences
- We are systematically discovering open problems and making them public to find innovative answers
- In case of any mistake, we are not searching for the guilty person, but for a solution to avoid the same situation in the future
- For any submitted suggestion we examine its possible implementation elsewhere
- We use various tools for non-monetary motivation of the innovators (public recognitions, a thank-you letter, prize-drawing, excursions…)
- Innovation incentives are integrated into the company's reward system
- The company's reward system enables the more successful employees to receive higher salaries
- Managers often suggest their subordinates to "formally" submit his/her good idea
- Suggestions from the subordinates are not considered as a personal criticism

The higher the difference among companies, the more opportunities the benchmarking can give to the lower-ranking ones.

The semi-structured interviews reveal some details regarding the state of innovation management in Slovenian forest companies. All the respondents express a positive attitude towards innovation. However, the overall level of innovation is undoubtedly low. Innovation is mostly perceived as a technological one, and rather in the sense of new or improved processes than in the sense of new/improved products. The specifics of the forest industry which is a service industry, offering service and not goods, explains the managers' little interest in product innovation, especially in the view of a limited perceiving of "innovation"

only as a technical one. In fact, none of the companies mentioned any kind of service innovation (e.g. expansion of operations in the direction of tourism or sustainable development, since both are being discussed in the Slovenian National Forest Strategy as possible business opportunities). As stated by one of the companies, striving for new products – the products non-typically-woodworking ones – resulted in finding that these inventions are either already existing on the market or too expensive. So, product innovation in these companies is limited to an introduction of improvements of existing products.

(Process) innovations are usually related to the procurement of new technologies (developed outside of the company) and their implementation. The training related to innovation is, consequently, oriented towards the appropriate and safely use of these tools and technologies. Other kinds of education or training are not common, in spite of the fact (or due to the fact) that the educational level of employees is relatively low. Companies declare also a lack of funds available for training as an obstacle. Good examples stated by the companies include e.g. weekly meetings with the employees (since the nature of forest business does not allow the employees to be working in one location) and a longer monthly meeting with the purpose to discuss innovation. One company even stated a yearly meeting where the best employees-innovators were awarded (which, as a matter of fact, is a common practice in many (more innovative) industries).

Companies have a very limited or no knowledge regarding the support environment for innovation and sources of capital. As discussed in the National analysis of the state, these institutions are somehow dispersed and their focus not clear, so they might indeed be far away from the reality in a low-innovation sector as the forestry undoubtedly is.

In spite of the low level of innovation , notable differences can be observed among companies, at least in the management's attitude towards innovation if not in the results of innovation (innovative products, processes etc.). A higher level of innovation is not limited to a certain size of companies. In fact, two most notable positive evidences can be seen in the largest of the companies (a forestry company with 375 employees) and the smallest one (an entrepreneur with 14 employees). Both declare a strong positive attitude towards innovation and deploy techniques for encouraging it (e.g. brainstorming, monthly meeting with innovation as a subject. encouragement for training, a workgroup of engineers). These two companies can be considered as a reference within the forestry industry, while further improvements of innovation management apparently need to be developed on the basis of experience from other industries.

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