



EUROPEAN UNION
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ChangeMakers

INNOVATION MANAGEMENT

Learning material for the study module “Start-ups for sustainable environment created by youngsters”



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Current learning material is prepared for the teachers of high-school and gymnasium level students participating in Interreg Central Baltic project CB851 “ChangeMakers - Start-ups for sustainable environment created by youngsters” to better understand Innovation Management. Materials are compiled by the experts of Riga Technical University and meant for a 75-90-minute lesson and is supplemented with presentation, available at the Interreg Central Baltic ChangeMakers project’s web page <https://sites.utu.fi/changemakers/>

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TABLE OF CONTENT

Proposed outline of the lesson	3
0 - PREPARATION.....	4
Homework prior to the lesson	4
I – INNOVATION MANAGEMENT.....	5
1.1. Definitions of Innovation.....	6
1.2. Principles of innovation.....	8
1.3. Preconditions of Innovation	10
II - SOURCES OF INNOVATION	11
2.1. Different Ways of Innovation Classification	16
Product, Process, Marketing, Organization Innovation	16
Gradual and Radical Innovation	17
Technological and Non-technological Innovation	17
2.2. Innovation Process	18
2.3. Innovation management	20
III – AFTERPARTY	21
References.....	22

PROPOSED OUTLINE OF THE LESSON

Table below proposes outline of the Innovation management lesson and the estimated duration of each sub-session. In the following chapters, you can find the topics we recommend you cover under each stage. Adaptions to the learning material are encouraged, please inform the CM team if you alter the materials, so we could consider the adaptions to be included for the course to be carried out in 2021.

Lecture materials

- Handouts to students and material for lecturer

Presentations

- Include's all information from lecture materials as well as tasks
- Presentations might be given to students

ORDER	SUB-SESSIONS	ESTIMATED DURATION ¹
0	Preparation: students to do some warmup tasks and gain intriguing innovation literature	Prior to class
I	Introduction: general discussion based on everyone's personal experience and the homework students were invited to complete (see previous chapter)	20 min
II	Innovation management session: presentation with practical tasks	90 min
III	Afterparty: additional creative thinking method, idea evaluation and development method exploration that could help in innovation management	After the class

¹ The study material does not propose the possible breaks that might be needed to keep the focus and good pace. Teachers are expected to estimate the need for breaks based on school and group specific needs.

0 - PREPARATION

All students at the age of 15-18 are welcome to take part in the course. No previous experience is required. Only an open mind and curiosity to learn something new are needed to complete the proposed assignments.

Homework prior to the lesson

DO:

- Exercise.1. In 2 minutes write down as many functionalities of pencil as possible (be creative)
- Exercise 2. In ~500 words write your motivation to join the course and the field/idea to which you would like to apply your knowledge

EXPLORE ADDITIONAL LITERATURE SOURCES:

- Anthony, S.D., 2012, The little black book of innovation, Harvard Business review Press, Boston
- Berkun, S., 2001, The Myths of Innovation, O'Reilly, Sebastopol
- Gailly, B., 2018, Navigating Innovation, Springer
- Schaufeld, J., 2015, Commercializing Innovation, Springer
- Tidd, J., Bessant. J., Pavitt, K., 2001, Managing Innovation, 2nd edition, John Wiley&Sons

I – INNOVATION MANAGEMENT

Estimated duration of the session ~90 minutes

Slides: INNOVATION MANAGEMENT .pptx

Task No 1. Recall an innovative product or service which you have encountered in your life – describe why you consider it innovative (10 minutes).

Currently – at the age of information based economy the role of innovations becomes even more crucial.

The role of innovations has been widely discussed nowadays, because of the drawn conclusion, that it is the main precondition for the ability to maintain competitiveness of economy (Porter, 1985), (Christensen, et al., 2003), (Tidd et al., 2005) and business (O’Reilly, 2008), (Nooteboom, 1999). The main motivating factors for implementing innovations in a company are covered by Oslo Manual:

1. Improvement of company operations;
2. Improvement of productivity;
3. Increase the ability to create innovations;
4. Maintaining competitiveness and creation of competitive advantage (OECD, 2005).

As it seems innovations are a crucial element of our age, but what is innovations? There is a variety of definitions, but they all have common consensus on these elements:

- Innovation is the main force behind economic development and has existed since the dawn of the mankind;
- Innovation is the process and the effect of the process can be managed to influence its results;
- The result of the innovative process gives measurable benefits to the parties involved;
- Most well-known manifestation of innovations are the development of new products, manufacturing of product from new materials, development of new product design, method or strategy that is used to achieve better results;
- Invention is a part of innovation.

1.1. Definitions of Innovation

The term innovation has been defined in various ways and each definition encompasses a different aspect of the concept:

- An innovation is the implementation of a new or significantly improved product (good or service), or a process, a new marketing method, or a new organizational method in business practices, workplace, organization or external relations (OECD, 2005).
- The minimum requirement for an innovation is that the product, process, marketing method or organizational method must be new (or significantly improved) to the company. This includes products, processes and methods that companies are the first to develop and those that have been adopted from other companies or organizations (OECD, 2005).
- A common feature of an innovation is that it must have been implemented. A new or improved product is implemented when it is launched on the market. New processes, marketing methods or organizational methods are

implemented when they are brought into actual use in the company operations (OECD, 2005).

- An innovation is defined as:
- The introduction of a new item that is one with which consumers are not familiar yet, or of a new quality of an existing item.
- The introduction of a new method of production, which needs by no means be founded upon a discovery of something scientifically new, and can also exist in a new way of handling a commodity commercially.
- The opening of a new market; that is the market into which a particular branch of manufacturer of the country in question has not previously entered, whether or not this market has existed before.
- The conquest of a new source of raw material supply or half-manufactured goods, again irrespective to whether this source has already existed or whether it has first been created.
- Carrying out of a new organization of any industry, like the creation of a monopoly position (for example through trustification) or breaking up of a monopoly position (Schumpeter, 1934).
- In an essential sense, innovation concerns the search for, and the discovery, experimentation, development, imitation, and adoption of new products, new production processes and new organizational set-ups (Dosi, 1988).

To better understand what innovation is and what it is not, The Oslo Manual points out changes in company, which are not innovations:

- Trading of new or improved products by wholesalers, retailers, warehouses and transport companies are not considered innovations;
- Purchasing or minimal upgrading of hardware that is identical to already installed one or extension or modernization is not innovation. New

hardware or upgrade must be new in the company and must contain significant technical improvements;

- Firms engaged in product production and make single and often complex items according to customers' orders. Unless the one-off item displays significantly different attributes from products that the firm has previously made, it is not a product innovation.
- Changes in the price of the product or the productivity of the process as a result of change in factual prices;
- If a company suspends some activities aimed at improving its efficiency, it is not an innovation;
- In certain industries such as clothing and footwear there are seasonal changes in the type of goods or services provided which may be accompanied by changes in the appearance of the products concerned. These types of routine changes in design are generally neither product nor marketing innovations. For example, the introduction of new season anoraks by a clothing manufacturer is not a product innovation unless the anoraks have, for example, a lining with significantly improved characteristics. However, if the occasion of seasonal changes is used for a fundamental change in product design, that is a part of a new marketing approach used for the first time by the firm, this should be considered a marketing innovation (OECD, 2005).

1.2. Principles of innovation

The principles of innovation help understand better the essence of the concept. P. Drucker has laid down 5 principles of innovation (Drucker, 1993):

- Begin with an analysis of the opportunity. It starts with the reflection on potential sources of innovation. For example company Lego has a vast range of instruments and methods how to get information about the habits

of its clients – from Lego conventions where the users can express their thoughts on the product, to experiments where the a person is allowed to use (or better say play) with the product.

- Analyze the opportunity to see if people will be interested in using the innovation. For example P&G (Procter and Gamble) has implemented a system which makes the company employees on all levels to contact with its clients, to better understand needs regarding the existing products and their willingness to use new or improved products.
- To be effective, the innovation must be simple and clearly focused on a specific need, for example Lego created a new series for girls called Lego Friends.
- Effective innovations start small. For example, Apple found a solution to three fundamental problems of portative computers by implementing new power packs which were more energy efficient thus reducing the computer heat as a result making cooling fans unnecessary. Getting rid of the cooling fans made the computers smaller, quitter and cooler.
- The aim is to become a market leader in a certain environment. The company Tata-Nano made their cars specifically for Indians who are used to riding scooters.

Task No 2. Each participant, using any three objects around him/her, creates something new (5 minutes) and argues whether their creation is an innovation (5 minutes).

1.3. Preconditions of Innovation

Some researchers write about the preconditions of innovation, for example, Skarzynski and his partners have identified 3 crucial preconditions – time and space, diverse thinking, combinational chemistry (see figure No 1.1.)

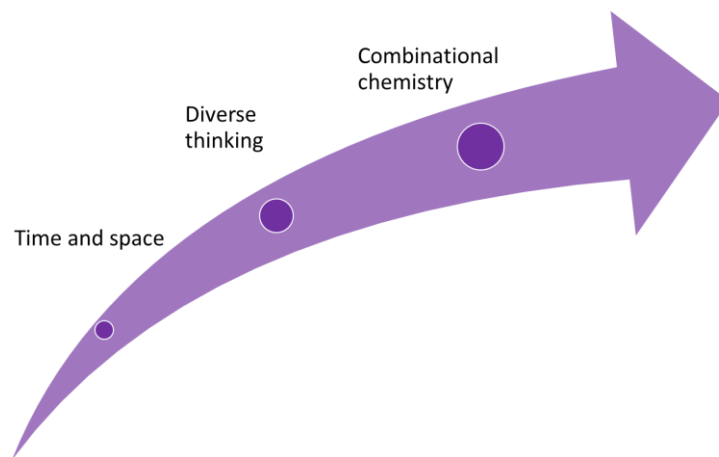


Figure no. 1.1. Preconditions of innovation

Source: Skarzynski et al. (2008)

Innovations have to have a defined time and space where people can operate within the process of innovation – that is to generate ideas and experiment. Google has 70/20/10 law, which allows employees to use 10% of work time for their projects, 20% for strategic goals and 70% for their direct work. Such companies as 3M and Gore have followed the example of Google by giving their employees respectively 15% and 10% of their time for innovations.

Diverse thinking is also crucial for innovations. To create such a thinking company one needs:

- Analytical and creative thinking;
- People from different levels in the organization;
- People with and without experience;
- People of different ages;

- People who master technologies and people who master people's psychology;
- People from within and outside company.

The third precondition is to make the combinational chemistry, by making the structure of the company open to such initiatives, provide free flow of ideas etc.

Task No 3. Each group of three people (the groups must be formed by people with different characteristics) must create something new using 3 objects around them (3 minutes) and argue whether their creation is an innovation (7 minutes). When was it easier to come up with an idea – by yourself or in a group making the combinational chemistry?

II - SOURCES OF INNOVATION

P. Drucker suggested that purposeful, systematic innovation begins with the analysis of opportunities, and classifies "Seven Sources of Innovative Opportunity". The first four lie within business or industry and second set of sources outside business or industry (Drucker, 1993).

Sources within Business or Industry

Source of Innovation Number 1: Unexpected Success and Failures. For example, an unexpected success came when IBM calculating machines for banks started to be used by libraries; Ford Edsel failure which leads to legendary Ford Mustang production. Unexpected innovation often is the continuation of existing work, where existing knowledge and experience are used.

Source of Innovation Number 2: Incongruities. Discrepancy and dissonance between what is and what "ought" to be, or between what is and what everybody assumes to be. There could be **incongruity between the reality of an industry, and the assumptions about it**, for example, Nikita Khrushchev (Russian politician who led the Soviet Union during the part of the Cold War) was wrong when saying that "the Russians will never want to be car owners- taxis are cheaper". He did not take into account the fact that the vehicles mean something much more than reduced costs, they also mean freedom, mobility, etc. There could be incongruity between perceived and actual customer values and expectations, for example, the request for a small car with still enough space inside seems to be incongruent. This, however, was solved in a new design as the Smart. **There is also incongruity within the rhythm or logics of a process, for example**, eye surgeons had one important problem in surgeries- cataract ligament sectioning. But Alcon enzyme solved this problem since it was able to break cataract ligaments with some drops of Alcon. This enzyme was created from a certain enzyme, which only needed to find the way to preserve it longer. The possibility of incompatibility usually sees who works in a particular sector.

Source of Innovation Number 3: Innovation Based on Process Needs. Incongruities in process needs essentially look for a weak or missing link in an existing process. There could even be the situation when everybody is aware of the problem, but there is no solution, for example, the reflectors on highways in the United States and Japan. In order to create successful solutions, it is necessary to understand the users' needs and have knowledge of a particular subject.

Source of Innovation Number 4: Changes in Industry and Market Structures. Changes in industry and market structures usually take place as a result of changing customer preferences, tastes and new values. For example, the rapid growth of a particular industry is a reliable indicator of changing industry structures, like it was

when, Japanese penetration of the USA auto market with smaller and more fuel-efficient cars when there was a dramatic increase in gasoline price. It allowed them to take advantage of changing consumer preferences for vehicles. So these could be social, political or technological changes. For example, first aid centres in the USA were developed on the basis of changes in industry.

Changes outside Business or Industry

Source of Innovation Number 5: Demographics (population changes).

Demographics and population changes (age, education, disposable income, geographic shift, etc.,) are one of the most reliable predictors of the future. For example, the "aging" of Europe and the decrease of birth rate means that there will be an increase in demand for products, which elderly people use. An increase of the number of people in retirement age will decline market need for the products for young people. For example, in Japan there is a rapid increase in the development of robots, because they understand that there will be lack of low skilled labour.

Source of Innovation Number 6: Changes in Meaning and Perception. That is how we look at the facts, they do not change, but change their meaning, such as health indicators in recent decades have greatly improved, but we are health conscious even more than before, so there is the development in healthcare journals, healthy food and other businesses etc.

Source of Innovation Number 7: New Knowledge (scientific and non-scientific).

New knowledge can be a source of innovative opportunities but has the longest lead time of all innovations. Knowledge-based innovations are almost never based on one factor but on the convergence of several different kinds of knowledge. For example, the jet engine was originally patented in 1930. Its first military test was in 1941 and the first commercial jet plane was the Comet in 1952. Boeing

eventually developed the 707 in 1958, 28 years after the patent and required the convergence of the technologies of aerodynamics, new materials, and fuels.

There are also other approaches how to classify the innovation sources, for example, we can classify two kinds of innovation sources:

Science push. Studies have shown that companies that invest in research and development operate more efficiently, with greater market value and sales growth (EARTO, 2002). For example, biotechnology, nanotechnology, etc. have been the source of many innovations.

Demand pull. Such as human desire for more compact, multifunctional phones, encourages manufacturers to create ever-new solutions.

Referred to other research the sources of innovation could be new technologies, scientific research and discoveries, niche markets, customer requirements, competitive bid, standards and legislation, cooperation with customers, experts and other interested parties, etc. (Gilliard, 2014). There is a tendency that more and more people are involved in innovation processes and topical issue in the open innovation paradigm, where external sources are very important. External creators of open innovation in practice, see in figure 2.1.

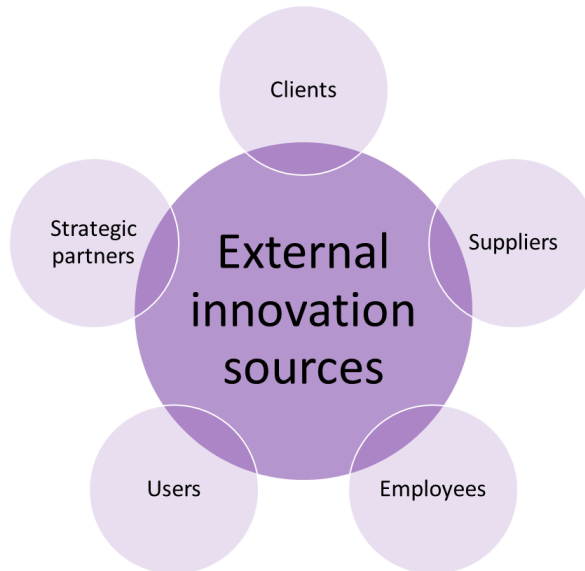


Figure no. 2.1. Open innovation external innovation sources

Source: AT Kearney (2013)

Customers and users as sources of innovation are becoming more common because they are the most motivated to find solutions and understand best what is important for them. For example, the sailing boat 'Laser' design was created by the Olympic athletes- Bruce Kirby, Ian Bruce and Hans Fogh.

Close links with competitors, suppliers and providers of complementary products can be a source of innovation. For example, Kodak and Fuji were competitors on the camera and film market, but now Fuji is supplemented by Kodak.

Task No 4. Which sources of innovation do you think are the most promising?
Explain your idea. (10 min)

2.1. Different Ways of Innovation Classification

Innovation can be classified by its results, pace of implementation, significance, process of cooperation etc. Each of the innovations can be classified in many different ways, for example, *iPhone 6* could be considered as a technological innovation as well as product innovation or gradual innovation, etc.

Product, Process, Marketing, Organization Innovation

A **product innovation** is the introduction of goods or services which are new or significantly improved with respect to their characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics. Examples – e-book readers, walkmans or GPS. Improved product innovations are a new model of *Gillette* razors or a new smartphone model.

A **process innovation** is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. Examples - implementation of barcodes or new machinery in the process of manufacturing, use of computers in product design, new methods of supply etc.

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. Examples – mineral water producer *Začumuiža* fills its water in bottles as well as different types of plastic containers like small yogurt cups. As a marketing innovation, an unusual advertisement in social networks or new methods of funding using *Kikstarter* may be considered etc.

An **organization innovation** is the implementation of a new organizational method in the company business practices, workplace organization or external relations. Examples – remote work opportunities or non-hierarchical organization of company or self-organization, like transport sharing network *Uber*.

Gradual and Radical Innovation

By their pace and significance innovation can be categorized as either gradual or radical innovation (Schumpeter, 1934) (Garcia et al., 2002).

Gradual innovation is a continuous and uninterrupted process, in which minor changes or improvements are made in the product or service. Gradual innovation helps to maintain competitiveness and position in the market and helps to find new solutions and functions for the already existing products, processes etc. A good example is the evolution of means of writing with ink – from simple quills to advanced ballpoint pens. Other example is the Internet which becomes faster.

Radical innovation is a process, which brings fundamental changes and principal novelty in the industry, technology or organization. The innovation materializes in creation of totally new product, e.g. steam engine, television, wireless internet etc.

Usually are radical innovation forms the base for gradual innovation like in the case of television which gave way to innovations in technological development in other fields, such as marketing.

Gradual innovation can be compared to evolution, which happens step by step, but radical innovation can be considered as a great leap, which results in a new product and it is possible that it makes the previous product obsolete.

Technological and Non-technological Innovation

All innovations can be divided as either technological or non-technological innovations.

Technological innovation is a process, in which new or improved technologies are developed and used in manufacturing and the implementation of new products or processes. These kinds of innovations are usually product and process innovations. They are characterized by the need of greater financial investments (in permanent assets and purchasing of non-material assets) and that it is easier for competitors

to mimic or copy them (Scmidt et al, 2007). Examples are the implementation of internet banks or interactive television.

Non-technological innovation is a novel organizational or marketing method, which increases the value of clients in the company (Scmidt et al, 2007). The main kinds of non-technological innovation are a marketing, strategic, ecologic, brand, business model, a supply chain, financial and other innovations. These innovations require less financial investments and they are harder to be copied by competitors (Scmidt et al, 2007). Examples are lean management, creation of training and motivation systems for employees, economizing recourses etc.

Researches indicate a positive effect of the combination of both technological and non-technological innovations for company operations and the ability to implement novelties in the market (Mothe et al., 2010). If a new product is created (a technological innovation), its success can be vastly improved by non-technological innovations.

Task No 5. Classify the products in presentation by the first 3 classifications (10 min)

2.2. Innovation Process

There are many views of how to define the innovation process, but one of the well-known conceptions is a theory of author A.T. Kearny - that innovation process consists of three parts- idea management, development processes and launch/continuous improvements (IMP³prove, 2014), see figure 2.2.

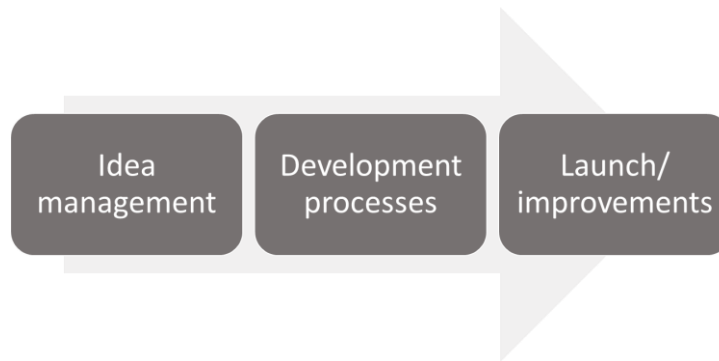


Figure no. 2.2. Innovation process

Source: developed on the basis of IMP³prove (2014)

The first part of innovation process is **idea management**. It consists of two parts- idea generation and idea development. Usually the first part is used to find a solution to a defined problem. Ideas could be created by a closed group, or the process of creation could involve many parties, such as customers, partners, suppliers, etc. Ideas could be created after a competitor or partner analysis. This process involves also idea management - idea evaluation and project/business plan development.

The second part of the innovation process is **development processes**, which includes research, development and deployment. The second phase may include a variety of activities:

- Research and scientific basis.
- Invention and intellectual protection.
- Prototype, pilot development, testing and improvement.
- Implementation planning.
- The required purchase of technology or the improvement.
- The launch.

The third phase is the **launch/continuous improvements**. At this stage the most important activities are innovation marketing, controlling, monitoring. Innovation process in organization can be managed by a particular manager (the enterprise, innovation or project manager), which carries out the process of innovation management in collaboration with stakeholders. But it is possible that each stage of the innovation process has its own responsible person.

2.3. Innovation management

Innovation management’s goal is to successfully implement the innovation. On the base of it there is an innovation process, but the innovation management is a complex system, which includes other components essential for innovation management. “A.T. Kearney House of Innovation” reflects a complex nature of innovation management, see figure 2.3.

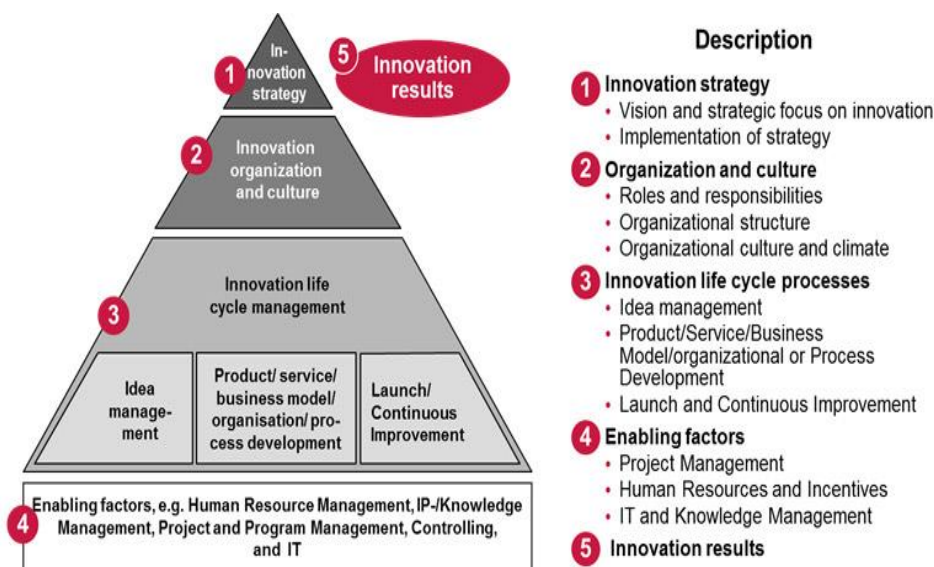


Figure no. 2.3. “A.T. Kearney House of Innovation”

Source: A.T. Kearney (2013)

“A.T. Kearney House of Innovation” concept covers all innovation management elements- from innovation strategy, innovation organization and culture to the

innovation process (innovation life cycle management) and the enabling factors of innovation management (human resource management, IP-/knowledge management, project and program management, controlling, IT management), innovation results.

III – AFTERPARTY

Afterparty: additional creative thinking method, idea evaluation and development method exploration.

SOURCES FOR EXPLORATION

- www.creatingminds.org
- www.mindtools.com
- www.edwdebono.com
- [www.thinkingschool.co.uk/resources/thinkers-toolbox /](http://www.thinkingschool.co.uk/resources/thinkers-toolbox/)
- www.mindwerx.com
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Additional sources:

www.creatingminds.org

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www.edwdebono.com

[www.thinkingschool.co.uk/resources/thinkers-toolbox /](http://www.thinkingschool.co.uk/resources/thinkers-toolbox/)

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