

UNIVERSITY OF LJUBLJANA  
SCHOOL OF ECONOMICS AND BUSINESS

MASTER'S THESIS

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**APPLICATION OF NEUROSCIENCE IN HUMAN RESOURCES  
MANAGEMENT: EVIDENCE FROM COMPANIES OPERATING  
IN THE WESTERN BALKANS**

Ljubljana, September 2023

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## **LIST OF ABBREVIATIONS:**

**EEG-** Electroencephalography

**EMG-** Electromyography

**fMRI-** Functional Magnetic Resonance Imaging

**GSR-** Galvanic skin response

**HR-** Human resources

**HRM-** Human Resources Management

## INTRODUCTION

Seemingly simple question like "how does our brain function?" led to the rise of the scientific field of neuroscience, which has a wide range of applications. Neuroscience defined as "the collected multidisciplinary sciences that analyse the nervous system to understand biological basis of behaviour" (Squire et al., 2002) has been one of the fastest developing areas. Today, we can witness neuroscience being used in previously unimaginable contexts. Advances in the study of the human brain and its activities over the last decade have resulted in a better understanding of cognitive behaviours that are key to education: emotion, learning, memory and intellect. It is highlighted that people in the education industry could see benefits from cognitive science (Geake & Cooper, 2003). In addition, neuroscience has started to be applied in the world of economics, starting with business, marketing (Ahmad, 2010), finance (Mateu, Monzani, & Muñoz Navarro, 2018), and human resources management (hereinafter HRM). This Masters's thesis will focus on the latter, and will aim to go further into the subject, raising issues and making recommendations.

Neuroscience creates a number of opportunities for increasing the quality of HRM and further development of this area. HRM can be looked at as a discipline that studies how people could be better managed in order to achieve organizational goals (Armstrong & Taylor, 2014). Having that in mind, knowledge about how the human brain works can be of high importance and can even pose as a disruptor that can change how managers think about human resources. In addition, "operative use of habits, attention and emotion in Human Resources Management can tested by combining neuroscientific insight and studies that are focused on Human Resources" (Tewari & Mahapatra, 2018).

Neuroeconomics is a relatively new discipline that emerged as a synthesis of economics and neuroscience. When two related areas could not provide sufficient answers to the same questions regarding human behavior, it was only reasonable for them to integrate. Failures to solve decision-making concerns led to the formation of a new field, which was named "neuroeconomics," aimed to better understand human abilities (Polister, 2008), which is poised to have a thorough impact on various facets of business management.

One definition is given by Aldo Rustichini. He states that neuroeconomics is an interdisciplinary field that crosses boundaries between neuroscience, psychology and economics (Rustichini, 2009), while Glimcher addressed this field as a "synthetic discipline" (Glimcher, 2008). In other words, it is evident that authors view this field as an interdisciplinary subject that is based on the logic as well as the laws of the neuroscience, psychology and economics.

The future of HRM is open-ended. The field is already strongly influenced by external forces such as the emergence of new technologies, the advancement of knowledge across various fields and disciplines in the human and economic sciences, changes in the nature of work, as well as the further advent of globalization. These developments altogether serve as a signal for HRM to evolve and to adapt existing practices (Rotich, 2015).

Organizations can now use tools such as EEG (electro-encephalography), and neuro-cardiac monitors to track behaviour and decision-making process from a neuro-psychological point of view. In addition, brain-based protocols can be used to gain more information on sleep patterns, heart rate, and other data connected with factors that affect well-being at work (Wall, Cooper, & Brough, 2021). All of these tools, such as brain scanning technology and know-how from neuroscience, can give much more precise information to HRM to ensure a better working environment and improve the motivation of workers.

Even though the main focus of the thesis is on the Western Balkan region (Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia) for the purposes of research, countries of the Southeast Europe, Slovenia and Croatia, are added as it has been estimated that these countries would add value to the research itself. The reason for this approach was not to only provide basis for the comparison, but also use the experience as well as knowledge of these countries when it comes to the application of neuroscience in field besides medicine, especially in the field of HRM. Since the region of the Western Balkan is undergoing deepening integration in the EU and a global economy this approach is even further justified. With an increasing presence of international companies, the Balkans is also a region where HRM innovations take place. The Western Balkans is however also a region that is understudied including the application of new technologies, and in particular neuroscientific technologies in HRM. Thus, this thesis aims to contribute to filling in this research gap, while also formulate actionable recommendations that can benefit companies operating in the Balkans. In order to provide a whole picture on this topic, a comparison will be done with two countries from the European Union. Because of the close proximity to Western Balkan countries as well as historical ties, similar mentality and language, Croatia and Slovenia were chosen to be included in the sample.

The purpose of my Masters's Thesis is to understand what are the determinants of Western Balkan companies' decisions to adopt or not to adopt neuroscientific innovations in the field of HRM. I compare insights from the Western Balkans to insights from Slovenia and Croatia.

In addition to its analytical insights, the thesis will also provide recommendations on how Western Balkan companies can utilize knowledge and tools stemming from neuroscience.

The research goals of the thesis are:

- To overview and critically analyse the arising opportunities and challenges of using neuroscience in the field of HRM
- To determine the level of awareness that companies in the Western Balkans have on using neuroscience in human resources
- To identify the factors affecting the decision of companies to adopt or not to adopt neuroscientific innovations in the field of HRM
- To determine if there are differences between Western Balkan companies and two EU countries, Slovenia and Croatia when it comes to applying neuroscience in HRM

In order to fulfil the above-mentioned goals, the thesis will be asking the following research questions:

1. RQ1: How can companies leverage advances in neuroscience in order to improve human resources management?
  - What are the opportunities of using neuroscientific tools in HRM?
  - What are the challenges/ limitations?
  - What are the best practices of using neuroscientific tools in HRM?
2. RQ2: What is the level of awareness that companies in Western Balkans as well as Slovenia and Croatia have regarding using neuroscience in human resources?
  - How familiar are companies operating in the Western Balkan and Slovenia and Croatia with neuroscientific innovations in HRM?
  - How enthusiastic are they towards the application of neuroscience in HRM?
  - Can Western Balkan companies learn from Slovenia and Croatia when it comes to application of neuroscience in HRM?
  - How can companies in the Western Balkans gain more knowledge and improve the application of neuroscience in their business?
3. RQ3: What are the determinants of the Western Balkan companies' decisions to adopt or not to adopt neuroscientific approach towards HumanResources Management?
  - What role do the financial costs of new technologies and knowledge gaps play when deciding to adopt or not to adopt neuroscientific tools?
  - What is the starting point for a company to start using this innovation?
  - How do companies' characteristics, i.e. size, age, and characteristics of the industry in which they operate affect their decision to adopt or not to adopt neuroscientific tools in HRM?

The thesis is based on three types of research. First, I conducted qualitative analysis of secondary data such as official statistical data, popular data (news, websites, magazines), and scientific data (journals, articles, books, reports), as well as reports by companies, consultancies and think tanks on neuroeconomics and neuroscientific innovations in HRM. This informed the thesis' theoretical part, and helped understand what are the opportunities and limitations of new technologies. Insights from the secondary data were used to formulate questions for surveys as well as in-depth interviews. Second, I collected primary data via surveys with local/regional and international companies with presence in the Balkans. The surveys were distributed to companies in the Western Balkans. The surveys were focused on gathering data on two dimensions: level of knowledge and level of enthusiasm of companies regarding usage of neuroscientific innovations in HRM. Lastly, I complemented this data

with in-depth interviews with 3 experts from different fields, one from the HRM field, one from the field of neurology, and one from the field of neurocoaching.

The thesis starts with establishing theoretical foundations, starting with the definition of neuroscience and its techniques and methods. This section will go over the types of study that have been conducted in this field, provide some basic information about human brain and how it functions as well as give detailed description of neuroscientific tools and how they work. The section that follows will be concentrated on neuroeconomics, a field in development, and will seek to thoroughly go through the studies done in this area. This section will explain the history and provide definitions of this new study. There will also be word about what is new in this area and what kind of research has been done so far. Last thing to be covered in this neuro area section are the positive as well as negative sides of using neuroscientific tools in other fields. Following that, the attention will be on HRM, the core of this thesis. There will be words of its past and development, and explanation of the definitions. In addition, there will be an emphasis on the techniques and instruments that HR standardly uses. The second part will go over the diffusion of neuroscientific instruments in HRM, being the main thing this thesis aims to go through. This part will give an explanation of how can neuroscientific tools be used in this field, what are the opportunities as well as the limitations of this approach.

The third section is methodology. This section focuses on providing a sample description, explaining the survey and interview questions, and discussing how the sampling and research process went. The most essential element of this section is the data analysis, which was performed using SPSS for the survey questionnaire, and traditional content analysis for in-depth interviews. The chapter that follows goes through the cases of Western Balkans as well as Slovenia and Croatia, providing brief explanation about the economical and employment situation in these countries and giving practical examples on companies that apply neuroscience in the filed of business, but focusing mostly on HRM.

The fifth chapter will present results of in-depth interviews, discussing in detail all three of them and providing expert point of view on the topic. This part is of extreme essence as it will provide answers to research questions that survey questionnaire alone was unable to address. Last part is consisted of discusion and limitations as well as final remarks and conclusion.

## **1 DEFINING CONCEPTS: HUMAN RESOURCES MANAGEMENT, NEUROSCIENCE AND NEUROECONOMICS**

This chapter engages with key terms when it comes to HRM, neuroscience and the functions of the brain as well as neuroeconomics. The first part will provide explanation on what the field of study HRM is, what tools this field uses and why it is of extreme value for the company itself. Followed by the introduction of the discipline of neuroscience, which will

cover the main functions of the brain and neuroscientific tools to provide basic understanding of this field in order to introduce its application in the field of HRM.

## **1.1. Human Resources Management**

### 1.1.1 History And Definition

Human resource management (HRM) is defined as the process of developing formal procedures in an organization to manage human potential in order to achieve organizational goals. Since the 1900s, when this subject was largely concerned with wages and personnel tracking, it has grown enormously (Mathis, Jackson, Valentine & Meglich, 2017). However, as business organizations and the context in which they operate evolved and became increasingly complex, so did the need to understand and better motivate employees, build good working environment and improve talent searching processes. HRM can be looked at as a part of management that plays an important role in each organisation, no matter its size or number of employees.

The beginning of this field's history may be found in the USA in 1901, where a distinct department was initially created to handle activities related to human resource management. The National Cash Register Co., Ford, and Bethlehem Steel were one of the first businesses to establish such a division. At the time, these divisions were referred to as the personnel departments, and its major objective was to resolve employee concerns and enhance employee relations. As shift wages increased to \$5.00, Ford's department in charge of managing these tasks began to expand as a result of a greater need for individuals skilled in handling the hiring process. Back then, division of work and salary were the main focus of these departments. The result of each of these processes was the so-called Human Relations Era (DeNisi, Wilson & Biteman, 2014).

According to theorists Haslinda (2009) and Torraco (2001), the origins of HRM may be traced back to England in the 1800s. Haslinda (2009) believes that the industrial revolution has caused human resource management to advance even farther. The author continues by stating that Frederick W. Taylor, a mechanical engineer who increased industrial efficiency, advised that managing people should include their welfare and not only focus on their job and productivity. Others argue that following the Second World War, the field of human resource management was founded with the intention of separating the managerial from the personnel management functions. Eventually, it was believed that there was little distinction between HRM and personnel management; nonetheless, terminology revisions caused PM to become HRM (Haslinda, 2009).

The field of HRM has changed tremendously during the past couple of decades, mainly under the influence of Industrial revolution which led to creation of new jobs and practices. New concept was created by Federic W. Taylor in 1903, the concept of Scientific Management, which will become HRM today. The period that followed was the era of behavioural sciences that shifted the focus of the organisations towards the social aspects of

human behaviour. With the development of technology, as well as economics and workforce, the changing of HRM began. That is how HRM progressed from being a scientific management idea to a strategic discipline. Further changes such as globalization, had put more pressure on the HR departments to evolve into functional units. Because of that, HRM has evolved into a strategic contributor to the Organizational Environment and has become critical component of organizations' purpose, vision, and strategy (Oswal & Narayanappa, 2015). Lastly, with further development of technology and constant employment of IT, HRM has shifted to e-HRM.

Importance of HRM can be seen in its focus on employees with the aim of improving their satisfaction. In return, good HRM leads to satisfied team that will be motivated to work harder. A continuous cycle is created when effective HRM practices lead to advancement in financial performance which in return can finance further development of the human resources management. HRM aims at creating a good working environment with satisfied employees who are driven to perform well. This all influences customer service that excels as employees tend to work better and better if they are satisfied. As a result, HRM influences and increases productivity leading to good financial performance (Stewart & Brown, 2008).

Changes that today's world is tackling with such as globalization and rising technological trends have also influenced the field of HRM. It should be highlighted that this field has come a long way, but it still needs to get more acknowledged as being an important part that influences the success and wellbeing of the employees. Although it has received positive feedback from senior leaders, still there are people within the organisations who are hesitant and do not see the benefits of an effective human resources management (Stone & Deadrick, 2015).

The main benefit of the field of HRM can be seen through its motivation of the employees and care for their wellbeing. It has been proven that if the companies' goals are aligned with the goals of the employees, they will be more likely to perform better which will in return influence positively on the success of the company itself. Therefore, Rich and colleagues highlight that companies should strive to use innovative strategies and solutions relating monitoring and assessing employees in order to provide better and effective motivation (Rich, Lepine, & Crawford, 2010).

Responsibilities of HRM managers are vast and include multiple activities and serve as partners to many other managers. Starting with providing valuable strategic advice and counsel as HRM managers have the most precise information on both internal employee information and external situation that therefore makes them the best resource for decision making. In addition, human resources managers provide multiple services regarding the whole employment process, from recruiting to testing and organising trainings. Lastly, their role also includes creating new policies as well as implementing them and advocating for employees (Snell & Morris, 2018).

Research over the past ten years has revealed breakthrough knowledge regarding the importance of HRM. Researchers have been emphasizing that when employees are properly motivated, they may become a unique source of competitive advantage (Huselid, 1995) that every company strives at.

### 1.1.2 Technological HRM tools and techniques

In order to efficiently handle their responsibilities, HRM uses tools, set of technical solutions that simplify and improve long procedures. Some of those tools are Oracle HCL cloud, Dayforce and ADP Workforce Now. The first tool is a cloud based application that provides solution to money planning and human capital resources. Main benefits are improving employee performance and reducing the time for hiring new employees (Dey, 2023). ADP Workforce NOW is a cloud-based platform that improves efficiency of the employees, helps manage attendance as well as time and improves talent management (Sonary, n.d.). Dayforce provides all the information needed about the employees in one place as well as provides advanced analytics improving proactiveness and decision making (“HR,” n.d.). In addition to these softwares, there are also others available on the market such as GroveHR that can automate the onboarding process as well as organise the human resources processes all in one place. Moreover, internal database, Performly, provides internal interaction between employees which in return improves performance as well as collaboration (Startup Stash, 2023).

HRM activities and HRM practice are key areas of the HRM function. These two areas must work in a coordinated way to ensure best results. The year 2023 brought new revolutionary practices such as innovative 360 feedback, which is a system of giving anonymous feedback to the employees that in return provides valuable insight to the human resources department (Gupta, 2023).

HR managers need to properly understand available tools and techniques in order to ensure smooth operating of the business. Number one activity that helps with helps the management department is planning. HR needs to incorporate mission, vision and values into recruiting as well as retention practices. For this part to be successful. Extensive plan must be set in place. There are multiple tools to help with this part, such as the SWOT Analysis, Conducting Online surveys and Scatter plots. Another tool that has proven useful is Trend Analysis that emphasizes present trends based on past data (Pribanic & Pribanic, 2023).

Another innovative tool that has been recognized by the literature as useful for the field of human resources is Data Mining technique used mostly for talent management. This approach functions by creating prediction rules on how to recognize talent for the appropriate role (Tripathi & Gaur, 2019). In addition, blockchain technology can also be applied in HRM with the goal of eliminating the problems that biases bring in the recruitment process as well as decreasing the risk of employing wrong candidates (Mallick, Sengupta, Ingawale, & Aljapurkar, 2022).

Moreover, behavioural approaches are used by many companies in order to assess employee performance. However, some companies still use traditional methods that are consisted of annual meetings in order to allocate bonuses. Modern HR management is consisted of the growth of the potential of individual employee as well as evaluation of his results. These procedures can be further improved and modernised by adopting new practices (Garden, 2021).

## 1.2 Neuroscience

Neuroscience is the study of the brain focusing on all the scientific, evolutionary, computational and medical aspects of the nervous system. The goal of the neuroscientist is to observe all of the elements of the nervous system in order to offer answers to questions such as how does it function, what is its structure, and how it may be altered (Mandal, 2019).

When studying neuroscience and its impacts, the concept of behavioural neuroscience should not be overlooked. The term was born from the explosion of neuroscience, and it represents the study of neural bases of behaviour as well as mental processes. This field provided the understanding of the term neuroplasticity- the nervous system's capacity to change in reaction to its surroundings or experiences (Breedlove & Watson, 2017). The insight provided from this study is not only valuable to doctors and medical professionals, but also for marketers, business owners, managers, HR professionals. The latter will be of the main focus in this Masters's thesis.

It has become evident that there are waves of knowledge being exchanged between economics and neuroscience and that there is a lot that these disciplines can learn from each other. Kenning and Plassmann state that there are vast differences between concepts homo oeconomicus and homo neurobiologicus. Homo oeconomicus is rational man in economical theory aiming to pursue his best interest whereas the latter idea claims that neurobiology is what causes the behavioural and economic characteristics of homo neurobiologicus (Kenning & Plassmann, 2005).

Kenning and Plassmann (2005) gave an explanation that the concept of homo oeconomicus comes with certain drawbacks because it has been proven that people's decisions are guided and influenced by emotions, so the concept of bounded rationality<sup>1</sup> does not show the whole picture. The year 1970 bring new wave of opportunities as economical models were at the time being expanded using knowledge from multiple fields. That is how behavioural economics started as a new study. The authors state that the following problem rose- the understanding that certain concepts such as unemployment has not been observed in an objective way. The solution to this was using tools that can provide such approach. Neuroscience is the answer to this, and that is why researchers started began to use

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<sup>1</sup> "The term bounded rationality' is used to designate rational choice that takes into account the cognitive limitations of the decision-maker — limitations of both knowledge and computational capacity" (Simon, 1990)

techniques that this study provides in order to study brain processes that underpin behaviour (Kenning & Plassmann, 2005).

According to Camerer, Loewenstein, and Prelec (2004) the fastest advance in neuroeconomics will be made in the study of risky decision-making, with an emphasis on three major topics: risk judgements, risky choice, and probability (Camerer, Loewenstein, & Prelec, 2004).

Nevertheless, some foundations for neuro-HRM research exist. Hawes (2013) builds upon psychology of personality, attempting to link psychology and economics and show the connection between the different bodies of knowledge that HRM uses. Kostos (2020) provides an insight in how neuroscience can inform Human Resource Development and how that path remains to be established and upgraded. Butler et al. (2015) discuss the potential applications of organizational cognitive neuroscience, noting the numerous possibilities it creates for companies, shedding light on challenges and give a roadmap for rigorous and meaningful future study in the field, while also listing neuroscientific methods and how they are applied.

As research has been improving, new fields have been working together such as neuroscience and psychology and the results show even more precise information about human behaviour. EEG, fMRI, positron emission tomography (PET), machines from neuroscience, offer valuable insight into human brains that can be analysed by advanced computer analysis presenting that there is a connection between the body and the brain. This research is of high value for managers and leaders as they now see that employees' behaviour at the work place might be totally different that they had previously thought. In addition, it is now understandable why some initiatives for organizational changes fail (Rock & Schwartz, 2006). This all shows why application of neuroscientific insight, knowledge as well as tools is useful in human resources specifically.

As the popularity for this field grows, as always, there are enthusiasts and sceptics. Researchers states that it is unclear how successful the neuroeconomic strategy will be. There are strong supporters of this discipline who argue that it will provide numerous possibilities; however, there are those who argue that there is little connection between economics and neuroscience and that this link cannot provide much. The authors fall somewhere in the first group, explaining that the advantages of expanding interaction between neurobiology, psychology, and economics are already clear. This is demonstrated by the fact that each field has something to contribute to because they are all concentrated on the same thing- human decision-making process (Sanfey et al., 2006).

According to Zeki, Goodenough and Zak (2004), neuroeconomics is an emerging field that uses neuroscientific tools and knowledge with an aim to provide better understanding to how decisions are made. He stated that there are important lessons that neuroscience can teach economics. Starting with the usage of multiple measurement. In addition, neuroscience sends

the message that the focus should switch from trying to find correlation to finding causation. The paper also puts an emphasis that neuroeconomics provides a framework, a unified one for measuring neurophysiological activity during the decision-making process (Zeki, Goodenough, & Zak, 2004).

Faruk Gul and Wolfgang Pesendorfer (2008) state that neuroeconomics takes a different strategy than economics, which looks at humans as reasoning beings; instead, it employs psychological insights to develop and evaluate economic models and assumptions. Neuroeconomics has two goals: the first is to explicitly refer to neuroscience data in order to deny conventional economic models, and the second is to challenge economic theory and ideas (Gul & Pesendorfer, 2008). This goes to show the difference between traditional economics and explains what neuroeconomists actually do, which will be discussed further in the thesis.

Study done by Glimcher and Rustichini (2004) explains that the neuroeconomical approach is being born from the understanding that just one science can't provide the whole picture. The authors argue that there should be a link between neurobiology, economics and psychology in order for decision-making process to be explained. They further put an emphasis on the future, explaining that there will be a unification of these studies with an aim to provide a general theory of human behaviour (Glimcher & Rustichini, 2004).

The history of studying the brain starts with the ancient Greeks who strived to understand the role of the brain, how it functions, as well as to explain neurological illnesses (Brazier, 2018). There were many minor but significant advances in creating the study of the brain, all of which contributed to a rapid expansion of the field in the twentieth century. Roman physician Gallen (170 B.C.) explained that the person's bodily functions are controlled by the brain. In 1543 first textbook that tackles the field of neuroscience titled "On the Workings of the Human Body," was published by Andreas Vesalius (Hunter, 2017). Broca's area, concept introduced by a French surgeon and anatomist Pierre Paul Broca, was the first brain region to be connected to a specific function, in this case, language function. Its finding might be understood as the beginning of the scientific theory of cortical function localization (Amunts & Zilles, 2012). That is why the part of the brain that is in charge of speech bears the name Brocas). The EEG (electroencephalography) was invented in 1929 while the first Positron Emission Tomography (PET) scanner was invented in 1974. The year 1992 presents the boom of neuroscience when MRI (magnetic resonance) was first used to map activity in the human brain (Hunter, 2017). Since then, the field has been blooming, offering insight to not only how some illnesses should be treated but also to other fields of science, which will be discussed later in the thesis. Researchers in consumer neuroscience have addressed a wide range of subjects with growing methodological complexity. Multiple sectors benefited from the use of neuroscience, including add testing, the resolution of certain key marketing difficulties, and the testing of whether brands have an influence on the consumer experience (Smidts et al., 2014). Furthermore, neuroscience may be used in the field of law. Its role may

be understood as assisting the legal system in developing methods for providing optimal incentives for human and business behaviour (Zeki, Goodenough, & O'Hara, 2004).

### **1.3 The human brain and nervous system**

Although it is recognized how important the brain is, a large part of it remains to yet be discovered. Nervous system is the center of control and communication of every organ and muscle. It is consisted of central and peripheral nervous systems. Brain and spinal cord form the central nervous system, while the peripheral system includes all the nerves<sup>2</sup> and neurons outside the brain and spinal cord. The nervous system is built out of neurons or nerve cells that represent the basic unit of the nervous system composed of a cell body, axons (transmitting extension) and dendrites (receptive extensions) (Breedlove & Watson, 2017).

The main question here is; how is the information being processed? Neurons are trained to communicate with other neurons and have the structure to do so. They send messages using an action potential (electrical signal). Communication between neurons happens using synaptic transmitters (Dubin, 2002).

Each brain hemisphere (part of the cerebrum) comprises four lobes: frontal, parietal, temporal, and occipital. It is possible to identify general categories of processing that are specifically associated with specific cortical lobes. For example, frontal lobe is important for high-level cognition, movement, while temporal lobe is associated with hearing and sense of smell. Parietal lobe processes sensory information from the body, and occipital lobe is in charge of processing information from the eyes (Breedlove & Watson, 2017). Understanding how the human brain works and which lobe or region of the brain is responsible for particular function is crucial to knowing which neuroscientific tools should be used.

Neuroplasticity could serve as an illustrative example clarifying the potential for HRM to benefit from insight from the field of neuroscience. Neuroplasticity refers to the capacity of the nervous system to adapt and reorganize its structure and function in response to stimuli (Cramer et al., 2011). Within any organisation, it is important for employees to demonstrate adaptability by embracing changes, such as adopting new technologies and alternative approaches to their job. Neuroplasticity facilitates specifically that; the development of emotional intelligence, overcoming bias and enhanced learning abilities (ISG, 2023).

#### **1.3.1 Neuroscientific Tools and Techniques**

As previously discussed, neuroscience has been providing different areas of study some valuable insight that can be used in many types of research. The application of neuroimaging tools has provided an opportunity to better understand how human make decisions.

Numerous methods for neuroscientific research are now accessible, including positron emission tomography (PET), magnetic resonance imaging (MRI), near-infrared

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<sup>2</sup> Collection of axons bundled together (Breedlove & Watson, 2017).

spectroscopy (NIRS), and electroencephalography (EEG). These methods fall into two categories: structural imaging, which focuses on the brain's structure, and functional imaging measurements, which concentrate on the brain's actual functioning. As traditional methods such as observation could not provide information on the subconscious, neuroscientific tools and psychological measures can be combined to provide more precise information about the human behaviour (Hu & Shepley, 2022) These tools also allow other professionals outside of the field of medicine to use these tools in their research giving insight that would not be possible without these types of instruments. In the following section, tools that are most frequently used in the area of business will be discussed. Table 1 below summarised those tools, provides brief explanation of their use, as well as shortly describes their advantages and disadvantages.

*Table 1: Neuroscientific tool*

<b>NEUROSCIENTIFIC TOOL</b>	<b>DESCRIPTION</b>	<b>ADVANTAGES</b>	<b>DISADVANTAGES</b>	<b>POTENTIAL USE IN HRM</b>
fMRI	Identifies changes in the blood flow and oxygen levels caused by mental activity	Safe and non-invasive, high spatial resolution	Expensive, difficult to interpret	Can provide insight on neural basis of human reward processing mechanism
EEG	Represents a recording of brain activity	Speed	Lower spatial resolution, for some population can lead to seizures,	Quantify human cognitive performance
Eye-tracker	Measures eye positions as well as eye movement	Provides valuable insight on where the human gaze goes	It does not provide answers to specific questions relating human gaze	Gaining insight on level of engagement, judgment, decision making
GSR	detects changes in the human sympathetic nervous system	Useful for field experiments	variation in responses due to slow responders, possible false reading due to sweating	Testing employee feedback, providing insight on the emotional state of the employees

*Source: Own work.*

### *1.3.1.1 Functional Magnetic Resonance (fMRI)*

The MRI is a non-invasive imaging technique that is used to map the internal structure and some aspects of function within the body (Katti et al., 2011). fMRI is also a non-invasive neuroscientific method that is now broadly used to search for alterations in the brain activity

that is correspondent with particular cognitive process (Heeger & Ress, 2002). This tool is also useful as it identifies which regions are active during as specific task. Advantages of using this tool are several such as; it is safe, non-invasive tool with high spatial resolution and reasonable temporal resolution (Breedlove & Watson, 2017).

How does functional MRI work? The blood-oxygen-level-dependent (BOLD) signal, which quantifies variations in blood oxygenation linked with neuronal activity, is used to quantify regional brain activity (Logothetis, Pauls, Augath, Trinath, & Oeltermann, 2001). By comparing regional BOLD values, fMRI maps brain activity associated to distinct cognitive functions during tasks. Because of this, neuroscientists are able gain insights into human behaviour and also allow medical professionals and researchers to detect malfunction in the organ responsible for illness (Elliott et al., 2020).

However, this is not a perfect tool and has multiple disadvantages. Firstly, it is an expensive tool and to make thing even complicated, it requests for a person to be completely still in the machine. In addition, it is extremely difficult to interpret an image and some researchers do not have a clear understanding how it actually works. Because of that, there is hope that in the future the fMRI will be made to better serve the needs of the researchers by focusing on individual neurons (Watson, 2023).

fMRI is a valuable tool for investigating the underlying brain mechanisms involved in human reward processing (Wang, Smith, & Delgado, 2016).

### *1.3.1.2 Electroencephalogram (EEG)*

“Electroencephalography is a medical imaging technique that reads scalp electrical activity generated by brain structures” (Teplan, n.d.) To put it another way, electroencephalogram (EEG) represents a recording of brain activity. EEG has excellent temporal resolution as it detects electrical activity in the brain. However, this tool also comes with a couple of drawbacks that ate related to sensitivity as well as spatial resolution (Mullinger & Bowtell, 2010).

It is important to note that EEG monitors the energy generated by your brain, but it does not measure your feelings or emotions. The question is; how does it work? Brain waves, are patterns formed from the small electrical signals produced by nerves in our brains. Small electrodes and cables are connected to your head during an EEG. The electrodes detect the mentioned brain waves, and the EEG machine enhances and captures them on graph paper or a computer screen in the form of a wave pattern (Mandybur, 2018).

What makes EEG great is the speed. This means that within fractions of a second, after a stimulation is given, complex patterns of neural activity can be documented. However, EEG provides less spatial resolution when compared with an MRI (Teplan, n.d.). Although EEG is considered to be an extremely safe procedure, it comes with certain risks. EEG can cause seizures, however rarely, and only in people that do suffer from seizure disorders.

Furthermore, certain disorders or conditions may conflict with the reading of an EEG exam, such as; hypoglycemia (low blood sugar), oily hair or even hair on which hair spray was used, lights, body or eye movement (John Hopkins Medicine, 2021).

EEG has the potential to serve as a tool for the quantification of human cognitive function, as well as for offering insights into how workload effects said performance (Ismail & Karwowski, 2020).

#### *1.3.1.3 Eye-Tracker*

Eye tracking is a process used for measuring gaze points and movement of eyes. It can be applied to multiple areas such as gaining insight into human behaviour, as this tool helps identify human emotions. In addition, it is used for diagnostics for some neurological conditions as well as website usability. Eye tracker is also beneficial for stress analysis where level of stress of the employees can be measured successfully, particularly in IT, accounting, banking etc (Venugopal, Amudha, & Jyotsna, 2016).

How does this tool function? With specific characteristics such as pupil, the camera monitors the reflection of light sources. This information is utilized to calculate the rotation of the eyes as well as the direction of look. Eye trackers can also be used for detecting additional parameters such as blink frequency and pupil size changes (Venugopal, Amudha, & Jyotsna, 2016).

Advantage of this tool is that data obtained using eye-tracker can hardly be manipulated. Also, this tool provides the ability to collect precise data on what and how long respondents focused their attention on. Because of this, researchers can gain valuable insight into the respondent's interests (Velasquez, 2013).

One of the tool's drawbacks is a lack of understanding in this area. A lack of awareness of standard metrics for eye data quality complicates various elements of manufacturing and operating eye trackers, as well as investigating eye movements and vision (Holmqvist, Nyström, & Mulvey, 2012). In addition, another disadvantage is the inability to conduct research on a larger sample (Goldberg & Helfman, 2011; Vila & Gomez, 2016).

The utilization of eye tracking technology enables researchers to obtain valuable insights into several aspects of human behavior, such as judgment, decision-making processes, as well as levels of engagement and cognitive load (Tobii, n.d.).

#### *1.3.1.4 Galvanic Skin Response (GSR)*

The Galvanic Skin Response is a measure of the conductivity of human skin. Its primary goal is to detect changes in the human sympathetic nervous system (Shi et al., 2007). GSR is particularly useful for field experiments as it is easy to use and transfer. This is especially interesting for academics who want to measure mental arousal during in-store experiences.

The problem with this tool is the variation in responses- some people are slower than the other. In addition, excessive sweating of the hand can cause false readings (Neuralsense, 2019).

GSR, like other neuroscientific tools, has a wide range of applications. Firstly, it is used in behavioural therapy. It can also be used as a polygraph (Sharma, Kacker, & Sharma, 2016). It is used to detect emotion, stress and anxiety and because of that it can be used to measure stress levels (IHT, 2023). In addition, GSR can be used in marketing, add testing and UX design (Roche, 2021).

The potential use of Galvanic Skin Response in Human Resource Management lies in its utilization as a tool to get valuable insights into employees' emotional states. The galvanic skin response exhibits variability in response to emotional changes, enabling a comprehensive assessment of individuals' emotional states. This can facilitate the evaluation of employee feedback.

#### **1.4 Neuroeconomics- definition and history**

The subsequent portion of the thesis will address the conceptual framework and implications associated with the term "neuroeconomics." This discourse will touch upon the origins and development of this area, with a particular focus on the historical trajectory of this discipline. This section has significant importance as it addresses the diffusion of neuroscience and economics and their consequential contribution to the emergence of this important discipline.

The history of neuroeconomics, or at least a glimpse of it can be attributed to the paper written by Michael Platt and Paul Glimcher. Their paper's primary goal is to explain how a decision-theoretic model can provide an alternative approach to investigating the neural processes that occur between sense and action. The results of their study indicate that “a neurobiological framework for the study of choice based upon the same classical decision theory that has guided behavioural studies of the choices humans and animals make may provide a powerful paradigm for studying the sensory decision motor process” (Platt & Glimcher, 1999). This all led to the first “touch” between economics and neuroscience.

The year 2003 brought the first conference discussing this area. Held at the Emory University, its constitution; 1/3 of attendees were the PhDs from the field of neuroscience, 1/3 MD, and 1/3 PhD in economics. This sent a message that there is a huge opportunity of diffusion of these fields and that attention should be right there.

Glimcher and Fehr (2008) state that the history of neuroeconomics can be traced to two separate events, dating further back to what Michael Platt thought about the longitude of existence of this field. The book talks about two important events in the making of neuroeconomics; neoclassical revolution in the 1930s and the start of cognitive neuroscience in the 1990s. The authors stated that the future of neuroeconomics and its role in the study

of human behaviour is bright and ever growing (Glimcher, Camerer, Poldrack, & Fehr, 2008).

Polister (2008) provides another view on history of this science, saying that the roots of this field date back to the period of Babylon and Rene Decartes. The authors explain that Decartes error and Babylonians empiricism motivated the development of neuroeconomics as well as economics. Both concepts state that misconceptions are born out of relying purely on one of the extremes- pure theory or pure statistics. That is how the neuroeconomics started, as an integration of the above-mentioned extremes (Polister, 2008).

Glimcher, Camerer and Podrack (2008) emphasize that there are many types of neuroeconomical experiments. First one being “behavioural” experiment which was conducted with healthy participant whose behaviour was examined and the second type being “lesion” experiments whose focus was on studying the behavioural consequences of brain damage. Another type of experiment examines the effects of drugs on certain economic decision. In addition, authors state that neuroeconomics has gone one step further providing neuroeconomical experiments with the Ultimatum game. The main aim of this experiment is to explain what are the reason behind rejecting certain offers (Glimcher, Camerer, Poldrack, & Fehr, 2008). All of this demonstrates that neuroeconomic tools and expertise can be used to analyse human behaviour.

Another study also agrees that there are huge distances between economic models and reality, stating that “irrational” choices also need to be taken into account. Authors stress that researchers in the field of neuroeconomics put an emphasis on really grasping how certain choices are made (Dow Schüll & Zaloom, 2011).

In addition to two groups of thinkers regarding this matter, authors (2008) argue that in the development of neuroeconomics, there were also two paths, two groups of researchers, both of which provided valuable insight. The first one concentrated on testing alternatives to neoclassical preference theories by using brain imaging as a tool. The second one aimed at testing and developing models using economics theory as a tool (Glimcher, Camerer, Poldrack, & Fehr, 2008).

This section illustrates the extensive research that has been dedicated to this emerging field of study. The subsequent part will center on the topic of Human Resource Management (HRM) and clarify the use of neuroscientific techniques within this field.

## **2 DIFFUSION OF NEUROSCIENCE AND NEUROSCIENTIFIC TOOLS IN HRM- CHALLENGES AND OPPORTUNITIES**

This chapter discusses in-depth the possible application of neuroscience as well as neuroscientific tools in HRM. Through the reviewed literature, challenges and opportunities of this new approach will be discussed and presented.

Some literature covers the area of neuroeconomics and applying neuroscience in the field of business. Academics in marketing, finance, and economics are early adopters of new neuroscientific methodologies, and organizational researchers have a lot to learn about this area (Murray & Antonakis, 2018). However, while there has been some enthusiasm regarding the prospects that neuroscience presents, it appears that many HRM scholars and practitioners are also cautious towards it. This cautiousness is related to the fact that this field is new and unknown, but it should not be overlooked that neuroscience has gone a long way and that it can provide information to both applied and basic research (Murray & Antonakis, 2018).

Most of the research has been concentrated on the application of neuroscientific tools in decision making, while its application in the HRM has been slowly emerging. That is why this thesis is focused on that part specifically.

Kenning and Plassmann emphasized that there are several types of neuroscientific tools that can examine decision making in economics. It is stated that the idea behind neuroeconomics itself is to use neuroscientific tools to give explanation on how emotional processes in fact impact our decision making. In addition, it is emphasized that economic theory comes with flaws, such as the concept of homo economicus, and the fact that consumer makes rational choices. All of this does not stand in the real world. Because of these drawbacks of economical theory, other sciences gave input to the rise of research in this field. That is how behavioural economics rose, with the merge of economical and psychological ideas (Kenning & Plassmann, 2005).

Friederike Fabritus casted light on the rising topic of including neuroscience in other fields such as HRM, stating that HR professionals could build better employee experience programs if they really understood that behaviours of the employees are influenced by their different brain chemistries (Vogel, 2023).

Recruitment process, one of the tasks of HRM could be under the influence of biases and therefore have an impact on choosing the wrong candidate. This could be altered by using processes that have neuroscience at its base (Petrou & Rammata, 2021). One successful example would be using a model that has neuroscience in its core, such as AI-powered gamified assessments that would give an opportunity to put candidates into real situations they would tackle at the work place with the goal of seeing how they would potentially react in real-life situation (Ahmed, 2022). In addition, neuroscientific principles can be included in the interview process by trying to increase serotonin level in order to provide a calmer, more natural environment that gives a better chance for the candidates to present themselves in a proper way (Menon & Bhagat, 2022).

Another activity of the HRM sector is providing feedback to its employees. This process can also be improved using neuroscience, with adding evaluation that is based on neuroscience to the existing tests and methods (Balthazard, Waldman, Thatcher, & Hannah, 2012).

The reviewed literature emphasises that “economics needs brains” and that is evident that neuroscience will have an impact on economics (Camerer, Loewenstein, & Prelec, 2004). In the light of this thesis, HRM also needs to intertwine brain knowledge into their practices and it has been doing so. This century brought that kind of opinion, it highlighted the obvious, that the most valuable asset of the company is the human brain itself. Human resources management could reach its full potential when corporations abandon the old strategy and focus on "administrating and optimizing brains" (Willer, 2016).

Another point in favour of using neuroscientific approach is the ability to really understand importance of the motivation and its significance. By grasping the reasons behind why some people behave in such manner, managers can get important insight on how to properly motivate employees with the aim of better achieving the company goals. This valuable information about motivation is provided by neuroscience itself showing that it can be useful in improving motivation (Kenan-Flager Business School, 2023).

In addition, research has showed that neuroscientific methods can help leaders determine the level of employee engagement within their organisations (Waldman et al., 2013). By offering insight into a specific employee's behaviour, neuroscience can help leaders enhance their coaching (Rock & Donde, 2008).

Significant number of companies have been adopting neuroscientific knowledge, ideas and tools into their businesses. With it come problems and possibilities, excitement to employ these new tools and dread of the unknown. A good example is a NEUROHM, a leading global leader whose major aim is to transform neuro-research and leverage it towards the achievement of business goals (Neurohm, 2022).

A number of companies are enthusiastic and embrace neuroeconomics-based innovations in numerous parts of business, marketing being the most prominent. IKEA is one such firm that opted to use neuroscience to better understand how to create new sources of energy and gain better understanding of their consumers' reactions to this new business strategy. To assure the success of their new business model, they developed EEG and eye tracker in conjunction with the company's strategy (Furr, Nel, & Ramsay, 2019). Another example is Yahoo, who employed neuromarketing information to assure the success of their campaign before spending too much money. Frito-Lay also employed brain imaging, claiming that it produces better results than focus groups (Burkitt, 2009). The consultancy Changing Dialogues is another example of how neuroscience may be used in HRM specifically. Rachel Jackson, the company's director, uses neuroscientific expertise to help executives better handle stress. Understanding the impact that difficult times may have on others can help you navigate those situations and assist employees in making better decisions (Martindale, 2014).

On the other hand, there are companies that are hesitant when it comes to embracing neuroeconomics. They are aware of the difficulties and challenges that come with it; literature (Ashkanasy, Becker, & Waldman, 2014) outlines a few major concerns. The first

concern is that neuroscience attempts to limit organizational behaviour to activity in a specific region of the brain, and that this field cannot provide adequate information for organizational behaviour theory. Technological and methodological problems raise the concern that neuroscientific procedures provide insignificant results. The third problem emphasizes the concern that while neuroeconomics provides novel perspectives in theory, there is not much to be used in practice. Lastly, there are issues that euphoria towards using neuroscience can produce overreactions in favour of and against the concept. (Ashkanasy, Becker, & Waldman, 2014).

Having all of this in mind, it is understandable that there are reasons for and against using neuroscience in the field of business. That is why my main goal in the thesis is to critically overview both the opportunities and challenges that stem from the application of neuroscience in HRM, and identify the reasons why companies choose to adopt or not to adopt neuroscientific innovations.

The table 2 summarizes what has so far been revealed about the diffusion of neuroscientific methodologies in HRM and serves as an introduction to Chapter 3, which will cover the actual application of these tools in Western Balkan and EU nations. The table's major goal was to convey awareness that specific HRM tasks may be improved further by employing neuroscientific techniques or information, and that these tools can be employed in addition to standard HRM approaches to provide the greatest results.

*Table 2: Presentation of HRM tools and neuroscientific tools*

<b>HRM ACTIVITY</b>	<b>HRM TOOL/METHOD</b>	<b>NEUROSCIENTIFIC TOOL/METHOD</b>	<b>BEST NS PRACTICE</b>
Recruitment process	Interview, psychological tests	NLP, eye-tracker, GSR, Thomas Psychometric Tests	The use of AI-powered gamified assessments, Neuroagencija
Stress management	Wellness programs	Uses neuroscientific knowledge to better understand how to handle stress, Eye tracker	The consultancy Changing Dialogues
Handling reactions of the employees to certain work situations	Acknowledging feelings, promoting good communication	EEG, eye tracker, GSR, Face and Voice analysis	Direct Neuro
Motivation of the employees	Employee of the month awards, bonuses	NeuroHR	Promosapiens
Satisfaction of the employees	Bonuses, trainings, promoting a good environment	NeuroHR as well as neuroscientific knowledge	Promosapiens

*Source: Own work.*

This section of the chapter will cover both aspects of the narrative, negative and positive, with the goal of providing the complete, true representation of this fusion between economics and neuroscience.

Starting with the negatives, two main constraints of this area are the results' validity and reliability. Due to small sample numbers, it is not always possible to provide useful recommendations. Furthermore, it is critical for these kinds of studies to consider methodological issues, because neuroscientific techniques cannot detect and always be able to pick up minor changes in brain activity (Hubert, 2010). Another problem that has come up is the matter of the validity of statements that are drawn from the brain scans, as results obtained via this kind of measure may be accurate in one setting and inaccurate in other (Kenning & Plassmann, 2005).

Another problem stated in the literature is that the benefits of applying neuroeconomical approach can't be properly seen and measured. This is partly due to the fact that the field of neuroscience is complex and is not easily understood. Also, manipulative marketing strategies cause problems. Academics from marketing and neurology have found that ethics is one of main issues that comes up relating to neuromarketing (Eser, Isin, & Tolon, 2011). Because of the importance of ethics in brain research, new field has emerged called neuroethics (Fuchs, 2006) that studies ethical as well as social and legal implications of neuroscience (Illes & Bird, 2006). Another problem that arises is that neuromarketing could possibly make goods irresistible to customer (Stanton, Sinnott-Armstrong, & Huettel, 2016).

Moreover, economics and neuroscience have completely different roles and provide answers to different questions, so it is argued how useful would the field that represents a unification of the mentioned studies be. Another problem stated in this article is a technical one-problem with interpreting data (Müller, 2019).

Reviewed literature states there are a couple of essential challenges regarding this field. Starting with the first problem that neuroeconomics faces it to be able to validate the empirical basis of existing concepts. In addition, another challenge this field will have to tackle is to "further expand and validate the obtained results". Finally, the primary task of neuroeconomics will be to direct the transition of acquired results into business practice via firms or even media channels (Hubert, 2010).

Researchers state that neuroscience can't lead to further evolvement and development of economics as it has no instruments to tackle the problems that economics handles. The authors further explain that economics is much more flexible than neuroscience gives credit, and that state that the pure proof of that would be how biases and changes of preferences are tackled in many situations. Moreover, they argue that neuroeconomics and economics have completely opposing objectives and because of that they handle same situations in a different manner (Gul & Pesendorfer, 2008).

One of the opportunities stated in the literature is that neuroeconomics is trying to fill in the gaps of other disciplines, highlighting that the insight of neuroscience can help and even improve theory predictions in economics theories. In addition, author emphasizes that there will be growing interest for this field of research as new laboratories are being built, recognizing the importance of this study (Müller, 2019).

One of the main advantages of this new approach is "mapping and identifying neural signals for value". As a result, scientists can now gather data on brain activity related to the rewarding system, social stimuli, and even identify neural markers for financial transactions. However, some parts of the neurological foundation for decision-making, are still very little understood (Huettel, 2010).

Camerer and colleagues (2005) explain how neuroscience has significance for economics. They claim that by employing neuro-imaging, which can currently identify which areas of the human brain are engaged while an economical choice is being made, we will be able to replace conventional economic theories with more thorough explanations. In addition, they raised the question- how would the field of economics look today if it had been using insight now available from neuroscience (Camerer et al., 2005). This means that opportunities are vast and that there is further space for development of this area.

This chapter was primarily concerned with the diffusion of neuroscientific techniques in HRM and describing the advantages and disadvantages of this innovative approach. It is also worth noting that this section concluded that neuroscientific approaches do not need to entirely replace traditional HRM methods, but may be used as an additional tool to get better results. Furthermore, it was explained that, in addition to the use of the tools, the value may be observed in knowing basic neuroscientific concepts in order to truly understand employees and their requirements.

### **3 WESTERN BALKAN AND EU AS RESEACH AREAS OF THE APPLICATION OF NEUROSCIENCE IN HRM**

As stated previously, the primary objective of my Master's Thesis is to determine the factors that influence Western Balkan firms' decisions to implement or reject neuroscientific HRM innovations. I contrast the perspectives of the Western Balkans with those of Slovenia and Croatia. This section will provide a summary of the research sample: The Western Balkans, Slovenia, and Croatia.

In order to get better results, Slovenia and Croatia are included in this research in order to compare them as EU countries with Western Balkan countries. Reason for choosing Slovenia and Croatia is due to their "long historical ties with its neighbours to the southeast and because of its former incorporation in the Kingdom of Serbs, Croats, and Slovenes and federal Yugoslavia" (Crampton, Danforth, & Allcock, 2023). Moreover, Slovenia as well as Croatia were included in the sample because these countries are in the European Union, and

are of extreme value for comparison. In addition, for the participant in the interview, due to the convenience sampling and the situation that this particular company can pose as a good practical example, a person from Slovenia was chosen to do the interview. As Slovenia is a country where neuroscience is applied in the field of business such as in company NeuroVirtu, and where academics do research on this topic (Kraljič et al., 2022), it is reasonable why this country is added to the sample. Similar case is with Croatia, in addition to being the newest member of the European Union. Including both of the countries from the EU provides valuable insight as it gives the opportunity to do a comparison between the two EU countries with Western Balkan countries.

### **3.1 The case of the Western Balkans**

The Western Balkans region consists of 6 countries; Albania, Bosnia and Herzegovina, North Macedonia, Montenegro, Kosovo and Serbia (International Bureau, n.d.). All of the Western Balkan nations desire to join the European Union, but they all struggle with the same issue of convergence when it comes to living standards. The key reason is the lack of needed institutions and other factors that would support long term productivity. On the other hand, Western Balkan region can boast with its attractiveness to investors. In addition, this region has a favourable geographical location, low labour costs and good tax regimes (Sanfey, Milatovic, & Kresic, 2016).

Western Balkans countries are expected to enhance human capital development for a knowledge based by the 2020 Economics and Investment plan for the Western Balkan. From the ministerial meeting of the Western Balkans Platforms on Education and Training & Research and Innovation in December 2020 it was concluded that Human capital development must be at the forefront of the political choices. The workforce needs to be up skilled as well, which should be another goal (European Training Foundation, 2020).

Western Balkan countries all share the same problem, migration and ageing of the population. This all results in a labour force that is unprepared for a changing market, which indicates that competences are constantly shifting. In addition, job posts are changing due to globalization and climate change. Nowadays, employers expect future employees to not just possess general knowledge provided from the schooling system, but value analytical thinking, team work, problem solving as well as good communication and presentation skills. However, research shows that people from the Western Balkan region continue to lack competencies needed for economic transformation (OECD, 2023). This does not hold in Slovenia, as in this country most of workers are well matched with their job posts. Also, it is important to mention that this country has a high score in literacy (OECDiLibrary, 2018) which is not the case with the Western Balkan countries.

Last three years with the pandemic and War in Ukraine have brought hard times for the Western Balkan countries that have showed resilience in this challenging period. Economies of this region saw growth and strength in at the beginning of the 2022, however, it was

impacted, but not severely, with the electricity and heat prices going up. In addition, job creation slowed down even though the employment rates have gone up in the second half of the 2022 (World Bank Group, 2023).

Neuroscience is slowly entering multiple fields, and this innovation is starting to happen in the Western Balkans. Regarding the academic community, this new field is being researched for quite some time, starting with Dimitriadis) who has been applying neuroscience in numerous fields like leadership, communications, education and marketing for over 10 years. Dimitriadis is currently the Regional Director at the University of Sheffield International Faculty for Montenegro, Serbia and Bosnia and Herzegovina (projectmanagement, n.d.). He has worked with many successful companies such as AstraZeneca, IKEA, Coca Cola, Nestle and more, offering Neuromarketing and NeuroHR research and consulting. One of the aims of his company Neurogenesis is “facilitating conversations for the better development of applied neuroscience initiatives in the country.” (Neurogenesis, 2022).

Regarding the practice, the number of the companies is not vast, but still significant for the growing field. Bogdan Mijović, PhD in Neuroscience, is the co-founder of a wearable device for both recording and analysing electrical brain activity. The device is mostly used in research but poses as a reminder that there is still a lot of space for opportunities in this field. mBrainTrain is a company that offers devices such as Smarting Pro Line that represents an easy to use, wireless EEG (mBrainTrain, 2023).

Direct Neuro is another good example from practice. This company employs EEG, eye-tracker, GSR as well as Face and Voice analysis. Their main activities will be focused on both marketing as well as human resources. This company aims at helping brands communicate their messages to their target audiences efficiently and also strive at gaining insight in how employees react to some working situations. Nielsen, one of the global leaders in charge of data analysis stated that neuroscientific techniques with traditional ones, the accuracy reaches 90%, which is significantly higher than 30% obtained via traditional methods (Jovanović, 2021).

### **3.2 The cases of Slovenia and Croatia (EU Countries)**

Slovenia joined the European Union in 2004, and adopted euro three years later in 2007. It has one of the highest GDP per capita among the Southeast Europe’s countries, due to a good infrastructure, educated labour force and an excellent location. Slovene’s economy has been ranked 37<sup>th</sup> freest in the 2023 Index. Regulatory framework that has been established strives at boosting employment growth (The Heritage Foundation, 2023). Regarding the unemployment rates, in January 2023, registered unemployment rate was 5.6%, meaning that it is 1.3 percentage points lower than in January the previous year. There is a shortage of properly educated HR, particularly in the fields of construction, health and social care, IT, transport, warehousing, and hospitality, which are all in need of workers (EURES, 2023).

Croatia joined the EU in July 2013, and adopted euro in January 2023. In the year 2020, one of the most important sectors of Croatia's economy were wholesale and retail trade, transport, accommodation and food services (20.1%), as well as industry (19.2%) (European Union, n.d.). Croatia's GDP is predicted to rise by 1.6% in 2023 and even more in 2024 reaching the growth of 2.3%. Sectors that proved to be the most successful are construction and trade, transport, food services as well as accommodation. In Croatia, unemployment rates are at the all time low dropping to 6.6%. Even though the number of population is dropping, the labour force is projected to continue rising (European Commission, 2023).

Example from practice regarding this topic is a company in Croatia, Promosapiens. Dalibor Šumiga, founder of the agency Promosapiens and expert in behavioural marketing is an excellent example of how neuroscience can be applied in the field of business, specifically in human resources management. Šumiga gives an explanation on new method that uses neuroscientific insights and tools called NeuroHR, which is able to analyse level of satisfaction of employees and their perception on the company and the surrounding they work at. Promosapiens is the only company in Croatia that uses neuroscience in order to improve human resources processes. This company uses EEG to get the needed information in addition to the software for unconscious questioning. The main benefit of applying neuroscience in this field, from the perspective of Šumiga, is that NeuroHR can measure motivation of the employee on the unconscious level, meaning that it provides information about the specific that not even the person that is questions is not aware of. He also puts an emphasis that even though some people are hesitant to this type of methods, there are those that are curious and that their team explains to the employees the whole process, making them more comfortable and explaining that this method is not invasive and that data will be analysed only with their consent (Promosapiens, 2021).

Neurovirtu is a consulting company specialised in strategic communication in multiple fields ranging from HR to political campaigns. This company states that with good and strategic communication from the start, a company can successfully fulfil its goals. They are first in region that started applying neuroretorics and behavioural economics in communication. They highlight that recent decades brought the new knowledge about the human brain that can be of extreme use for communication. They provide multiple services, among which is neurochoaching, that combines knowledge on the biopsychological foundations of effective communication as well as training with the companies' communication challenges (Neuro Komunikacijski Coaching, 2022).

In addition, in Slovenia there is another company that uses the insights from neuroscience called Neuroagencija, founded in 2011. This is an advisory company that specializes in communication, lobbying, and business solutions and applies neuroscience in stages of analysis, strategy formation and implementation. They offer wide range of services among which are NLP (neuro linguistic programming) coaching as well as neuroframing in 7 steps, and change management (Neuroagencija, 2020). The NLP methods has shown great improvement in the field of human resources. NLP has been proved to decrease the time

needed for HR personnel to go through resumes as well as eliminate the problems that biases bring (Linly, 2021).

## **4 METHODOLOGY**

To gather insights regarding the application of neuroscience in HRM in the Western Balkans, survey questionnaire was conducted. In addition, in order to complete the research and provide the whole picture, in-depth interviews were conducted with an HRM professional, neurologist and the expert from the field of neurocoaching.

### **4.1 Survey research design**

In order to provide answers to research question, mainly focusing on providing what are the determinants of Western Balkan companies' decisions to adopt or not to adopt neuroscientific innovations in the field of HRM, survey questionnaire with 268 respondents was conducted using Google Forms in English Language. The survey was distributed via multiple social networks (Facebook, Instagram, LinkedIn), groups for HRM professionals and sent out via e-mail, Messenger and LinkedIn. The majority of messages and e-mails were partially personalised in order to increase response rate. The respondents were from the Western Balkan countries as well as two European Union countries, Slovenia and Croatia, with the majority of respondents coming from Montenegro. The survey was focused on HRM professionals or those who handle HRM duties within the company. The survey was designed to gather insights from respondents on questions about the company's characteristics as well as more specific questions about their familiarity with the term neuroscience and its application in HRM, as well as their perspectives on the opportunities and challenges of this approach. The survey ended with the Likert scale where 7 statements regarding participants' opinion about multiple topics including application neuroscience in HRM were listed.

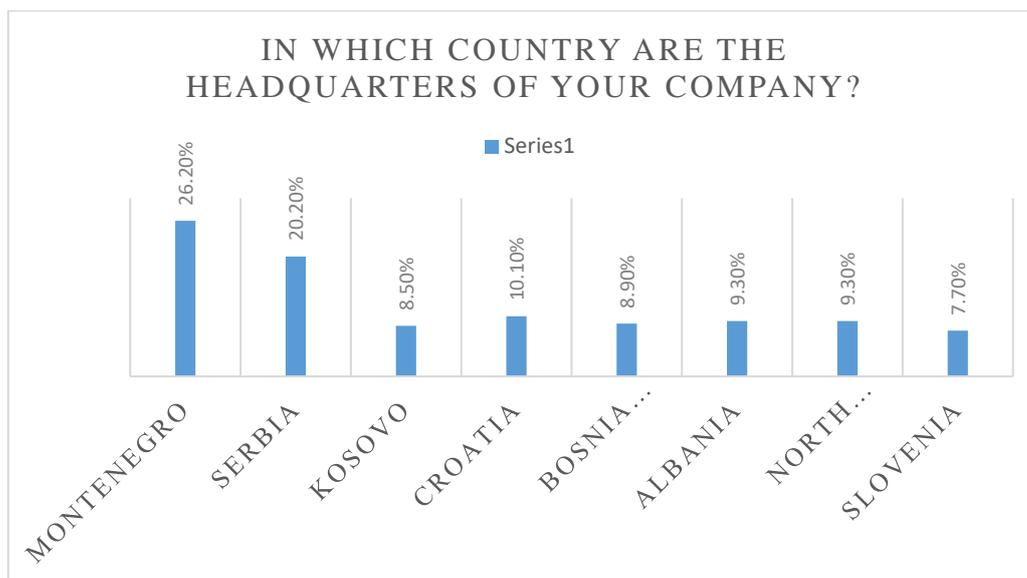
### **4.2 Description of the survey sample**

The survey was distributed via LinkedIn, Facebook, e-mail and Viber. The total number of contacted respondents was a little above 1000. The starting point of distributing the survey was to use HRM groups on all of the mentioned social media. As the number of responses was low, the tactics for increasing the response rate was to partially personalize the messages that are being sent via e-mail and LinkedIn. The survey was available for 3 weeks and the final number of survey respondents is 268, with 160 respondents finishing the whole survey. The reason for this is that the first question aimed at filtering people that work in the HR field from those that do not, as the target group were only people from the human resources field. In addition, another cut off point was question number 8 in the questionnaire regarding the familiarity with the term neuroscience, if the respondents were not familiar with this field, the survey ended for them on that page. The respondents who were not familiar with this field, 16.5%, or 41 respondents were excluded from the questionnaire. However, those respondents provided an answer to an important question which was question number 10

“Would you be willing to learn more about the application of neuroscience in the field on HRM?”, with 235 respondents answering “yes” and 13 “no”. This question revealed that people in the HRM department are eager to learn more about this subject. This is expected as it has been proven that most people are eager to learn new things. One survey found that 78% of employees are eager to learn new skills throughout the working day and 65% of employees stated that they feel empowered when offered an opportunity for attending trainings (Chinn, 2022). This can also be attributed to the fact that respondents mostly came from large enterprises (Figure 4) and those companies offer possibilities to learn more, having in mind that those companies “are actually fertile ground for innovation” (Lambert, 2022).

The respondents came from countries from the Western Balkan as well as two members of the European Union, Slovenia and Croatia, with most of the respondents coming from Montenegro (26.2%), followed by Serbia (20.2%), Croatia (10.1%), Albania and North Macedonia (9.3% each), Bosnia and Herzegovina (8.9%), Kosovo (8.5%), and Slovenia (7.7%). Having that in mind, western Balkan countries take up 82.2% of the sample that is 224 respondents, while EU countries; Slovenia and Croatia 17.8%, that is 44 respondents.

*Figure 1: Location of head-quarters*



*Source: Own work.*

Survey was focused on those people that are in some way connected with the HRM department which is 91.5% of the respondents which is presented in the Figure 2. Out of those, 78% of respondents are HR professionals, and 14% or those who handle HR related duties. As it was mentioned before, the survey ended for those respondents that do not work in this field which was 7.5%, or 20 respondents. The HR department's professions were divided into 8 key HR positions in order to offer a better basis for the analysis and a better understanding of the data that had been collected. The other professions were categorised under the “other“ category (11%). Majority of HR professionals were HR managers

(29.55%) within this category were HR directors, employment managers and employee relationship manager. Next category were specialists who are in charge of the whole hiring process, meaning that they are the ones who have the most valuable insight in what tools are useful within the department-Recruiters (18.18%), within this group were also recruiter managers, recruitment developers and talent acquisition. Next category were HR specialists (13.64%) that overlook all of the functions in the HR department (Pavlou, 2022), followed by Chief human resources officers (10.23%) who are in charge of overseeing labor relations policies and practices (Gartner, 2023) 5.11% of respondents were HR consultants and 4.55% were HR coordinators who offer administrative support to the HR department. Lastly, HR administrators made up 3.98% of responses, followed by executive HR (3.41%) who have a crucial role with the department and provide support to HR in implementing different projects (HR University, n.d.). HR managers play many different roles at the company, and it is considered to be a mid-level position within this department (Bartram, 2023). However, it is crucial to note that these professionals play a significant part in shaping an organization's culture, which means that the majority of the sample has the power to decide and recommend which methods are used in the department for the recruitment process. Within this category were HR directors, whose duties include creating annual budgets and selecting software, systems, and other purchases (Bartram, 2023) meaning that these professionals also have the power to decide which tools will be bought and used within the department. From the sample we can conclude that the answers were provided by the professionals who really do have valuable insight on the usefulness of tools and those who make decisions relating the matter.

*Figure 2: HR duty demographics*

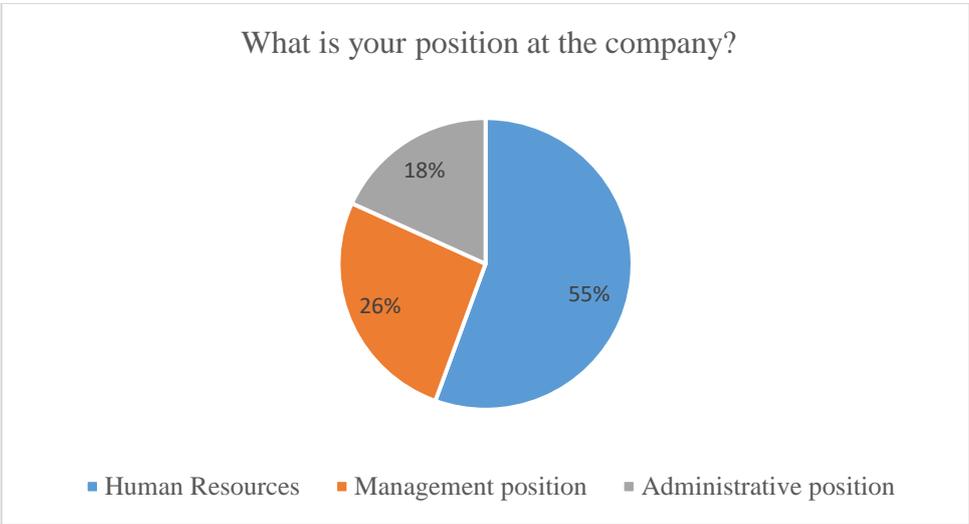


*Source: Own work.*

In some organizations, the HRH department does not exist as a separate division, but such activities are performed by someone else in the company. The reasons for this are mostly

due to high costs needed to develop and maintain the department (mostly salaries and programs), and some companies would rather spend that funds on other activities. Other reasons are the want and need to have simplified management as well as simplified hiring procedure. Based on the data from the survey showed in Figure 3 it can be concluded that those participants that handle HR related duties come mostly HR professionals, within which category we have recruiters, payroll specialists and talent acquisition (55.56%), followed by Management in which category are Executive position and Business position (26.39%). Last category is administrative position that was 18.06% of the sample. We can conclude that in companies that do not have a separate HR department within the company, majority of respondents that handle HR duties come from Management positions.

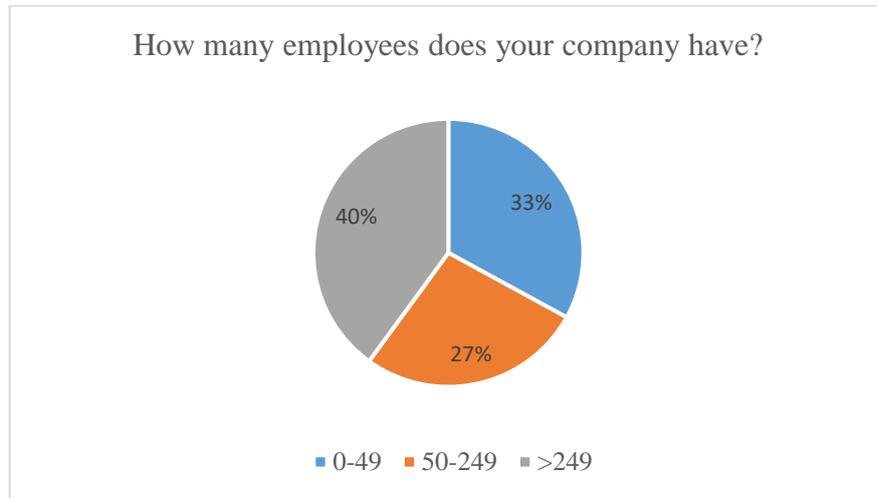
Figure 3: Respondent's position at the company



Source: Own work.

From the data obtained from the survey, the majority of companies were large enterprises with more than 249 employees (39.52%), followed by small enterprises with 0-49 employees (33.06%) and medium enterprises with 50-249 employees (27.42%). This is probably due to the fact that smaller companies are less likely to see the immediate benefits of having and HR department and those activities are usually handled by the owner itself (McCumber, 2021). Having that in mind, it is understandable why majority of the respondents are HR employees from large enterprises. It is important to mention that there are significant differences between the HR department in large and small enterprises. Starting with the size of the department itself as well as available resources and technology. Small companies tend to have smaller departments and their employees handle multiple duties at the same time. Also, those types of companies tend to use only basic softwares such as spread sheets for their activities. However, HR professionals in small companies tend to have a much larger influence and have a crucial role in shaping organisations' culture (Innvocon, 2023).

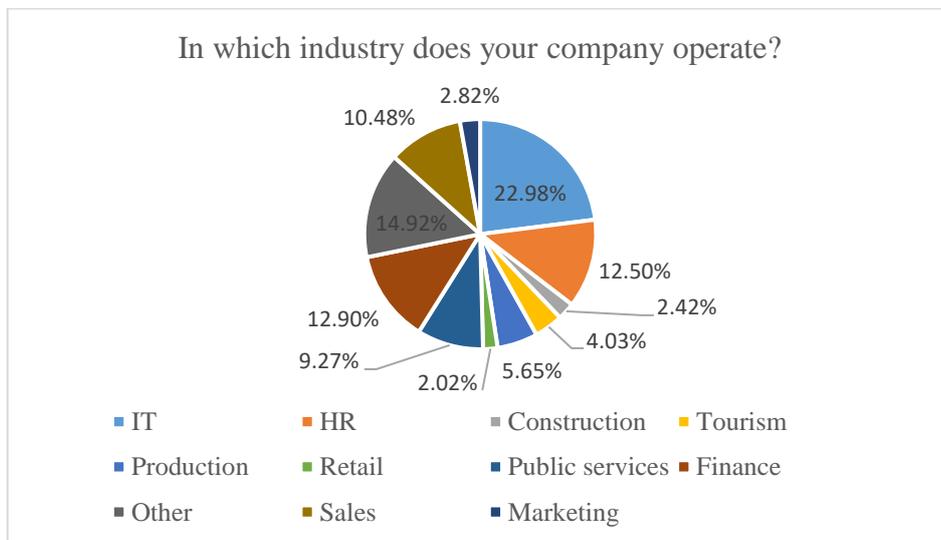
Figure 4: Company size spectrum



Source: Own work.

The next question “In which industry does your company operate?” aimed at gaining insight in which industries are the companies that respondents have been working for. In order to provide better insight, as well as prepare data for analysis in the SPSS programme, 10 key industries were recognised. The majority of respondents (22.98%) were employees from the IT industry, followed by Finance industry (12.90%) and the HR (12.50%). Sales industry represented 10.48% of the respondents while Public services were (9.27%). Employees from the production industry represented 5.65% of the sample while 4.03% were employees from the Tourism. Least number of respondents came from marketing (2.82%), then construction (2.42%) followed by retail (2.02%). The rest of the sample were sorted in the option “other”. The results are presented in the figure 5.

Figure 5: Industries

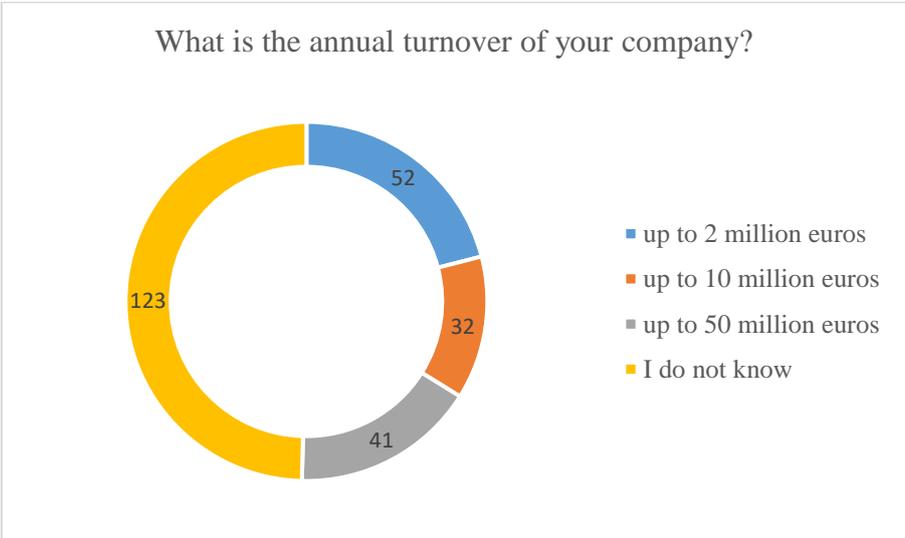


Source: Own work.

When it comes to how many years has the company been operating for, majority of respondents 34.68% were professionals from the companies that have been operating for less than 10 years, followed by 32.66% in companies that have been on the market between 10-20 years. 18.95% of the respondents worked for companies that have been operating for more than 30 years. Least number of respondents (13.71%) came from companies that have been on the market between 21-30 years.

When it comes to annual turnover as shown in figure 6, majority of respondents (50%) do not know what that number could be. This could probably be due to the fact that the target group were HR professionals, whose area of expertise does not include knowing this information. For those participants who knew this data, majority of the companies had the annual turnover of up to 2 million euros (21%), followed by companies with the annual turnover of more than 50 million (16%), and up to 10 million (13%).

Figure 6: Annual turnover of respondent`s company



Source: Own work.

**4.3 Expert in-dept interview sample description**

Expert in-depth interviews were conducted with the aim to provide perspective from three different professionals. The interviews were conducted both via e-mail and in person, depending on the availability of the interviewees as well as their preferences. Number of interviews were three, one person from the field of HRM, one a neurologist, and one from the field of leadership and coaching. Two respondents came from Montenegro-Western Balkan country and one from Slovenia, EU country. Due to the wish of two interviews to stay anonymous, there won't be mentioning of their identities nor the name of the company/institution they work for. The interviews were specialised for each interview; for the HR professional number of questions was 17, for neurologist 14, and for last professional 16. The first couple of questions for each interview had a goal to warm up and easily

introduce the topic of interest. In addition, first couple of question aimed at understanding how did the respondents enter their fields, what tools they use or what their company does. All three of the respondents were asked about their opinion about opportunities and threats as well as why they believe companies choose to adopt or not to adopt neuroscientific innovations in HRM.

In depth interview is a qualitative technique used to gather information about peoples' feelings, opinions and beliefs. During this type of method, participants feel more relaxed and are willing to express their real thoughts on the questioned topic (Zaharia et al., 2008). The reason for choosing in-depth interview about the application of neuroscience in the field of HRM in companies operating in the Western Balkans is to get a better insight on the topic and provide answers to research questions that were not able to be resolved using only survey questionnaire. The participants in the interview are presented in the table 3. As mentioned before, due to the wish of two participants to stay anonymous, names and companies will not be mentioned in order to respect their privacy.

The sample was chosen via convenience sampling. This type of sampling is a type of non-probability sampling where units of the target population are chosen based on how easy they are accessible, their availability and willingness to participate in the research (Etikan, 2016). Having that in mind that is the reason why there are two participants from Montenegro, as the writer comes from that country. In order to achieve high variability degree, participants are chosen from three different professions, which is presented in the table 3 on the next page. The interviewees were chosen in a way to have a representative from all of the fields of research that are of interest for this thesis. One from the field of human resources in order to gather data on how processes of HR are handled at this particular moment. One participant is a neurologist, here the goals was to get a better insight on the field of neuroscience and possible applications outside of the field of medicine. Last participant is a neurocoach, and this participant presents the example from practice where knowledge from neuroscience is applied in business.

*Table 3: Expert in depth interview sample description*

<b>PROFESSION</b>	<b>FOCUS OF RESEARCH</b>	<b>COUNTRY</b>	<b>YEARS OF EXPERIENCE</b>
HRM PROFESSIONAL	Human resources Management	Montenegro	More than 2
NEUROLOGIST	Neuroscience	Montenegro	More than 10 years
NEUROCOACH	Applying neuroscience in other fields	Slovenia	More than 5 years

*Source: Own work.*

The first interviewee has more than 2 years of experience in the field of Human Resources. This person works at a financial institution and handles all of the HRM related activities being mostly focused on the recruitment process.

The second interviewee is a neurologist with more than 15 years of experience working as a doctor, and more than 10 years as a specialist in neurology. His insight was of extreme value as it gives another perspective to the thesis, being a medical professional and someone who really understands neurological tools.

Last interviewee is an expert in the field of Linguistics, who is the owner of a consulting company that strives to apply neuroscience and psychology in the field of communication. This participant is valuable as it provides a practical example how can neuroscience be applied in other fields.

#### **4.4 DATA ANALYSIS**

The data gathered using survey questionnaire was analysed using SPSS, statistical program used for various types of analysis, in this case descriptive statistics cross-tabulation. While primary, qualitative data provided by the expert in-depth interview was analysed using content analysis. The findings will be explained in detail in the parts of the thesis that follow.

### **5 RESULTS AND DISCUSSION**

#### **5.1 Results of the survey**

The main goal of the survey was to provide answers to what are the determinants of Western Balkan companies` decision to adopt or not to adopt neuroscientific approach in HRM (research question 3). That is why the first set of questions was about the country of headquarters, size of the company, annual turnover, and similar which was discussed in the section 4.2 Description of survey sample. In addition, with the questionnaire we wanted to find out what are the opportunities as well as challenges of using this approach in the field of HRM. Another goal was to determine the level of awareness that Western Balkan companies have on this type of approach. In order to reach this objective, survey was conducted using Google Forms.

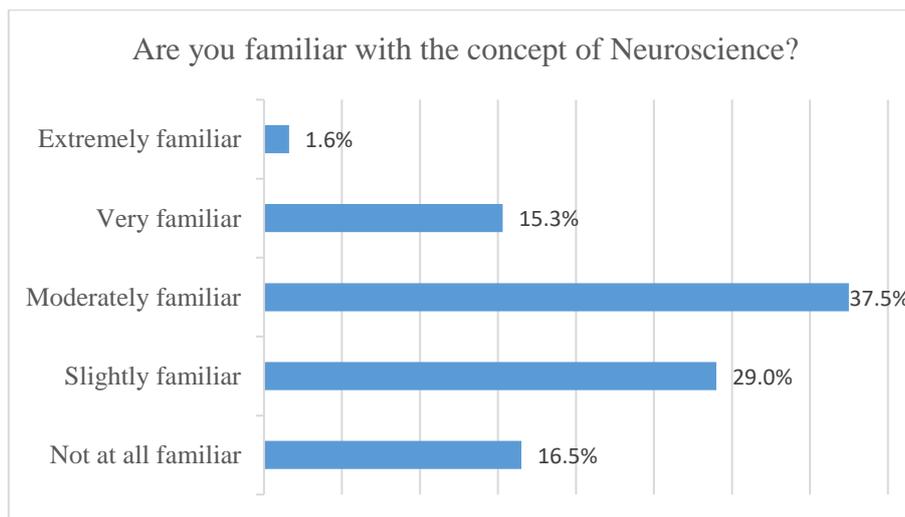
The survey (that is available in the appendix) consisted of 17 questions with an opening statement that aimed at giving basic information to respondents about the purpose of the research. The structure of the survey can be divided into five parts. The first part consisted of questions that aimed at finding out the information about the country where the headquarters are, size of the company, industry, annual turnover, and similar with the aim of finding out if these determinants affect the decision of the company to adopt of not adopt neuroscientific innovations in HRM. The second part was the familiarity of respondents with the term neuroscience and its application in human resources management. The third part of the survey was devoted to level of readiness to attend the trainings and apply innovations in

the field of HRM. The fourth part aimed at describing level of application of neuroscience in HRM. The last part were the benefits and barriers.

### 5.1.1 Familiarity and awareness with neuroscience and its application in HRM

In order to provide a better picture of respondents' understanding of the term neuroscience, the question asking the respondents to rate the level of familiarity with the term itself. The respondents were presented with five options: "not at all familiar", "slightly familiar", "moderately familiar", "very familiar" and "extremely familiar". The results are presented in the Figure 7. When it comes to this question, majority of the respondents answered that they are moderately familiar with this topic 37.5%. The option "slightly familiar" was chosen by 29% of the respondents. Only 1.6% or 4 respondents stated that they are extremely familiar with the concept of neuroscience meaning that just a small fraction of the sample has extensive knowledge on the topic. 16.5% of the respondents are not at all familiar with this term, while 15.3% are very familiar with it.

Figure 7: Familiarity with the concept of neuroscience

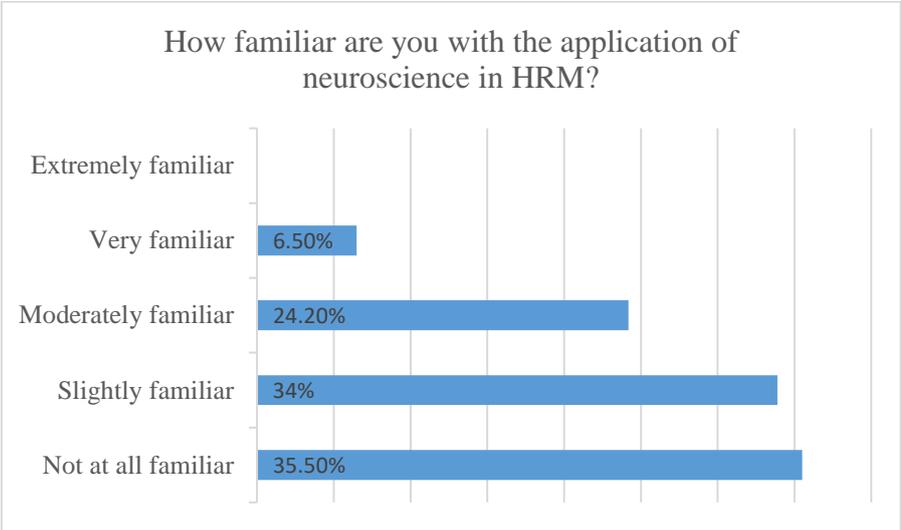


Source: Own work.

The following question: "How familiar are you with the applications of neuroscience in HR management?" had the aim on gaining insight if people are familiar with how neuroscience can be applied in human resources management. Results are presented in the figure 8. Majority of the respondents, 35.5% stated that they are not at all familiar with this claim, followed by 33.9% who expressed that they are slightly familiar with it. The option "moderately familiar" was chosen by 24.2% of the respondents while the least number of participants stated that they are very familiar with application of neuroscience in HRM (6.5%). The option "extremely familiar" was not chosen by any respondent. From this, we can conclude that respondents are even less familiar with this topic than the term neuroscience itself which can later on have an effect on their willingness to adopt or not to adopt neuroscientific innovations in the field of HRM as this field is new to them. This data

provides an answer to Research Question 2 and states that companies from the Western Balkan do not have extensive knowledge on this topic.

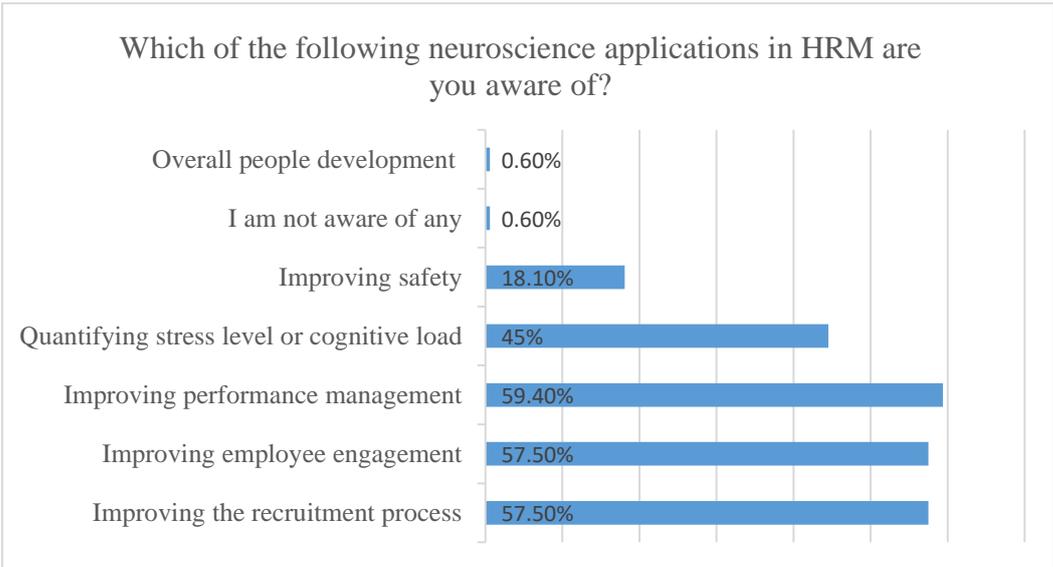
Figure 8: Level of familiarity with application of neuroscience in HRM



Source: Own work.

Regarding the question 11: “Which of the following neuroscience applications in HRM are you aware of?” the aim was to find out more about the respondents` knowledge about the application of neuroscience in HRM, so the respondents were presented with the multiple-choice questions, where they could choose with what application they were familiar with or add an option if they knew something that was not mentioned.

Figure 9: Level of awareness towards neuroscientific applications in HRM



Source: Own work.

The figure 9 shows that majority of respondents (59.4%) are familiar with the application that improve performance management, followed by applications that improve employee management and recruitment process (57.5% each), quantifying stress level or cognitive load (45%) and improving safety (18.1%). We noted that just one respondent added another option and just one another respondent chose the option that he/she is not familiar with any applications.

### 5.1.2 Level of readiness for training

The third part of the survey was focused of training and innovations in this field. When it comes to training on using neuroscientific methods in HRM, 90% of the respondent said that they have not attended such training while, 10% responded that they did.

For the sample that answered that they did attend the trainings in this field, one new question was presented that was not shown to the other part of the sample that did not go to these trainings, asking to shortly describe the trainings. 15 respondents provided answers to this question giving variety of answers.

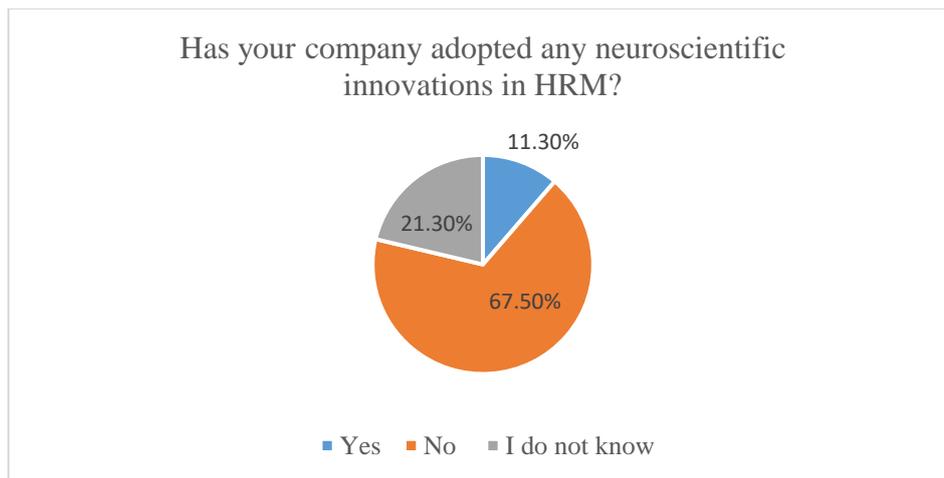
Three respondents answered that they attended mindfulness meditation. Mindfulness meditation is a technique that aims to guide your attention, which means being aware of your breathing, thoughts, and movement (Yilmaz, n.d.). This demonstrates that respondents are conflating this term with the concept of neuroscience. Six respondents answered that they have attended training in how to improve performance management through motivation, self-confidence and similar. This also show respondents are not really familiar with this topic as they conflate it with other terms. However, 5 respondents showed that they really do understand what trainings in neuroscience are and said that they attended education in how can neuroscience help in selling bank products or provide information about the level of stress in the process of recruitment. In addition, respondents attended educations in developmental neuroscience, NLP master, brain adaptive leadership approach as well as applying neuroscience in candidate assessment, recruitment process.

Even though that this number of respondents that really did attend workshop concentrated on applying neuroscience in HRM is small, it shows that some trainings in this area exist in the Western Balkan and that there is room for further progress. Lastly, one respondent said that they had attended Dr. Nikolaos Dimitriadis' lecture, who has been applying neuroscience in communication, marketing, leadership and education for over 15 years (HR. Weekend, 2023). The survey's findings revealed two things. First off, it supported the notion that respondents are not particularly informed about the key concepts of applying neuroscience, as was already discussed before. Second, even though some people mistake this phrase with others, a few respondents really received extensive training on the subject, and workshops of this nature do exist in the Western Balkans.

### 5.1.3 Level of adoption of neuroscientific application in HRM

Question number 13 asked: “Has your company adopted any neuroscientific innovations in HRM?”. The results are presented in the figure 11. 67.5% of the respondents claimed that their company has not embraced any neuroscientific advancements in HRM, whereas 11.3% said that their companies have done so. 21.3% of respondents are unaware of any neuroscientific innovations that their companies have used in this field.

*Figure 10: Has your company adopted any neuroscientific innovations in HRM?*

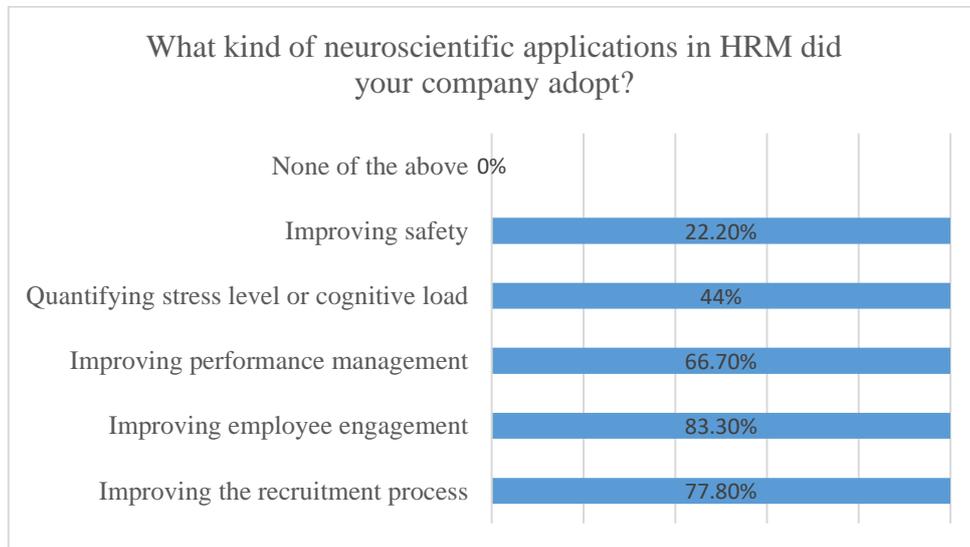


*Source: Own work.*

The following two questions there was a condition that the respondents stated that their company has adopted neuroscientific innovations in HRM, for the rest of the sample, these questions were not shown. Question: “What kind of neuroscientific applications in HRM did your company adopt?” was aimed at the 11.3% of the respondents that had previously answered that their companies have adopted neuroscientific innovations in HRM. For those respondents, one more question was opened with the goals of finding out more about their experience with those innovations. These questions were not presented for the 67.5% of the respondents who answered that their companies did not use any of these kind of innovations within their business, as well as for the 21.3% of the respondents who chose the option “I do not know”. For the question that followed, respondents were asked to choose what innovations that their company adopted were (when it comes to applying neuroscience in HRM). The options were exactly the same as they were for previous question. As presented in the figure 11, most of the respondents (83.3%) responded that when it comes to neuroscientific application in HRM, their companies adopted applications relating improving employee engagement, followed by improving the recruitment process (77.8%), improving performance management (66.7%), quantifying stress level or cognitive load (44.5%). Least number of respondents (22.2%) chose the option “improving safety”. We can conclude from the data that although there aren't many businesses that use neuroscience in human resource management, they nonetheless exist (11.3%). It can be concluded that the applications chosen by the respondents are at the same time, positive sides of the application

of neuroscience in business that was discussed in the chapter before, and that respondents do see the advantage of applying these innovations, as will be discussed further in the thesis.

*Figure 11: Level of awareness towards the application of neuroscience in HRM*



*Source: Own work.*

#### 5.1.4 Employees' experience with the application of neuroscientific innovations

Another question “If your company has adopted above mentioned innovations, please shortly describe the experience” was presented to the mentioned 11.3% of the respondents aiming to find out more about their experience with their company adopting neuroscientific innovations. Out of 18 people that were presented with this question, 12 respondent as this question was left optional. The table presents systematized answers that respondents provided, while detailed explanation will be provided in the section that follows.

*Table 4: Experience of employees with neuroscientific innovations*

NUMBER OF RESPONDENTS	EXPERIENCE
5	Positive experience, improvement was seen, helped with stress resilience
2	Attended neuroscientific trainings and workshops in motivation and leadership
1	Attended mindfulness trainings, which means that they conflate the terms
2	Described NLP as well as Thomas Tests, which means that they expressed high level of knowledge on the topic

*Source: Own work.*

Four respondents explained that those innovations yielded a positive impact on the process of candidate selection as well as on the employees, and that improvement can be seen, which is consistent with the answers the respondents provided in the questions before. One respondent said that the trainings were performed on the global level and later on implemented at local levels. Another respondent explained the recruitment process in detail, stating that when it comes to their company the recruitment process goes through the headquarters, stating that candidates go through the 3 step phase. This respondent also said that besides neuroscientific trainings, their company organises workshops in the field of motivation and leadership. One respondent explained that their company organised mindfulness training which again shows that respondents conflate neuroscientific training with that term. Two respondents highlighted that those innovation provided feedback when it comes to stress resilience. One respondent stated that the NLP (natural language processing) in their company was used for higher management.

One particular answer was interesting saying that their company uses Thomas Test, a psychometric test used in the recruitment process that aims at providing thorough understanding of the candidate's feelings and thoughts. Main benefits of psychometric tests are that they can provide insight at a candidate's workplace personality and skills and because of that, it enables recruiters to make informed decisions and reduce recruitment costs (Thomas Psychometric Tests, n.d.). The administration of psychological, neuropsychological, personality, and academic exams that assess how well the brain is functioning and certain behaviors is referred to as psychometry (Knight & Coniglio, 2022). This being said, Thomas Test can be looked at as the application of neuroscience in HRM, meaning that this respondent is well educated in this area and that their company sees the advantages that this innovation brings. One respondent expressed that people are surprised by the power of reasoning. Lastly, one respondent provided an explanation on how can neuroscience be used, showing that they do understand what are the applications of it, but not really providing its own experience with it.

From the data, we can conclude what was already discussed, there are very few people in the sample that really understand the topic and provided great insight for this thesis. However, great deal of the respondent have just basic knowledge on the matter, but do show enthusiasm when it comes to gaining more knowledge on applying neuroscience in HRM.

#### 5.1.5 Attitudes of the employees from the Western Balkan and Slovenia and Croatia regarding the application of neuroscience in HRM

The following question: “Please rate your level of agreement with each statement, from strongly disagree to strongly agree” was consisted of five statements regarding trainings, gaining more knowledge on this topic as well as willingness to apply neuroscience in their companies. Respondents were provided with a Likert scale and options ranging from strongly disagree to strongly agree. Numeric values were assigned to each of the options of the respondents’ attitudes, starting with grade 1 being assigned to “strongly disagree”, 3 being

assigned to “neither agree nor disagree” all the way to “strongly agree” being given a grade 5. For all of the statements/attitudes the average number will be assigned and discussed. The average grades were calculated using Descriptive statistics in SPSS, which are presented in the Table 5.

*Table 5: Descriptive Statistics*

	N	Minimum	Maximum	Mean	Std. Deviation
14. Statement 1: If there was an opportunity for my team to attend a training session in the field of Neuroscience and its application, I would attend it.	160	1	5	<b>4.27</b>	.785
14. Statement 2: I would be willing to invest time/money for the training session in the field of Neuroscience	160	1	5	<b>3.86</b>	.896
14. Statement 3: I do not believe that Neuroscience helps in other fields besides medicine	160	1	5	<b>1.84</b>	1.009
14. Statement 4: I would be willing to learn basic neuroscientific principles if it would be helpful for my job position]	160	1	5	<b>4.34</b>	.753
14. Statement 5: If majority of companies started to apply this new practice, I would be willing to extend my knowledge in this field]	160	1	5	<b>4.19</b>	.805
Valid N (listwise)	160				

*Source: Own work.*

The first statement aimed at understanding whether the respondents would be willing to attend neuroscientific training if there was an opportunity for them. The average grade of the provided answers was 4.28 meaning that that number falls above the number 4 assigned for option “agree”. We can conclude that there is a very high probability that majority of respondents would attend the trainings in this field if provided with an opportunity, showing that there is enthusiasm in learning more about the application of neuroscience in HRM.

The second statement aimed at discovering if respondents would be willing to invest time/money in attending the workshops in the field of neuroscience. Following the same logic explained for the Likert scale questions, average grade was 3.86, which is still above average but below the grade assigned for the option “agree”. This grade is lower than for the question before. Majority of respondents are ready to invest time/money into these workshops. We can conclude that respondents would be willing to attend the workshops.

With the third statement we wanted to test if respondents believe that neuroscience can be used in other fields besides medicine, but the question was asked using a negation. The statement was the following: “I do not believe that neuroscience helps in other fields besides medicine”. The average number for this statement was 1.84, being below the grade assigned for option “disagree” meaning that majority of respondents disagree with the given statements, which means that majority of respondents believe that neuroscience can be applied in areas besides medicine, which is promising as it means that there is awareness of its application in other fields.

Fourth statement had a similar aim as the statements described above, but wanted to really understand respondent’s willingness to learn basic principles of neuroscience when it comes to it being useful for their job position. The average number was 4.34 which is meaning that the respondents more than agree with the statement. We can conclude that respondents would be willing to learn more about this topic if that knowledge can be applied and used at their job post. This particular data is interesting as it shows that when it comes to investing time/money in learning and gaining knowledge on the field of neuroscience, respondents do show less enthusiasm, but when put in another perspective, that is when they can use it in a professional way, they show enthusiasm and willingness.

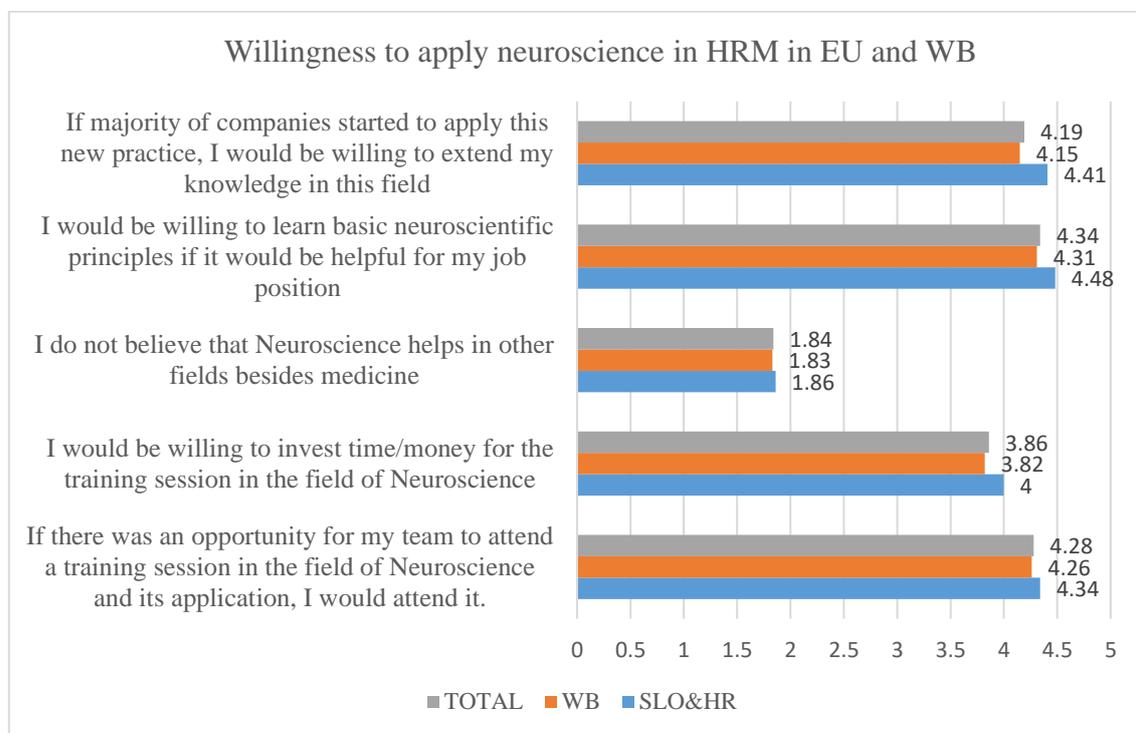
Last statement from this set of questions was also put in professional frame and asked if majority of companies decided to adopt neuroscientific innovation in their practices, would they be willing to extend their knowledge on the matter. Average number for this statement was 4.19, meaning that it falls under the option “agree” and that most of the respondents would be willing to get more knowledge on the topic if other companies started applying neuroscientific tools and knowledge. However, that number is lower than the average number for the question before. We can conclude that respondents are more willing to learn about this topic if they can use it at their job position, then they are for them to be proven competitive at another company.

To summarize, based on the entire sample, which includes Western Balkan countries as well as Slovenia and Croatia, there is a high level of agreement with wanting to learn more about neuroscience and its application in HRM, even investing time/money to further educate themselves. Furthermore, the majority of the sample strongly disagreed with the notion that neuroscience can only be applied in the domain of medicine.

In order to provide answers to research questions, cross tabulations were done in the SPSS. Questions 14 and 17 were recognised as the most important parts and they were used for deeper analysis through cross tabulation. Answers (means) to the question 14 and 17 were analysed depending on where their head quarter are (WB or Slovenia and Croatia) what the respondents` position at the company is, size of their company, how many years has their company been operating for and what the annual turnover is. The means are shown in the figure below, and they will be used as a foundation for the analysis to determine whether there are variations between different segments.

When it comes to the head-quarters of the company and its cross comparison to the question 14, there are very small deviations in answers in the averages for Slovenia and Croatia on one and WB countries on other side, as can be seen in the figure 12.

Figure 12: Willingness to apply neuroscience in HRM, EU VS WB



Source: Own work.

All respondents more than agree with the first statement. In Slovenia and Croatia respondents are slightly above average expressing higher level of agreement with this statement, with Western Balkan countries being below the average which represents an almost insignificant deviation from the mean. Results from the second statement provided a similar conclusion, meaning that there is a slightly higher level of agreement in the Slovenia and Croatia when it comes to having more costs in order to gain more knowledge on the topic of neuroscience. For the third statement respondents expressed level of disagreement with the fact that neuroscience can be only used in the field of medicine. Slovenia and Croatia expressed higher level of agreement, but still very close to the mean calculated for

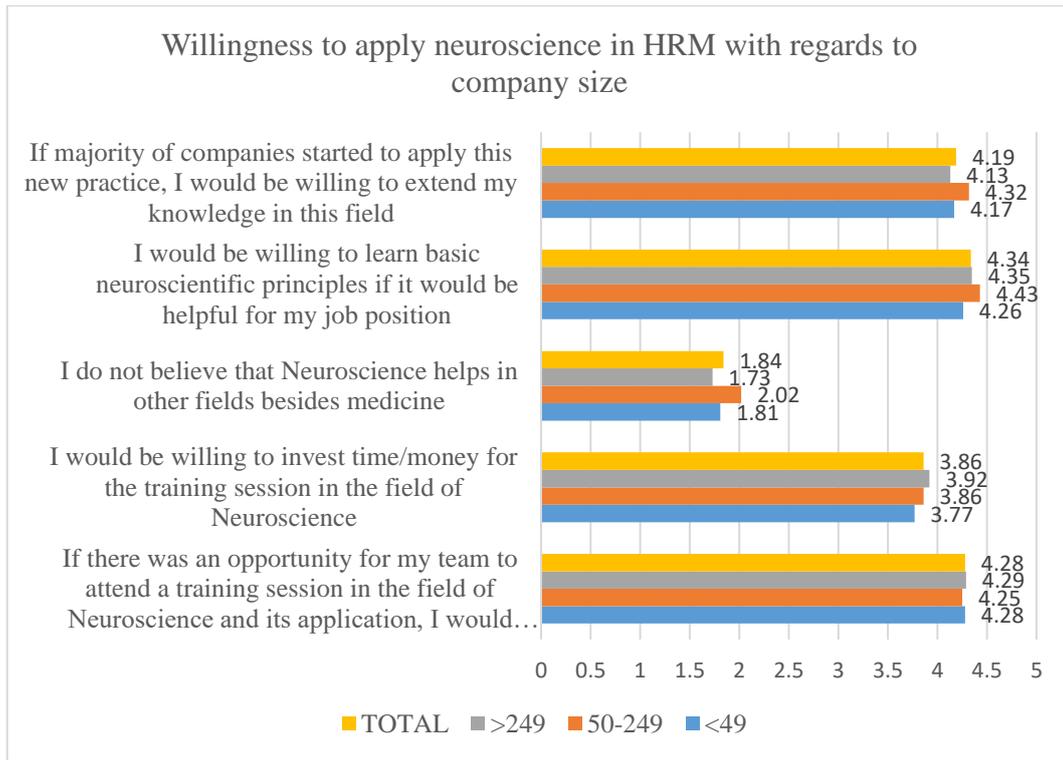
this statement. When comparing the data, past claims relating to the minor variations between the Western Balkan and EU countries' results are validated. The results from the fourth statement presented what has been consistent for most of the statements, that there are no large deviations from the mean between the results, meaning that when it comes to comparing Western Balkan countries with two EU countries, the differences are almost insignificant. Even though the difference between the responses from these two categories is slightly higher in this case when compared to the statement before, deviations from the average number (specifically when it comes to Western Balkan countries) are still minimal. Last statement provided similar conclusion. Earlier conclusions about insignificant deviations from the average number are also confirmed in this case. Having that said, it can be concluded that there are no significant differences between Western Balkan countries and Slovenia and Croatia when it comes to wanting to learn more on the application of neuroscience in HRM and believing that neuroscience can be used in other fields.

When it comes to the position of the respondents at the company, three categories were recognised, HR position, Management position-not in HR as well as administrative position, with only 3 respondents selecting that option which is why this category will not be taken into consideration.

For these segments (Management position VS HR Position), deviations from the mean were insignificant and extremely small, but some conclusions can still be drawn from them. From the results, we can conclude that HR employees expressed a slightly higher level of agreement with all the statements when compared to the Management professionals regarding the question 14. This can probably be due to the fact that those in Management positions wear multiple hats and have other responsibilities within the company and do not consider trainings as a real benefit as HR people see it. In addition, as mentioned before, HR professionals are probably more likely to want to be included in the trainings as they constantly search for new opportunities and ways to improve themselves, however, once again, this is just an assumption as deviation from the mean are almost insignificant. In addition, results also showed that employees from the HR department believe that neuroscience can be used in other fields, while professionals from Management positions show lower level of disagreement from them even coming close to being neutral. Moreover, it was deduced that both departments would be willing to further educate themselves on the topic if it proven useful for their job post. It is important to mention that this average number is the same as the one for the first statement, meaning that employees are mostly interested to learn about this topic if the education is provided at the company and important for the job. The last statement proved this point even further expressing that that participants are more interested in learning more about the matter if proven useful for their company rather than if it were a new trend within the job market.

Responses to the question 14 of the participants from the survey based on the size of the company they work for are presented in the section that follows. Results are presented in the figure 13.

Figure 13: Willingness to apply neuroscience in HRM with regards to company size



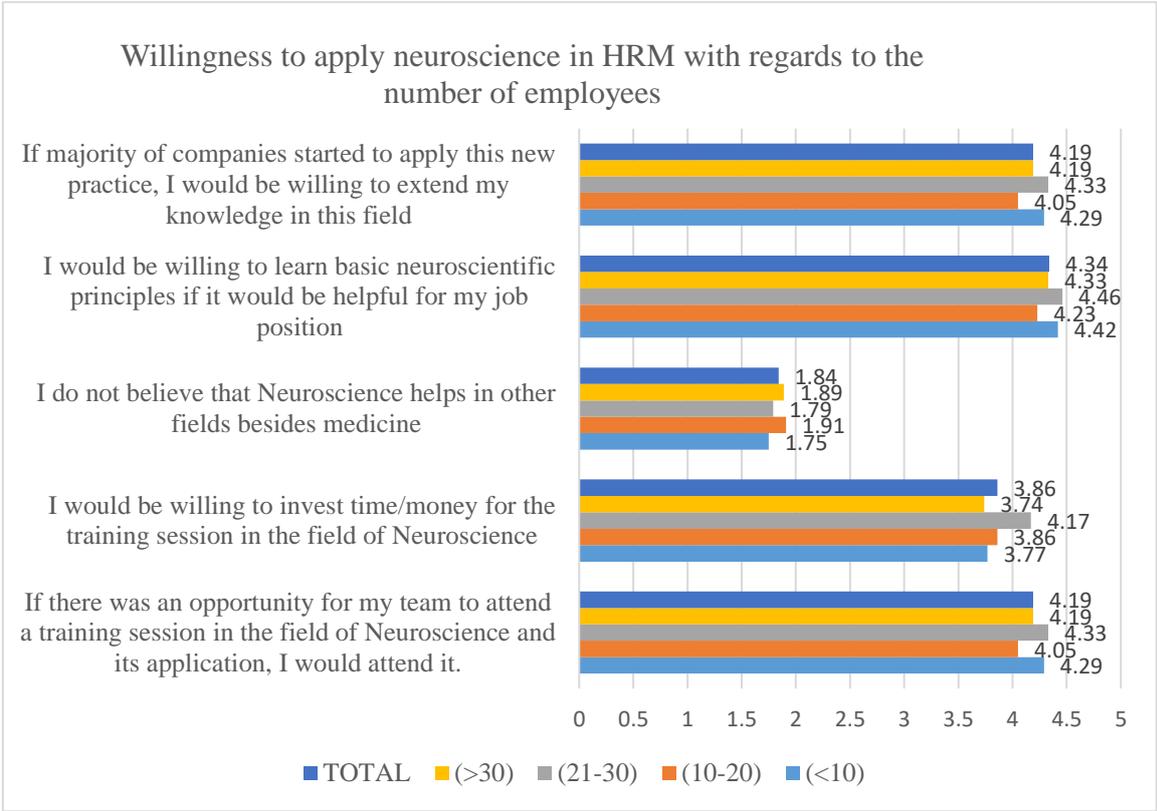
Source: Own work.

In this case also, we can conclude that there are no significant deviations from the mean among the 3 subsamples. Regardless the size of the company, they would be willing to invest time/money into learning more on the topic, however, large enterprises expressed the highest level of agreement with the statements. In addition, both small and large companies disagree with the fact that neuroscience can only be used in the field of medicine. From the small deviations from the mean, it can be concluded that medium and large companies presented higher level of agreement with the statement that they would be willing to learn more about the topic if proven useful for their company. Only in the fifth statement, there was a larger level of deviation from the average number, meaning that medium enterprises have a higher level of agreement when it comes to learning more on the topic if other companies started using this approach.

In addition, responses to the question 14 of the participants from the survey based on how many years the company has been operating were analysed in order to gain insight if this company determinant has the effect on the decision of the company regarding the application of neuroscience in HRM. From the results provided in the figure 14, we can conclude that regardless of how many years the company has been operating for, they all disagree that neuroscience should only be used in the field of medicine. In addition, similar results were provided when it comes to learning more on the topic if proven useful for their company. This means that regardless the number of years that the company has been operating for, all companies expressed higher level of agreement to learning more on the subject of applying

neuroscience in HRM if it would be of use for the company that they work. However, they expressed lower level of agreement when it comes to learning more on the topic if other companies started adopting it. Again, the trend of small deviations from the mean continues and it can be deduced that due to that, the number of years that the company has been operating for does not have an impact on the companies’ decision to adopt or not adopt neuroscientific innovation. However, it needs to be emphasized that with the increase of sample size, this assumption could potentially change.

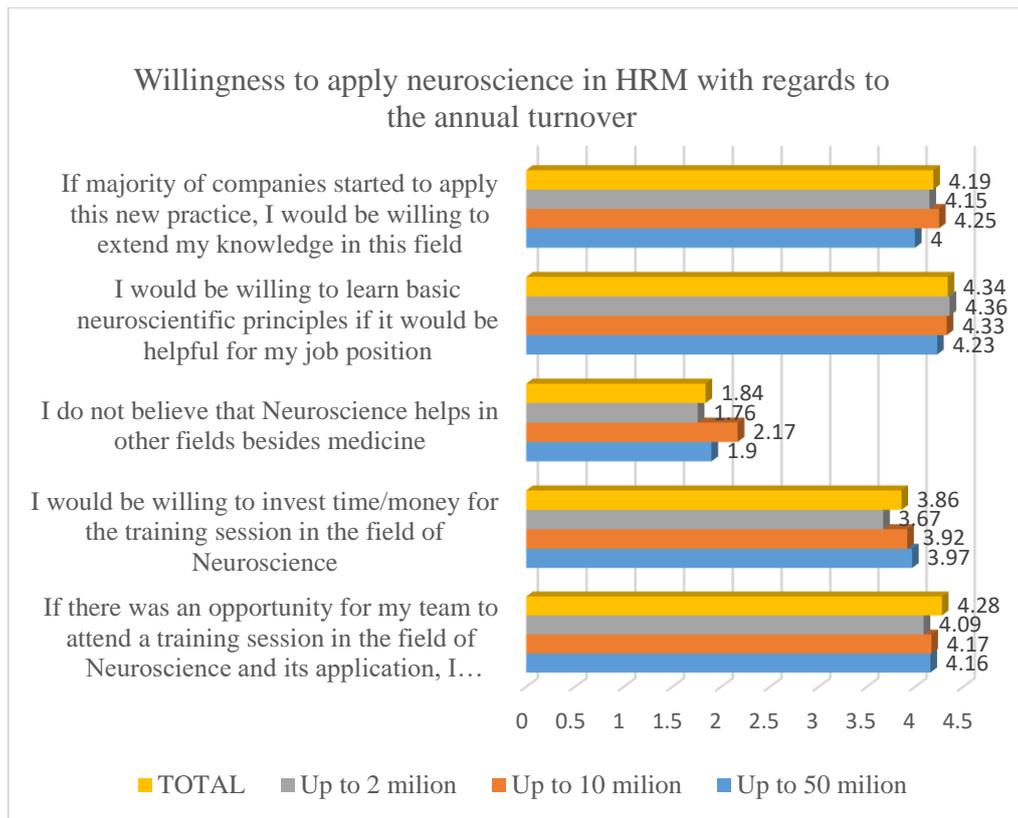
Figure 14: Willingness to apply neuroscience in HRM with regards to the number of employees



Source: Own work.

Last category that was used for cross comparison with the question 14 aimed at understanding if another company determinant such as annual turnover affects the decision of the company to adopt or not adopt neuroscientific innovations in HRM. For the question regarding the annual turnover, there were three options; companies with the annual turnover of up to 2 million, 10 million, 50 million and the option “I do not know”. This last option will be disregarded in the analysis that follows. The collected data show, once again, almost minor variations from the mean. Looking at the results provided in the figure 15 on the next page, we can conclude that annual turnover of the company does not have significant impact on the willingness to learn more about the term neuroscience, attend trainings if proven useful for their job or job at the other company.

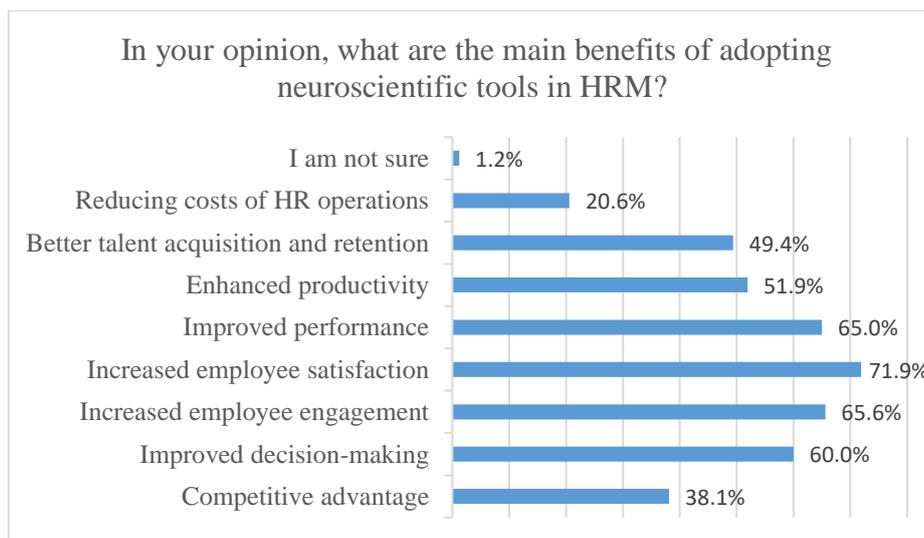
Figure 15: Willingness to apply neuroscience in HRM with regards to the annual turnover



Source: Own work.

Question 15:” In your opinion, what are the main benefits of adopting neuroscientific tools in HRM?” in the survey was focused on benefits of adopting neuroscientific innovations in HRM. Results are presented in the figure 16.

Figure 16: Benefits of adopting neuroscientific tools in HRM

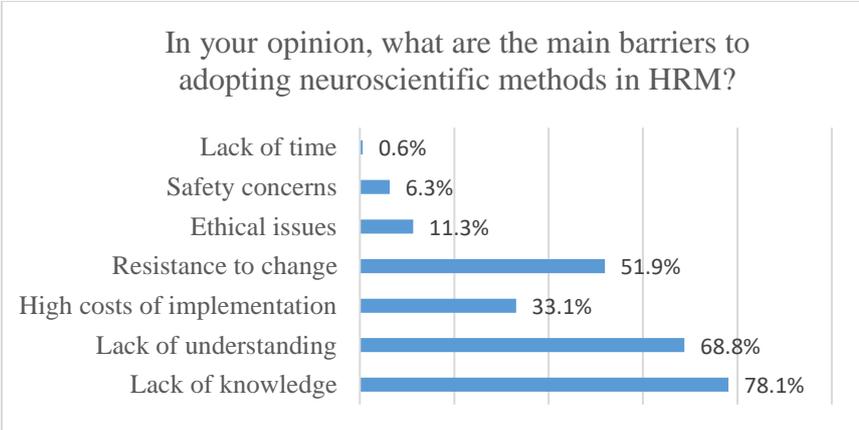


Source: Own work

Multiple options were given to the respondents, as well as the chance to add another if they could think of something that wasn't covered in the list. Majority of the respondents (71.9%) recognised that increased employee satisfaction was the main benefit of adopting neuroscientific tools in HRM. Increased employee engagement was the second most chosen option (65.6%). We can conclude that main benefits that respondents can see are concentrated on employees and their well-being. 65% of the respondents think that improved performance is the main benefit, followed by improved decision-making (60%). Enhanced productivity was believed to be the main benefit by 51.9% followed by better talent acquisition and retention 49.4%. For the option that competitive advantage that neuroscientific tools give 38.1% sees it as the main benefit and lastly 20.6% chose reducing costs of HR operation. Only 1.2% of the respondents were not sure what the main benefits are. We can conclude that majority of respondents recognised the main benefit to be for the employees and their performance, with a significant portion of them also seeing the advantage for the company.

Question 16:” In your opinion, what are the main barriers to adopting neuroscientific methods in HRM?” was focused on finding out what respondents believe are the main barriers to adopting neuroscientific innovations in HRM. This question was also multiple response question, with an option for respondents to add another one. As presented in the Figure 17, majority of respondents stated that lack of knowledge (78.1%) was the main barrier, followed by lack of understanding (68.8%). Resistance to change was thought to be the main barrier by 51.9% of the respondents, followed by 33.1% thinking that high costs of implementation should have that position. 11.3% of respondents believe that ethical issues are the problem when it comes to adopting this innovation in HRM, followed by 6.3% of respondents thinking that safety concerns are the main barrier. Lastly, marginal 0.6% added an option that lack of time is the biggest hurdle. It can be concluded that when it comes to barriers, majority respondents saw internal/personal factors to be the biggest problem; that is lack of knowledge and problems with adapting to new things. Second place was given to high costs for the company.

Figure 17: Main barriers of adopting neuroscientific methods in HRM



Source: Own work.

In the last question of the survey, we have used once again the Likert scale with seven statements/attitudes regarding the complexity of the term neuroscience, its usefulness and problems and opportunities it brings. This question stated:” Please rate your level of agreement with each statement, from strongly disagree to strongly agree”. Once again, to get a better insight of the level of agreement respondents had towards these statements, numeric values were assigned to each of the five options presented in the Likert scale. Using the same system and logic explained for the question 14, average grade was determined. For each statement that number will be discussed. As explained for the question 14, average grades were calculated in the SPSS, and the results are presented in the table 6.

*Table 6: Descriptive Statistics*

	N	Minimum	Maximum	Mean	Std. Deviation
17.Statement 1: Neuroscience is too complicated	160	1	5	<b>2.66</b>	.768
17. Statement 2: I believe there is a bright future for practical use of neuroscience in multiple fields	160	1	5	<b>3.98</b>	.696
17. Statement 3: I believe that neuroscience should only be used in medicine	160	1	5	<b>1.92</b>	.908
17. Statement 4: Neroscience raises ethical concerns	160	1	5	<b>2.79</b>	.864
17. Statement 5: Neuroscience will gradually become more accessible and understandable to all parts of the world	160	1	5	<b>3.78</b>	.766
17. Statement 6: Neuroscience is only for highly educated personnel	160	1	5	<b>2.54</b>	.924
17. Statement 7: Practical use of neuroscience is too expensive and can only be used by large companies	160	1	5	<b>2.88</b>	.827
Valid N (listwise)	160				

*Source: Own work.*

The first statement aimed at giving insight in whether respondents believe that neuroscience is too complicated. The average number was 2.66 meaning that it falls below the average assigned to the option “neither agree nor disagree”. We can conclude that majority of respondents believe that neuroscience is not too complicated.

Second statement was focused on finding out if respondents believe there is a bright future of the application of neuroscience in HRM. The average number was 3.98, meaning that respondents agree with the statement regarding the advancement and frequent use of neuroscience in the field of HRM in the future.

Third statement wanted to once again test if respondents think that neuroscience should only be used within the limits of medicine. The average number was 1.93, which means that respondents disagree with the fact that neuroscience can only be applied in medicine meaning that there is opinion that there are other fields where neuroscience can be applied at.

The fourth statement wanted to see if respondents believe that neuroscience raises ethical concerns. The average number was 2.79 meaning that majority of respondents do not agree with that statement as this number falls below the average assigned to the option “neither agree nor disagree”.

The fifth statement wanted to get insight on level of agreement of the respondents with the fact if neuroscience will with time become more accessible and understandable with all parts of the world. The average grade for this statement was 3.78 which is close to the level grade assigned for the option “agree” meaning that the respondents mainly agree with the statement.

The sixth statement aimed at understanding if respondents believe that neuroscience is only for highly educated personnel. The average grade was 2.54, meaning it is below average and within the grade assigned to “disagree”. This means that respondents believe that this field can be learned and that there is space for people in this field that do not have extensive knowledge on it.

The last statement aimed at seeing if respondents believe that the practical use of neuroscience is only for large companies and too expensive. The average number was 2.88 meaning that majority of respondents do not agree that practical use of neuroscience can only be leveraged by large companies. They also do not agree that it is too expensive. The results show that there is room for application of neuroscience in medium and small companies.

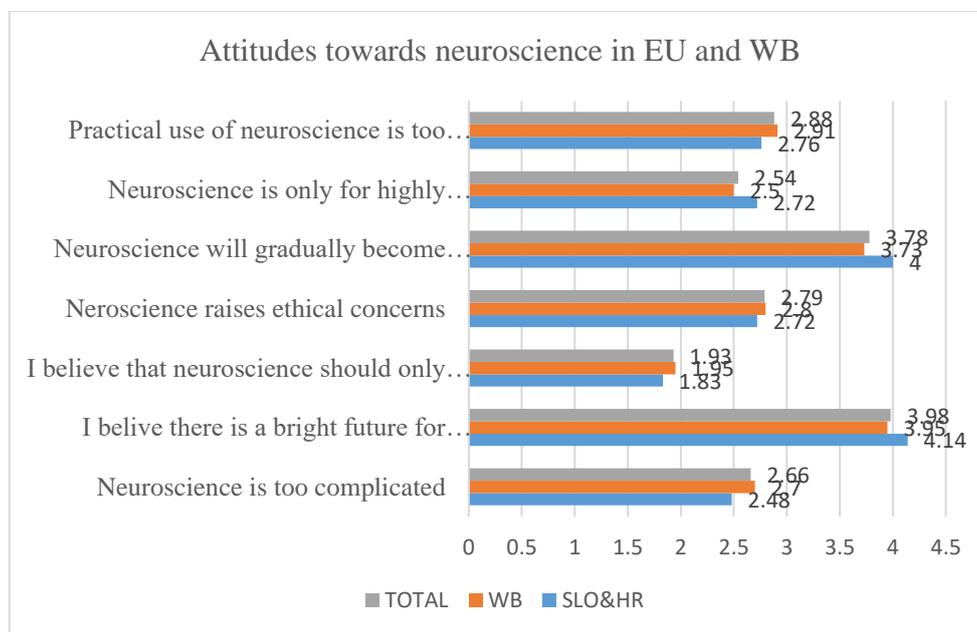
It can be concluded that generally speaking, the respondents expressed the highest level of agreement with the fact that there is a bright future for practical use of neuroscience in multiple fields as well as with the statement that neuroscience will gradually become more accessible and understandable to all parts of the world. On the other hand, they have

expressed the lowest level of agreement with the statement that neuroscience should only be used in medicine, meaning that among this sample, there is a high level of belief that neuroscience can be used in other fields.

Cross tabulations with this question is done regarding the headquarters there are (WB or Slovenia and Croatia) what the respondents position at the company is, size of their company, how many years has their company been operating for and what the annual turnover is. The means are shown in the figure below, and they will be used as a foundation for the analysis to determine whether there are variations between different segments.

We will start with the answers of two subsamples WB countries on one side, and Slovenia and Croatia on other side (shown in the following figure 18).

*Figure 18: Attitudes towards neuroscience in EU and WB*



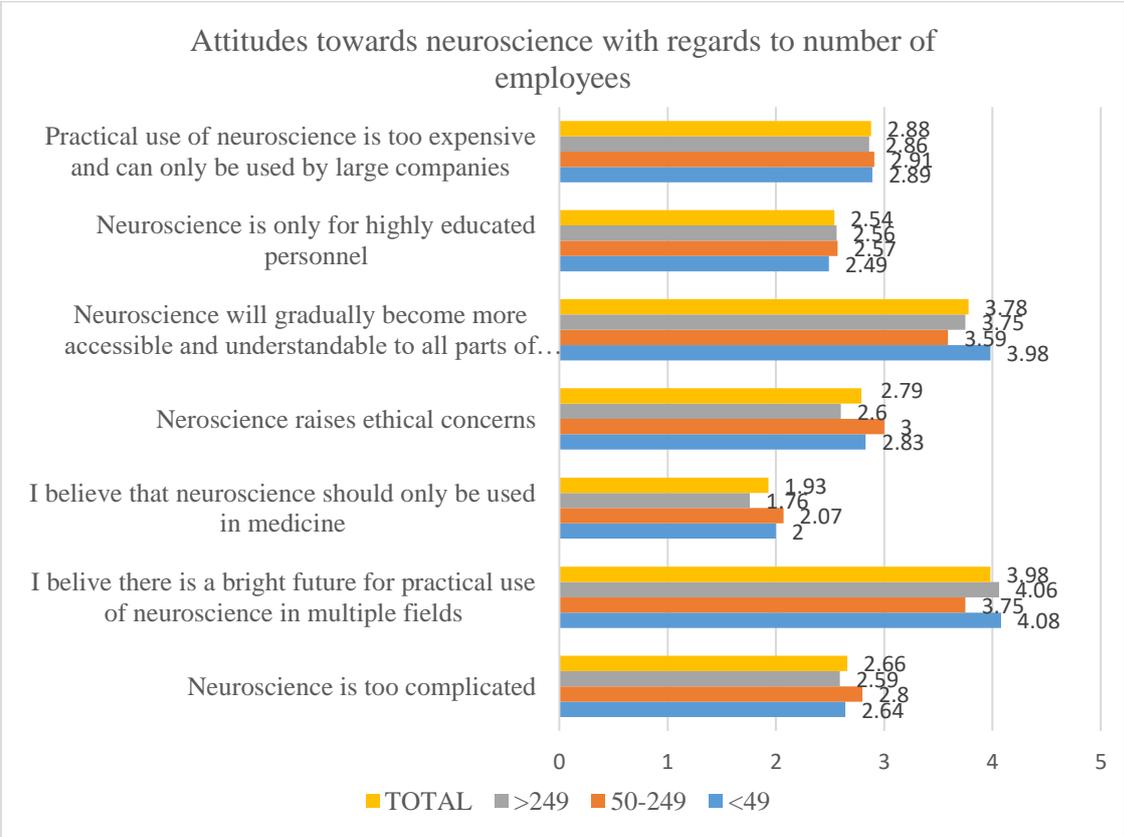
*Source: Own work.*

No significant differences between Western Balkan countries and two EU and SEE countries, Slovenia and Croatia exists, as deviations from the mean are almost insignificant. However, when considering those small deviations, some differences can be seen. We can conclude within the Slovenia and Croatia there is a slightly higher level of agreement that neuroscience can be used in other fields when compared to Western Balkan countries. Although, these differences are still considered insignificant. In addition, we can conclude that EU countries have a little bit higher level of agreement when it comes to believing that with time, neuroscientific tools will be more available. Also, considering the small deviations from the mean, slightly higher level of agreement was presented in the Western Balkan countries that neuroscience is only for highly educated personnel. In addition, EU countries presented a slightly higher level of disagreement to the claim that neuroscience is

expensive and is only useful for large companies. However, from the presented results it is evident that deviations from the mean are small in all of the statements. Having that in mind, we can conclude that there are no substantial differences between the responses given in the Western Balkan countries and Slovenia and Croatia, two EU countries. Having that said, we can disregard the minor variations between them that were described above and move on to analyse the entire sample to gain insight into the factors that influence SEE companies' decisions to adopt or not to adopt neuroscientific innovations in HRM.

Same logic was used for the next category in order to analyse if the size of the company will have influence on companies' attitudes regarding the complexity of the term neuroscience, its future etc. as it is shown in the figure 19. Having in mind that there are no extreme deviations from the average for the rest of the statements, we can conclude that the size of the company does not have a significant effect on the decision of the companies' willingness to learn more about the topic to adopt or not adopt neuroscientific innovations. However, it has a slight impact when it comes to willingness to adopt neuroscientific innovation within their company, as medium enterprises expressed the highest level of concern when it comes to neuroscience being too complex, raising ethical issues and being only useful for highly educated personnel and large enterprises. It should be noted that these deviations are not significantly higher from the average.

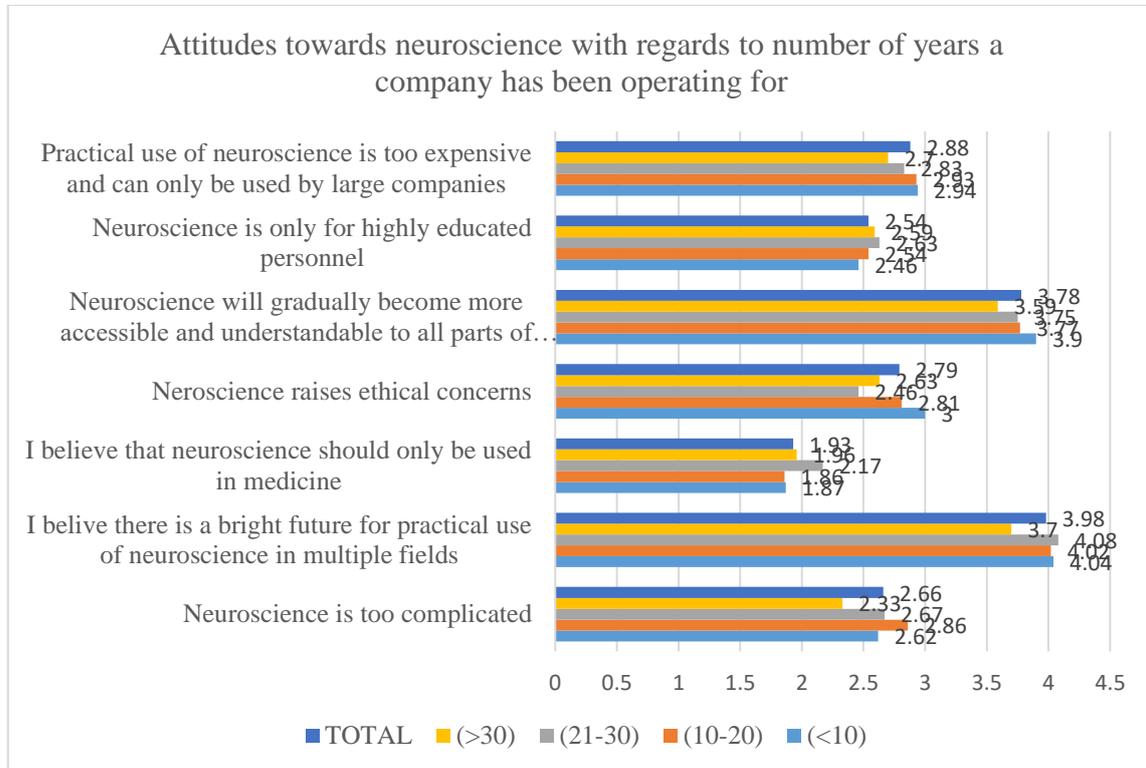
Figure 19: Attitudes towards neuroscience with regards to number of employees



Source: Own work.

The next cross comparison aimed at understanding if how many years the company has been operating for has an effect on the decision of the company regarding the application of neuroscience in HRM. The results of the mean are presented in the figure 20.

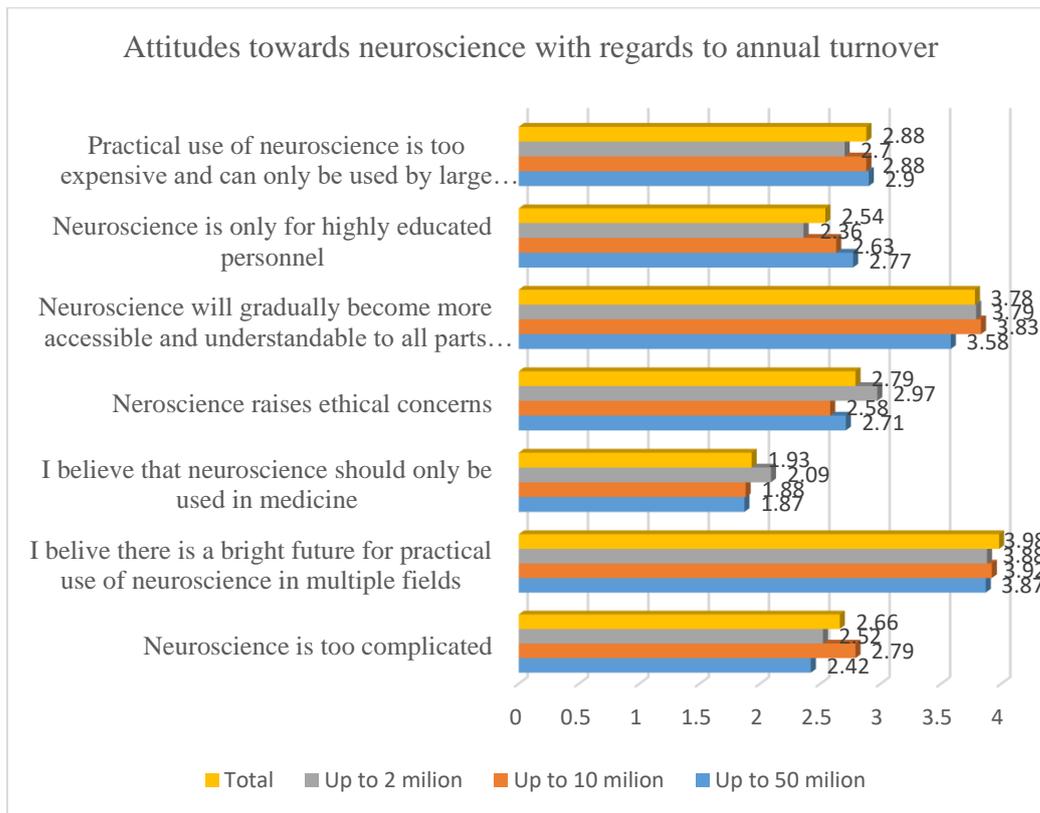
*Figure 20: Attitudes towards neuroscience with regards to number of years a company has been operating for*



*Source: Own work.*

We can conclude that there is no significant impact on the companies' opinion towards how complicated the field is, how useful it is and what its potential future can be, as there are no deviations from the mean. When it comes to the statement that neuroscience is too complicated once again, small deviations from the mean were presented, however, in companies that have been operating for more than 30 years, a slightly (but still insignificant) deviation from the average number can be seen, meaning that they have expressed the highest level of disagreement.

Figure 21: Attitudes towards neuroscience with regards to annual turnover



Source: Own work.

Last category, annual turnover was also cross compared with the statements from the question 17. Results are presented in the figure 21. We can conclude that for this question also, there are no significant deviations from the average number, as was the trend for this whole section. However, largest deviations from the average, but still small, were seen in companies with the annual turnover of up to 50 million expressing the lowest level of disagreement that neuroscience is only for highly educated people, meaning that there is some level of hesitation to its application by people that do not have extensive knowledge on it. This can also be proved by the fact that these companies also expressed lowest level of agreement when it comes to neuroscience being more useful and understandable over time. We can conclude that there is a possibility that within the companies with the annual turnover of more than 50 million, there is a lesser level of enthusiasm towards this new approach. However, these companies expressed highest level of disagreement that neuroscience is too complicated, but this can also show that these companies do not consider this field too complicated, but are not eager to apply it in the field of business. This statement can also be proven by the fact that these types of companies expressed the lowest level of enthusiasm to learn more about the field of neuroscience if other companies started applying it, as well as the lowest level when it comes to educating themselves more on the matter if proven useful for their job position.

To conclude, with this section we wanted to discover if there are differences between Western Balkan countries as well as Slovenia and Croatia when it comes to applying neuroscience in HRM. In addition, the goal was to discover if specific characteristics such as; country where the head-quarters are, size of the company, annual turnover and number of years a company has been existing has an impact on the companies' decision to adopt or not to adopt neuroscientific innovations in HRM. Due to small deviations from the calculated mean from the provided responses, we concluded that there are no significant differences between Western Balkan countries and Slovenia and Croatia when it comes to this topic. In addition, it was deduced that the mentioned characteristics do not impact the companies' decision when it comes to application of neuroscience in HRM. However, for the purpose of research, those small deviations were regarded and analysed with the hope that those conclusions could potentially be proven when increasing the sample size.

## **5.2 Results of in-depth interviews**

As was discussed in the chapters above, three interviews were conducted with three different professional to gain better insight on the topic. HRM professional that works at a financial institution provided information about their current practice and shared their knowledge, familiarity as well as level of enthusiasm towards this new field, stating that if it proven useful to their company. They would be willing to adopt this practice. The HR professional provided valuable insight as these professionals are of focus to this thesis. That is why the first set of questions to this participant aimed at discovering how does the process of the HRM look like, what tools they use and do they see the space for improving the methods they are currently applying. They explained the importance of the HR department emphasizing its role of the support system to the company. They further explained how the HR listens to the needs of employees and adopts personalized approach as well as that this department motivates growth and provides support to the management when it comes to decision making. When asked about the flaws of the current methods they use and how it can be improved, they stated that the process of selection can be improved with a good test of characteristics. This proves that within the HR world, there are those professionals that see the need for improving the existing practice.

Neurologist shared extremely valuable thoughts relating the neuroscientific tools, their use as well as his thoughts about how these methods can be applied in the HRM. This participant chose this field specifically as the development of neurology in the last decade has lead to prolonging life expectancy of some very ill patients as well as brought cure to some cases that were not able to be cured in the past. Given that a person with a medical background highlighted the potential and benefit of using neuroscience in the field of human resources, this respondent, who has more than 10 years of experience, offered information of the utmost significance. This was the only interview that was done in person.

Last participant was a person from the world of practice, who shared how their company uses neuroscientific insights in daily business, specifically in communication and coaching

in Slovenia. They are the owner of the consulting company that is focused on building and implementing strategy of communication in multiple fields ranging from political campaigns to the HR. This interview was valuable as it provided an opportunity for further comparison about the level of awareness about this practice between Western Balkan countries and one of the members of the European Union, Slovenia.

When analysing the interviews, the following conclusions emerged which are presented in the table 7, will be analysed in more detail in the text that follows

*Table 7: Conclusions from the interviews*

<b>KEY FINDINGS:</b>	<b>INTERVIEWEE/ QUOTE</b>
Neuroscience is useful for the field of HRM.	All three professionals
The main problems of applying neuroscience in HRM are lack of knowledge, hesitation towards new approaches and high prices.	HR professional “My biggest concern would be the reaction of the candidates during the selection process, that is whether they are ready to use the tool”
Applying neuroscience in business can improve decision-making.	Neurocoach
The enthusiasm to learn more about this approach is high.	Neurologist
Neuroscientific tools could potentially be superior to traditional methods.	Neurocoach “The advantage is in additional insights beside traditional methods“
Tools such as EEG and EMG can be useful for the HRM practitioners.	Neurologist

*Source: Own work.*

### 5.2.1 Expert opinion about the application of neuroscience

Regarding the awareness of the term neuroscience, the most knowledge, naturally, had the neurologist that has been practicing this field of medicine for more than 10 years. Neurocoach has a masters’ degree in languages and is familiar with the basics of psychology as well as neuroscience and is familiar with the use of NLP method. The HR employee was moderately familiar, which can be concluded from the explanation they provided on opportunities and threats of using neuroscientific tools in HRM. These results on the level of familiarity with the mentioned term are consistent with the data obtained from the survey questionnaire, that HR personnel are moderately familiar with this term.

When it comes to applying neuroscience in the field of Human resources management, HR personnel stated that they are not sure how what their opinion is towards this, showing a level of hesitation; also consistent with the results obtained from the survey. The participant from practice showed enthusiasm explaining that their company uses neuroscience and applies it in the field of communication. They further explain that they want to find out how people understand messages as well as how they make decision, with the goals of influencing

them. However, it needs to be emphasized that this company does not use neuroscientific tools, but they follow the field and use the insights, understanding of mental processes as well as neuroscientific discoveries. They further explained neuroscientific insights can be applied in all of the phenomenon that involves mental processes of people, stating that the application is difficult due to the lack of available technology and personnel, specifically neurologists outside of the field of medicine. In addition, they explained that by companies can adapt their processes as well as environment in order to avoid stress as well as improve efficiency of employees by understanding the mental processes. Neurologist provided a completely new perspective stating that he believes neuroscientific tools such as EEG and EMG as well as neuroscientific insight and knowledge can provide information that are not written in the books. They further explained that the EEG some characteristics can be seen and with EMG life habits, expressing that this could be of use for the HR department. They also underlined that he believes the future for neuroscientists to be bright. When asked about the further advice for the researchers in the application of neuroscience in the field of economics, they stated that it would be of use to make a multidisciplinary team that would also be consisted of neuroscientific experts and that he believes by doing this, valuable insight will be provided.

#### 5.2.2 Expert opinion about opportunities and threats of applying neuroscience in HRM

Every innovation is accompanied by a surge of enthusiasm as well as skepticism. In order to acquire a deeper understanding of opportunities and challenges, experts were interviewed. The expert from practice stated that when it comes to opportunities, the question of understanding the reality of the mental process is the main focus. They further gave examples on where can neuroscience be applied at, specifically when it comes to the field of human resources, stating that neuroscientific methods can measure reactions to different stimuli, and because of that, provide a better interpretation as well as insights when compared to traditional methods. They also stated that by having this kind of knowledge on the neural basis as well as psychological construct, a whole picture is built which can be useful for change management. However, when asked about the challenges of this new approach, they stated what the problem is, as many old beliefs will have to be changed there will be a paradigm shift. This is understandable as people are hesitant to change, and it is only logical that they will act in a similar fashion when it comes to this new approach. In addition, they put an emphasis on the possibility of manipulation as big data and biometrics are prone to it. However, they offer a solution explaining that if used in an ethical manner, this manipulation can be a good thing as it can lead to nudges that can further have a positive impact on the society, if not misused.

The HR employee at first expressed scepticism towards the application of neuroscience in the field of HRM, stating that they have heard about it, but they are not sure how they feel towards it. However, they have shown positive attitude to learning more on this topic. This point of view is also consistent with the obtained results from the questionnaire, and the pattern here can be seen; the HR personnel are a bit sceptic but they would be willing to

learn more. When it comes to the opportunities of using this approach, the participant recognized that it could change the process of selection, but also stated the concerns about how the employees would react to the tools being used. They claimed that compared to conventional approaches, neuroscientific technologies would produce results more quickly. They noted that there are situations where the candidate performs well on the interview, but the practice shows the opposite. They believe the neuroscientific tools can be used in this particular example. Regarding the threats of using this approach, they state the hesitation of people towards this new approach, stating that they believe it would cause discomfort and stress, which the HR especially does not want for their candidates or employees.

When asked about the opportunities of using neuroscience in fields besides medicine, the neurologist explained that basic knowledge on the functionality for example left and right hemisphere can be of use for somebody doing an interview. They went on to say the objectivity to be one of the advantages of using these types of tools, and the precision of obtained results. When asked about the threats and limitations of these methods, they stated the possibility of technical problems and the possible bad images due to the magnetic forces used.

### 5.2.3 Expert opinion on the companies` perspective

This section was of main focus as it was extended the results obtained from the survey questionnaire and provided more detailed descriptions of the opinion that the companies have towards this approach.

The HR professional stated that they believe that one of the reasons that companies would have to adopt neuroscientific innovations in HRM is that these tools provide quicker results. They underlined that they are a better tool for decision making and would even replace the tests of characters that are being used at the moment. Regarding the reasons that the companies would have not to adopt this approach, the participant left it blank.

The neurologist believes that the tool EMG can be proven of use for the election and recruitment of the employees that need to have some manual and mechanical abilities. This tool provides that kind of information that can not be obtained using any other method.

The neurocoach believes the biggest worries that companies have regarding the use of neuroscientific tools in their business are prices of the needed technology as well as the lack of knowledge. This insight is also consistent with the results obtained from the questionnaire where 78.1% of the respondents stated this to be one of the main barriers to this approach. The participant underlines that there is a solution to these problems, firstly the development of the industry as well as education can lead to price decrease. Also, experts from outside of medicine from the field of neurology is needed to provide valuable insight for businesses. When it comes to the reasons for adopting this approach, they believe that it is because of how interesting the field is as it is something new, but they do emphasize that the management also needs to be open to new approaches.

## **6 RECOMMENDATIONS AND LIMITATIONS**

The thesis used both primary and secondary data that were analysed in order to provide answers to research questions. The main purpose was to provide the explanation what are the determinants of Western Balkan companies' decision to adopt or not to adopt neuroscientific tools and insights in the field of human resources management. The research was consisted of both qualitative and quantitative research techniques that gave the same recommendations that will be discussed in the following section.

### **6.1 Recommendations based on the research findings**

Based on the results from both the expert interviews as well as survey questionnaire, it can be concluded that a small number of respondents were really aware of what the application of neuroscience in HRM means. Majority of respondents are moderately familiar with the term neuroscience itself (37.5%). However, their knowledge on its application in other fields is limited. Because of this, it is understandable why there is a certain level of hesitation towards this innovation. Having that in mind, one of the reasons why companies are not willing to adopt neuroscientific innovation is the lack of knowledge in this area. In order to solve this problem, there should be a way to educate people on the basis of the functionality of the human brain, having in mind that the reviewed literature shows that even elementary insight on how the brain works can be helpful for decision makers, marketers as well as human resources practitioners. Informing the public about the topic of neuroscience as well as its possible application in other fields can be done through elective courses in high-schools or Universities, trainings within the companies, or even focus groups suggested by the interviewed neurologist.

From the survey, we can conclude that there is a strong will to learn more about this field, 94.8% of the respondents, meaning that demand for these types of educations and courses is high, which is a good opportunity for neuroscientists and neuro-professionals to start offering some kind of educational programs from the field of neuroscience. By increasing the level of knowledge about the topic, it is possible that the opinions of the employees in the HRM will shift from being sceptic to being enthusiastic, having in mind that people are reluctant to things they do not know a lot about. This can be also concluded from the interview with the HRM practitioners that stated that they would be willing to learn more about this if proven useful in their company. Educating people about the benefits of using this innovative approach can lead to raised awareness of the topic and increased willingness to try neuroscientific application. Agencies as well as companies with a developed HR department can help with this by writing blogs and promoting new ideas in business. A good example is the company Promosapiens as well as NeuroVirtu that write blogs on their websites and whose owners, such as the case with Neurovirtu use social media to talk openly about this topic and spread awareness.

In addition, this thesis found out that specific determinants such as country where the headquarters are, size of the company, age, annual turnover, do not affect the decision to adopt or not neuroscientific tools in HRM. However, this could potentially change by increasing the sample size.

As proved by the reviewed literature, neuroscience is finding its way to different fields and its insights are being used in fields that were unimaginable a decade ago. This research demonstrated that there is room for advancement in this area of HRM practice, as well as a desire to learn more about it. As a result, with time and with more in-depth understanding of the subject, the perspectives of employees in HR could potentially change.

*Table 8: Summary*

<b>FINDINGS</b>	<b>RECOMMENDATIONS</b>	<b>BEST PRACTICE</b>
Low level of awareness towards application of neuroscience in HRM	Increase trainings at the companies regarding this topic	Companies that use Thomas Tests
There is no significant difference between WB and EU when it comes to application of neuroscience in HRM, but practical examples show otherwise	WB companies should learn from the practical examples from Slovenia and Croatia	Promosapiens and tool NeuroHR
Specific characteristics (country where the HQ are, size of the company, age, annual turnover) do not affect the decision to adopt or not neuroscientific tools in HRM	This could be a stimulus to any company size, country of the HQ or annual turnover could take into consideration to adopt neuroscientific tools in HRM	Promosapiens

*Source: Own work.*

## **6.2 Limitations of the research**

The literature on applying neuroscience in HRM is currently limited, however, researchers in the field of neuroscience and its application in different fields of business is growing and it is understandable to expect that the field of neuroeconomics will see growth. Young academicians and researchers may find it difficult to write their papers on this topic due to the lack of relevant literature, which limits the foundation of their research and makes it difficult to draw conclusions.

An important limitation was the sample size of the research conducted. As the target group was specific, inviting only HRM practitioners or those who handle HR duties, it is reasonable why the sample consisted of 268 respondents. In addition, by increasing the sample size, a better and more complete picture could be provided.

The sample included in this study holds significant value due to its inclusion of several countries and a diverse range of human resource management specialists with various job titles. Furthermore, the sample utilized for the interviews possesses inherent strengths as it

encompasses three distinct individuals that collectively hold a shared perspective about the application of neuroscience in the field of Human Resource Management (HRM). The research could also benefit from conducting a larger number of interviews with a more diverse set of practitioners that would in even more specific manner point out the opportunities and threats of using this new approach as well as provide a better picture on reasons companies are enthusiastic or hesitant to this field.

Lastly, adding additional techniques for data analysis would result in providing better ideas. These techniques could be regression analysis as well as factor analysis.

## **CONCLUSION**

The main purpose of the thesis was to provide the insight on what are the factors affecting Western Balkan as well as Slovenian and Croatian companies' decision to adopt or not to adopt neuroscientific innovations in HRM and to critically analyse the opportunities, barriers as well as challenges of using neuroscientific tools and innovations in the field of HRM. The thesis also determined the level of awareness that HRM employees have on the term neuroscience itself as well as the application of it in the field of HRM.

The first research question, concerning how can companies leverage advances in neuroscience in order to improve HRM, was answered with insights from literature review as well as with the gathered data from the interviews and survey. The reviewed literature showed that companies may benefit from using neuroscientific tools in a variety of ways. Starting with helping to understand how emotional processes impact our decision making, which can be valuable for HRM professionals. Another way that companies can make use of neuroscientific methods is in the recruitment process that can be improved by using these insights to remove problems that biases cause. In addition, even knowledge on how the human brain works can help the HRM professionals by making them better understand the employees, help them reach their full potential and find better ways to motivate them. Furthermore, because these techniques can offer a deeper understanding of employee behaviour, neuroscientific tools may also be helpful in assessing the level of employee engagement. One of the interviewees, a neurologist, explained that only by using specific neuroscientific tools, such as EMG, it can be concluded that a person has needed motor abilities, which is of high importance for many occupations, such as repairers, tool grinders, dentists, jewellers, aircraft mechanics and other. Another interviewee, a neurocoach, emphasized that companies can use neuroscientific insights in order to improve certain aspects of business. By understanding how the human brain works, companies may modify their procedures and working environment to reduce stress and boost employee productivity. The reviewed literature proves that there are opportunities for advancement in this field, as Willer 2016 explains that the field of HRM can reach its full potential if it focuses on "administrating and optimizing brains" (Willer, 2016).

From the survey we concluded that majority of respondents overall saw (potential) neuroscientific innovations in HRM as predominantly positive. Naturally, advancements

could not be possible without taking care of barriers. When it comes to main barriers of this new approach, the respondents stated that they believe it is lack of knowledge (78.1%), followed by lack of understanding (68.8%) and resistance to change (51.9%).

To advance neuroscientific innovations in HRM, we need best case references. Starting with the company Promosapiens that applies specific neuroscientific tool called NeuroHR in order to provide insights on the level of satisfaction of the employees as well as their perception on the company they work for. As this tool can measure the unconscious processes, it means it can provide more useful insight than would for example in-depth interview or survey. Another good example from practice is the company Direct Neuro that uses multiple neuroscientific tools such as EEG, GSR as well as Face, Voice analysis and eye-tracker in marketing as well as human resources. These practical examples show that there are companies who are successfully in applying neuroscientific tools and this trend could increase with years and improved knowledge on the topic. In addition, experts from other fields, such as those that were included in the interview expressed a high level of enthusiasm toward this new innovation. One of the very valuable insight from this research can be seen in the response of the neurologist that stated that these tools would in fact be valuable to people in the field of economics, specifically in HRM as these tools provide more precise information than do the traditional methods, which is also stated in the literature.

The second research question was related to the level of awareness that companies at the Western Balkan have on using neuroscientific tools in HRM. The obtained data gathered from the HRM professionals or those who handle HRM related duties, shows that the level of awareness with the application of neuroscience in HRM is relatively low. Some respondents even conflated this term with others, such as mindfulness meditation. Yet, despite the relatively little hands-on knowledge and experience, respondents are highly enthusiastic about the prospects of neuro-HRM innovations., The majority of the respondents are willing to learn more about this topic (87.6%) and would be willing to invest both time and money to do so.

Relating the subquestion about how can Western Balkan companies learn from Slovenia and Croatia, we revealed that there are no significant differences between these two subcategories when it comes to willingness to apply neuroscience in HRM. However, companies successfully applying neuroscience in the field of business in Slovenia and Croatia, such as Promosapiens, Neurovirtu and Neuroagencija, are setting the standards for Western Balkan companies, such as NeuroHM.

The thesis also studied the determinants of the Western Balkan companies' decisions to adopt or not to adopt neuroscientific approach towards Human Resources Management. The research findings indicate that criteria such as the location of head-quarters, the duration of companies' operations, and annual turnover do not have a significant influence on this decision. The results showed there are minor differences between the responses given in the Western Balkan countries and Slovenia and Croatia.

When it comes to the position of the employees and their willingness to learn more on the topic HRM professionals expressed higher level of enthusiasm to learning more about the topic of neuroscience. The size and age of the company do not have a significant impact on the employees' will to learn more about the topic. However, employees of medium size companies expressed the highest desire to learn.

In sum, the thesis captured an interesting paradox: among HRM professionals in the Western Balkans, there is overall limited familiarity with the particularity of neuroscientific innovations in HRM, but there is a high level of enthusiasm and willingness to learn. Organizations have the potential to enhance their workforce's knowledge on this subject matter, while also fostering their motivation to acquire further understanding about the practical implications of neuroscience within the realm of Human Resource Management (HRM). One potential strategy to enhance knowledge on the subject matter would involve arranging training sessions and inviting industry professionals to facilitate them. In the realm of further academic research, the discipline of neuroeconomics is seeing a notable advancement, with an increasing number of scholars expressing a growing curiosity in this subject area. Furthermore, universities are actively promoting this emerging field of study and facilitating research by offering resources and facilities within their faculties to support the production of academic papers exploring the use of neuroscience in the business domain.

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## **APPENDICES**



## **Appendix 1: Abstract in Slovenian**

Nevroznanost postaja vse pomembnejša za razumevanje kognitivnih vedenj, kot so čustva, učenje, spomin in intelekt, ki so ključnega pomena za izobraževanje. Zaradi tega se nevroznanost uporablja na različnih področjih, vključno s poslovanjem, trženjem, financami in upravljanjem človeških virov (HRM). To magistrsko delo se osredotoča na uporabo nevroznanosti na področju HRM, njegov namen pa je obravnavati pomembna vprašanja in podati priporočila. Nevroznanost ponuja priložnosti za izboljšanje in nadaljnji razvoj upravljanja človeških virov in se razlikuje od tradicionalnega pristopa k upravljanju. Prihodnost upravljanja človeških virov je odprta, nanjo pa vplivajo nove tehnologije, napredek znanja, spremembe na področju dela in globalizacija. Orodja, kot so EEG in nevrokardialni monitorji, lahko spremljajo vedenje in odločanje z nevrološko-psihološkega vidika. Ta orodja lahko zagotavljajo bolj natančne informacije za upravljanje človeških virov z vidika izboljšanja delovnega okolja in motivacije delavcev. Vendar pa je uspeh neuroekonomskih strategij še vedno negotov. Namen te magistrske naloge je razumeti odločitve podjetij z Zahodnega Balkana za uvedbo nevroznanstvenih inovacij na področju HRM ter podati priporočila za uporabo nevroznanstvenega znanja in orodij.

Da bi pridobili vpogled v uporabo nevroznanosti v HRM na Zahodnem Balkanu, je bila izvedena spletna raziskava z 268 anketiranci iz šestih držav. Poleg tega so bili za dopolnitev raziskave in zagotovitev celotne slike opravljeni poglobljeni intervjuji s strokovnjakom s področja HRM, nevrologom in strokovnjakom s področja neurocoachinga.

Čeprav se ta magistrska naloga usredotoča na regijo Zahodnega Balkana, v raziskavo so dodane tudi države jugovzhodne Evrope, Slovenija in Hrvaška, saj je bilo ocenjeno, da bi vključitev teh držav dodala vrednost sami raziskavi. Razlogi za takšen pristop niso bili le zagotovitev podlage za primerjavo, temveč tudi uporaba izkušenj in znanja teh držav, ko gre za uporabo nevroznanosti na različnih področjih razen medicine, zlasti na področju HRM. Ker se regija Zahodnega Balkana vse bolj vključuje v EU in globalno gospodarstvo, je ta pristop še bolj upravičen. Zaradi vse večje prisotnosti mednarodnih podjetij je Zahodni Balkan tudi regija, kjer so prisotne inovacije na področju HRM. Vendar pa je Zahodni Balkan tudi regija, ki je premalo raziskana, vključno z uporabo novih tehnologij in zlasti nevroznanstvenih tehnologij v HRM. Zato je namen tega magistrskega dela prispevati k zapolnitvi te raziskovalne vrzeli, hkrati pa oblikovati uporabna priporočila, ki lahko koristijo podjetjem, ki poslujejo na področju Balkana.

Na podlagi raziskave smo ugotovili, da večina anketirancev vidi potencial nevroznanstvenih inovacij na področju HRM kot pretežno pozitiven. Vendar pa lahko na podlagi rezultatov anketnega vprašalnika in intervjujev s strokovnjaki tudi sklepamo, da se le majhno število anketirancev resnično zaveda, kaj pomeni uporaba nevroznanosti v HRM.

Pregledana literatura je pokazala, da lahko podjetjem uporaba nevroznanstvenih orodij koristi na različne načine; na primer pomaga razumeti, kako čustveni procesi vplivajo na

naše odločanje, kar je lahko dragoceno za strokovnjake s področja HRM. Poleg tega lahko nevroznanstvene tehnike omogočajo globlje razumevanje vedenja zaposlenih in so lahko koristne tudi pri ocenjevanju stopnje zavzetosti zaposlenih.

Raziskava je tudi pokazala, da podjetja, ki uspešno uporabljajo nevroznanost na poslovnem področju v Sloveniji in na Hrvaškem, kot so Promosapiens, Neurovirtu in Neuroagencija, postavljajo standarde za podjetja na Zahodnem Balkanu, kot je NeuroHM.

Raziskava je preučevala tudi dejavnike, ki vplivajo na odločitve podjetij na Zahodnem Balkanu, da sprejmejo ali ne sprejmejo nevroznanstveni pristop k upravljanju človeških virov. Ugotovitve raziskave kažejo, da merila, kot so lokacija sedeža, leta delovanja podjetij in letni promet, nimajo pomembnega vpliva na to odločitev.

Ta raziskava je pokazala, da je na področju prakse upravljanja človeških virov še veliko prostora za napredek in še, da obstaja tudi želja po dodatnem spoznavanju tega področja. Posledično bi se s poglobljenim razumevanjem te teme potencialno lahko izboljšale perspektive uporabe nevroznanosti v HRM.

## **Appendix 2: INTERVIEW 1: Neurocoach**

1. *When did you start showing interest in the field of neurocoaching? How long have you been researching this field?*

Some 20 years ago during the master in linguistics I found cognitive linguistics and started to study applied neuroscience on my own. Beside NLP as a basic method that I encountered earlier, this was a new field of my interest. In this years I have been following the development of neuroscience and its use in other fields.

2. *What does your company do? What are the main services you provide? What are its mission and vision?*

My company is a consulting company focusing on the strategy of communication in different fields (from HR to political campaigns). The mission of the company is to be a family company offering business infrastructure to family members. The vision is to be a highly specialised consulting firm with high added value and therefore high end price of consulting.

3. *What tools/methods do you most frequently use for coaching and consulting?*

We use the insights from neuroscience and psychology and apply them in the field of communication. The main questions are: how do people understand messages, how do people make decisions, and how can we influence these processes. We are eclectic in the use of different methods and we approach each project case by case.

4. *In what areas can neuroscientific knowledge be applied to?*

Basic insights can be applied in every phenomenon that involves people and mental processes. While it is not so easy to directly apply technology since it is not so available and it is difficult to find neurologists outside medicine. So we base our work on neuroscience discoveries and we interpret it in order to use it in practice.

5. *What are the tools and methods that neurocoaching uses in everyday practice?*

We use the understanding of mental processes, especially the process of meaning construction (interpretation, decision making). So we use the logic that is discovered and not directly technological approach and research by our own.

6. *In what areas of your business do you apply neuroscientific tools at?*

As said, we don't directly use tools, but follow the field and use the insights.

7. *What are the opportunities of this new approach?*

It is very important to understand the reality of mental processes. So it is an ontological and epistemological question.

8. *What are the challenges you face everyday as an expert in this field?*

Especially the fact that neuroscience is facing a paradigm shift based on its discoveries, and since many old beliefs have to be changed.

9. *Can you please give me an example of the application of neuroscience in the field of business, specifically human resources management?*

Understanding the mental processes with a biopsychosocial model helps to adapt the company's environment and processes to avoid stress and to improve the efficiency of employees. One can measure physiological reactions to different situations and so improve the interpretation beside traditional methods (interviews, polls...).

10. *In your opinion, what are the main advantages of using neuro knowledge and neuro tools in comparison to traditional methods?*

Understanding the process from biological drive to psychological constructions helps see the whole process and to apply this understanding in change management. The advantage is in additional insights beside traditional methods.

11. *What potential threats could the use of these tools lead to?*

Biometric and big data has a big potential for manipulation. But if this is used ethically the manipulation will bring positive results (as choice architecture and nudging), while it can also be misused.

12. *What do you believe are the biggest worries that companies have regarding the use of neuro tools in their business?*

Lack of knowledge and the price of direct use of technology.

13. *How do you think that this problem can be solved?*

Education and industrial development to cut prices, but especially having more neurologists outside medicine in order to have experts for business purposes.

14. *What do you believe are the biggest reasons why companies chose to apply neuro tools in their business?*

It is interesting for them since it is something new. But the management must be open to new approaches.

15. *Would you and in what area of business apply these tools at?*

Analysis of the situation and challenges, and during change management for checking the real impact of changes.

*16. Do you have something to add, that I have missed bringing up today?*

It is important to follow the latest epistemological development in this field, since the accumulation of insights is bringing a new paradigm that will influence other fields.

### Appendix 3: INTERVIEW 2: HR Professional

1. Šta Vas je privuklo baš ovoj oblasti, i kako je izgledao Vaš početak?

Oblast HR-a me najprije privukla zbog komunikacije sa ljudima, prirode posla koji je veoma dinamičan, briga o zaposlenima koja je ključna za uspješnost u kompanijama.

2. Kako Vi vidite ulogu i značaj sektora ljudskih resursa u Vašoj kompaniji?

Smatram da ljudski resursi igraju značajnu ulogu u svakoj kompaniji gdje postoji veliki broj zaposlenih. Prema mom mišljenju, uloga ljudskih resursa je da bude podrška i oslonac zaposlenima u kompaniji. U svakom trenutku da "osluškuje" njihove potrebe i da ima personalizovan pristup prema svakom od zaposlenih. Pored toga, važno je da ljudski resursi uvijek rade na rastu i razvoju zaposlenih, da imaju sposobnost da prepoznaju potencijal i da to bezuslovno podrže. Sumirano, glavni fokus ljudskih resursa je zadovoljstvo zaposlenih. Pored navedenog, pružaju značajnu podršku menadžmentu u vidu donošenja odluka, koje su sistemski važne za organizaciju.

3. *Kako izgleda proces izbora kandidata? Možete li mi detaljnije objasniti korake u tom procesu?*

Svi kandidati imaju prava na prijavu. Proces selekcije počinje izborom kandidata koji posjeduju kvalifikacije za određenu poziciju. Najčešće se proces odvija u dva kruga selekcije.

Pored HR-a, razgovoru prisustvuju i menadžeri organizacionih jedinica u okviru koje se traži kandidat.

4. *Kako teče intervju i koje metode koristite u procesu selekcije kandidata?*

U uvodnom dijelu, HR predstavlja samu kompaniju, njenu korporativnu kulturu, kao i opis oglašene pozicije. Zatim, riječ prepušta menadžeru organizacione jedinice koji daje detaljniji opis posla. Nakon toga, zajedno HR i menadžer postavljaju pitanja. U zavisnosti od složenosti pozicije, HR ima pripremljen set pitanja koje postavlja kandidatu.

5. *Koje su, prema Vašem mišljenju, prednosti i mane metoda koje trenutno koristite? Da li smatrate da postoji prostor da se taj proces unaprijedi?*

Voljela bih da se proces unaprijedi sa dobrim alatom kao što je test ličnosti. Navedeni test bi radili kandidati koji uđu u uži krug selekcije. Ukoliko je oglašena pozicija menadžerska, HR vrši provjeru referenci.

6. *Da li smatrate da je proces zapošljavanja objektivn ili subjektivn?*

Koliko god se trudimo da bude objektivn, vjerujem da dosta uticaja ima naše samo subjektivno mišljenje koje kreiramo u toku razgovora. Ukoliko se prilikom izbora kandidata ustanovi da HR poznaje nekog od kandidata, nije poželjno da prisustvuje procesu selekcije. Ovo je praksa upravo radi donošenja objektivne odluke.

7. *Da li ste čuli za primjenu neuroloških aparata u oblasti ljudskih resursa? Koji je Vaš stav o tome?*

Čula sam i nijesam sigurna koliko isti podržavam.

8. *Da li smatrate da bi primjena tih alata bila korisni za Vašu kompaniju?*

Vjerujem da bi značajno promijenio tok procesa selekcije i da bi se odluke razlikovale u odnosu na metode koje koristimo. Što se tiče ostalih procesa u kompaniji, nijesam sigurna koliko bi zaposleni bili zadovoljni alatom i u kojim trenucima bi ih koristili (da li je to u važnim razgovorima sa nadređenima ili slično).

9. *Koje bi po Vašem mišljenju bile prednosti, a koje mane upotrebe neuroloških alata u oblasti ljudskih resursa?*

Putem neurološkog alata, u procesu selekcije, vjerujem da bi HR dobio sliku brže nego na osnovu razgovora. Česte su situacije u kojima kandidat "zablista" na razgovoru za posao, a u praksi bude drugačije od onoga što je predstavio. Upravo iz tog razloga, smatram da bi putem ovog alata HR brže donio zaključak i kreirao sliku o samom kandidatu.

Što se tiče mana, nijesam sigurna kakav bi bio odziv korišćenju ovakvog alata kod ljudi u Crnoj Gori. Posebno iz razloga što nije praksa kod nas i odbijaju da vjeruju u nešto što nije skorz ispitano. Samim tim, možda bi pojedincima to izazivalo nelagodu i manji stres, a takav osjećaj ne želimo da ima bilo ko u u našoj kompaniji.

10. *Koji su glavni razlozi, po Vašem mišljenju, zbog kojih su kompanije voljne da upotrebljavaju ove alate?*

Najviše radi "izbjegavanja" situacija kao što je opisana u 9. pitanju i radi bržeg donošenja odluka. Vjerujem da bi ovaj alat u potpunosti umanjio značaj testova ličnosti, kao alat koji se koristi u ljudskim resursima.

11. *Koji su glavni razlozi, po Vašem mišljenju, zbog kojih kompanije nisu voljne da upotrebljavaju ove alate?*

*12. Da li bi Vi kao HR profesionalac bili voljni da upotrebljavate neurološke alate u svojoj kompaniji?*

Bila bih spremna da probam kako bih se uvjerila na koji način funkcioniše. Ukoliko bih uvidjela da to itekako olakšava i ubrzava proces selekcije, svakako bih se odlučila za isti.

*13. Koje procese u upravljanju ljudskim resursima, mislite da bi upotreba neuroloških alata najviše unaprijedila?*

Proces selekcije.

*14. Na primjer, da se Vaša kompanija odluči da koristi neurološke alate u sektoru ljudskih resursa, koje bi bile Vaše najveće brige?*

Najveća briga bi mi bila reakcija kandidata prilikom procesa selekcije, odnosno da li su spremni da se isti alat koristi.

*15. Da li bi ste bili voljni da naučite više o ovoj oblasti?*

Da!

*16. Da li bi pohađjali trening ili neku drugu vrstu usavršavanja orjentisanu na primjenu neuroalata u oblasti HR-a?*

Da!

*17. Da li imate još nešto da dodate, a da procjenjujete značajnim za ovu temu?*

## Appendix 4: INTERVIEW 3: Neurologist

1. *Zašto neurologija? Zašto Vas je baš ova oblast privukla, i kako je izgledao početak Vaše karijere?*

Zbog toga što je to grana medicine koja trenutno ima najveću mogućnost ekspanzije uvođenjem novih terapija, uvođenjem novih patofizioloških mehanizama i zbog toga sam srećan naravno što sam to izabrao zato što smo u zadnjih desetak godina napravili ogromne pomake a naročito u Crnoj Gori u poslednjih 7-8 godina, tako da oni pacijenti koji nekad nisu mogli da budu liječeni, koji su prerano umirali, koji su bili proglašavani kao najteži pacijenti, sada oni spadaju u lakše do srednje pacijente.

2. *Koje aparate Vi kao neurolog koristite u svakodnevnom radu?*

Svakodnevno koristim aparat za elektromioneurografiju, aparat za evocirane potencijale, znači vizuelni evocirani potencijali, somatozenzorni evocirani potencijali, auditivni evocirani potencijali. Povremeno aparat EEG. Dakle, EEG, EMG i evocirani potencijali

3. *Prema Vašem mišljenju, koje su prednosti neuroloških aparata? Šta Vam neurološki aparati omogućavaju da saznate?*

Pružaju ogromnu podršku prije svega u postavljanju dijagnoze, u terapijskim odlukama. Tako da bez njih, mnoge dijagnoze ne bi bile moguće.

4. *Koja su ograničenja sa kojima se suočavate pri upotrebi neuroloških aparata u svakodnevnom radu?*

Pa, sad nešto razmišljajući o njihovim ograničenjima, izuzev nekih tehničkih problema koji mogu ponekad da se jave, iz različitih razloga, prije svega zbog nekog lošeg baždarenja i uticaja magnethih sila koje mogu na neki način da pokvare snimke, nema drugih ograničenja.

5. *Da li ste morali da imate neku obuku koja je bila kompleksnija, prije toga, ili ste to mogli savladati kroz praksu?*

Obuku u trajanju od dvije godine

6. *Da li smatrate da se neuro aparati mogu primjenjivati u nekim drugim oblastima, van medicine? Da bi recimo neka znanja mogla biti korisna za ekonomistu ili za osobu koja radi u HR-u. Koje bi to, po Vašem mišljenju, bile oblasti?*

Mislim da da. Naravno, i kroz EEG i kroz EMG, mi nekad vidimo, odnosno kroz iskustva i znanja vidimo neke karakteristike koje možda nijesu napisane u knjigama. Kroz EEG možda i neki karakteri ličnosti se mogu na taj način procjenjivati. A kroz EMG, životne navike mnogih ljudi bi se mogle vidjeti. Tako da mi recimo na EMG snimku možemo da vidimo ljude koji konzumiraju alcohol, koji konzumiraju psihoaktivne supstance, isto tako i na EEG-

u. Ne možemo sa sigurnošću da tvrdimo ali ako postoji bilo kakva bojazan, može da se potvrdi na ovim snimcima i razišljamo odmah u tom pravcu. Tako da bi imalo smisla. A naročito prilikom odabira ljudi kojima su potrebne neke mehaničke sklonosti, odnosno neka manuelna spretnost, na osnovnu EMG se to brzo vidi.

7. *Možete li dati neki primjer kako se neurološki alati mogu primjenjivati u praksi izvan oblasti medicine, naročito u oblasti ljudskih resursa?*

Odgovoreno gore

8. *Koji je Vaš stav o korisnosti i pouzdanosti rezultata dobijenih ovim putem- za na primjer, ekonomiste, konkretnije zaposlene u oblasti ljudskih resursa?*

To nije definitivno i eksplicitno dokazano. Naravno dokazano je ako sumnje koju postavimo prilikom ovih snimanja i prilikom pregleda kasnije se i definitivno potvrdi. Kažem na osnovu dosadašnje prakse i iskustva itekako može biti povezano.

9. *Da li smatrate da bi elementarno poznavanje funkcionisanja ljudskog mozga, moglo da doprinese osobama zaposlenim u oblasti upravljanja ljudskim resursima?*

Itakako, itakako. I to je mislim veoma važno, poznavanje funkcionisanje lijeve i desne hemisphere mozga, ne do kraja ali približnije da se upozna sa tim. Prilikom intervjuja itekako to može koristiti.

10. *Da li smatrate da bi osoba koja ne posjeduje prethodno znanje iz oblasti medicine, preciznije neurologije, mogla da koristi te alate, na primjer u svrhe istraživanja? Da li bi te Vaše dvije godine prakse mogle nekako da se "zamijene"?*

Mogle bi ali uz neke fokus grupe. Tako bi moglo uz jedan kraći period, asli sam period korišćenja aparata i tehnika snimanja, mislim ispod 6 mjeseci da ne može.

11. *Ukoliko smatrate da ima potencijalnih opasnosti, u primjeni neuro-alata u drugim oblastima, molim Vas da ih navedete.*

Upravo to nepoznavanje do kraja i neadekvatna obuka.

12. *Da li bi neki od alata mogao da pruži jasniju sliku, nego na primjer upitnik, inetrju ili fokus grupa?*

Ja mislim da bi, jer ovo je ipak egzaktno is a dosta jasnim primjerima, a intervju može subjektivni osjećaj biti onakav ili ovakav, dobijamo objektivniju mnogo sliku.

13. *Kakva je Vaša prognoza vezano za buduću primjenu neuroloških znanja u oblastima van medicine, naročito u oblasti ljudskih resursa?*

Neko ko se usko bavi ovim aparatima, ja mislim da ima budućnost i perspektivu.

14. *Koji savjet bi dali mladom kadru koji se bavi istraživanjem mogućnosti primjene neuronauke u ekonomiji?*

Mislim da bi dobro bilo napraviti neki multidisciplinarni tim gdje bi svakako bio prisutan i neurolog i ljudi koji se bave neuronaukama in a taj način da se napravi neki zajednički projekat gdje bi svako sa svoje strane dao doprinos i siguran sam da bi rezultati bili bitni.

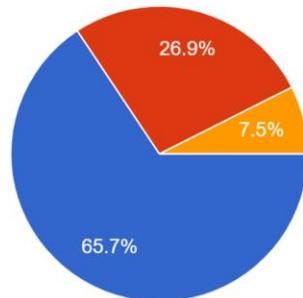
15. *Za kraj, da li bi ste nešto dodali, o čemu u intervjuu nije bilo riječi, a da smatrate važnim za ovu temu?*

Mislim da je to to, da smo zajedno zaključili da se mogu koristiti ove alatke u regrutovanju ili u prolanaženju nekih mana ili prednosti ispitanika.

## Appendix 5: SURVEY

1. Are you an HR practitioner or someone who handles HR related duties in your company?

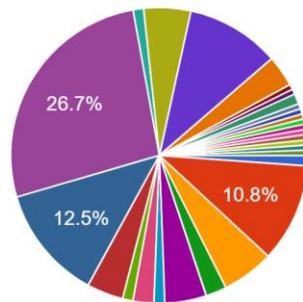
268 responses



- Yes, I hold an HR position in the company
- Yes, I am a person handling HR duties
- No

2. What is your position in the HR department?

176 responses

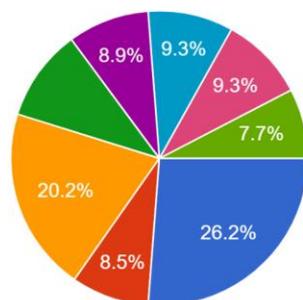


- Employment Manager
- Recruiter
- Recruitment Manager
- HR Analyst
- HR Coordinator/ Staff Coordinator
- Employee Relations Manager
- Executive HR
- Associate Executive HR

▲ 1/4 ▼

3. In which country are the headquarters of your company?

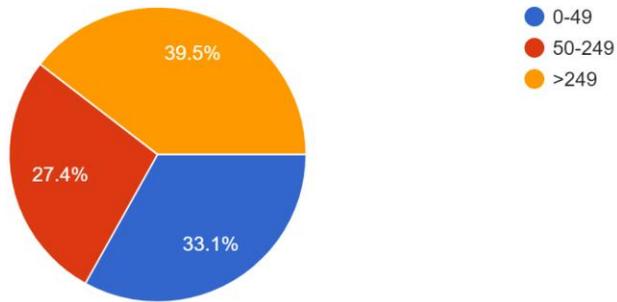
248 responses



- Montenegro
- Kosovo
- Serbia
- Croatia
- Bosnia and Herzegovina
- Albania
- North Macedonia
- Slovenia

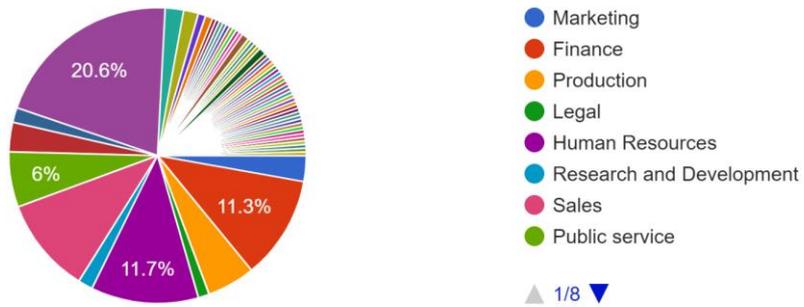
#### 4. How many employees does your company have?

248 responses



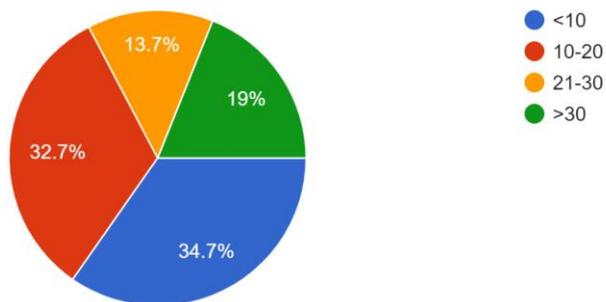
#### 5. In which industry does your company operate?

248 responses



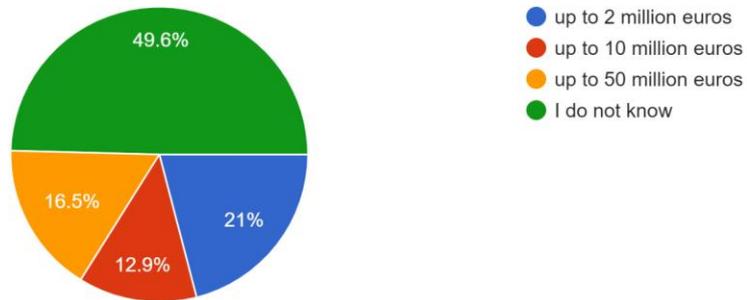
#### 6. How many years has your company been operating for?

248 responses



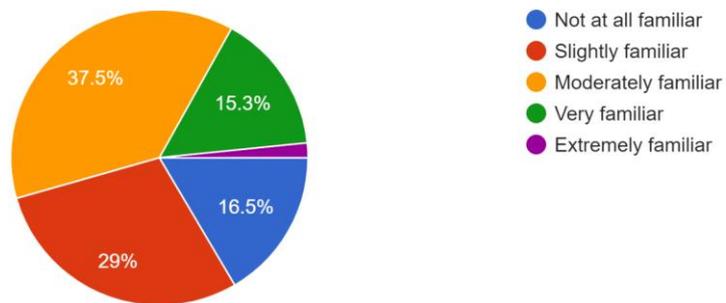
### 7. What is the annual turnover of your company?

248 responses



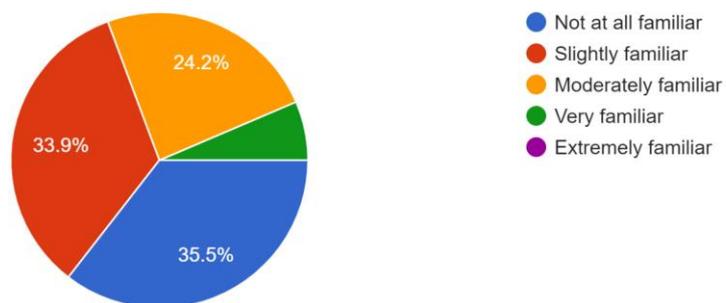
### 8. Are you familiar with the concept of Neuroscience?

248 responses

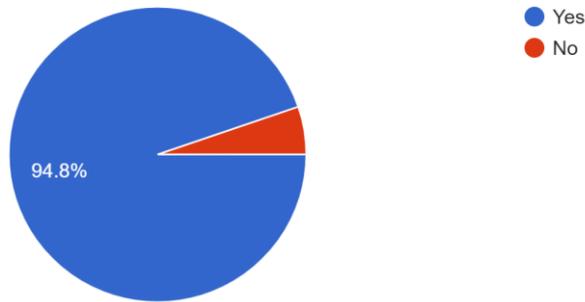


### 9. How familiar are you with the applications of neuroscience in HR management?

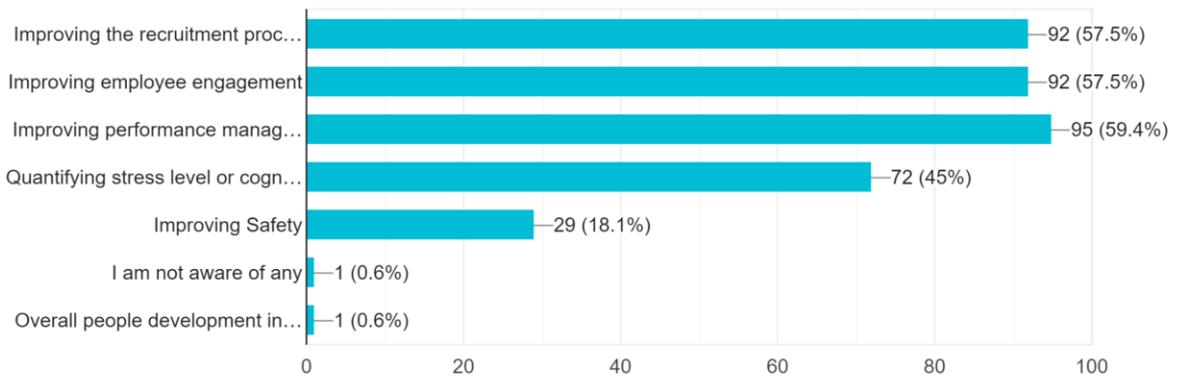
248 responses



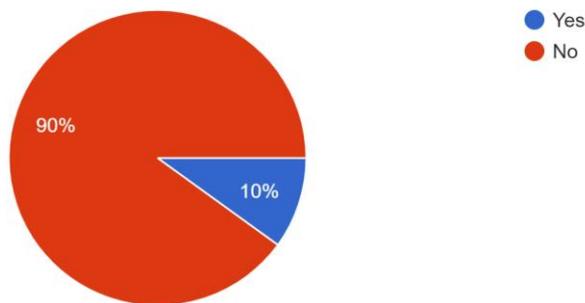
10. Would you be willing to learn more about the application of neuroscience in the field on HRM?  
248 responses



11. Which of the following neuroscience applications in HRM are you aware of?  
160 responses



12. Have you ever received training on using neuroscientific methods in HRM?  
160 responses



12.1 Please provide short description of the training.

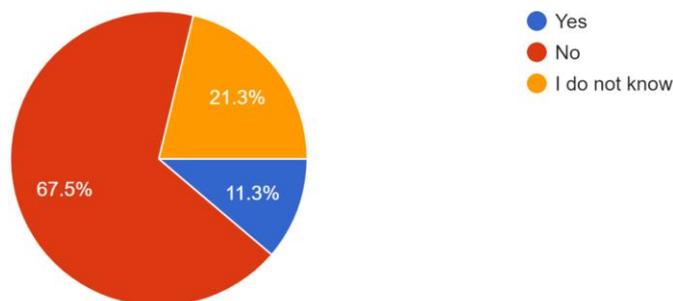
15 responses

Performance management related training.
Mostly training in the field of leadership and motivation with trainers such as Tony Robbins, Tobias Beck and local trainers. The trainings have most to do with motivation and self-confidence in order to achieve better results in sales.
Stress management, Presentational and storytelling skills, Mindfulness, Creating habits
Mindfulness meditation
How neuroscience can help when selling bank product,
Performance management- we go through corporate trainings. About Employee engagement we are reading a lot, following trends about various generations for instance we have different triggers for gen Z and baby boomers. When we talk about TAP training we follow corporate projects, workshops, meetings, manuals and training also we include local agency which program is based on TAP training so we are happy to improve our skills and knowledge.

Mindfulness
NLP Master
It was about the art of coaching and mindsets of the people in Hr
RSM Global provides trainings
During the training, topics related to neuroscience have been included in relation to recruitment decision-making, candidate assessment, and throughout the entire process.
Brain adaptive leadership approach
Developmental neuroscience: In every L&D activities (training, workshops, coaching), I use principles of developmental neuroscience to support grow, change, forms new brain patterns. That kind of learning, relearning and unlearning patterns get insight in behavioural changes and "encourage" development regarding new performance in job.
Dr. Nikolaos Dimitriadis' lecture
Trainig about how neuroscience can help in providing information about stress level in recruitment.

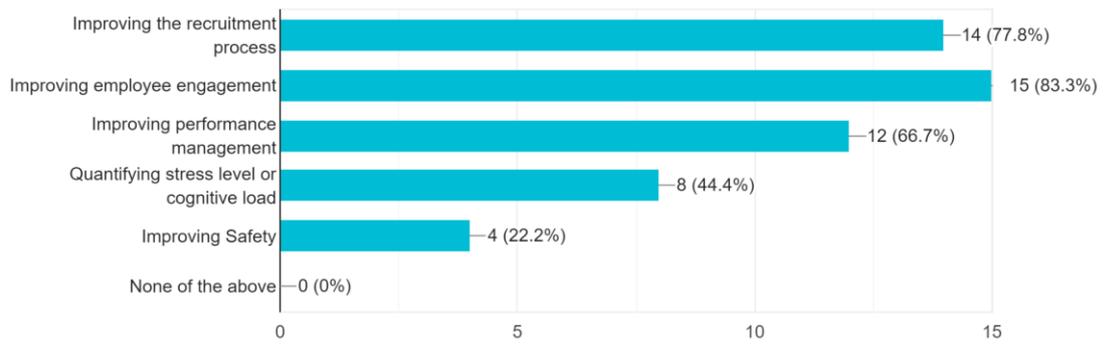
13. Has your company adopted any neuroscientific innovations in HRM?

160 responses



### 13.1 What kind of neuroscientific applications in HRM did your company adopt?

18 responses



13.2 If your company has adopted above mentioned innovations, please shortly describe the experience

12 responses

Giving our best to improve all HR aspects including all above mentioned processes. Positive Employees reaction on each inovation made.

The recruitment process always goes through our HR Department in HQ, which is in charge of all employment process for the top management and most of the middle management. The recruitment process is consisted of 3 phases, which contains also testing of self confidence and motivational part. As for the performance management, our company is constantly organizing in-house trainings as well as free online courses/trainings in the field of motivation, leadership, employment behaviour, time management, and training regarding tough deadlines and dealing with the sress. Besides this, we have implemented a e-Academy for our employees all over the world, and all employess MUST monthly go through assigned trainings which can be sales oriented or neuroscientific trainings.

There is quite an improvement

It is about TAP. The process is short than used to be and we always give a feedback to candidates. The candidates do Thomas test and we send them results to see on which skills and traits they should improve.

We conducted several trainings with employees in the area of mindfulness with great employee feedback and results

Neuroscience entails measuring the physical processes that take place in the brain and drive the behavior that psychology describes

It has facilitate a lot the management and the way we work, has low down the stress in the employees

NLP is present as training module for higher management

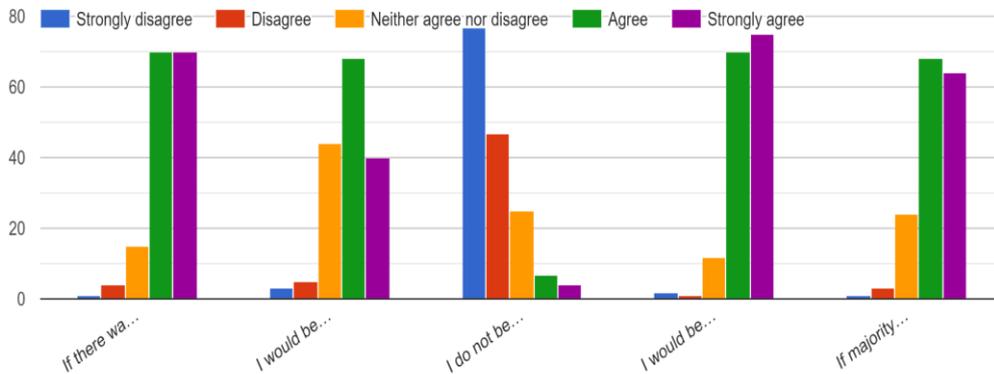
Our utilization of neuroscience methods in candidate interviews and selection has yielded a highly positive impact on the precision and suitability of candidate selection.

People are generally interested and surprised by power of reasoning.

Those methods were implemented on a global level and just transferred to local companies

Determening stress reseliene in the recruitment process.

14. Please rate your level of agreement with each statement, from strongly disagree to strongly agree Note: If you are using your phone, please rotate your screen to Landscape format in order to see all of the options.



Statement 1: If there was an opportunity for my team to attend a training session in the field of Neuroscience and its application, I would attend it.

Statement 2: I would be willing to invest time/money for the training session in the field of Neuroscience

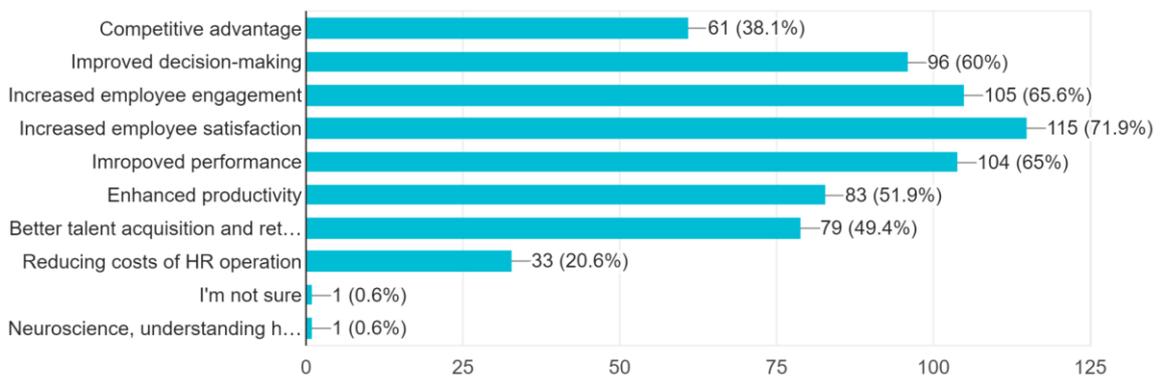
Statement 3: I do not believe that Neuroscience helps in other fields besides medicine

Statement 4: I would be willing to learn basic neuroscientific principles if it would be helpful for my job position

Statement 5: If majority of companies started to apply this new practice, I would be willing to extend my knowledge in this field

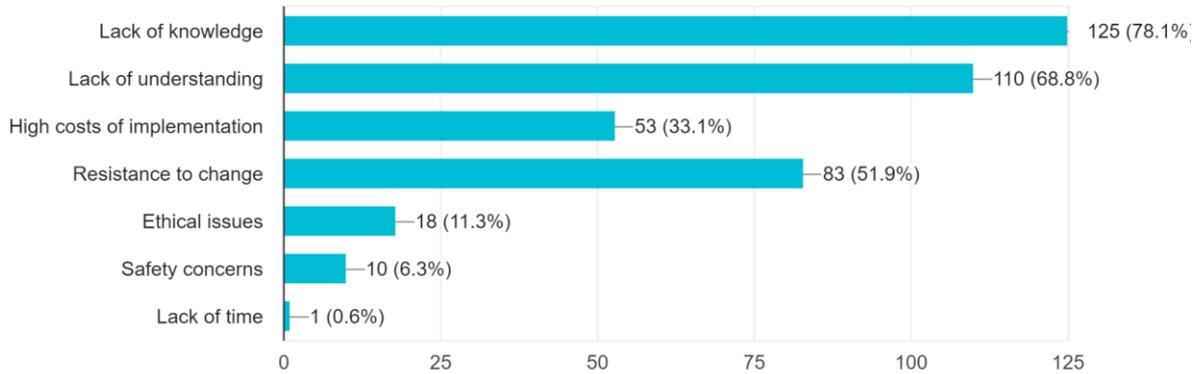
15. In your opinion, what are the main benefits of adopting neuroscientific tools in HRM?

160 responses

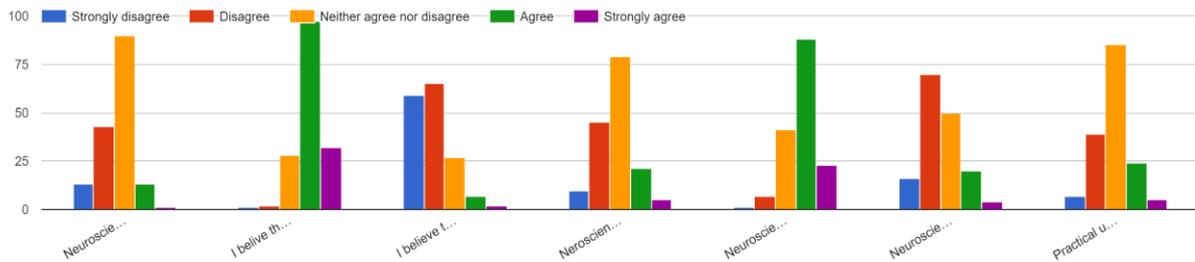


16. In your opinion, what are the main barriers to adopting neuroscientific methods in HRM?

160 responses



17. Please rate your level of agreement with each statement, from strongly disagree to strongly agree Note: If you are using your phone, please rotate your screen to Landscape format in order to see all of the options.



Statement 1: Neuroscience is too complicated

Statement 2: I believe that there is a bright future for practical use of neuroscience in multiple fields

Statement 3: I believe that neuroscience should only be used in medicine

Statement 4: Neuroscience raises ethical concerns

Statement 5: Neuroscience will gradually become more accessible and understandable to all parts of the world

Statement 6: Neuroscience is only for highly educated personnel

Statement 7: Practical use of neuroscience is too expensive and can only be used by large companies

