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CONTENT

SPRING MESSAGE OF THE SCIENTIFIC DIRECTOR

The **Conservative Political Action Conference** is the largest and most influential gathering of conservatives in the world. Launched in 1974, CPAC brings together hundreds of conservative organizations, thousands of activists, millions of viewers and the best and brightest leaders in the world. Each year, CPAC brings together and energizes over 15,000 people – from college-aged to retired – who represent leading conservative organizations, educational institutions, elected officials, thought leaders, media personalities, influencers and grassroots activists who fight for conservatism in America and abroad.

On April 25th and 26th, the Center for Fundamental Rights hosted CPAC Hungary, the largest conservative gathering in Hungary and internationally, for the third time. World's conservative leaders, thinkers, and influencers will reunite in Budapest. We'll welcome Geert Wilders, leader of the Dutch Party for Freedom, Santiago Abascal, president of the Spanish VOX, and US Senator Markwayne Mullin, Congressmen Andy Harris and Keith Self. This year's keynote speaker is also the Prime Minister of Hungary, Viktor Orbán. In 2023, CPAC Hungary concentrated on the liberals nightmare. Hungary's Prime Minister outlined the 12 points for success, including the Hungarian rules of game making friends, defending the national sovereignty and keeping illegal migrants outside the borders. The current CPAC Hungary 2023 provided a unique platform for joining with allies from North and South America, Europe, Japan, Israel and Australia. The proclamation sounded "United We Stand!".

The event under the motto "God, Homeland, Family" attracted more than 1,500 people, including 200 foreign decision-makers, journalists, politicians and influencers. It was already the third time that CPAC gathered in Budapest developing the Hungarian capital as the Headquarters for conservative policy-makers. Ronald Trump in his video message highlighted that "Every day we are battling to preserve our culture, protect our sovereignty, defend our way of life, and uphold the timeless values of freedom, family and faith in Almighty God."

The **22nd International Conference on Management, Enterprise and Benchmarking - MEB 2024** -under the motto: „Paradigm Shift: Path to Shared Drift" provided a forum for presenting and discussing novel aspects of and data about relevant fields of research and practice. We strive to provide an opportunity for exchanging knowledge and premonitions regarding the topics to be addressed throughout the event. This event was held on 19-20 April 2024 at the Keleti Károly Faculty of Business and Management at the Óbuda University in Budapest in cooperation with the ERENET Network. Some 80 people participated in this event from Albania, Bulgaria, France, Germany, Pakistan, Poland, Romania, Slovakia, Slovenia, Serbia, Spain, Vietnam and the United Arab Emirates and the USA. MEB is the only entrepreneurship and SME-oriented event held regularly in Hungary. It has a high reputation. MEB provided a good opportunity to specialists who with to present their ideas, and new theoretical thinking on enterprising. This is a very good platform for doctorandus students trying to lend their wings.

Dr. Antal Szabó
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PAPERS

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FATIGUE MANAGEMENT AND TIPS FOR A HEALTHY LIFESTYLE BASED ON THE LATEST SCIENTIFIC EVIDENCE

Abstract:

"Follow a healthy lifestyle..."We hear this phrase over and over again... Yes, of course, we know it...and we implement very little of this truly valuable advice in our daily lives. This paper is a wake-up call. It highlights WHY it makes sense to implement them. The author reviews the convincing results of recent scientific studies.

Keywords: Global climate crisis, Health, Fatigue, Circadian system, Sleep, Physical activities, Breathing exercises

JEL Classification: I10, J24, R11, Q01, Q54

PART 1.

INTRODUCTION

How can we better take care of our health? What should we do? How can we manage our fatigue? After the COVID-19 pandemic, these questions were formulated in the minds of many people... We are living in a 24/7/365 fast-paced world. Everything that we do seems urgent. Time_running out,_let's do it now... every task is important... etc." That's why most people are looking for a "quick and easy solution." The answer to those three questions above has been the same for thousands of years: follow a healthy lifestyle. The following review of some of the latest relevant scientific literature is a "wake-up call". It highlights WHY it makes sense to implement in our life some very well-known basic rules. Some of the basic pillars of a healthy lifestyle: are healthy sleep habits, physical activity, proper breathing, sufficient daily water intake, a balanced diet, and satisfactory social interactions. This review focuses only on the following three of them: sleep, physical activity, and proper breathing.

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This paper is organized as follows:

1. fatigue; 2. circadian system - as the foundation of our life; 3. sleep; 4. physical activity; 5. proper breathing.

1 FATIGUE

1.1 The definition of fatigue

Every one of us has her/his own "private definition" of fatigue... The question is whether there is any widely-recognised, universal scientific definition of fatigue?

Interestingly, there is no uniformly accepted definition of fatigue in the scientific world. From a practical point of view, in this review we are using the International Civil Aviation Organization's (ICAO) definition (ICAO is a specialized agency of the United Nations.):

"Fatigue is defined as a physiological state of reduced mental or physical performance capability resulting from sleep loss or extended wakefulness, circadian phase, or workload (mental and/or physical activity) that can impair a crew member's alertness and ability to safely operate an aircraft or perform safety-related duties." (ICAO_Int. 2013).

In the world of aviation they implemented the Fatigue Risk Management System (FRMS). The goal of FRMS is to continuously monitor and manage fatigue-related safety risks, based upon scientific principles and knowledge as well as operational experience that aims to ensure that relevant personnel are performing at adequate levels of alertness (ICAO).

Let's look at an approach to fatigue in the medical literature. Finsterer's research team reviewed the previously published data on fatigue in 2013. They concluded that "fatigue needs to be recognized as an important condition that is not only a symptom but may also be quantified and can be modified by various measures depending on the underlying cause" (Finsterer et al 2014).

An important point to make is that sleepiness is not the same as fatigue. Sleepiness is the feeling of needing sleep or being ready to go to sleep (Oxford Learners' Dictionary of English).

1.2 Measuring fatigue

The methods used to measure fatigue have improved a lot in recent years. The level of fatigue can be measured by subjective and objective means.

For **subjective measurement,** there are validated questionnaires to use (e.g.: Fatigue Severity Scale (FSC); Checklist Individual Strength-20 (CIS-20); Emotional Exhaustion (EE) scale; etc.). Since fatigue causes physiological changes in the human body, it is possible to use instruments for **objective measurement**. Examples: The **E**lectro**E**ncephalo**G**ram (**EEG**) records the electric activity of the surface layer of the brain underneath the scalp. It is a non-invasive method in which small sensors are placed on the scalp. These sensors detect the electrical signals produced by the brain.

Brain function requires a lot of energy. Those areas of the brain where the neurons are actively working consume more oxygen than their surroundings. The functional **N**ear-**I**nfrared **S**pectroscopy (**fNIRS**) is widely used to monitor the degree of brain activation. This instrument can monitor brain activation by measuring oxygen levels in the blood vessels of the cortical part of the brain. The examined person wears a special cap on her/his head during the examination. The near-infrared light painlessly penetrates through the skin and skull and sheds light on the cortical brain tissue. Here the light is absorbed at different rates. This reflects changes in the cortical activity. The equipment is small and movable, it works silently and it is easy to use. Nowadays, fNIRS is

widely used to monitor the degree of brain activation. (Koike S. et al 2013; YouTube Webinar 2022). See Figure 1.

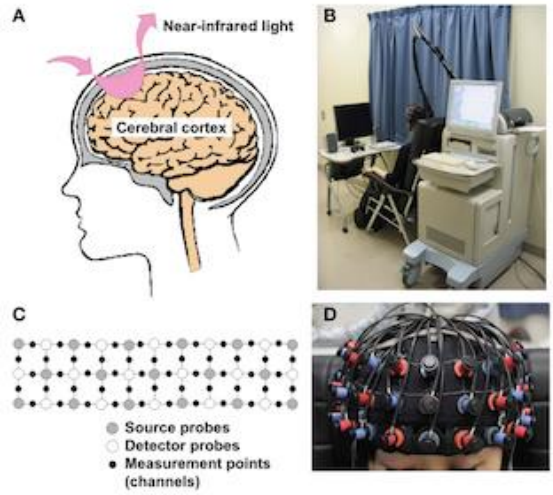

Figure 1

Koike S, Nishimura Y, Takizawa R, Yahata N, Kasai K.: Near-infrared spectroscopy in schizophrenia: a possible biomarker for predicting clinical outcome and treatment response Frontiers in Psychiatry. 14th Nov 2013 ;4:145. doi: 10.3389/fpsyt.2013.00145. eCollection 2013.

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Based on our current understanding there is a well-defined part of the brain behind the frontal bone of the skull, which is called the "prefrontal cortex". "This part regulates our thoughts, actions and emotions through extensive connections with other brain regions. This "prefrontal cortex"—the most evolved brain region — subserves our highest-order cognitive abilities. However, it is also the brain region that is most sensitive to the detrimental effects of stress exposure. Even quite mild acute uncontrollable stress can cause a rapid and dramatic loss of prefrontal cognitive abilities" (Arnsten, 2009).

Let's see in a very simplified way what happens in our body when stress hits us. Our adrenal glands produce the stress hormones, which are Cortisol and Adrenalin. In our brain stem, which is evolutionarily the most ancient part of our brain, the neurons in the so called "Amygdala" and "Hypothalamus", and other regions start to work extra actively, and they "take over the governance".

In other words, when we are alert, under normal circumstances, the frontal lobe of our brain controls our behaviour and emotions. When we are under stress, the ancient centres of our brain take over: Fight or flight!

Ting Pan's research team studied 30 healthy aviation pilots' brain activity in a flight simulator. In their study, wearable fNIRS equipment was used. The results show that the degree of brain fatigue is reflected by the fNIRS data from the prefrontal cortex of the brain. Reduced brain activity in the prefrontal cortex means less alertness, slower reactions, and more errors (Pan T. et al 2022).

2 CIRCADIAN SYSTEM

2.1 General overview

All the living organisms on this planet accommodate to daylight and darkness changes as a result of the Earth's rotation around its axis every 24 hours. The organisms (from bacteria, plants, animals to humans) controlled by their own circadian systems are synchronized by their environment. The words "circadian" comes from Latin, "*circa*" meaning "around", and "*dies"* meaning day (Colombek, 2010). Circadian system (frequently called circadian rhythm) allows living organisms to accommodate the continuous changes in their environment, and it regulates their physiology and behaviour.

We can say that circadian rhythm is a physiological, mental, and behavioural process which completes and restarts the cycle on a daily basis. It is encoded in our genes and tied to the Earth's rotation and the light/dark cycle.

The circadian rhythm is a "time-keeping system" that comprises a wide variety of processes including sleep-wake cycles, eating–fasting cycles, activity–rest cycles, body temperature, coordinating the behaviour and physiology of all organs for whole-body homeostasis (Zhou et al 2022). The 2017 Nobel Prize in Physiology or Medicine was awarded to Jeffery C. Hall, Michael Rosbash and Michael Young to honour their discoveries of molecular mechanisms controlling the circadian rhythm (Nobel Prices; Huang RC, 2018).

Every cell (!) of the human body has genetically determined oscillators, which we call "biological clocks". They generate so-called "endogenous oscillations" which are synchronized to the changes of the environment, such as the daylight/night cycle (Roenneberg et al 2012; Kuhlman et al 2018; Patke et al 2020).

To make it simple, biological clocks generate rhythmic anticipatory signals to decide e.g. when we stay alert, when we have time and energy for digestion, when we can rest and clear waste material from our body etc. (Constantini et al 2020).

Skeletal muscle constitutes approximately 40% of total human body weight and it contains 50 to 75% of the body's total proteins. Therefore, it consists of the largest collection of peripheral clocks in the human body. Similar to skeletal muscle, the circadian rhythm that regulates bone functions also depends on the cues from scheduled feeding and fasting (Juliana et al 2023). The newest discoveries demonstrate the critical role of circadian rhythms and sleep in immune system homeostasis (Scheiermann et al 2013; Haspet et al 2020, Boiko et al 2022; Schmitz et al 2022). Sufficient sleep and synchronized circadian rhythms have a key role in cognitive processing, mood regulation, and in maintaining physiological well-being (Watling et al 2017).

Light and darkness are the most important "time-givers" (the literature uses the German word "Zeitgeber") for the circadian clocks (Roenneberg et al 2022).

2.2 How does it work?

Special cells in our eyes (in the retina) perceive the quantity and quality of light. The blue light (~480 nm) most strongly stimulates these cells, and they directly project this info into our brain, more specifically to the suprachiasmatic nucleus (hereafter SCN) in the hypothalamus. SCN is the "circadian master clock" (Brainard GC et al 2001; Hattar S. et al 2006).

When dark night arrives in nature, this "master clock" sends information to the pineal gland, which is also located in the brain. During dark nights this pineal gland secretes a large quantity of Melatonin into the blood, and it promotes sleep onset and regulates the circadian sleep phase, and it also aids in the entrainment of clocks located in all peripheral cells and organs (Hardeland et al 2012). See Figure 2

Exposure to light at night, even at very low intensities, strongly inhibits Melatonin secretion, which may disrupt the overall synchrony of the central and peripheral clocks (Brainard et al 1988).

The "master clock" (SCN in our brain) is also connected to another "key player" of the circadian rhythm in our brain: the pituitary gland. This gland controls the Cortisol secretion from the adrenal gland by means of a hormone.

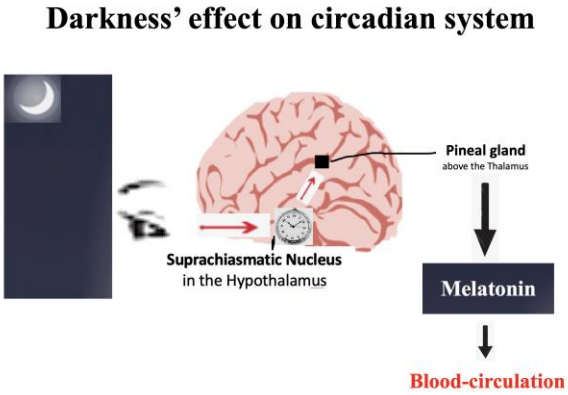

Figure 2

This drawing illustrates in a simplified way that:
- during darkness at night this "master clock"(Suprachiasmatic Nucleus) sends a command to the Pineal gland (small black square in the figure above) to start to produce Melatonin. To make it simple, we can call Melatonin as a "sleep hormone". Melatonin reaches all our cells through the bloodstream, sending them the message to switch to night mode". (Figure made by author.)

To be alert, we need a certain level of Cortisol. Early in the morning, the Cortisol concentration is high in our blood, and it declines slowly throughout the day. Cortisol is involved in a number of physiological processes in the human body, i.e.: metabolism, and immune response (Chan et al 2010; Son et al 2011; Oster et al 2017). If we are under stress, cortisol (and adrenalin) level increases in our blood, As a consequence, our heart beats faster, our blood pressure rises, our breathing is hurried and superficial, and all this means we are "ready to fight or flight".

2.3 Chronotypes

We all know that there are people who get up early, perform well during the daytime, and prefer to go to bed early. On the other hand, others tend to get up late, and they perform best in the afternoon or even late at night. People's circadian rhythm differs among individuals, depending on their preferred period during the day for sleep, cognitive and physiological functions.

Chronotype has been defined by Roenneberg: Chronotype describes individual differences in sleep timing, and it is determined by genetic background, age, sex, and environment (e.g., light exposure)" (Ronnenberg et al, 2012). Individuals' chronotype can be divided into three groups: Morningness (frequently called "larks"), Intermedia and Eveningness (frequently called "owls") types (Roennenberg at al 2003; Aktas et al 2023). Chronotype might change with age; Morningness chronotype is generally dominant in childhood, a shift towards Eveningness chronotype occurs in adulthood, and it turns back to Morningness chronotype as age advances (Roenneberg et al. 2007, Druiven et al. 2021).

Knowing these biological facts, it would be desirable for educational institutions and employers to take into account the Chronotype of their students and employees.

2.4 Fluctuation in our level of alertness during daytime

Alertness can be defined as a cognitive state or readiness and openness to respond to stimuli and process incoming information (Posner et al 2007; Jedon et al 2022).

Attention is a cognitive process crucial for the performance of all human activities, be it learning, working, engaging in sports, arts, social interaction, or recreational activities (Valdez, 2019).

Probably most of us noticed that we have a decline in our performance during the midafternoon hours, the so called "post-lunch dip". This phenomenon occurs even when the individual has had no lunch at all (Monk TH, 2005). Why does it happen? The answer lies in our circadian system. According Valdez and his research team, healthy individuals who are classified as "Intermediate Chronotype" show acceptable levels of cognitive performance from 10:00-14:00h and from 16:00-22:00h. What does it mean? It means that e.g. school testing should be scheduled during these intervals. However, these intervals will obviously vary according to chronotype, and they may also be modified by factors such as age, sleep deprivation, or medicaments (Valdez et al, 2012).

Our body temperature also follows the circadian rhythm. The daily minimum of body temperature corresponds to the time when the person feels most sleepy and is least able to perform mental or physical tasks.

Based on this figure, the person's minimum body temperature is between 02:00h and 04:00h, and between 14:00h and 16:00h. See Figure 3.

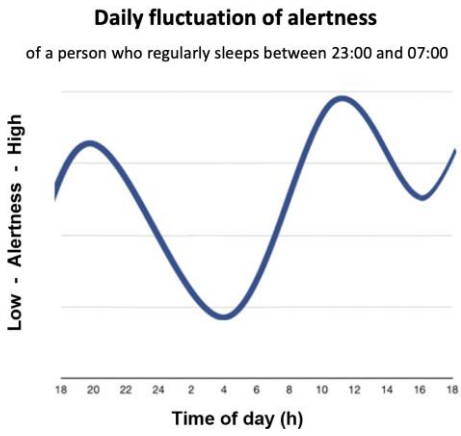

Figure 3

An Intermediate Chronotype Individual feels tired and sleepy in the afternoon between 14:00-16:00h, and if this person will not sleep at all at night, he will feel extra tired and sleepy between 02:00-04:00h in the morning.

The figure informed by Pablo Valdez: Circadian Rhythms in Attention. *The Yale Journal of Biology and Medicine*, 2019 Mar; 92(1): 81- 92.

2.4.1 What can we do to enhance our performance during the "post-lunch dip" instead of drinking coffee?

The answer is simple: let's use more light! Light has a strong impact on our attention. Askaripoor's research team studied the effects of light intervention on healthy people's performance during the post-lunch dip. The result was that participants had significantly better moods and performance under the saturated white light condition compared to the normal white light and dim light conditions during the post-lunch dip period (Askaripoor et al 2019).

2.5 Circadian disruptions

Before the advent of electric light, humans were exposed to minimal light at night. Since the adoption of electric light, pervasive exposure to nighttime lighting has blurred the boundaries of day and night, making it more difficult to synchronize biological processes. Overwhelming evidence indicates that a healthy circadian rhythm is essential for overall health and its disruption causes pathologies (Klermann et al 2023). Any disturbances, so-called circadian disruptions, may have adverse consequences for health, physical and mental performance, and well-being.

It is a shocking fact that two-thirds of Europeans cannot see the Milky Way due to artificial night sky glow (Falchi et al 2016). Approximately 15-20% of the population is engaged in shift work and countless individuals are exposed to nightly light pollution such as TV screens, computers screens, etc. (Rajaratnam et al 2001). Exposure to light from self-luminous displays may be linked to increased risk of sleep disorders because these devices emit optical radiation at short wavelengths, close to the peak sensitivity of melatonin suppression (Wood et al 2013).

2.5.1 Some examples

Metabolic Syndrome
Metabolic syndrome is a state in which several conditions, including hyperglycemia (a symptom of diabetes), high blood pressure, high level of cholesterol in the blood, and obesity, occur concurrently. (O'Neil et al 2015; Chai et al 2021). The number of people who are suffering from Metabolic Syndrome is increasing worldwide (Noubiap et al 2022).

Heart- and blood-vessels diseases
It is confirmed that the cardiovascular (heart and blood vessels) system also exhibits strong circadian rhythm (Huang T. et al, 2020). Research is ongoing on the possible connection between circadian rhythm disruption and cardiovascular diseases. This is a quotation from a paper of Chai's reserach group: "in the year 2023 there were 2102 papers found to be associated with the circadian rhythm in cardiovascular diseases, and the number of publications is increasing year after year" (Chai et al 2023).

Effect on the bones
One of the causes of osteoporosis (= a condition in which the bones become weak and are easily broken) - among other causes - is related to an alteration in the circadian rhythm. Due to the influence of the circadian rhythm on the musculoskeletal system, those working in shifts and with circadian disruption are at increased risk of bone fractures and osteoporosis (Juliana et al 2023; Mohd Azmi N.A.S. et al 2020).

Effect on the teeth
The prevalence of decaying, holey teeth is increasing worldwide (WHO, 2022). Obviously, the health of our teeth is affected by many factors. Different research groups have found the following: the disruption of the circadian rhythm affects saliva production and composition, reduces immune function, alters oral microbiota composition, and influences dietary habits, all of which can contribute to decaying teeth (Grover et al, 2015; Uchida et al 2022; Kurtovic et al, 2023).

Emotion and mood regulation
Bedrosian and Nelson's review focuses on the role of artificial light at night in mood regulation. Their conclusion is that "converging evidence suggests that circadian disruption alters the function of brain regions involved in emotion and mood regulation" (Bedrosian and Nelson 2017).

Jet Leg

"Jet leg is a sleep disorder in which there is a mismatch between the body's natural circadian rhythm and the external environment as a result of rapid travel across multiple time zones" (Choy and Salbu, 2011). They are symptoms like disturbed sleep, daytime fatigue, reduced alertness, headaches, feeling hungry based on the traveller "home time zone", etc. An interesting observation is that eastward travel is associated with a longer duration of jet lag than westward travel. After a certain time (it is individually different) the body's internal circadian rhythm adapts to the new time zone and jet lag diminishes. (Choy and Salbu, 2011).

Social jetlag

Social jetlag is defined as a form of circadian misalignment that arises from the discrepancy between activity/ sleep schedules on school/work days and free days (Wittmann et al 2006.) It is logical that circadian misalignment occurs when there is a mismatch between the environmental time and the body's internal time. It is obvious that it has negative impact on human health (Eisenstein, 2013; Vetter 2020).

Over the last 200 years, our human lifestyle has dramatically changed as a result of technical improvement. We live in a fast spaced 24/7/365 society. The technical improvement taking place on a day-to-day basis has undoubtfully eased our daily life. We spend a lot of time indoors, we drastically reduce daytime light exposure, and we use artificial light at night; as a result: we receive a weakened light/dark signal. Think about traveling by airplane across time zones and shiftwork. Caliandro's research team summarizes the current knowledge on Social jetlag and its effect on human health and suggests new strategies to improve our current understanding of this phenomenon (Caliandro et al 2021).

Ciradian rhythm... So what?
We are human beings living on planet Earth. The 24 hours cycle is encoded in our genes. Our chronotypes show variation (Morningness, Intermedia, Eveningness). At the same time, we live in an ever-accelerating world. Millions of people work in three shifts. There are many occupations where - whether it's day or night - people's lives depend on the decision of a person on duty (aviation pilots, truck drivers, health care professionals, policemen, firemen, etc.). What can we do to accomplish our tasks efficiently, safely AND in good mood? How do we preserve our physical and mental health? Every person is a unique individual. It is worthwhile for all of us to think individually about what we can do in practice in order to realize the aforementioned goals.
The author of this overview hopes that the reader can make use of some practical ideas presented in the

3. SLEEP

We know from our everyday experience how important good quality sleep is for our physical and mental health, and our general well-being. We spend approximately one third of our lifetime in sleep. It's no doubt that sleep is an essential component of our life. From ancient times to present day, many philosophers, doctors, writers, poets have written about the importance of sleep. In the Greek Mythology the god of sleep is named Hypnos. "In ancient vase paintings, Hypnos is presented as a young man with wings who brought sleep by moving his wings or by sprinkling oblivion's dew from a branch or even by pouring hypnotic juices from a horn."Morpheus is the god of dreams (Askitopoulou et al, 2000). Hippocrates (460 to ca. 375 BCE), the central historical figure in ancient Greek medicine also considered sleep necessary for the maintenance of human health (Askitopoulou, 2015).

Sleep has also been addressed in many significant literary works since the very beginning of written traditions Let's examine a quotation from Shakespeare:

"O sleep! O gentle sleep!
Nature's soft nurse, how have I frighted thee,
That thou no more wilt weigh my eyelids down
And steep my senses in forgetfulness?"

Shakespeare: Henry IV (3.1.7-10.)

In recent decades sleep research has advanced to a large extent. Researchers have made considerable effort in the quest for a better understanding of the neurophysiological mechanisms of sleep.Our understanding of the neurophysiological processes involved in sleep production is still quite far from being fully verified and complete (Ezenwanne EB, 2011).

3.1 Definitions of sleep

There are a large number of different definitions (Def hereafter) of sleep - none of them is "official". Here are some examples:

Def 1:
"Sleep is a reversible state in which conscious control of the brain is absent and processing of sensory information from the environment is minimal. The brain goes "offline" to sort and store the day's experiences and replenish essential systems depleted by waking activities" (ICAO, Doc 9966_2016).

Def 2:
"Sleep is a recurring, reversible neuro-behavioral state of relative perceptual disengagement from and unresponsiveness to the environment. Sleep is typically accompanied (in humans) by postural recumbence, behavioral quiescence, and closed eyes."(Cascadon and Dement, 2005).

Def 3:
"Sleep is a neurophysiological process that plays a key role in biological pathways crucial to brain and body health" (Ucella et al, 2023).

Def 4 (sleep timing!):
"Sleep timing is a behavioral, systemic output; while it is regulated by the circadian system, it is also influenced heavily by the homeostatic drive for sleep, as well as work and social constraints on when sleep can occur" (Vetter, 2020).

Def 5:
"Sleep is a natural and reversible state of reduced responsiveness to external stimuli and relative inactivity, accompanied by a loss of consciousness. Sleep occurs in regular intervals and is homeostatically regulated, i.e., a loss or delay of sleep results in subsequently prolonged sleep" (Borbély et al 1999).

Despite the definions being different, we can identify some common features that appear in all or most of them:

1. sleep is a reversible state of the brain and body, i.e. one wakes up after sleeping
2. sleep takes place regularly, i.e. the sleep-wakefulness cycle is repeated over and over again
3. sleep involves a loss of consciousness, i.e. the brain goes „offline" (but not inactive!)
4. sleep involves a reduced sensory responsiveness to the environment, i.e. minimal reactions to the outside world
5. sleep has the function of restoring the energy level of the brain and body, i.e. it recharges the „batteries"

3.2. Sleep regulation

Homeostasis* is "a self-regulating process by which an organism can maintain internal stability while adjusting to changing external conditions. Homeostasis is a dynamic process that can change internal conditions as required to survive external challenges" (Billman, 2020). This concept explains how an organism can maintain more or less constant internal conditions that allow it to adapt and to survive in the face of a changing and often hostile external environment (Billman, 2020). Our health and vitality are the result of homeostatic regulation.

* *Etymology of the word:" homeostasis" comes from ancient Greek; hómoios=similar; stasis=standing, state* (Biology Online)

Metabolism "consists of a series of reactions that occur within cells of living organisms to sustain life. The process of metabolism involves many interconnected cellular pathways to ultimately provide cells with the energy required to carry out their function" (Judge A. and Dodd MS, 2020).

Sleep researchers have largely accepted the "**two-process model"**, which states that sleep is regulated by both a homeostatic and a circadian process (Borbély, 1982). The *homeostatic process* means that when we are awake during the day, the feeling of pressure to sleep, the so-called "sleep-drive" is continuously increasing during the entire day. After a good full night's sleep, in the morning of the new day, this homeostatic process begins to build up again, which means that the lowest level of sleep-drive right after spontaneous awakening starts to grow gradually as the day passes. The *circadian process* refers to the physiology of the internal biological clocks (see Chapter 1). These two processes together determine most aspects of sleep and related variables like sleepiness and alertness. (Waterhause 2012; Borbély 2016; Deboer 2018; Koronowski 2021; Borbély 2022).

3.3 What happens in our body while we sleep ?

Sleep is an active process and plays a central role in our physiology: "These include the renewal and repair of our body's tissues, our metabolism, our physical growth and development, our ability to fight infection, our learning skills and memory, and our ability to regulate our emotions" - summarizes Prof. Espie in 2022 (Colin CA, 2022).

Our brain is continuously working day and night, and consumes the most energy in our entire body (!). "The human brain accounts for ~2% of the body weight, but it consumes ~20% of glucose-derived energy, making it the main consumer of glucose (~5.6 mg glucose per 100 g human brain tissue per minute." (Mergenthaler et al, 2013).

Even through the closed eyelids of a sleeping person, it can be detected that her/his eyeballs move from time to time. The electric activity of the brain can monitored with ElectroEncephaloGram (EEG). Human sleep is classified by EEG signals into different phases: wake, Rapid Eye Movement (REM) sleep, and NonRapid Eye Movement (NREM) sleep. The NREM phase is further divided into three stages. In each phase and stage, our brain wave patterns, eye movements, and the body's muscle tone are different. Each sleep phase is approximately 90 minutes long. These cycles periodically repeat 4-6 times every night. (Carskadom et al 2011; Patel et al 2022).

Sleep induces the fluctuation of hormones important for the regulation of normal metabolism. Sleep also serves to enforce rest and fasting, thereby supporting the optimization of metabolic processes at the appropriate phase of the 24-hour cycle" (Borbély et al 2016). Good sleep patterns can contribute to reducing the risk of diseases of the heart and blood vessels (Makarem et al 2022). Schmitz's research team has studied the relevant scientific literature and concluded that "sufficient sleep duration is important in both reducing susceptibility to infection and increasing antibody response after vaccination." (Schmitz et al, 2022). Sufficient quantity and quality of sleep are essential for maintaining the best possible mental alertness (Olaganathan et al, 2021).

3.4 Sleep and human performance

Good sleep is crucial to maintaining normal cognitive functions. For example, sleep duration and sleep quality are associated with efficient language learning as well as consolidating memory (Fenn et al 2003; Stickgold et al 2005; Walker et al 2010). Hokett's team concluded that "Better sleep quality has been associated with better episodic memory performance in young adults" (Hokett et al 2021). Good sleep has a positive impact on students' academic performance (Hokett et al 2022). It is obvious that long-term sleep deprivation causes health problems such as learning and memory disorders. In our modern industrial society, many people sleep less than what their bodies need. Lack of sufficient amount of sleep has a negative effect on the performance of people.

Insufficient sleep is defined as a curtailed (i.e. shortened) sleep pattern that has persisted for at least three months for most days of the week, along with complaints of sleepiness during the day. (ICSD-3, 2014)

After insufficient sleep, even elite athletes' performance was significantly worse (Sargent C. 2021). Lack of good sleep can negatively influence the performance of shift workers as well. "Sleep influences work performance in shift workers more directly compared to non-shift workers"- (Yeo H.et al 2022). During the COVID pandemic in 2021 an Italian research group analyzed self-report questionnaires of more than 1200 university students about their sleep-patterns: 65 % of the participants reported poor sleep quality. (Carpi M. et al 2022).

3.4.1 Sleep deprivation tests

3.4.1.1 Extreme sleep-loss durations

How does sleep deprivation affect a person? There have been scientific publications on this topic since 1896. In the United States in 1960s there was a "sleep deprivation record experiment" with continuous medical monitoring. Randy Gardner, a 17-year-old person at the time, ~~who~~ undertook a prolonged vigil during the Chrismas vacation. "He has been fascinated by 'extremes' since early adolescence." - wrote one of the medical observers. He was under continuous psychiatric observation during this long sleep-loss period. The length of the vigil turned out to be 11 consecutive days without sleep, which is extraordinary, but it also raises questions about how exactly we can detect and verify wakefulness, as well as questions about the ethicality of the experiment. The case study was published in the "Archives of General Psychiatry", by Gulevich et al.*: "Psychiatric and EEG Observation on a Case of Prolonged (264 Hours) Wakefulness."* (Gulevich et al 1966).

In 2018, Water's international research team reviewed the previous historical studies on extreme sleep-loss durations. They analyzed 21 studies where sleep deprivation was of 24 hours to 11 days. They concluded that "sleep loss can be a direct cause of prominent hallucinations and other misperceptions, as well as mood changes, distorted thinking, delusions, depersonalization, and time distortions" (Waters et al 2018) Today, experiments exceeding 48 hours of sleep deprivation are considered unethical, and therefore they cannot be conducted, which means that there can be no „record trials" anymore.

3.4.1.2 Partial sleep deprivation

One of the consequences of sleep deprivation is increased sympathetic activity and an elevated level of Cortisol. This influences the entire body; there is an increase in pro-inflammatory phenomena and oxidative stress, which can lead to the dysfunction of the vascular endothelium (the internal part of the arterial blood vessels). Poor sleep for longer periods causes chronic circadian misalignment (i.e. a disturbance in circadian rhythm) which leads to metabolic dysfunction (*See in chapter 2*) and related disorders, e.g.: obesity, type-2-diabetes (St-Onge M. et al 2016; Hall MH et al 2018; Smith et al 2019, Makarem N. et al 2022).
A plethora of studies examine the relationship between fatigue and sleepiness, and driving behaviour.
Cellini's reserach team examined 22 healthy young individual drivers' behaviour, using a driving simulator. The participants were asked to take part in the study in two steps. Step 1 was conducted after a full night of sleep

(around 8 hours); Step 2 was conducted seven days later with the same participants after partial sleep deprivation (only about 5 hours of sleep). The test was done in both cases between 13:00 and 15:00. See details in Figure 4.

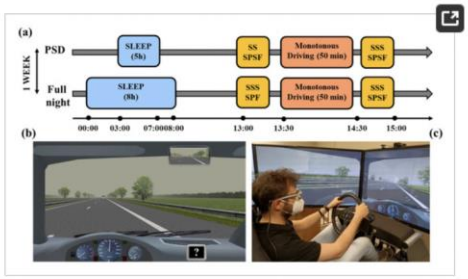

Figure 1. (**a**) Schematic representation of the experimental procedure. We used a within-subject design with all participants performing the study in two experimental conditions (full night of sleep and partial sleep deprivation) separated by one week. The order of the condition was counterbalanced across participants. (**b**) The driving scenario adopted for the experiments: Monotonous Environment. Note the question mark (?) on the dashboard monitor positioned on the lower-right part of the screen, which appeared every 9 min. (**c**) A participant driving in the dynamic simulator. PSD: partial sleep deprivation; SSS: Stanford Sleepiness Scale; SPF: Samn–Perelli Fatigue Scale.

Figure 4.
Cellini N, Bruno G, Orsini F, Vidotto G, Gastaldi M, Rossi R, Tagliabue M. The Effect of Partial Sleep Deprivation and Time-on-Task on Young Drivers' Subjective and Objective Sleepiness. Int. J. Environ. Res. Public Health ***2023****, 20(5), 4003; https://doi.org/10.3390/ijerph20054003 Based on open-access Creative Commons CC BY 4.0 license, and approval of Prof. Nicola Cellini) https://doi.org/10.3390/ijerph20054003*

The result of Cellini's study was that "even a single night of partial sleep deprivation (i.e. sleeping less than 5 h) can affect objective and subjective sleepiness while driving. Moreover, our data confirm that both objective and subjective sleepiness increase throughout a monotonous driving scenario" (Cellini et al 2023). Another review concluded that restricted sleep (= less then 5 hours of sleep during the previous night) was associated with negative affective states, as heightened emotional activity (Drury et al, 2012).

Even relatively moderate sleep restriction—if sustained night after night—can seriously impair waking neuro-behavioural functions in healthy adults (Arsintescu et al 2022).

3.5 Caffeine and sleep

Caffeine (1,3,7-trimethylxanthine) is apparently the most widely consumed legal psychoactive substance around the world. Natural caffeine is found in various plants e.g. coffee beans, cacao beans, tea leaves, etc. Caffeine can by produced synthetically as well. Beside coffee and black tea, there are a lot of soft drinks and energy drinks which contain caffeine. Caffeine absorbs rapidly from the gastrointestinal tract. The half-life of caffeine varies from person to person, but the average time is around 4 to 6 hours. Caffeine in moderate doses (40 - 200 mg) acts within the brain to decrease fatigue, increase alertness, and decrease reaction time. (Dam RM et al, 2021, Walter K, 2022). Killgore and Kamimor observed the impact of caffeine on 23 healthy participants' performance during three consecutive nights of total sleep deprivation. Caffeine maintained attentiveness on the first night, but during the second and the third night of sleep deprivation caffeine did not maintain normal performance. "Caffeine is an effective countermeasure for sleep deprivation but cannot be considered as a replacement for "(Killgore et Kamimor, 2020).

3.6 Alcohol and Sleep

Alcohol (= ethanol; as in wine, beer, etc.) is quickly absorbed from the intestines into the bloodstream and enters ~~to~~ the brain where it produces intoxicating effects. In controlled laboratory studies, alcohol intake has been

shown to alter physiology and disturb sleep homeostasis and architecture. Alcohol intoxication causes reduction in brain activities, including those brain regions which are responsible for cognition, learning, memory, and skilled performance (Jacob and Wang 2020). Alcohol consumption produces feelings of well-being and stimulation (for a short time), but also "impairs psychomotor performance, disturbs cardiovascular function and sleep, and can disrupt next-day mood and behavior"(Pabon et al 2022).

The aim of a study in Finland was to assess the effects of alcohol intake on the autonomic nervous system during sleep. The heart functions of more than 4,000 people was monitored day and night with a portable device. The participants in this study regularly registered in their diary when they consumed alcohol, and when they were abstinent. The result was that "Alcohol intake disturbs cardiovascular relaxation during sleep in a dose-dependent manner in both genders" (Pietilä et al. 2018).

3.6.1 Sleep deprivation compared with alcohol intoxication - effect on performance

In Dawson and Reid's study forty healthy participants were kept awake from 8:00 in the morning until 12:00 noon on the following day (a total of 28 hours wakefulness). They psychomotor performance (Computer-administered test of hand-eye coordination) was measured every 30 minutes. Some days later, when all the participants slept well, at 8:00 in the morning they started to consume 10-15 g alcohol at 30-minute intervals until their mean blood alcohol concentration reached 0.10%. The results of tests show that the effects of moderate sleep loss on performance are similar to moderate alcohol intoxication (Dawson and Reid, 1997).
To keep it simple: *being awake for 24 hours is similar to having a blood alcohol concentration of 0.10%*

In 2020, Lowrie and Brownlow compared the effects of sleep deprivation and a small amount of alcohol consumption on driving performance in thirty healthy young people. In a driving simulator half of the group drove after 24 hours of wakefulness, the other half of the group consumed some alcohol and started to drive when the measured breath alcohol concentration was 22 microgram per 100 ml of breath, which is the official Scottish drink-drive limit. The result of this experiment is thought-provoking: *"The degree of driving impairment induced by a single night of sleep deprivation was found to exceed that resulting from alcohol intoxication sufficient to produce a breath alcohol concentration of 22 µg/100mls, barely over the legal drink driving limit in Scotland"* (Lowrie and Prownlow, 2020).

3.7 At different ages, how many hours of sleep are necessary to maintain human health?

The American Academy of Sleep Medicine and Sleep Research Society have a Consensus Statement: "Adults should sleep 7 or more hours per night on a regular basis to promote optimal health."(Watson et al, 2015).
The Position Statement of the multidisciplinary expert panel of the US National Sleep Foundation says that "Recommended sleep durations are as follows: 14-17 hours for newborns; 12-15 hours for infants; 11-14 hours for toddlers; 10-13 hours for preschoolers; 9-11 hours for school-aged children; 8-10 hours for teenagers; 7-9 hours is recommended for young adults and 7-8 hours of sleep is recommended for older adults" (Hirshkowitz M. et al 2015).

3.8 Sleep health

"Sleep health is a multidimensional pattern of sleep-wakefulness, adapted to individual, social, and environmental demands, that promotes physical and mental well-being. Good sleep health is characterized by subjective satisfaction, appropriate timing, adequate duration, high efficiency, and sustained alertness during waking hours."(Buysse, 2014)

3.8.1 Sleep hygiene

The author of this paper typed "sleep hygiene" into Google search on 10th July 2023. The search instantly provided 210,000,000 (two hundred and ten million) results, and the scientific research literature is also robust on this topic.

It is easy to give great pieces of advice such as "Go to bed at the same time each night and get up at the same time each morning, including on the weekends." It is a great piece of advice, but at the same time, we all know it well from our own experience that this is almost impossible to achieve for most of us. In our modern industrial society, many people sleep less than what their body needs. Some people "regret the time spent sleeping" because ~~of~~ they are overloaded with tasks. Other people clearly overestimate the capacity of their own body: "I'm efficient even with little sleep" This is hardly ever true. A plethora of studies confirm that the deterioration of performance can be objectively measured after only one night of shorter-than-usual sleep. Nothing replaces the sufficient amount and quality of sleep.

3.8.2 The '5 principles' of good sleep

Colin A Espie, Professor of Sleep Medicine at the University of Oxford knows today's reality well. He published a short report in the Journal of Sleep Research in 2022 called "The '5 principles' of good sleep". His purpose is to "encourage people to Value, Prioritise, Personalise, Trust, and Protect their sleep" (Espie, 2022).
He briefly summarized his '5 principles' clearly in his YouTube video called "Simple Tips for Better Sleep from Every Mind Matters": https://www.youtube.com/watch?v=OvQTjAlIvI8.
If the reader is further interested in this topic, I recommend that he or she read the entire text of Prof. Espie's report: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9285041/

PART 2 continues in the next ERENET PROFILE

Kolodko Ukrainian sculptor mini statues in Budapest
left: Mekk Elek in the Széll Kálmán Square
right: Cheched Ear Rabbit in the Buda Castle
Photo © by Dr Antal Szabó

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EMBRACING THE WISDOM OF NON-VIOLENCE: LESSONS FROM HISTORICAL STRUGGLES AND SPIRITUAL TEACHINGS

Abstract

The paper presents the various approaches to war and peace.

Keywords: non-violence and peace, Kurukshetra war, Christian beliefs, Warshaw Pact, NATO

JEL Classification: D74, F51, H56,

> **"Hatred is never appeased by hatred in this world; By non-hatred alone is hatred appeased. This is a law eternal."** Dhammapada – Chapter 1, Verse 5

> *"May all beings look at me with a friendly eye. May I do likewise, and may we look at each other with the eyes of a friend." Rig Veda 10.22.25*

> *"Blessed are the peacemakers, for they shall be called the children of God…..Eye for eye, and tooth for tooth.' But I tell you, do not resist an evil person. If anyone slaps you on the right cheek, turn to them the other cheek also".*
>
> *MATTHEW 5:9, 38,39*

NON-VIOLENCE AND PEACE CENTRAL TO INDIAN RELIGIONS

The Indian freedom struggle stands as a profound example of a movement fought in the spirit of non-violence. No weapons were used to physically harm, cause pain, or eliminate individuals or groups. Mahatma Gandhi believed in resolving conflicts and pursuing justice without causing harm to others physically, mentally, or emotionally. Ahimsa was not merely a strategic tool but a way of life and a moral imperative. Indian spiritual traditions such as Buddhism, Jainism, incorporates A himsa as a core ethical principle. Peace and harmony hold a central position in Hinduism, with a fundamental principle being the practice of non-violence.

KURUKSHETRA: FROM WAR TO PEACE? [2]

However, it's worth noting that at Kurukshetra, blood was shed in a violent war. While it provided a solution, it also resulted in the tragic loss of brothers and relatives. This raises a crucial question: should we engage in violent wars again?

Over centuries, the Indian mindset imbibed the core lesson from the Mahabharata's battle at Kurukshetra. While the epic conveys several lessons, its ultimate teaching emphasizes the imperative of non-violence, fostering dialogue, discussion, and debate. Wars and battles, it asserts, do not lead us anywhere, and the act of killing one's kith and kin should not be tolerated.

[2] The **Kurukshetra War**, also called the **Mahabharata War**, is a war described in the Hindu epic poem *Mahabharata*, arising from a dynastic struggle between two groups of cousins, the Kauravas and the Pandavas, for the throne of Hastinapura. The war laid the foundation for the events of the *Bhagavad Gita*.

NO TIME FOR WAR AT ALL: BLESSED ARE THE PEACEMAKERS!

In the journey of the Israelites to a land they considered their inheritance, from the time of Moses, several wars were fought. The toll in human lives prompts a sobering question: how many perished in these conflicts?

Ecclesiastes 3:7-8 says, "There is a time to tear apart and a time to sew together. There is a time to be silent and a time to speak. There is a time to love and a time to hate. There is a time for war and a time for peace." However, this is often misunderstood. Does it refer to wars that physically kill and eliminate people, communities, and races?

According to Jesus in St. Matthew 5:9, "Blessed are the peacemakers," and further, he advises not resisting an evil person but turning the other cheek when faced with adversity (Matthew 5:38-39).

DID CHRIST ADVOCATE CONVERSION?

Christ's teachings are frequently misunderstood. When Jesus urged going to the ends of the world to make everyone his disciple, it became a verse open to misinterpretation. While Jesus was alive, he did not attempt to convert anyone to Judaism or his group of new disciples, choosing instead to engage in dialogues and discussions with many.

The Good News and the message of Christ are intended to transform individuals into embodiments of love, kindness, and empathy. If the received Gospel transforms someone into a religious fanatic, it suggests a lack of understanding of Christ; Jesus's spirit is not living within such individuals. Jesus desires to spread the fragrance of love through their lives.

The Holy Spirit, residing within, illuminates life, radiates love, and combats spiritual adversaries, as highlighted in St. Paul's Ephesians 6:12. The Rig Veda echoes this sentiment, calling for viewing all beings with friendliness, fostering harmony and peaceful coexistence. It demands seeking peace through non-violence. Rig Veda 10.22.25 states: "May all beings look at me with a friendly eye. May I do likewise, and may we look at each other with the eyes of a friend?"

WARSAW PACT, NATO, and THE WEST

When the Cold War ended with the dissolution of the Soviet Union, there was a collective sigh of relief, with Warsaw Pact nations abandoning their treaty. Yet today, there are again threats of wars and conflicts in different regions.

Recently, a leader from the Middle East quoted the Bible: "There is a time for war and a time for peace." And he declares that this is the time for war. Is war the only solution?

From Kurukshetra to World War II, many lessons have been learned. In the post-World War II era, numerous conflicts and wars have unfolded. Despite our collective failure to achieve lasting peace, is it not time to earnestly strive towards it? While many nations and their leaders proclaim that this is not an era for war but for working collaboratively for the common good, it is time to pray for peace and harmony through dialogue and discussions. Let's seek peace not through violent wars and conflicts but through understanding and collaboration.

(P. Koshy), 10 March 2024

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THE CURRENT TRENDS OF ARTIFICIAL INTELLIGENCE [3]

Abstract:

A detailed description of the then research work of Artificial intelligence has been presented in the presented research paper. At present, Data Science is being used very fast in the Internet world, in which the contribution of artificial intelligence is important. Natural language processing and natural language understanding are also being established to make computers efficient. Human-like behavior will be demonstrated by making the software and hardware made in the future efficient by artificial intelligence. The present research paper completely describes the detailed form of artificial intelligence in the current scenario.

Keywords: Artificial Intelligence, Data Science, Natural Language Processing, Machine learning, deep learning etc

Jel Classification: O33, J24,

I. INTRODUCTION

Artificial intelligence is such a field of knowledge, under which the machine is made capable of reasoning, learning, solving any problem, making its own decisions and thinking etc. It can also be understood in such a way that such an expert system has to be created, by which not only dialogue can be established between man and machine; Rather, all the activities entrusted to him by the command of the human could be accomplished by the machine with great alertness and scholarship. For the construction work of this expert system, where on one hand the processing of written, spoken and visual language is being done, on the other hand such a hardware structure is being built, which can see, hear, read, feel and think. Able to do Artificial intelligence is the result of integrated knowledge of all the three disciplines of Computer Engineering, Computer Science and Computational Linguistics. In fact, scientists of artificial intelligence have considered the problem of language as a problem of communication that is why, while on the one hand general linguistic science throws light on special aspects of language, on the other hand syntactical, semantic and contextual elements are coordinated under artificial intelligence.

According to Slokan (1979), the real purpose of artificial intelligence was to study knowledge. Formulate common knowledge related to the acquisition, representation and application of knowledge within a expert system that can be expanded as needed. For a machine that could efficiently communicate with different types of people, it was also necessary to learn what types of information people ignore in different situations.

II. FEATURE:

- LOGIC:

The way a human is given knowledge from childhood, it is trained, so that a human can make the right decision on the basis of logic at the right time. In the same way, after equipping the machine with knowledge, logic is

[3] Second edition. Originally it was published in the International Journal of Creative Research Thought (IJCRT), Volume 11, Issue 3, March 2023. ISSN: 2320-2882

needed to make the right decisions at the right time, so that the knowledge can be presented and interpreted properly.

- LEARNING:

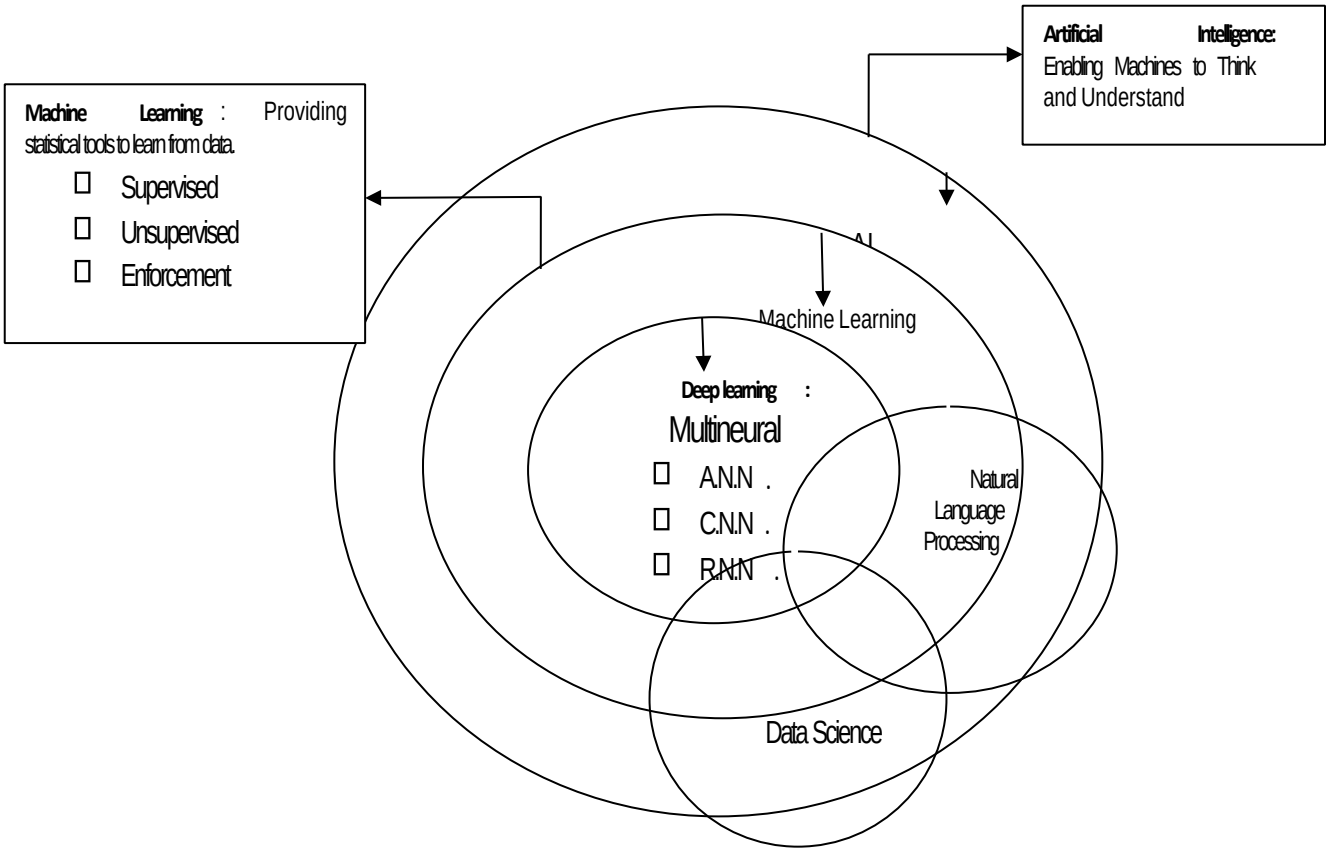
The machine is made capable of self-learning to make new decisions from the set of data and rules stored in the machine. Where the machine can learn, reason and take decisions by itself.

- PROBLEM SOLVING:

All the information about the global knowledge for the machine is a problem, which is solved step by step. To solve the problem, the ability to store knowledge and take decisions through logic is also developed.

- PERCEPTION:

The machine also has to be made empirical, so that it can help in taking the right decision. Like: Just as human experiences with all the senses like eyes, nose, ears etc., in the same way, by developing empirical systems in the machine, it is made capable to decide to see, hear, understand etc. Artificial intelligence can be easily understood in the following diagram.



III. HISTORY

Modern artificial intelligence has been seen in history for the purpose of defining the human thought system of philosophers. The year 1884 is very important for artificial intelligence. Charles Babbage worked on this date on a mechanical machine that displayed intelligent behavior. However, as a result of studies in this area, he decided that he would not be able to produce a machine that behaved as a human, and postponed his work. In the 1950s, Claude Shannon introduced the idea that computers could play chess. Work on artificial intelligence continued very slowly until the early 1960s.

The rise of artificial intelligence officially dates back to 1956 in history. In 1956, for the first time, a session on 'Artificial Intelligence' was introduced at a conference at Dartmouth College. Marvin Minsky states in his book "Stormed Search for Artificial Intelligence" that "the problem of modeling artificial intelligence will be solved within a generation". The first artificial intelligence applications were introduced during this period. These applications are based on logic theorems and the game of chess. Programs developed during this period were different from the geometric forms used in intelligence tests; which has given rise to the idea those intelligent computers can be made.

In 1950, a scientist named Alan Turing conducted an experiment to determine whether a machine could be made intelligent enough to make its own decisions. This test shows the intelligence given to the machine. At that time the intelligence level of the machines passing the test was considered sufficient. In 1957, John McCardie developed a programming language called LISP (List Processing Language), with the help of which artificial intelligence could be provided functional form in the machine. It was one of the oldest and powerful programming languages, allowing creating simple programs. The period between 1965 and 1970 was called winter or dark period, because artificial intelligence could not be developed during this period. It was a period in which the haste and optimism fueled by expectations led to the idea that it would be very easy to give machines intelligence. That's why this time was also called the dark period because of not getting the expected results, because the artificial intelligence systems were being made intelligent by uploading data, which could not be successful. Between 1970 and 1975, artificial intelligence gained momentum and work on topics such as disease diagnosis was achieved to a great extent, and this result established the basis of artificial intelligence. During the years 1975 to 1980, it was considered that artificial intelligence can be established along with other branches of science.

In the 1980s, artificial intelligence began to be used in large projects with practical applications, and substantial successes were achieved in all fields of science, allowing artificial intelligence to be adapted to human life to solve real-life problems. Put. Even now, more affordable software and other tools are being created using artificial intelligence according to the needs of the users, whose nature has become very wide and elaborate.

IV. HISTORY OF ARTIFICIAL INTELLIGENCE IN CHRONOLOGICAL ORDER

- 1206: One of the pioneers of cybernetic science, Abru izz bin Razzaq al-Jazari, created self-controlled machines powered by water.
- 1623: Wilhelm Schickard invented a machine and a calculator capable of performing four functions simultaneously.
- 1672: Gottfried Leibniz developed a binary counting system, which briefly became the basis for today's computers.
- 1822–1859: Charles Babbage built a mechanical calculator. Ada Lovelace is considered to be the first self-replicating program.
- 1950: Alan Turing, the founder of computer science, introduced the concept of the Turing test.
- 1951: The first artificial intelligence program was written for the Mark-I device.
- 1956: A program for solving mathematical problems is introduced by logic theorists Newell, Shaw, and Simon. This system is considered as the first artificial intelligence system.
- A schematic network for machine translation systems was developed by Margaret Masturman and others in the late 1950s and early 1960s.
- 1957: John McCardie of MIT created the LISP (List Processing Language) language. He is also known as the father of artificial intelligence.
- 1960: JCR Licklider described the human-machine relationship in his work.
- 1962: Unimation was established as the first company to manufacture robots for the industrial sector.
- 1965: An artificial intelligence program 'Eliza' was written.
- 1966: The first animated robot "Shaky" was created at Stanford University.
- 1973: DARPA begins development for a protocol called TCP/IP.

- 1974: Internet was used for the first time.
- 1978: Herbert Simon earned the Nobel Prize for his theory of finite rationality, a seminal work on artificial intelligence.
- 1981: IBM created the first personal computer.
- 1993: Production of human-like robot 'Cog' began at MIT.
- 1997: Supercomputer named Deep Blue defeated world famous chess player Kasparov.
- 1998: The first artificial intelligence player named Furby was launched in the market.
- 2000: Kismet, a robot that could use gestures and mimic movements to communicate; was introduced.
- 2005: Robot 'Asimo', closest to human ability and skill of artificial intelligence, was introduced.
- 2010: 'Asimo' made to work using brain power.
- 2011: IBM's Watson won Jeopardy and a quiz show where it had to solve complex questions as well as riddles. Watson had proved that he also has an understanding of natural language and has the ability to solve complex questions in the shortest possible time.
- 2012: Google has launched an Android app feature "Google Now", which is also capable of providing secret information to the user in the form of predictions.
- 2014: Chatbot "Eugene Goostman" won a competition in the famous "Turing test."
- 2018: IBM's "Project Debater" debated a tough topic with two master debaters, whose performance was commendable.
- Google demonstrated an AI program "Duplex", a virtual assistant that automatically made hairdresser appointments on calls. This hairdresser's appointment didn't realize she was talking to a machine.
- 2023: OpenAI released GPT-4, which is used with both the API (with waiting list) and features ChatGPT Plus.

V. CLASSIFICATION OF ARTIFICIAL INTELLIGENCE

(A). BASED ON GENERAL PURPOSE

i. ARTIFICIAL NARROW INTELLIGENCE

These types of trained systems represent almost all types of systems currently in operation, including even the most complex and capable systems ever built. Artificial micro-intelligence refers to systems that are capable of performing only one specific task automatically, using human-like abilities. These types of systems are made for a particular task only, whose capacity and limits are already determined. These types of systems use machine learning and deep learning methods to learn from themselves and provide us with the output. Presently built and working 'Google Assistant' and „ALEXA" are similar systems.

ii. ARTIFICIAL GENERAL INTELLIGENCE

Artificial general intelligence includes all systems that are capable of self-learning, understanding, and decision-making like humans. Such systems would be able to perform all but one specific task independently. Such systems would be equipped with multi-functional capabilities capable of making decisions like humans.

iii. ARTIFICIAL SUPER INTELLIGENCE

Systems with artificial superior intelligence will represent the highest pinnacle or final stage of research and these systems will be called the most intelligent systems on Earth. Such systems will have high memory, fast data processing, analysis and accurate decision making, apart from being multi-functional. These types of

systems will be considered the most popular and unique, which will make human life convenient. However, such systems can also prove to be the
biggest threat to human life.

(B). BASED ON HISTORICAL

a. REACTIVE MACHINE

These types of systems are the oldest, which have very limited working capacity. Memory was not used at all in these systems. The machine did not learn anything from the previous tasks performed to complete the current task. In these, the ability to 'learn' was absolutely negligible. Data sets were created in the machines of this time, which automatically gave their response by combining the inputted data. To make this operation more efficient, their memory was not used.
The best example of this type of machine was the Deep Blue system built by IBM, which defeated chess great Garry Kasparov in 1997.

b. LIMITED MEMORY

Such systems are an advanced version of Reactive Machines, in which they make decisions based on the characteristics of reactive machines as well as by learning from historical data. Limited memory is used in this, where the data is stored. Machines find it difficult to learn from stored data by themselves. Almost all the systems in use at present fall under this category. The best example of such systems is smart phones, which allow your smrt phone to automatically open and access the phone once your face is recognized. Almost all current trained systems, from chatbots, virtual assistants to self-driving vehicles, are powered by limited memory.

c.THEORY OF MIND

There is a new generation of training systems under the theory of mind, the development of which is currently being researched by researchers. In these types of systems, a human-like brain is being created, so that communication between humans and machines can be established. These types of systems understand all the needs of human beings interact with humans and take their own decisions. Building systems using theory of mind is a challenging process, which involves
understanding human needs, understanding their emotions, taking informed decisions and providing desired outputs.

d. SELF-AWARE
This is the last stage of such artificial intelligence systems, which are only a concept at the present time. Self-aware Trainable Systems are such systems, which will be self-aware like the human brain, that is, it will be capable of thinking and thinking on its own. Such systems would not only be able to understand and develop human emotions, but such systems would also be able to express their own feelings, needs and possibly even desires after communicating with humans. Many scholars have also expressed or are expressing their deep concern regarding the development of such systems. This is also because after such systems become self-aware, such systems would also be capable of having thoughts of self-preservation.

VI. APPLICATION OF ARTIFICIAL INTELLIGENCE

1. NATURAL LANGUAGE PROCESSING

Natural Language Processing is an area under which natural language spoken by humans can be analyzed, synthesized and language understanding can be established on the basis of computer. Its applied areas include

text-to-speech systems, speech-to-speech systems, machine translation, OCR and other linguistic applications that use natural language.

2. IMAGE PROCESSING

Digital image refers to prototyping a digital image through a digital computer. We can also say that it is a use of computer algorithms, in order to get a better image or to extract some useful information. Digital Image uses Formulation and Institute models to prototype and analyzes digital images. Enhancing the Diversity of Targeting Digital Images

3. AI IN HEALTHCARE

In the field of medicine, artificial intelligence has to be used to promote the medical system and also to reduce the cost. Detect patterns to make diagnosis more secure and faster for different types of diseases. IBM Watson understands natural language and answers all kinds of questions posed. This system creates a new concept in the field of medicine and represents a new scenario through scoring scheme. There are many AI software available in the medical field that help patients and healthcare customers complete important tasks like finding diagnostic records, booking appointments, etc. A range of AI systems are also being used to detect, understand and treat pandemics such as COVID-19.

4. AI IN BUSINESS

AI is being used in abundance in the field of business. With its help, it is being used to find customer information, integrate chatbots into websites, etc. In the academic world and various I-Analysts, there is also an emphasis on automating the various types of task situations.

5. AI IN EDUCATION

In the field of education, important tasks such as simplifying the evaluation process, providing sufficient time to the instructors, providing education automatically through online medium are being accomplished by AI. Being able to analyse and adjust the content of the concerned subject according to the needs of the students, so that they will be able to work at their full speed.

6. AI IN FINANCE

Using AI in the banking sector, systems like Mint or TurboTax are becoming able to work with new changes. These types of applications collect personal data and are also capable of providing financial advice for the future. The method of buying a house and other types of financial services can be obtained using software such as IBM Watson. Artificial intelligence systems today carry out most of the Wall Street business.

7. AI in law

In the field of law, artificial intelligence is being used for the purpose of knowing rules and securing records. Helping to make the tedious process of legal labour much simpler through AI system. Due to which the customer support is going to improve a lot. Law enterprises use methods like machine learning to identify documents and extract knowledge from them as needed.

8. AI IN MANUFACTURING

Manufacturing tops the list of industrial and scientific uses for building robotic systems. Take for example robots which are capable of completing one or multiple tasks at the same time as in modern workplaces.

9. AI IN BANKING

In the banking sector, automated chatbots are being created using artificial intelligence, which are used to perform banking transactions. No human interaction is required to complete this task. Artificial intelligence is being used for important work like giving bank loans, determining the creditworthiness of customers.

10. AI IN TRANSPORTATION

Self-driving vehicles are being built, which are increasingly capable of driving without a driver using AI. Through AI, traffic forecasting, flight delay planning and increasing the productive capacity of maritime shipping are being carried out.

11. AI IN SECURITY

Automation and machine learning methods have emerged as a big word in the field of network security as well. With their help, not only has the theoretical side been strengthened, but the practical side has also been strengthened. Using artificial intelligence and machine learning, they are bringing real value to security by detecting attacks, malware and other threats on the network. SIEM software uses machine learning methods to identify suspicious activities. By collecting information from different sources, A.I. will detect links to events and attack campaigns. Thus AI security technology is being used to reduce the chances of theft, fraud, data tampering etc. and authenticate various transactions faster. The technology is ripe for organizations to counter the various types of cyber-attacks being carried out

VII. TOOLS OF AI

1. Machine Learning: It is a subject area that provides statistical tools to analyze and synthesize any language. Machine learning is a new knowledge discipline, which provides useful and necessary algorithms for artificial intelligence. It mainly includes three types of techniques namely supervised, unsupervised and enforcement.

2. Deep Learning: It is a discipline that helps intelligent systems makes the right decisions. This technology includes important algorithms such as Multineural Networks (ANN, CNN, RNN), which help the computer system to make deep decisions as much as possible.

3. Programming Language: A programming language is also needed to apply artificial intelligence to a computer, with the help of which the machine is made efficient by rules. At present, Python programming language is mostly being used for artificial intelligence. The reason for this is also because natural language can be applied simply and easily under the Python programming language.

4. Database: Artificial intelligence requires a strong database, with the help of which data can be stored in the server. In the field of artificial intelligence, there are many databases working in the field of services related to cloud computing, mainly Google Cloud SQL, Azure etc.

CONCLUSION

Therefore, in conclusion, it can be said that in the present scenario, the work area of artificial intelligence is becoming very wide and vast. The use of artificial intelligence is not only in health but in all those areas where computers are being used today. The coming future will be completely robotic, in which all the work will be dependent on the machine and with the help of the
machine, the work can be done very quickly, which will make human life easier and simpler.

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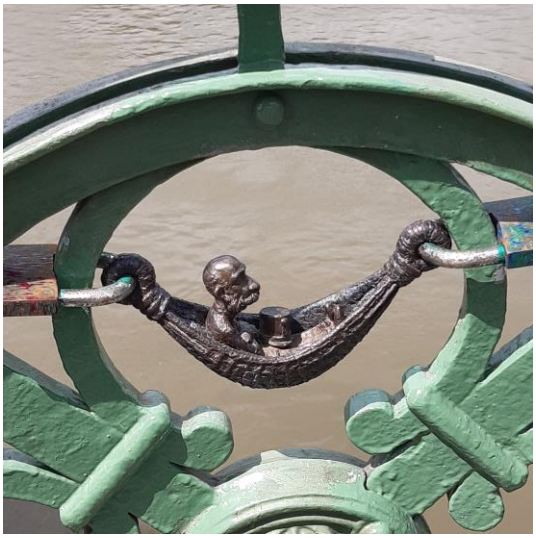

Kolodko Ukrainian sculptor mini statues in Budapest
left: Franc Joseph in the Freedom Bridge
right: Süsü Hungarian tale figure on the Freedom Square
Photo © by Dr Antal Szabó

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INSTITUTIONAL ACADEMIC ENTREPRENEURSHIP AND ACADEMIC SPIN-OFF COMPANIES: PRACTICES AND ISSUES [4]

Abstract

The research problematizes academic entrepreneurship and its public-institutional and private forms. The need to expand the concept of "academic entrepreneurship" by including activities and organizational forms that are not aimed at the formation and distribution of profits is argued. The unsuitability of Decree No. 61 of 2 April 2000 on the terms and conditions for the creation of commercial companies by state higher education institutions for the purposes of the economic realization of the results of scientific research and objects of intellectual property, published in the "State Gazette", no. . 33 of April 7, 2020

Keywords*:* academic entrepreneurship; spin-off companies; commercialization

JEL Classification:

1. INTRODUCTION

Academic entrepreneurship, entrepreneurial universities and sustainable relationships between academia and business have been the subject of active discussion in policy, media, research and business circles for several decades. The focus is usually on the structuring and development of **academic spin-off companies (ASOs**)1 and the commercialization of scientific results, including through technology transfer. Academic entrepreneurship is defined variably and is nuanced depending on key elements of different models and on the specifics of national innovation systems.

In many European countries (for example, Germany and France), professors in classical universities are civil servants and for a long time they did not have the right to carry out commercial-entrepreneurial activity in their own name and at their own expense. However, other countries, such as Sweden, have introduced a special six-month "entrepreneurial" unpaid leave for those wishing to set up a business, after which they can return to work. by offering such opportunities, American universities also try to attract and retain their best personnel. In *Bulgaria,* the liberal regulation of the activities of teachers and researchers creates prerequisites for the individual non-institutionalized entrepreneurship of scientific workers to flourish, although it is not always directly related to their scientific or teaching activities.

This type of entrepreneurship is usually recognized either formally through the direct ownership and participation in the management of the company by the academic staff of universities and research organizations, or informally - through narratives about specific companies of related persons (family) of scientists who for some reason they do not wish to be they do not wish to be exposed there (for example, with positions in the

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state or in the municipal government, incompatible with the implementation of commercial-entrepreneurial activity).

Almost all researchers are united around the common understanding that academic spin-off structures are part of the research process and play an essential role in the transfer of knowledge, in the acquisition of new types of skills and in the reformatting of market segments. Some authors conceptualize academic entrepreneurship as an important tool for institutional change both before and now and define it as *"the search for future forms of value related to the creation, application and transmission of academic knowledge" (Wadhwani* et al., 2017). The result of academic entrepreneurship can also be non-profit organizations (which can be considered as social spin-off organizations), new institutions (institutes, centers, national programs, schemes) or significant innovations in public power (e.g. digitization, opening of big data etc.). ASOs have their important place and role in the knowledge-based economy. They shorten the time for commercialization of the scientific result, reduce the risk in this process, respectively the planned costs. Due to the proximity of these companies to the academy, there is also a reverse transfer of knowledge to the university and laboratories, i.e. faster internalization2 of knowledge both in the direction of business and in the direction of academia. The prestige of academic entrepreneurs in society increases, and some also become role models (role models) for schoolchildren and students. All these changes could have a long-term effect on the achievement of a higher quality of those choosing an academic career. In Europe, there is a large concentration of spin-off companies around the Fraunhofer Institutes 3 and Max Planck 4 (Germany), the Catholic University of Leuven 5 (Belgium), the Technical University of Delft (Netherlands) and the Swiss Federal Institute of Technology in Zurich 6 and Loza Max Planck 4 (Germany), the Catholic University of Leuven 5 (Belgium), the Technical University of Delft (Netherlands) and the Swiss Federal Institute of Technology in Zurich 6 and Loza at 7 . Typically, these companies attract high-risk capital, go through the most rounds of funding, and have the fastest growth. A good one an example of this is the established Institute for Computer Sciences, Artificial Intelligence and Technologies (INSAIT) 8 at the Sofia University "St. Kliment Ohridski", whose ambition is to bring the successful practices of technology transfer and commercialization of scientific results from Switzerland to Bulgaria. Here it is important to emphasize that because of the huge budget and certain privileges, INSAIT will be the focus of attention of the academic community and there is no room for mistakes. An in-depth study of the whole population of universities in three other countries (Italy, Norway and Great Britain), which have very different quality of educational services, shows that the presence of a functioning technology transfer office (TTO) increases the number of ASOs, but reduces their quality (Bolzani 2014). Countries with a high degree of protection of intellectual property and with developed stock trading have more fast-growing spin-off companies and have a relatively large share of the intellectual capital of the founder scientists, resp. sales of the scientists' shares. Therefore, better enforcement motivates more entrepreneurs to choose growth strategies based on intellectual property deals and dispersed ones, while greater legal uncertainty is overcome by more concentrated control and ownership. In all analyzed countries, there is a serious geographical divergence of the available knowledge capital with a dominant concentration in regions where the best universities and research institutes are located. This problem is particularly acute in Bulgaria, where internal migration to Sofia, Plovdiv and Varna creates problems even for populated places with independent universities (Gabrovo and Blagoevgrad). A number of publications consider the possibilities of building and developing ASO as a catalyst of activation of less developed regions to support the cohesion of knowledge (Benneworth & Charles 2005). From a theoretical point of view, less developed countries and regions that are not sufficiently integrated with the main markets and knowledge centers can achieve rapid growth through the so-called frugal innovations.

An applicable and understandable content of the concept of *lean innovation* is given by Weyrauch & Herstatt (2017). They define them as technological innovations that simplify an existing global innovation, significantly reducing its cost. This is achieved either by giving up some functionalities that make it impossible to directly apply the relevant innovation in the main markets where it was initially introduced, or by developing a new service using an old technology that will not generally be sought in the developed world. Frugal innovations are

local and require specific knowledge that researchers (local and foreign) usually possess. That is why their development is often linked to research projects in the field of international development, in which scientists from different universities participate. Therefore, it is increasingly necessary to strengthen the interdependent bridge between science and society (including civil society and local communities), which should develop in a similar way to the relationship between science and business.
There are a number of examples of frugal innovations that have emerged in developing countries (such as the applied market), which in a sense are ahead of some of the "dinosaurs" in developed countries. Such an example is mobile money transfers in Kenya 9 (pilot since 2005 and full-scale since 2007) and in the Philippines (since 2005). The transformation of the mobile phone into a payment terminal for payment with credit cards was realized for the first time by the company "Dateks" (first for Blackberry and then for Apple), which is the largest (in terms of turnover) Bulgarian company, the result of academic entrepreneurship. In Bulgaria, the publications related to academic entrepreneurship are mostly case studies, with the exception of the studies of Prof. Ivan Chalakov'steam (see for example Tchalakov et al., 2011), who see academic spin-off companies as a key driver for institutional change and transformation to a market economy. In this regard, since *the institutionalization* of ASO is poorly researched, here we have set ourselves the task of problematizing it and offering recommendations for creating conditions for effectively and sustainably institutionalized spin-off companies in our country. Because if ASOs remain primarily *private formations for too long,* universities will not only have lost benefits, but more importantly, they will not have an accurate measure of the value created by research, and the knowledge gained in the process of ASO activities will not to be democratically accessible to all members of the academic community.

2. THEORETICAL FRAMEWORK

In the Italian context (Bax et al., 2014) a certain structure can be identified as an ASO if it meets the following four conditions:
– to have at least one participating university researcher present the nature of the enterprise;
– this researcher has a long-term commitment to the university (at least 3 years); – the enterprise is profit-oriented; – the production and/or sale of products and/or technologies and/or high-tech services should be in the same fields in which the academic investigator develops his skills and in some sense the ASO is a consequence of them. This understanding of ASO is perhaps the most widespread and meets expectations in Bulgaria. Some authors set an additional condition - the main entrepreneur and bearer of the idea to leave the university or the research organization (Belini et al., 2019), but it rather reflects certain normative rules about the incompatibility of the position of public officials with the conduct of private business. In our country, university professors and scientists from BAS and other research institutes have been given the opportunity10 to found companies without any complicated permits and controls. This turns out to be a good solution because it allows many enterprising scientists to bring their ideas to market, compensating for low salaries and the lack of funding for research, especially until we enter the European Union.

Earlier definitions of ASO (e.g. in a study on Sweden) included within the scope of the founding students and staff of the university, and the idea need not be the result of research, but must have originated in the university environment and not be the result of from a different, side job for another company (McQueen

Wallmark 1982). With such a formulated definition, of course, many more examples of ASO11 could be found, but overall measurement would be more difficult. Student spin-off firms tend to be opportunistic, responding to a specific market need, and have low research productivity because they have not had the opportunity to

generate relevant new knowledge themselves. However, there are examples of ASO initiated by students and other researchers involved in the work. In Bulgaria, such is Tube Plant OOD, founded by Peter Neftelimov12 (65%) and Joana Ushakova (35%), but working in partnership with the Institute of Decorative and Medicinal Plants at the Agricultural Academy. The company is known for the brand "Flowers in a test tube"13 and received a number of entrepreneurial awards, including third place in the contest "Young host in science 2022", organized by the Technology Transfer Center of SU "St. Kliment Ohridski". "Flowers in a test tube" was ranked among the five finalists for our country in the World Entrepreneurship Cup.

In practice, there is a huge variety of ASOs that do not fully meet the formal criteria derived from the purest models in the USA, Italy, Sweden or Germany. The assumption of all definitions is that they are new firms. However, a scientist can enter as a partner in an existing small company and bring know-how to reposition and rebrand it as a start-up, with a new product or service to be sold to a strategic investor in a few years14 (in essence, this is an example of an entrepreneurial ASO based on an existing firm).

Another criterion is profit as a goal, which formally excludes the foundation of associations and foundations, although in Bulgaria there is a highly developed academic entrepreneurship through non-profit organizations (NPOs). At the beginning of the transition, many scientists from the social sphere oriented themselves towards carrying out activities through such organizations. Initially these are classic research projects financed by an external source, and later some of them founded (directly or indirectly - through the respective ONCs) and classic for-profit companies that generally commercialize knowledge and skills from the realized projects (for a detailed analysis of this kind entrepreneurship see Yalamov & Doichinova 2013). An example of classic student entrepreneurship, which generates profit from its work, intended to support the activities of the Business Club of the Faculty of Economics of SU "St. Kliment Ohridski" (which is ONC), is the merchandising of T-shirts and sweatshirts of the Faculty and the University15. Some authors purposefully exclude from ASO firms that are subsidiaries or controlled by universities, and hold to their institutional autonomy (Primay et al., 2003). However, in countries where dispersed ownership is not the norm and where minority shareholders do not have adequate protection (such as Bulgaria), the only way to protect is the possession of a controlling share of the property (not necessarily a majority, but one that allows according to the company'sarticles of association to be able to exercise control over certain key decisions). Therefore, in order to have institutionalized spin-off spin-off companies, they must either be partially/ fully owned by the academic organizations, or grant a license to use (the academy's)intellectual property, or/and have an option, which would guarantee a certain premium to the academy upon the academic entrepreneur's exit from the enterprise 16 . In a broader sense of ASO (including students as entrepreneurs), institutionalization can be limited only to cases where universities provide incubation services to student spin-off companies. Here, the contractual relationship may be more complex and include, for example, a share of the revenue for a period after the incubation services are "completed" equal to the period of using these services free of charge. This is the pattern in a number of Brazilian incubators, which have calculated that in this way they receive an above average rental price (or more generally services provided) from successful companies and do not burden the unsuccessful ones.

A serious theoretical niche in the literature, in our opinion, is the lack of understanding and research of ASO in the field of social innovation and even more generally – the creation of new sustainable social practices or institutions by scientists as a result of scientific research. These new practices or institutions generate value (often a public good) similar to the products and services of classical for-profit CSOs. An example of a non-classical academic spin-off in this regard is the organization and holding of the national and later the international Olympiad in Philosophy (IOP) (Kolev 2017). If we consider the activity as a set of ness of contracts, which

according to Coase (1937) is the essence of the firm, the total cash turnover related to the activity of the MOF certainly exceeds that of the average Bulgarian ASO. Since in the context of sustainable development, in order to carry out research aimed at solving certain societal problems on the model of solving business problems in a research partnership with academic organizations, the need for sustainable relations between the university and society is palpable, we believe , that it is necessary to expand the scope of the definition of spin-off companies. In our opinion, it should include not only ONC, but also more generally sustainable social practices and institutions providing new added value to society. For example, SU "St. Kliment Ohridski" implements the UniverCity17 project, which aims to carry out scientific research and development (R&D) aimed at solving specific community problems. It is possible for any of the prototyped research-based solutions to be 'commercialised',or in other words, to find a sustainable model for it to happen through a set of financial mechanisms. In that case, it would be an ASO without being a profit-oriented company.

Most often, after the founding of a spin-off company, the employment conditions of the involved scientists change, even if there is no "business angel" investor. The pace of their life also changes. They may move entirely to work in the private sector and, due to commitment, stop doing research and/or stop publishing because they want to keep the results for commercialization purposes. However, they can continue to work for the university with reduced commitment or take a sabbatical (career break). Some authors (Czarnitzki et al., 2013) believe that this transition has a high social cost and should be compensated at least partially, since, although it creates more benefits for society, scientists do not have the opportunity to accumulate new knowledge in full range due to other type of load. In order to stimulate academic entrepreneurship, in Italy, for example, a system of academic privileges was introduced in 2001, where the intellectual property of research results remains entirely with the professors. For more than 20 years, however, this has failed to motivate them sufficiently to maintain intellectual property protection and commercialize it. In the general case, there are different institutional forms of existence within the framework of startup companies or small scientific structures. An interesting form of employment is also related to the business incubator – it can provide a certain (limited) number of jobs in cooperation with a university. An incubator can also be a bridging structure between business and the university, as well as providing a "home" for new companies, such as the purpose is to commercialize intellectual property or a product developed at a university or research organization. Another aspect of collaboration between academia and business is the parallel work of researchers in the private sector. Some studies in our country show that their number is more than 15% in large companies, about 7.4% in medium-sized enterprises and slightly more than 2% in micro- and small enterprises (Yalamov 2021).

In the academic spin-off, we assume that the main idea is the result of the research carried out by the parent organization, regardless of the type of product offered to the new company. Spin-off companies created within the framework of the university are necessary rather due to the fact that no company exists that has managed to make a significant scientific breakthrough in a given field or solve a specific problem without expertise in applying a science-based approach. However, there is another assumption - that when a given scientific development has a clearly defined capacity to create a range of products and, accordingly, they have a tangible prospect for applications, natural prerequisites arise to build an ASO. If the main research structure has generated a certain scientific product, the academic spin-off unit can be seen as a tool for direct commercialization of university intellectual property (Pattnaik, Pandey 2014). According to Bax et al. (2014) "academic spin-off" is precisely the creation of ASO as a new high-tech venture, conceived and started by a researcher, which aims to use the results of previous research projects and provides adequate information for the improvement of the eco-innovation system. The authors believe that this phenomenon is relatively new (since about 2000). In the UK, a number of reforms have been implemented (see BIS, 2014) aimed at increasing the

transfer of knowledge between university and industry. UK public authorities have introduced 'impact'funding and support for university-industry joint technology formations, research councils, knowledge transfer partnership schemes and more. and quite distinctly support the creation and development of ASO. This policy is based on numerous studies that show that the most successful institutions for developing impactful innovations are those where academics attract private funding, create individual products and bring them to life (Ewalt 2015; Audretsch & Caiazza 2016; Belitski and Aginskaya 2018). Among the good practices supporting the development of ASOs and somewhat guaranteeing their success, we can mention: reducing corporate tax rates; encouragement of scientists through various types of incentives - moral and material, including academic awards for entrepreneurship; promoting the commercialization of innovations; creation of new production capacitiessti; rapid development of science parks and incubators, etc. The development of ASO in Europe is interesting, where two main trends are observed in the search for key technologies (Abramo et al. 2012): – reduction of the high-tech component of a large part of industrial sectors, which leads to a decrease in competitiveness in high-tech industries ;
– increased presence of small and micro-firms, which are reluctant to introduce innovations in products and processes. Both trends are largely related to the difficulty in assimilating the results of public research into the national scientific system. Added to this is the fact that university technologies and/or products are often insufficiently developed to be quickly and easily absorbed by industry (Markman et al. 2005). Various academic and business studies link the countries investing in and supporting academic entrepreneurship with the Anglo-Saxon model
– USA, UK, Australia, Canada and South Korea. According to Startup Genome 202018, by the end of 2019, 7 of the top 30 global entrepreneurship centers, including academic ones, are located in East Asia, 11 in the US, 5 in Europe, and 7 in the rest of the world. In 2020, the progress of academic entrepreneurship in Asia is visible. The established entrepreneurial ecosystems of Beijing (4th), Shanghai (8th), Tokyo (15th) and Hong Kong (29th) are joined by Seoul (20th), Shenzhen (22nd) and Hangzhou (28th place)19.

In recent years, China has also been among the top 20 countries. All of them, including China, have a targeted policy characterized by: intensive financial support of R&D; building regional capacity to absorb foreign technologies; systematic and effective technology transfer to commercial and industrial applications, particularly in high-tech industries; developing a third mission of universities related to the generation, transfer and use of knowledge developed in universities, with the ultimate application in non-academic environments.

Compared to the mentioned countries in Europe, the development of ASO is not so intensive, but it is sufficiently well distributed as an activity within the framework of the old member states. Single examples of well-developed academic spin-off companies are observed in the new Member States, but it cannot be unequivocally assumed that there has been significant progress, which is probably the result of the implementation of different models.

The actual independent structuring of an academic spin-off company from the university is usually caused by the emergence of certain contradictions between the preferences of whether to conduct fundamental research or to emphasize the commercialization of commercial the lization. But anyway, the intensive development of spin-off companies is manifested in the process of transition from fundamental research to commercialization (Vohora et al., 2004). Fini et al. (2017) point out that in Europe most of the autonomous ASOs have limited intervention, which is due to the fact that they are small in number structures, and according to some researchers, to this can

be added the lack of sufficient experience in starting and managing such kind of structures (Hammerstedt & Blach 2008).

One of the first regional initiatives aimed at reducing these deficits is the Walloon-Brussels First Spin-offs20 program from 1999. In 18 years, it managed to assist in the creation of 88 spin-off companies and train many future business managers for new business emerging technological structures. Such supporting initiatives are necessary because: – when moving from the public to the private sector, the administrative and business culture of academic employees changes; new management functions are related to problem solving, innovation, leadership and team building, financial management and employee motivation; – a long-term vision is necessary for the development of ASO; it must be based on a correct strategy and a viable business model, including guaranteeing a relatively stable financial flow. This is where a university or research institution can be particularly helpful at the beginning of the process. The construction of ASO is also related to providing added value to the product or service that is the object of the new structure. They must possess specific qualities that guarantee clear comparative advantages, and the knowledge-based product generated in academic spin-off companies is able to create such a competitive advantage. Along with patent protection, it is essential to ensure their good management in the creation of ASOs, because all market aspects and trends must be taken into account and at the same time adaptive and proactive behavior towards the rapidly changing environment is required. Looking at the factors that underlie the success of an individual company, Helm et al. (2018) examine three target segments: (1) the founders, (2) the parent organization and its characteristics, and (3) market conditions. The authors analyze employee motivation; the support provided by the parent organization; the need for innovation and the distinctive characteristics of the new company; the right business model that will best fit the market, and according to them, the most influential factors for success are motivation, the degree of novelty of the idea and the relevant valuation of the market.

To this can be added the entrepreneurial orientation, expressed in proactive behavior, which allows very quickly to address the needs of a given market niche, as well as the propensity to take risk (Hartsfield et al. 2017). For scientists, taking financial risk is a relatively easy decision because they have guaranteed salaries, but the difficulties for them stem from their inherent deficits in competitive 'aggressiveness'and niche-seeking autonomy, as well as their decision-making skills without it should be redefined by the parent organization – the university (Kwiatkowska 2017). In summary, it can be said that, as Korpysa (2019) also claims, the innovative nature of the structuring of ASO is determined mostly by the competitiveness of a given product on the market, by the current economic situation, including tax policy, by access to economic infrastructure and existing barriers.

3. STATE OF ASO IN BULGARIA

According to Tchalakov (2011), academic entrepreneurship in our country should be considered in a historical context. In the 1980s, the system of small enterprises in higher mechanical and electrical engineering institutes (VMEI - now technical universities) was practically a complete system for the commercialization of research. Students, graduate students and young researchers work in the enterprises, and the tasks they solve are often related to the substitution of imports from the USSR. A large part of the first entrepreneurs were precisely the employees of the small enterprises and research units at VMEI and at the faculties of natural sciences in classical universities. Such is Miroslav Hinkov (co-owner of "Mechatronics" - Gabrovo), whom the beginning of the transition found as a graduate student at VMEI - Gabrovo. An example of a serial IT entrepreneur, who started his business while he was an assistant at VMEI - Sofia, is Henri Levy with the company Fadata, registered in

April 1990 under Decree 56, who, after establishing it as a global supplier of insurance software , sold it in 2015. It can be said that a huge part of the Bulgarian IT sector originates from academia.

Another interesting case of commercialization in the same context are products resulting from the research of Prof. Hristo Krachanov (from the former VIHVP, now University of Food Technology, and the Laboratory of Biologically Active Carbohydrates, part of the Institute of Organic Chemistry at the BAS) - the juices from aronia. His first company was registered back in September 1990 under Decree 56 ("Saitekh" partnership company), and the current "Vitanea" OOD - in 2003. Prof. Krachanov is the author of over 40 publications and 9 patents registered in various countries. The company's product portfolio is quite diverse, with the manufacturers of the products located mainly in the Plovdiv region. The policy of creating a system of foreign companies (at the end of 1980s) is a planned mechanism for technology transfer from West to East, largely based on "reverse engineering". However, the real benefit of this act can hardly be estimated because the companies do not manage to survive long enough to feel the actual result of their work, and there are no data on what resources were invested in their construction in order to account for the cost ratio /benefits. It should be noted that the academic spin-off companies existing in Bulgaria do not strictly follow any of the known ASO models – they are far from the Anglo-Saxon and American models, they are not comparable to the Asian ones, and they are not even very close to generally accepted European practices . In the predominant case, these are quasi-structures, and the expected positive result of the creation of academic companies is not only commercialization and development of technologies, but also a contribution to local economic and technological development. However, in practice, a very small part of the expectations have been achieved, and the most important reasons for this are two: Bulgaria began to be interested in and develop academic entrepreneurship only after 1990, and more precisely with the development of the negotiation process and the accession of our country to the EU; - although the cooperation between the academic and business environments is a sign of quality for both scientists and business, it remains inert and fragmented (separate sectors, separate cities and faculties).

A number of other factors can be added, due to which (with few exceptions) we do not have examples of academic entrepreneurship in its classical sense. In Bulgaria, the economic impact of early entrepreneurial activity is limited - there is a lack of support for high-tech and/or innovative entrepreneurship at the national and regional level; there is even no support for entrepreneurship in specific and/or priority sectors, and if there is any, it is rather of a temporary nature. To a large extent, cooperation between business and academia is based on personal contacts, does not always transform into an institutional tradition, and is more often a one-off activity for a project or consultation for larger projects that require academic expertise. A partnership between academia and business is more possible when business is willing to fully finance the necessary development of an innovative product, but this is also rare. At the same time, in institutional cooperation, academic participants are not perceived as equal partners because they are financially dependent on the business partner, which, in turn, prevents the construction of a sufficiently favorable environment for cooperation. The more common practice is for a company to invite experts from academia and form temporary teams to create an innovative product. *All this is confirmed and from our research, which found that a large part of the ASOs studied in our country are not a classic example of an academic spin-off, aiming for a quick commercialization of a new scientific discovery, followed by a rapid and serious growth of the company.*

There are various variants of academic entrepreneurship, from the formation of parallel business structures owned by professors, to the provision of consulting services by companies of universities (or by professors as individuals), which support pat and useful models in various forms. Based on our research, we could outline the

following types of academic spin-off structures in Bulgaria. – ASOs, were created as a result of the closure of applied institutes and their transformation into commercial companies in the early 1990s. Much of the scientific staff of these institutes has been dismissed or is leaving due to a lack of security; the intellectual products created by them do not pass into other institutional ownership, and most of them are maintained or used by the scientists in their capacity as individuals. On this basis, small companies are created in almost all sectors, some of which are still successful.

– Small capacities (small enterprises) in technical universities. Cable television, and later some Internet providers, were our foundation and were developed by doctoral students, research assistants and assistants at technical universities, as well as by specialists in small enterprises, which after 1990 had to seek independent development. - ASO, was created based on the initiative of scientists at the beginning of the period of transition to a market economy with the ambition of independent business and better remuneration. Almost all the founders were engaged in universities or scientific institutes, and business units were built in parallel. Later, some of them stopped their scientific activity in public structures. - ASO was formed with the active intervention of business entrepreneurs with close contacts with a given university, who create a consulting pool of university professors possessing a certain know-how. The latter are actively involved in solving a given scientific problem, usually related to the execution of a project. Often, the organizational form of this type of ASO is a company under the Commercial Law - it is controlled by a non-profit association, in which management or general assembly scientists also participate. – ASOs created based on a government decision providing funding for a certain period. A typical example is the company "Joint Genomic Center" Ltd., which was founded in 2006 with a 50% share of SU "St. Kliment Ohridski" and the National Center for Agrarian Sciences (Agricultural Business Academy). After some restructuring (in 2010, SU was the sole owner), a foreign investor entered the Company - the company "Universal Bulgarian Investments" with 30.56%.
- ASO functioning under the active support - financial and logistics, of a given university or scientific organization.
– ASOs created with the assistance of a national or an international financial instrument supporting a new structure within the scientific organization for a certain period.
It is important to note that in the first two cases, the work of this type of structure started at the beginning of the transition to a market economy (in the 1990s), while the others are more typical of the period after 2005.

4. INSTITUTIONALIZED SPIN-OFF COMPANIES IN BULGARIA

In our country, 53 universities and colleges accredited by the National Agency for Assessment and Accreditation have a total of 143 investments (shares) in companies that carry out different business activities and which can be taken as a first approximation of ASO. The majority (74 in total) are companies under the Obligations and Contracts Act (DZZD). Although only 21 of them have been active in the last 10 years, it still shows the desire of the universities for partnership. It is interesting to check to what extent these potential business partnerships are based on or have led to academic partnerships – projects and publications (Fig. 1).

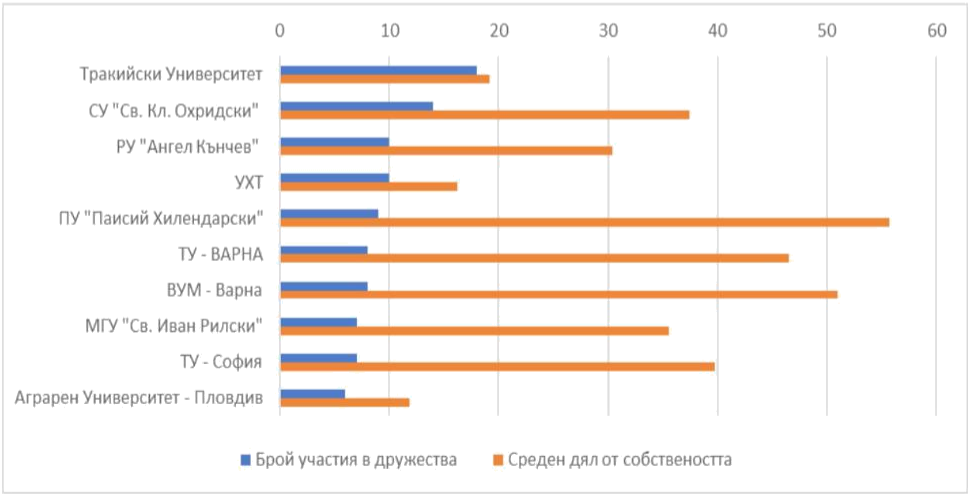

Figure 1. Top 10 universities by ASO institutionalization
Source: Commercial Register

Very often, DZZD are made for the purpose of participating in a project competition and cease to function after the completion of the respective project. One of the positive exceptions is the Technology Center for new developments in trenchless technologies21. It was created in 2012 under the project of OP "Competitiveness" as a public-private partnership between business (the company "Construction Mechanization" JSC), the local government (Kazan Lak Municipality) and an aademic institution (the University of Architecture, Construction and Geodesy - UASG). The center continues to be an active structure and so far with realized revenues of 136 thousand dollars. and with two busy people, albeit with a site that hasn'tbeen updated in a long time.

Three universities have an average ownership share in companies of less than 20% - the University of Thrace - Stara Zagora, the University of Food Technology - Plovdiv, and the Agricultural University - Plovdiv. They have a relatively larger number of partnerships compared to technical and broad-based universities. However, some of the companies have been inactive for more than 10 years, for example the iconic "Ikar" Ltd., in which 18 universities, the Ministry of Education and Science and several companies are partners.

As expected, the companies that actually operate are usually *sole proprietorships* (LLCs). The most successful in the commercialization of the activity from the point of view of the highest share of generated revenues is the UASG, followed by the Medical University - Varna (revenues from its hospital are not taken into account) and the Varna University of Management with two companies - "E -tours" and "Akademika VUM" (fig. 2).best performing company 22 wholly owned by a university and providing commercial services based on university research, laboratories and competences is UASG - TsNIP EOOD, founded in 2015, which according to Orbis is realized 862 thousand dollars income for 2021 and there are 19 employed persons 23. The company works both with state and municipal structures, as well as with small and medium-sized enterprises (SMEs). In 2020, it concluded public procurement contracts for BGN 170,000, in 2021 – for BGN 50,000, and in 2022 – for BGN 157,000 (until the end of October). A similar commercialization is carried out by Moscow State University "St. Ivan Rilski" through "My Neouniverse Engineering" - NIS-MGU EOOD. In 2021, the Company realized revenues of over USD 600,000. and has 11 employees. niversity, have transformed and incorporated their research sectors, which is a practice that deserves to be studied in more detail and possibly adopted by other universities.

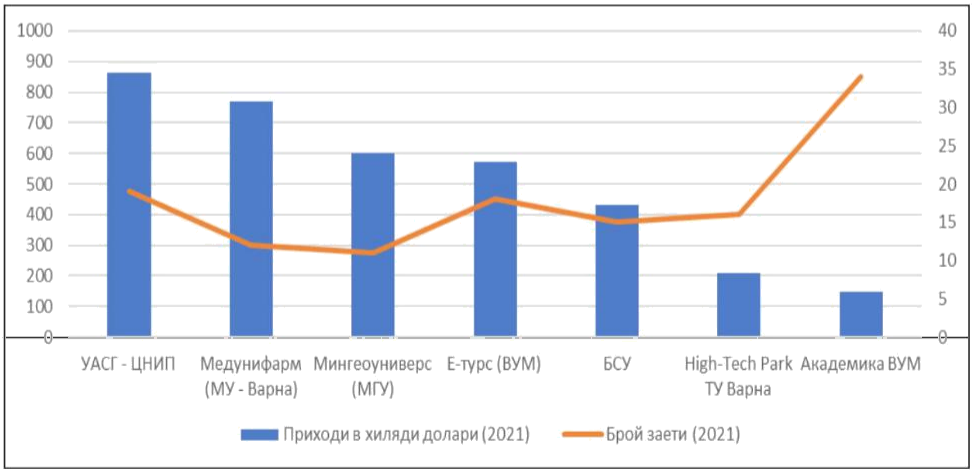

Figure 2. Top 7 institutionalized ASOs.

Both universities, UASG and Moscow State University, have transformed and incorporated their research sectors, which is a practice that deserves to be studied in more detail and possibly adopted by other universities.

The best-performing company that is not solely owned by a university is "E-Tours" Ltd. - here the Higher School of Management (VUM) has a share of 65%. The company is a tour operator company that skilfully capitalizes on the experience (investment, research, teaching, work) of the VUM team. The highest efficiency, measured in income per employed person in an academic spin-off company, is observed in that of MU - Varna (USD64,000 per person), followed by ASO of Moscow State University (USD55,000) and of the UASG (45 thousand dollars), and fourth place is VUM with USD 40,000. per person (Fig. 3). To some extent, however, this ranking is speculative because some of the employees in the respective commercial companies usually also work in universities, and if their full-time equivalents were considered based on hours worked, the values would be much higher. Most universities, alone or in various partnerships with other academic institutions, create high-tech centers, parks or incubators in anticipation of winning funding. Some of these companies are still working, the most successful being the High-tech Park at the Technical University - Varna, with USD 200,000. income in 2011

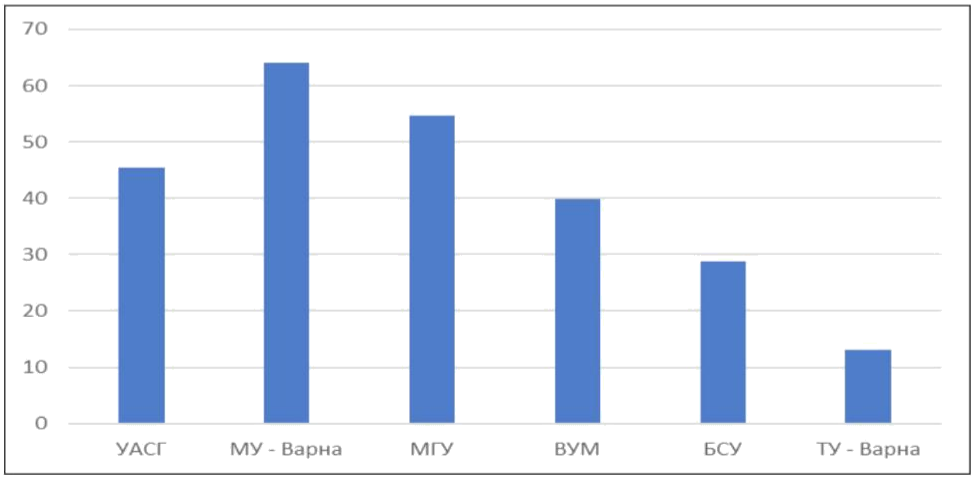

Figure 3. Income per employed person in ASO in thousands of dollars (2021) *Source:* Orbis, 2022

5. NORMATIVE AND OTHER ISSUES

Decree No. 61 of April 2, 2000 on the terms and conditions for the establishment of commercial companies by state higher education institutions for the purposes of the economic realization of the results of scientific research and objects of intellectual property ("State Gazette", No. 33 of April 7, 2020) is a fulfillment of the requirement of Art. 21, para. 1, item 15 of the Higher Education Act (HEA), introduced in 2016. This decree meets public expectations for the regulation of a similar type of activity, but at the same time, it contains many ambiguities and creates a number of obstacles, described in detail in the opinion of Prof. Borislav Borisov of September 9, 2019.24 The most important conclusion in the cited opinion is that a completely new decree is needed, built on the basis of a different philosophy for commercialization and for spin-off companies. Prof. Borisov notes that the decree is completely inapplicable to commercialization in the field of art and humanities.25

Generally speaking, the changes in the 2016 HSE are motivated by the need to promote the commercialization of research and its results. In practice, however, the decree creates conditions for a very restrictive interpretation of commercialization, which is within the narrow framework of Art. 4, defining the subject of the companies'activity. During our analysis of the companies, we were not able to find any universities that changed the subjects of activity of the already registered companies. Since the decree does not specify a time frame by which this should happen, we do not expect such action by universities to be taken anytime soon. Furthermore, there are no penalties for non-compliance with this statutory provision. During the preparation of the decree, an analysis of the real situation, including the practice of creating companies under the Law on Obligations and Contracts, which can also be used for commercialization, was clearly not carried out. If universities are expected to be entrepreneurially oriented, one should not start with a regulation that mainly sets barriers to such orientation. In practice with this activity- that of the most successful ASO at the moment - UASG - CNIP and NIS - Moscow State University, as well as the functioning hospitals and pharmacies at the medical universities, will be highly administratively difficult.

6. CONCLUSION

Various authors, incl. and our team, identify various individual science commercializers – academic entrepreneurs who have succeeded in developing local, national or international businesses. Some of them still belong to scientific structures, others have long since left. Although there is practice for institutional commercialization as well, it is still modest in terms of revenue and scientists involved. The reasons are complex.

The universities lack the administrative capacity to reorganize the activity so that it meets the requirements of Decree No. 61/2020 as much as possible, and there is no adequate funding to be able to catalog, evaluate, protect and register the relevant intellectual property as an asset, which could then be sold. Probably, in the now established research universities, this could be partially achieved with the expected target projects from 2023. Moscow State University, UASG and the Technical University - Varna, which are among the most successful commercializers, however, do not have this status and are not even assessed as promising to acquire it. Therefore, another type of incentive could be applied to them to ensure their sustainable development.

In recent years, much attention has been paid to patents and related licenses as a tool for commercialization, mainly following the Anglo-Saxon model and the Max Planck and Fraunhofer model, but the Bulgarian innovation system does not rely so much on patents and commercialization it happens on another level and in a different way.

Broadly speaking, commercialization is based on internalized knowledge and skills of the individual or collective, which is sold as a service. That is why it is more often carried out non-institutionalized, through the personal entrepreneurial projects of scientists. However, some scholars who have long commercialized their intellectual capital personally but would like to transform their expertise into an institutional legacy. In this regard, it is important to underline that limiting or banning this type of commercialization in Decree 61/2020 will lead to lost benefits for universities. In order to solve this problem, it is necessary to develop a number of procedures concerning the strengthening of technology transfer centers and the development of competences related to intellectual property, financing and business processes for commercialization.

There is still a somewhat dismissive attitude of established scientists dealing with fundamental science towards the so-called applications, who commercialize their knowledge. This neglect is often associated with underestimating the scientific abilities of practitioners and explaining market success with non-market methods. As a result, new lines of demarcation are being built within the scientific community, instead of seeking institutionalization of this diversification (similar to universities in the Anglo-Saxon world) along with partnership. The results of the presented research lead to the conclusion that academic spin-off companies can be an effective tool to increase the absorptive capacity of business when implementing innovations. ASO could also support the adoption of the new mission of the universities (fourth generation universities) and attract established researchers from abroad with the aim of commercialization in Bulgaria. The availability of human resources and still low taxes, together with the presence of a number of global companies in our country could change traditional attitudes. The INSAIT Institute has ambitions similar to ours and it is quite possible to become an additional center of attraction for scientists who will contribute to the innovative development of our country. Because the activities of ASO bring about social changes that are part of the more general healing of the innovation ecosystem.

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NOTES

1 Ivanov (Ivanov, 2015) uses the term *spin-off ,* and in order to ensure continuity in the magazine "Educational and Scientific Policy Strategies", we have preferred this transliteration to its spelling as *"spin-off",* found in other Bulgarian magazines such as "Economic Thought" (Sivov 2005), "Economic Research" (Baltov 2008) and "Sociological Problems" (Tchalakov 2011).
2 In the sense of Nonaka and Takeuchi (1995).
3 See for details www.fraunhofer.de.
4 See www.mpg.de.
5 See www.kuleuven.be.
6 See www.ethz.ch.
7 See www.epfl.ch.
8 See www.insait.ai.
9 The world-renowned M-Pesa service for micropayments becomes the basis for the rapid development of the fintech sector in Africa, and a harbinger of subsequent the development of mobile financial

services there. M-Pesa originated as a public-private research project in 2002 funded by the UK'sDepartment for International Development (DFID).

10. Although at the beginning of the 1990s there was a period of mass departure of entrepreneurial scientists, as they had to choose between a scientific career and business, after that the situation normalized. The example from that time with the chemist Ph.D. II century Dr. Nikolay Teodosiev, who has to leave the BAS because he prefers to stay in business with the family "Teokom" OOD, engaged in the production and trade of various industrial chemicals. BAS is leaving the property of Datex OOD for the same reasons.
11 The company "Batteryland" EOOD is an example of student entrepreneurship directly related to the university environment and networks. See in more detail Yalamov (2016), ch. 6 "Batteries and chargers online: the story of an accidental entrepreneurship", p. 69.
12 . At the time of the founding of the company, Neftelimov was a student at the Faculty of Economics of the University of St. Kliment Ohridski", and subsequently graduated with a master'sdegree in "Biobusiness and bioentrepreneurship".
13 See https://cveteve pruvetka.store/.
14 Such is the example of the company "Logsentinel".
15. See more details at www.suniforma.com.
16. The option is a contract in which the university or research institute will receive remuneration upon exit (sale) of the entrepreneur'sshare in the enterprise.
17 See www.univercity-project.eu.
18 See https://startupgenome.com/report/gser2022.
19 The ranking is according to the following indicators: new solutions, financing possibilities, infrastructure quality, market size and scope and capacity.
20. https://reseaulieu.be/wp-content/uploads/2021/10/20180129_Rapport_subvention_FIRST_spin_off_S.pdf.
21. See https:// trenchless-center.eu/.
22. If you do not consider UMBAL "Sveta Marina" EAD, owned by the Medical University - Varna, and the pharmacy in the Faculty of Pharmacy of the same university "Medunifarm" EOOD.
23. According to APIS, the average monthly number of health insured persons in the company is 14 (socially insured persons are even fewer). The values are different because APIS is based on the data of NOI for actual payments, while "Orbis" uses the declared data in the reports of the companies to the NSI and the NRA. The higher values reported by "Orbis" are due to the fact that if fees or salaries are paid to a second employee speech, but the person received income above the maximum thresholds, this will not be registered in the NSI, but it should be visible in the NSI and in the NRA.
24. https://www.unwe.bg/Uploads/Main/20b7b_%D0%A1%D0%A2%D0%90%D0%9D%D0%9E%D0%92%D0%98%D0%A9 %D0%95%20%D0%9F%D0%9C%D0%A1.pdf.
25. An example of this type of commercialization of knowledge about aesthetics and performative arts is the work of associate professor Petar Plamenov (Plamenov 2010), who takes on the role of dramatist and stage director, for example with Phaedra and The Arrow of Heraclitus.

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7th INTERNATIONAL SCIENTIFIC CONFERENCE ON BUSINESS AND ECONOMICS

ISCBE 24/ 24-26 June 2024/ UTAD, Vila Real, Portugal

On behalf of the Organizing Committee, we are thrilled to extend our invitation to you for the forthcoming 7th International Scientific Conference on Business and Economics (ISCBE 2024), hosted at Universidade de Trás-os-Montes e Alto Douro (UTAD), Vila Real, Portugal.

The conference aims to provide a dynamic platform for in-depth discussions on pressing issues in today's economic landscape. We invite contributions that delve into topics such as economic recovery post-pandemic, strategies for adapting to uncertainty, sustainable growth in the face of global challenges, digital transformations, the role of technology in economic resilience, supply chain disruptions, inclusive entrepreneurship, and the evolving nature of work. Researchers will explore and analyze innovative approaches and strategies for navigating economic uncertainties, emphasizing adaptation, innovation, and resilience in a world of crises.

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ISCBE is a conference organized regularly by the Faculty of Business and Economics, South-East European University, North Macedonia. This year it will be co-organized with Universidade de Trás- os-Montes e Alto Douro (UTAD) and CETRAD, Vila Real, Portugal.

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Domingo Ribeiro-Soriano is a Professor of Business Administration at the Universitat de València, Spain. He is also the co-director of the "Entrepreneurship: From Student to Entrepreneur" Chair. As a researcher, he has published more than 140 papers in SSCI/SCI-ranked journals, including the *Journal of Business Research, Technological Forecasting and Social Change, Entrepreneurship & Regional Development, Review of Managerial Science, Journal of Small Business Management, Small Business Economics*, and throughout his career, he has edited and contributed to books, journals, and conferences and has delivered keynote speeches at international conferences. He has also led several EU-funded projects, and contracts with private companies. Before starting his career in academia, he worked as a consultant at EY (formerly Ernst & Young).

Andreas Kallmuenzer is a Professor of Entrepreneurship and Management at Excelia Business School (since 2019). He holds a Habilitation qualification in Business Administration and a Doctorate in Management from the University of Innsbruck, Austria. He has carried out numerous periods of research at international Business Schools and Universities, including the University of Southern California (USA), the Jonkoping International Business School (Sweden), the University of Queensland Business School (Australia), and the University of Cádiz (Spain). Before his academic career, Dr. Kallmuenzer worked for several years as an entrepreneur in the tourism industry. He is affiliated with both the Tourism Research Center at the University of Innsbruck and the Travel and Tourism Research Association (TTRA) Europe. Dr. Kallmuenzer published over 50 articles in international double-blind and ranked scientific, including *Tourism Management, International Small Business Journal, Business Strategy and the Environment, Technological Forecasting and Social Change, and Journal of Business Research.*

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Memorial of Discoveries in Lisbon
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"Paradigm Shift: Path to Shared Drift"

Óbuda University (Budapest)

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09:00 - 09:30	**Opening Ceremony: András Keszthelyi (Óbuda University) Conference Chair**	**TA.122**
	Welcome speech: Mónika Fodor, Dean (Keleti Károly Faculty of Business and Management, Óbuda University)	
09:30 - 11:00	**Plenary** Session chair: **Danijela Voza** Host chair: **András Keszthelyi**	**TA.122**
	Danijela Voza (University of Belgrade) — Sustainable development progress and challenges - Modelling SDG's based on the income level in European countries	
	Sándor Kürti (Kürti RT) — Datarecovery on the top	
	Balázs Sziklai (Corvinus University) — Diffusion of Innovation on Social Networks	
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	Antal Szabó (ERENET Network) — EXPORATION AND PREDICTION OF EVOLUTION OF INDUSTRIAL REVOLUTIONS	

	Katalin Takács-György (Óbuda University) - **István Takács** (Óbuda University) — Why is so important to use mother language in science?
	Pascal Ricordel (Université Le Havre-Normandie) — The shift between the traditional and the new OPG model through a comparative analysis between Paris 2024 and London 2012
	József Poór (J.Selye University) - **Zsolt Sándor Kőmüves** (MATE University) - **Katalin Szabó** (MATE University) - **Gábor Szabó-Szentgróti** (István Széchenyi University) - **Gabriella Szécsi** (MATE University) - **László Pálmai** (MATE University) — Role and strategic importance of HR systems in V4 countries in light on an international empirical research in 2003
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	Kornélia Lazányi (Óbuda University) — The embedded nature of safety science through the looking glass of historical medical sources
	Sára Szatmáry (Óbuda University) — From Qubits to Society: Understanding the Human Dimensions of Quantum Computing
	Rozália Szatmáry (Óbuda University) — Is there a relationship between technostress and the acceptance of technology?
	Dániel Frankl (Óbuda University) — Exploring Security Weaknesses in VR Systems

	Péter Szikora (Óbuda University) — Limitations of self-driving cars	
11:15 - 12:30	**Online I** Session chair: **Oltjana Zoto** Host chair: **Elena Kokhti**	**TEAMS**
	Oltjana Zoto (Agricultiral University of Tirana) - **Oltjana Zoto, Silvana Nakuci, Elena Kokthi** (Agricultiral University of Tirana) — THE BEHAVIOUR OF THE ALBANIAN CONSUMER TOWARDS GENETICALLY MODIFIED PRODUCTS	
	Elena Kokhti (Agriculture University of Tirana) - **Sonila Papathimiu** (University of Tirana) - **Fatmir Guri** (Agriculture University of Tirana) — Leveraging Spatial Analysis for Enhanced Food Environment Insights: A Pathway to Sustainable Food Systems in Albania	
	Edona Haxhija (European University of Tirana) - **Drita Kruja** (European University of Tirana) - **Zamira Shabani** (University of Shkodra “Luigj Gurakuqi”) — Identifying Key Factors Influencing Nursing Care Quality: A Systematic Literature Review	
	Dávid Zoltán Tóth (Eötvös Loránd Tudományegyetem) — The social responsibility programme of a sports club. Slogan or change? Case study of the Falco-Vulcano Energia KC Szombathely Crucial Catch campaign.	
	Elena Myftaraj (University of Tirana) - **Irena Fata** (University of Tirana) — Empowering the Circular Economy in Albania through Big Data Analytics: Opportunities, Case Studies, and Regional Insights	

	Yameng Xue (LONGi Green Energy Technology Co.,) - **Linfei Ma** (Óbuda University) — Factors affecting consumers' purchase intention in the live streaming of fitness equipment	
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	Ina Keçi (University of Seville) - **Luis Miguel López-Bonilla** (University of Seville) - **Jesús Manuel López-Bonilla** (University of Seville) — The Circular Economy: Essential Research Issues in Sustainable Development	
	Ani Mbrica (Tirana Business University College) - **Ina Keçi** (University of Seville) - **Ermira Qosja** (Aleksander Moisiu University of Durres) — Students' Perspectives on the Circular Economy and Industrial Symbiosis	
	Mohamad Ali Saleh (University of Dunaujvaros) — The Future Trend of E-Mobility in Terms of Battery Electric Vehicles and their Impact on Climate Change: A Case Study Applied in Hungary	
	Krisztián Bálint (Óbuda University) — Creating a Decentralized Blockchain to Store University Data and Payment of University Course Material Through the Use of a Smart Contract	
	Richard Szabó (Óbuda University) — Hungarian financial security - historical background	
14:00 - 15:45	**Friday afternoon II** Session chair: **Ádám Béla Horváth**	**TA.321**

	Host chair: **Andrea Tick**	
	Andrea Tick (Óbuda University) - **Samer Bitar** (Óbuda University) - **Svetlana Kungurtseva** (Óbuda University) - **Yasmeen Abunemeh** (Óbuda University) - **Ai-peri Kenzhebekova** (Óbuda University) — From Waste to Wealth: Exploring the Viability of Profitable Recycling Businesses in Developing Economies	
	Noémi Piricz (Óbuda University) -**Vivien Leuba** (Óbuda University) — How is Innovation Changing Healthcare Supply Chains? – Review of Innovation Models and Their Impact	
	Ádám Béla Horváth (Óbuda University) — Impact of NIS2 requirements in non-technology intensive sectors	
	Andrea Tick (Óbuda University) - **Nikita Gelrot** (Óbuda University) - **Aigerim Shamieva** (Óbuda University) - **Elizabeth Sánchez Osuna** (Óbuda University) - **Robin Abdallah** (Óbuda University) — Navigating Finance: Exploring Student Financial Literacy and Decision-Making in 2023	
	Andrea Tick (Óbuda University) - **Shan Zaffar** (Óbuda University) - **Mohammed Alsaif** (Óbuda University) - **Ali Sleman** (Óbuda University) — The Loyalty Ladder: A Quantitative Exploration of Satisfaction and Commitment in Building Brand Loyalty	
	Mehreen Aneel (Óbuda University) - **András Keszthelyi** (Óbuda University) - **Péter Szikora** (Óbuda University) — Development Assessment of self-driving cars in developed and developing countries	
14:00 - 15:45	**Online II** Session chair: **Hima Parameswaran**	**TEAMS**

	Host chair: **Suvi Sivén**
	Bistra Vassileva (University of Economics-Varna) - **Teodora Daneva** (University of Economics-Varna) — Rethinking constructivist educational methodologies in the age of immersive technologies
	Erjola Barbullushi (University of Shkodra) - **Denisa Domni** (University of Shkodra) — Issues relating to waste management; Construction Industry
	Suvi Sivén (Laurea University of Applied Sciences) - **Jukka Sirkiä** (LAB University of Applied Sciences) - **Terhi Tuominen** (LAB University of Applied Sciences) — Developing SME personnel competence in strategic business sustainability
	Hima Parameswaran (City University Ajman United Arab Emirates) — How adaptive leadership can ignite a transformational change? An empirical study of the UAE-based educational system.
	Iwona Pawlas (University of Economics in Katowice) — THE EUROPEAN UNION\'S COURSE TOWARDS RESILIENCE AS A RESPONSE TO RISING GLOBAL TURBULENCE
	Krisdela Kaçani (University of Seville, Spain,) - **Myriam Luisa González-Limón** (University of Seville, Spain,) - **Luis Miguel López- Bonilla** (University of Seville, Spain,) -**Elena Kokthi** (Agriculture University of Tirana) — The impact of green banking practices on Environmental, Social and Economic Performance. The case of the Albanian Banking System.
16:00 - 17:45	**Friday afternoon III** Session chair: **Danijela Voza**
	TA.122

	Host chair: **Krisztián Bálint**
	Krisztián Bálint (Óbuda University) — Creation of a Unique University Diploma Based on Non-Fungible Token
	Krisztián Bálint (Óbuda University) — Creating an Energy-Efficient University Blockchain
	Anđelka Stojanović (University of Belgrade) - **Isidora Milošević** (University of Belgrade) - **Sanela Arsić** (University of Belgrade) — Modeling customer purchase intentions based on Corporate Social Responsibility practices
	Ardita Borici (University of Shkodra) - **Jetmir Muja** (University of Shkodra) - **Albana Borici** (University of Shkodra) — Service Quality in the Hotel Industry: Tourist Satisfaction and Loyalty. Case of Albania and Montenegro
	Danijela Voza (University of Belgrade) - **Aleksandra Fedajev** (University of Belgrade) — Ranking Western Balkan countries according to the digital skills among older people
	Aleksandra Radić (University of Belgrade) - **Sanela Arsić** (University of Belgrade) - **Đorđe Nikolić** (University of Belgrade) — Application of a Hybrid SEM-MCDA Approach for Examination of Different Industries' Attitude to Use ERP System
16:00 - 17:45	**Friday afternoon IV** Session chair: **Milica Velickovic** **TA.321** Host chair: **Zsuzsanna Deák**
	Tamás Zoltán Zakota (Óbuda University) - **József Fogarasi** (Óbuda University) — Data

	Collection Experiences and Economic Relevance of Urban Tree Inventories	
	József Fogarasi (Óbuda University) - **Artur Lakatos** (Partium Christian University) - **Ákos Botos** (Partium Christian University) — Prospect Theory Investigation of the Stock Market Interdependences during Crises	
	Milica Velickovic (University of Belgrade) - **Marija Panic** (University of Belgrade) — THE RELATIONSHIP BETWEEN WORKPLACE DIGITALIZATION AND OLDER WORKERS PRODUCTIVITY	
	Zsuzsanna Deák (Óbuda University) — Circular Economy Solutions for the Agri-food Business	
	László Borbás (Óbuda University) — Present and future of SMEs in the European Union	
	Zsuzsanna Deák (Óbuda University) - **Agnieszka Wojewódzka-Wiewiórska** (Warsaw University of Life Sciences) — Household overcrowding in selected countries of Central and Eastern Europe - urban-rural approach	
16:00 - 17:45	**Online III** Session chair: **Erarda Vuka** Host chair: **Árpád Szabó**	**TEAMS**
	Csilla Ilona Mizser (Óbuda University) — Risks and successes - through the integrity of the organizational system	
	Zsofia Nguyen (University of Sopron) — The effects of decoupling to Business	

	Executives and Enterprises
	Árpád Szabó (Partium Christian University) — The expectations of the supply side of the hospitality labor market from employers in the Central Region of Romania
	Erarda Vuka (Mediterranean University of Albania) — Improvement of customer service through generative AI
	Doan Minh Phuong (University of Finance - Marketing) — TECHNOLOGY INNOVATION AND FIRM PERFORMANCE OF NON-FINANCIAL PUBLIC LISTED COMPANIES: THE CASE OF VIETNAM.

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