Training Fiche

Title	**Cognitive Flexibility**	
Keywords	Cognitive flexibility, mental switching, cognitive switching,	
Provided by	SSE Riga	
Language	English	
Objectives	In this module, you will learn the concept of cognitive flexibility, understand its' role and importance in work and everyday situations. The module also presents ways to assess the level of cognitive flexibility in adults and offers specific and non-specific tools to improve it.	
Learning outcomes	• Identify cognitive flexibility. • Recognize the role and importance of cognitive flexibility as a future skill. • Recognize and use instruments to assess cognitive flexibility. • Know and apply techniques to enhance cognitive flexibility.	
Training Area	Complex problem solving	
	Critical thinking	
	Creativity	
	People management	
	Coordinating with others	
	Emotional intelligence	
	Judgement and decision-making	
	Service orientation	
	Negotiation	
	Cognitive flexibility	
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Content development

Unit 1: What is cognitive flexibility?

According to the World Economic Forum, Cognitive Flexibility (CF) is among the top ten skills that will be needed in the workplace of the future are the 'soft' skills, the innate human skills that simply cannot, at this point, be replaced by artificial intelligence or technology in general.

Understanding and ability to recognise, what is cognitive flexibility, and what it is not for that matter, is the key to being able to develop this crucial skill, hence the largest part of the module is devoted to defining, characterising and discussion of the concept.

Cognitive flexibility is defined as the ability to transition our thoughts between multiple concepts or perspectives. Or, as defined by Canas (2003): "Cognitive flexibility is the human ability to adapt the cognitive processing strategies to face new and unexpected conditions in the environment".

CF as a concept consists of two parts:

(1) Cognitive, referring to such brain functions as solving problems, thinking citically, connecting ideas and synthesizing information; and
(2) Flexibility, a quality associated with bending, twisting, thinking about things differently and changing approaches when needed.

Hence, the concept, in popular language, can be thought of as "flexible brain" or "brain that twists easily".

There are a number of alternative definitions:

- The brain's ability to transition from thinking about one concept to another. The quicker you are able to switch or "shift" your thinking from one dimension to another, the greater your level of cognitive flexibility
- Ability to think flexibly and to shift perspectives and approaches easily
- Intrinsic property of a cognitive system often associated with the mental ability to adjust its activity and content, switch between different task rules and corresponding behavioural responses, maintain multiple concepts simultaneously and shift internal attention between them (William, 1962)
- For a number of definitions used in academic, see Ionescu (2012)

Cognitive Flexibility in literature as also known by alternative or related terminology as "attention switching," "cognitive shifting," "mental flexibility, "set shifting," and "task switching".

A good way to illustrate the concept is using analogies. CF can be

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seen as changing channels on a TV where the brain is the TV, and channels are the streams of thought. In that way, if you are stuck with one channel and not able or willing to change it, the cognition is inflexible, whereas if you operate the remote control with ease and change between different channels rapidly, you have good cognitive flexibility.

CF can also be presented using optical illusion ambiguous pictures such as rabbit-duck illusion, faces-wase illusion, young lady – old lady illusion, as well as Schroder's Stairs, for example in the famous lithograph "Relativity" by Escher (1953), and numerous other pictures. What to watch out for is – how easily one switches perspectives, or how difficult it is to see the other way. The easier you change the perspective, the better cognitive flexibility you have.

While CF refers to the ability to adapt to a change, mental shifting is the process that makes it possible to adapt to the change. Shifting is the main component in cognitive flexibility (often referred to as the same concept). Characteristics of someone with strong mental shifting:

- Adapts quickly to changes and new situations
- Tolerates changes that occur during problem solving or carrying out a task easily
- Offers alternative solutions to problems
- Easily transition from one activity to another and know how to carry themselves properly in every situation
- Captures various dimensions of reality, sees from different points of view, recognizes hidden relationships, hence easily finds alternative solutions to the same problem
- Tolerates errors and changes, able to think about a situation from another person's point of view
- Finds compromises easily

During the module, audience can be presented with a few examples from real life situations, such as:

- You're getting ready to have breakfast and you realize that there's no bread left. What do you do? (How many other options one can think of)
- A good friend stops talking to you. Why is this? (Different situations that may have evolved)
- The usual road to work is closed. What do you do? (What alternative ways there are?)

Participants in the module can be invited to think of their own examples where they have shown good or lack of cognitive flexibility.

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Cognitive rigidity is the opposite of cognitive flexibility, or lack of it. It is inability to change behaviour or beliefs when they are ineffective in order to reach your objective. While in employment and life in general good cognitive flexibility is needed, there reasons for rigidity - the human brain likes stability and tries to avoid instability however it can. It can be discussed with participants if and when are the situations when some cognitive rigidity may be needed and when too much of flexibility is obstructing. For example, the need to act fast and decisive? Can it be cumbersome for an executive because it can be seen as inconclusive and weak?

A step back and recap of the CF in academic literature. As seen by the figure from Web of Science, the concept of Cognitive Flexibility has earned popularity in last decade. The origins of CF date back to 1988 when psychology scholars Spiro, Couldon and Feltovich formulated “Cognitive Flexibility Theory”. The three authors remain the most cited authors in the field. In the following years CF has been widely researched and published (as seen by the WoS data), and have established associations with greater resilience (Genet and Simer, 2011), better quality of life (Davis et al, 2010), creativity (many authors, including Lawrence et al, 2008), better performing executives (recent study by Becker and Klaner, 2021), avoidance of confirmation biases (Zmigrod et al, 2016), stress resilience, uncertainty, new challenges and a number of other life quality, performance and productivity markers. In 2022 there is a forthcoming special Issue "Cognitive Flexibility: Concepts, Issues and Assessment” in the Journal of Intelligence. Hence CF is a topical issue in current research.

Unit 2: Assessing the level of cognitive flexibility

While CF can intuitively be understood and realised if one possessed it or not there are also a number of instruments that are used to measure the (level of) cognitive flexibility. There are two groups of measures: (1) experimental methods, and (2) non-experimental.

(1) Experimental tests are typically age-specific due to the fact that they are either too simplistic or advanced for other age groups.

The degrees of cognitive flexibility are varying, not 1 or 0. For example, different people may be considered cognitively flexible – able to shift their thinking to adapt to new stimuli, but one may be able to accomplish this at a faster rate, so for him/her the CF is relatively higher.

Examples of experimental tasks to measure cognitive flexibility:

- A-Not-B Task (infants)

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- Dimensional Change Card Sorting (DCCS) Task (toddlers)
- Multiple Classification Card Sorting Task (children age 7-11)
- Wisconsin Card Sorting Test (WCST) (children age 9-11)
- Stroop Test (Colour-word Naming Test) (children over age 11 and adults)
- For more, see: Ionescu (2012).

Stroop test is probably the most common way to measure cognitive flexibility. More precisely, it measures the Stroop effect: (in psychology) the delay in reaction time between automatic and controlled processing of information, in which the names of words interfere with the ability to name the colour of ink used to print the words.

In the Stroop test, individual is presented with 3 different types of cards: a colour card, a word card, and a combo "colour-word" card. Their goal is to identify the colours on the colour card, the words on the word card, and then solely the colours on the "colour-word" card. By way how accurately the respondent answers and distinguishes between colour of the word and meaning of the word, the CF is measured.

Provided time, participants of the course may be invited to try online test here or here.

(2) Regarding Non-Experimental tests rely on survey questionnaires that allow to estimate the level of CF relative to other tests participants. The two most common instruments are:

- The Cognitive Control and Flexibility Questionnaire (Gabrys et al., 2018). It is based on self-assessment of statements, such as "I get easily distracted by upsetting thoughts or feelings", "I weigh out my options before choosing how to take action", "It's hard for me to shift my attention away from negative thoughts or feelings" etc. from which the CF is then revealed.
- The Cognitive Flexibility Scale (CFS) (Chan et al., 2008) is an alternative test instrument based on self-assessment of statements, such as "I avoid new and unusual situations", "I have difficulty using my knowledge on a given topic in real life situations" etc. (alternative to previous).

The participants of the module may be given opportunity to run the test online.

A note on age in relation to cognitive flexibility: adults ages 25 and up are thought to display the greatest degree of cognitive flexibility. The human brain is fully developed by the mid-20s, but up until the mid-20s, humans haven't reached their full

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cognitive capacity. Young children display a significant degree of cognitive inflexibility due to lack of cortical development. However, following the peak brain development in the mid-20s, CF tends to deteriorate, but it is thought that CF can be maintained and/or enhanced for a prolonged period with active measures and training. The elderly (65+) tend to have significantly reduced cognitive flexibility compared to younger adults. There is a transition between mid-life adulthood and elderly adulthood in which the cognition declines and neurodegeneration sets in.

Unit 3: 3 Enhancing and training

In this unit we shall review common ways to enhance and improve cognitive flexibility with focus on adults. The two directions to look for means of improving it are (1) targeted measures and (2) non-specific activities, that are found to improve CF among other benefits.

(1) Regarding the targeted tools, we can point out three, third of which is, arguably, the most common and important:

1. Cognitive behavioural therapy (CBT): Evidence-based psychological therapy which helps people change their patterns of thoughts and behaviour. In CBT, the goal is to reconstruct individual's thinking to consider more flexible options
2. Structure learning: The ability to extract information about the structure of a complex environment and decipher initially incomprehensible streams of sensory information. This type of learning involves similar frontal and striatal brain regions as cognitive flexibility
3. Training: Regularly, and purposefully, subjecting oneself to unusual new situations and different contexts trains the brain to be more flexible. Cognitive flexibility requires practice in the small moments of everyday life.

(2) Whereas among non-specific ways to improve cognitive flexibility worth mentioning are:

1. Reading. It activates several regions of human brain, working together at the same time. It keeps brain stimulated, just like building a muscle at the gym. This improves brain function overall and therefore, cognitive flexibility as well
2. Meditation. Studies have shown that both attention and cognitive flexibility can be enhanced by the practice of mindfulness meditation. The more advanced a person is with their practice, the greater the cognitive flexibility appears to be

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	3. Physical exercise. The psychological benefits of exercise: boosted mood, energy, and cognitive enhancement. Regular aerobic exercise is associated with the growth of new brain cells and is an effective way to increase cognitive flexibility 4. Sleep. Rapid-eye movement sleep is associated with information processing across neural networks. REM-dreaming is associated with increased creativity and reasoning abilities. Sleep is good for the brain, and for enhancing cognitive flexibility 5. Diet. Fatty acids help improve neurotransmission, cognitive function and reduce brain inflammation. A diet full of healthy fats or specific omega-3 supplements, may increase cognitive flexibility by reducing inflammation 6. Games. Any type of game that keeps your brain challenged, whether online, board games or even word puzzles and ad libs, can help build neural pathways. Having these fortified mental reserves can help delay cognitive decline as we age. As evident, the non-specific measures suggested here have myriads of benefits for life quality improvement, but they also work towards boosting cognitive flexibility.
Glossary	**Cognitive flexibility:** Cognitive flexibility (CF) is the human ability to adapt the cognitive processing strategies to face new and unexpected conditions in the environment. Also referred to as “attention switching,” “cognitive shifting,” “mental flexibility, “set shifting,” and “task switching”. **Mental shifting:** is the process that makes it possible to adapt to the change. Shifting is the main component in cognitive flexibility. **Cognitive rigidity:** lack of cognitive flexibility, opposite of cognitive flexibility, also inability to change behaviour or beliefs when they are ineffective in order to reach your objective. **Stroop effect:** the delay in reaction time between automatic and controlled processing of information, in which the names of words interfere with the ability to name the colour of ink used to print the words.

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Self-evaluation (multiple choice queries and answers)	

1. Cognitive flexibility is:
   a) Being good in yoga asanas
   b) The ability to think of something in a different way
   c) The ability to do a lot of different things simultaneously

2. Cognitive flexibility:
   a) Helps the person to adjust to change
   b) Helps to be a better problem-solver
   c) Both (a) and (b) are correct

3. Anne and Peter both have failed exam in mathematics and have to re-take it. Anne studied from her notes first time, and now is going to consultations with teaching assistant. Peter studied from textbook first time, and now reading the textbook and supplementary readings more thoroughly. Who has higher cognitive flexibility?
   a) Anne
   b) Peter
   c) None, because they both failed math exam

4. Is it possible to improve cognitive flexibility in adulthood?
   a) Yes
   b) No
   c) Only with professional training

5. What is Stroop test?
   a) A visual experiment to test for colour blindness
   b) Means to test delay in reaction time between automatic and controlled processing of information
   c) Behaviour test of bees under external stress factor

6. If someone offers alternative solutions to problems, it can be said that s-he:
   a) Indecisive
   b) Has strong mental shifting
   c) Good leader

7. What is cognitive rigidity?
   a) Inability to change behaviour or beliefs when they are ineffective
   b) An attribute of strong character
   c) A much desired property of a leader

8. Is it possible to measure cognitive flexibility?
   a) Not possible
   b) Only with experimental methods

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	c) With specially designed tests 9. Which of the following activities can improve cognitive flexibility: a) Reading, meditation, sleep b) Games and physical exercises c) All of the above 10. Cognitive flexibility and age: a) Are unrelated b) Peaks at age around 25 years c) The older the person, the higher the cognitive flexibility Answers: 1b, 2c, 3a, 4a, 5b, 6b, 7a, 8c, 9c, 10b
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	improve it? Available at https://www.weforum.org/agenda/2021/06/cognitive-flexibility-thinking-iq-intelligence/
Resources (videos, reference link)	**PPT Cognitive flexibility** **Best Practices: 1, 2** **Case study for Cognitive flexibility no. 1, 2, 3**

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