

INTERDISCIPLINARY DESCRIPTION OF COMPLEX SYSTEMS

Scientific Journal

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Cordially,

Zagreb, 27th March 2021

Josip Stepanić

EVERSION, ECOLOGY, TOUCH, AND RAIN: A POST-PC RHETORIC

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ABSTRACT

The post-PC era of computing offers digital rhetors an opportunity to innovate their inventional approaches. The new era is one in which an ecology of networked, distributed, sensor-based devices amplify our perceptions of self and world by changing the ecological relations that define our connections to our techno-social environments. By extending Casey Boyle's posthuman practice of rhetorical invention to the new computational era, rhetoricians can develop digital interactive projects that move participants by amplifying the choric bases of their perceptions of self and world.

KEYWORDS

rhetoric, digital, eversion, affect, post-PC

CLASSIFICATION

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EVERSION AND THE POST-PC ERA

Since the era of the personal computer (PC) peaked over three decades ago, much innovative work related to popular computing has focused on smaller, less dramatic computers that are designed to support us peripherally, monitoring and responding to the relatively minor or mundane questions of the day. From Mark Weiser's contributions to early work under the auspices of ubiquitous computing, early natural-user interface (NUI) design at Microsoft, and more recent initiatives like pervasive computing and the Internet of Things (IoT) have contributed to a shift away from the desktop computer, which enculturated us to a dualistic relationship between the virtual and the real. During the reign of the PC, the virtual realm of the computer was behind the screen, or inside the computer; the 'real world' was outside of it, the two separate and distinct. And popular depictions of the virtual during that era were expressive of the dualistic split between the two realms. Films like the Wachowski's *The Matrix* reinforced this split (until the sequel), and William Gibson's cyberspace was a distal realm, separate and distinct from 'meatspace'. But even Gibson has recognized how far things have changed since the new era of popular computing has replaced the PC. In an Op-Ed in the *New York Times*, Gibson describes this distinction as follows [1]:

Cyberspace, not so long ago, was a specific elsewhere, once we visited periodically, peering into it from the familiar physical world. Now cyberspace has everted. Turned itself inside out. Colonized the physical.

The eversion about which Gibson wrote in 2010, which echoes scholarly work on hybrid space and mixed reality, is due largely to the change in the technical infrastructure, the "ecology of devices" in which we now live [2; p.15]. The small, smart, sensory-based, wireless, networked microcontrollers and -processes that are increasingly embedded in our everyday lives – in our homes and apartments, our cars, all kinds of built environments (airports, malls, office buildings, public bathrooms, subways, highways) to wearable technologies embedded in sports equipment and clothing – contribute to what Gibson and scholar Steven E. Jones call our "everted lives." In his 2014 book, *The Emergence of Digital Humanities*, Jones offers a useful elaboration on the techno-cultural context to which eversion refers [3; p.19]:

The metaphor of eversion is particularly resonant, particularly useful, because it articulates a widely experienced shift in our collective understanding of the network during the last decade; inside out, from a world apart to a part of the world, from a transcendent virtual reality to mundane experience, from a mysterious invisible abstract world to a still mostly invisible (but real) data-grid that we move through everyday in the physical world.

Jones' depiction of the shift from a computational era characterized as an abstract, transcendent world apart (the PC era) to one that is combined with our everyday, physical world, especially in its more mundane moments, echoes Adam Greenfield's depictions of what he calls *everywares*. Greenfield describes an ever-growing number of micro-devices serving us from the interstices of our daily routines. These devices are meant to sense and respond to the activities that we perform on our way to the things that matter, like automating the process of paying tolls on the highway with RFID-based devices, or quietly standing in the corner, waiting and listening until we ask them to relay to us the weather or a news update. They are an essential part of today's data-grid, our contemporary techno-cultural infrastructure.

These devices may not be as attention-getting or dramatic as personal computers. In fact, they

are oftentimes designed to be ignored, designed to be forgotten while they are supporting and maintaining the vectors and velocities of our quotidian lives; nonetheless, they make a profound contribution to our new perception of reality. When Gibson or Jones point to eversion, they are pointing to the recognition that some of what makes the virtual unreal during a PC era has mixed with the real in the era that has eclipsed it. This mixed, everted, post-PC techno-ecological world is the one in which rhetoric scholars and practitioners have an opportunity to innovate their approaches to invention and to what counts as a moving, rhetorical-engaging project. As I will argue shortly, Casey Boyle's call for a posthuman rhetorical practice is a compelling way in which to engage with the dynamics of the post-PC ecology of devices in which we find ourselves increasingly connected and immersed. Working from Gilbert Simondon's ontogenetic theory of becoming, Boyle develops an approach to rhetorical practice that leads to suasive movements of change in our perceptions of individual capacity by changing aspects of the affective capacity of the ecological milieu of which individuality is an expression. Change, in other words, does not originate in the all-too-Western belief in autonomous, rational self; rather, it begins in the ecological dynamic that in-forms individuality. When a digital rhetor designs an interactive media project, a rhetorically-engaging ecological experience, the user generates their own everting amplifications, thereby leading to changes in individual capacity.

SENSORS AND ACTUATORS: AMPLIFICATION AND AFFECT

Essential to the capacity of these devices to evert our lives are the sensors and actuators around which they are designed. Many of these devices rely on sensory data about the "real" or physical world, data which is then transduced through one or more actuators to then make a physical change in the world. For example, as daylight fades on a street, and the ambient light sensors in each of the street lamps are affected by that change, the lights-as-actuators affect the physical world when they turn on. This relationship between sensor and actuator in the device context is one of the key ways in which the blur between the virtual and the real is generated. These kinds of devices, which are invisible as infrastructure, change the way we perceive and feel our world, our capacities associated with our sense of self, and our expectations.

To better understand the role of sensors in the post-PC era is the following opening from Jennifer Gabry's book, *How to Do Things with Sensors*. Gabry describes these devices in terms of their embeddedness in a network [4; p.1]:

The world of sensors is one of amplified connections. Sensors are meant to join up and speed up, while also facilitating and enabling. Whether these functions pertain to adjusting the lighting levels or advancing political engagement, a quickening of activity is expected to unfold through sensors.

To make changes to the ecology in which we are associated, sensory data is key. Sensory data is the initial connection with the physical world, which a computational system creatively transduces, subsequently sending it back through one or more actuators to the physical. The process, from sensor to actuator, is how eversion is supported. Like a stitch in time, these devices introduce a different valence or capacity into the everyday structure of our lives.

To build on the argument, regarding the need for innovation, sensors and actuators relates to Gilles Deleuze's Spinoza-inspired definition of a body. In his essay, "Spinoza and Us," Deleuze explains that, for Spinoza, the definition of a body is based on two propositions. The first is kinetic: "a body, however small it may be, is composed of an infinite number of particles; it is

the relations of motion and rest, of speeds and slowness between particles, that define a body” [5; p.123]. The second is concerned with its affective capacities: “a body affects other bodies, or is affected by other bodies; it is this capacity for affecting and being affected that also defines a body in its individuality” [5; p.123]. Spinoza’s definition is like a two-dimensional visualization, the lines expressive of its kinetic and dynamic dimensions, waxing and waning with each passing moment. Importantly, the definition can be mapped on to most any object or event: an insect or animal, a poem, a melody, a gesture. In fact, Deleuze offers the following description of a body in his book on Nietzsche: “Every relationship of forces constitutes a body – whether it is chemical, biological, social or political. Any two forces, being unequal, constitute a body as soon as they enter into a relationship” [5; p.37]. Returning to the street lamp – and focusing on the second axis, the photosensitive chemical in the sensor, cadmium sulfide (CdS), becomes a body under Deleuze’s definition in relation to the sun’s rays. During the day, when the number of photons hitting the semi-conductive powder are high, CdS allows electricity to flow freely across it. But when the sun goes down, and the number of photons affecting the powder are fewer, CdS acts as a resistor. A device designed to monitor the affective state of that CdS-photon body can transduce its affective state toward switching on or off the electricity from the city’s grid to the bulb that lights the street, which, too, can be defined as another kind of body. And from a broader point of view – and one that returns us to the level of a user’s experience of *everywares* – the feeling of well-being or safety that a pedestrian might experience when the street lamps begin illuminating the darkness of the street, can be viewed as another set of affective capacities, another ‘relationship of forces’ or body is amplified.

The point of making the connection to Deleuze’s Spinozist body is that the devices that change the ecological arrangement with which we are connected are meant to be a part of the world, to affect aspects of our mundane, everyday routine, operating from the interstices. Those devices, due to the ways in which they augment or amplify aspects of our everyday life, demand a different approach to both valuing and working with them. When these post-PC technologies quietly monitor and respond to aspects of our life, they change the ecology that is the basis for our felt and perceived world, and that ecological change requires a different approach to invention, one that focuses on an alternative logic of engagement, a distinct way of thinking through things, a “bastard reasoning”.

CONNECTING WITH THE *CHŌRA*

The ancient notion of the *chōra* has found its way back into rhetoric theory as a way of engaging with the alternative logic of our emotions, feelings, and affect in a techno-ecological context, which is a context introduced, in large part, by the kinds of devices mentioned above. Thomas Rickert’s essay, “Toward the *Chōra*,” is an important contribution to these ends. In his essay, Rickert offers a close reading of the *chora* outside of its limited place in Aristotle’s philosophical system by focusing on the uses/difinitions offered by Plato and much later Julia Kristeva, Jacques Derrida, and the American scholar Gregory Ulmer.

In regards to the latter scholars uses of it, Rickert writes the following [6; p.252]:

[T]he *chōra* transforms our senses of beginning, creation, and invention by placing them concretely within material environments, informational spaces, and affective (or bodily) registers. Thus, [Kristeva, Derrida, and Ulmer] are interested in how the *chōra* as an ancient line of thinking can illuminate contemporary concerns.

For Rickert, the material environments and information spaces in which we find ourselves today challenge rhetoricians to develop new methods of inquiry – specifically inventional methods that do not rely on the classical, Aristotelian *topoi* or on modern incarnations of it, like Kenneth Burke’s pentad. These approaches work well within language-based systems designed for “discursive, print-based notions of representation and rationality” [6; p.252], Rickert reminds us. But in a post-PC era, these “bookish” approaches are not resilient enough to match the new dynamics of distributed and networked spaces that the ecology of devices has introduced. It turns out that a shift away from the Aristotelian legacy of the *topoi* for the older notion of the *chora* resonates more productively with the dynamic and generative experience of space found within an era of eversion. In what follows, I will focus on Plato and Kristeva.

In Rickert’s reading and summary of recent scholarship about the Platonic dialogue, *Timaeus*, in which the *chora* is discussed at length, the term relates to a theory of creation that begins not from a fixed, stable starting point but rather a “distribution (or matrix) of beginnings” [6; p.257]. The Platonic *chora* is more like a receptacle or matrix comprising a complex distribution of forces. It is the source of all becomings, but it does not resemble that which emerges from it. It is elusive, hidden from direct view. It is the source of creation, but it exceeds the scope of the human intellect. It would seem to have a lot in common with the way affect is described by Melissa Gregg and Gregory J. Seigworth in their introduction to their collection, *The Affect Theory Reader* [7; p.1]:

Affect, at its most anthropomorphic, is the name we give to those forces – visceral forces beneath, alongside, or generally other than conscious knowing, vital forces insisting beyond emotion – that can serve to drive us toward movement, toward thought and extension, that can likewise suspend us (as if in neutral) across a barely registering accretion of force-relations, or that can even leave us overwhelmed by the world’s apparent intractability.

It is for this reason that the *chora* requires a different approach to reasoning, since it is expressive of a different logic, a “bastard reasoning,” as it is described in Plato’s dialogue [6; p.259, 8; 51a-51b, 8; 52b].

For Kristeva, in works like *Revolution in Poetic Language*, the *chora* is used in association with what she calls the semiotic realm. Kristeva posits two realms, the symbolic and semiotic. The symbolic realm is the realm of language and meaning. The semiotic is the realm of the “emotions, sensations, and other marks and traces of psychical and material experience” [6; pp.260-261]. In an article that includes both a summary of an application of Kristeva’s theory of the *chora*, Brian L. Ott and Diane Marie Keeling offer the following explanation [9; p.366]:

Adapting Plato’s conception, Kristeva understands the *chora* as the undifferentiated state between mother and infant prior to the acquisition of language and the paternal law. It is a womb-like enclosure - a sonorous envelope in which the prenatal and newborn infant feels at one with the sounds and sensations of the mother. For Kristeva, the *chora* corresponds to and enables the semiotic (or nonreferential) dimensions of rhetoric.

For Kristeva, as an infant acquires language, the vital and original significance of the semiotic is largely forgotten, the role of the symbolic largely eclipsing it. But the semiotic cannot be completely ignored. Without the *chora*, the humanities and sciences are little more than “archivistic, archaeological, and necrophiliac” [6; p.261, 10; p.13]. The *chora* is a necessary and

vital “extra-linguistic” dimension of human life, including artistic and intellectual creativity. As Kristeva argues in *Revolution in Poetic Language*, it is an essential source of avant-garde literature, poetry, and other experimental realms.

Traditional approaches to communication and invention rely on a stable, autonomous self who exists separate and distinct from the world, and whose individuality is predicated on a rational mind that communicates through language. It is a traditional subject propped up by a host of dualisms that work in parallel, and which include mind/body, inside/outside, truth/appearance, and more. Like conceptual scaffolding, these dualisms uphold a subject who is meant to be autonomous, individual, and rational. But as the dualisms that prop up this subject become blurred in a techno-cultural era based on an ecology of devices that contribute to eversion, an alternative conceptualization of self is required. Rickert writes, “In the new spatial paradigm, minds are both embodied, and hence grounded in emotion and sensation, and dispersed into the environment itself, and hence no longer autonomous” [6; p.251].

A focus on the chora is a step toward appreciating the complex, generative dimensions and capacities of the distributed set of forces comprising the ecology of devices that are everting the spaces in which we live and work.

The next step is to work toward a sense of practice. How, in other words, can digital rhetoricians innovate traditional practices based in the symbolic realm in order to work alongside the capacities of the choric ecology of post-PC devices everting our lives? For a possible answer to that question, I turn to Casey Boyle’s *Rhetoric and Posthuman Practice*.

A POSTHUMAN APPROACH TO POST-PC RHETORICS

In his approach to rhetorical practice, Boyle relies on the same definition of the Deleuzian-Spinozist body, linking it to his approach. For example, Boyle writes, “this project finds the body, any body, to be a set of tendencies that affects others and is affected by others. In this way, a body cannot be neatly defined except as a relational process, one that emerges with and through practices” [11; p.5]. In this definition, Boyle references implicitly the second dynamic proposition from Spinoza’s definition. For Boyle, a posthuman approach to rhetorical practice is derived in part from relational (read: networked and distributed) forces comprising human and non-human “actors.” It’s an approach that adopts in order to better respond to the changing dynamics of the post-PC era, which is an era in which a perceived change has occurred between self and world, which is epitomized by the experience of eversion. In fact, echoing some of the same techno-cultural context that Rickert described at the beginning of his article, Boyle writes, “Increasingly compounded by digital forms of mediation, our fast-evolving information moment *interrupts* long-standing divisions between human subjects and nonhuman objects” [11; p.6] (*my emphasis*). With this interruption in mind, Boyle offers an approach to rhetorical practice and invention that is meant to work from within this moment of perceived eversion.

Boyle’s approach to practice is strongly influenced by Gilbert Simondon’s work. He draws on a wide range of Simondon’s theories. For the purposes of this essay, I will focus on the following three ideas: Simondon’s *ontogenetic* approach to individualization, his theory transduction (and information), and his description of the ways in which individuality emerges and continues to transform toward new individualizations from a choric-like process of in-formation born of a metastable milieu.

Regarding his ontogenetic approach, Boyle explains that Simondon downplays the historical

interest in ontology in favor of ontogenetics. The difference is that the latter foregrounds the ongoing process of change and becoming, past, present, and future, that defines an individual's current state. For Simondon, an ontological approach to individuality tends to "elevate a principle of individuation over a process of individuation" [12; p.76]. This is a problem because the former does not adequately account for the ways in which individuality comes to be, and how that being is continually in-formed by "other influences" that Simondon claims could be 'equally important to the emergence of that individuated being" [12; p.76]. An ontological approach begins with a finished product (of individualization) and reverse engineers a description of the origins its form from the principles and properties comprising that final version. Harkening back to the role of the chora, we could say that the ontological approach does not adequately account for the genotextual matrix of influences, the semiotic background from which any expression of individuality emerges. Instead, we begin from the symbolic, and extend its paternal logic as far back as necessary, ignoring the material matrix from which what exists was and is continually in-formed. The "bastard logic" of the semiotic is ignored.

Related to Simondon's focus on ontogenetics is his theory of information. Boyle explains that for Simondon, information is a complex process of becoming or individuating [11; p.22]. An important first step toward understand this claim is to appreciate the difference between two approaches to what information is and does. The first values information for what it transmits. Information associated transmission reduces it to "that which can be transmitted as meaningful content between individual points" [12; p.74]. The second associates information with an ongoing and dynamic process of transduction. In their book, *Physical Computing: Sensing and Controlling the Physical World with Computers*, Dan O'Sullivan and Tom Igoe define the process of transduction in relatively simple terms. It is "the conversion of one form of energy into another" [13; pp.xix-xx]. Related to this is Simondon's more complex description of transduction, which Boyle describes as "a signal that changes as it travels across media, transversals that might include biological, cultural, and technological registers" [11; p.22]. He offers the example of sound as it is transduced from air vibrations through the diaphragm of a microphone, transduced again into an electrical impulse, earbuds, back through air vibrations and then through the human ear drum [11; p.22]. Returning to the earlier example of the street light, the sequence of transductions include the change of photons of light from the sun to chemical reaction in the cadmium sulfide that leads to changes in the analog sin wave of electricity coursing through that part of the circuit, which is then transduced into a numerical/digital value that can then be used by software to subsequently amplify or attenuate the analog sin wave associated with the light level of the street light in another part of the overall circuit. And related to the way transductions can affect biological, cultural, and technological registers, in addition to the abovementioned technological registers of the process, there are transductive mechanisms associated with the human eye (biological) and the sense well-being and safety that associated with a well-lit street at night (cultural).

With this idea of transduction in mind, information is a never-ending process in and through which individuation occurs. "Information," Simon Mills explains, "is the term used to describe the individuation process from a number of different perspectives" [12; p.44]. Relatable once again to the chora, we can think of information as a verb. Individuality is an ongoing process of in-formations, one after the next, born out of a metastable matrix of possibility. Like the mother-water in which Simondon's favorite crystal grows, individuality grows from within the metastable ecology of material-maternal forces. Information, in this description, is an amplifying structure in and through which transductions occur. Individuality is, after all, a complex set of

relations. And based on this unending transductive process of in-formed, serial becomings, Boyle argues that rhetorical persuasion is “an exercise in amplifying and attenuating affective forces in an ongoing attempt to individuate bodies.” [11; p.88]. In contrast to the classical approach to invention, which endeavors to find the available means of persuasion, Boyles posthuman approach “repeatedly poses the rhetorical question of ‘what a body can do?’” [11; p.59]. This question, which is one that resonates with the Deleuzian-Spinozist definition of a body, looks for ways in which to strengthen or weaken some of the affective capacities associated with an individual’s metastable ecology; so, echoing Boyles’ definition of persuasion, rhetoric is now concerned with discovering the available means of changing the affective dimensions of a body in order to change the perceived and/or felt characteristics of a given body.

This approach resonates with the following quote from Erin Manning’s monograph, *Always More Than One*, from which Boyle quotes. Manning writes, “A body is a complex activated through phases in collision and collusion, phasings in and out of processes of individuation that are transformed – transduced – to create new iterations not of what a body is but what a body can do” [11; p.78, 14; p.19]. So, my argument is that rhetorical practice is the discovery of the available means of intervention among some of these processes of individuation. When we amplify or attenuate some of the affective relations comprising a given phase of individuality, we introduce openings for new iterations to emerge.

In a post-PC era in which our sense(s) of self – our perceptions of the world; our feelings as expressions of affective capacity in the world; our sense-abilities – are inextricably linked to a choric-like ecology of devices, changes to that ecology are where a digital rhetor can practice this new approach to persuasion. In answer to the question about innovative methodologies/practices, for digital rhetors working in and with the sensors, actuators, and micro-processes comprising the new post-PC era, we develop interactive environments that, in practice, amplify or attenuate some of the relations comprising our sense-abilities of self.

AMPLIFICATIONS OF DELIGHT: RAIN ROOM

Earlier, I described the way in which many of the devices comprising the new post-PC era tend to work at the periphery of our attention, quietly moving or suading us toward new senseabilities of individuality, new perceptions of our world. But for a digital rhetorician developing interactive projects, these same technologies can be used in dramatic, overt ways. A “dramatic” project that both epitomizes some of the sensory capabilities of the new era and demonstrates how (posthuman) rhetorical practices can contribute to a perceived and felt change in self, which would signal a moving/suasive experience, the digital interactive installation, Rain Room, is a compelling example [15].

Rain Room was developed by two of the founding members of the London-based collective Random International, Hannes Koch and Florian Ortkrass. The initial installation of Rain Room was in the Barbican Gallery in London (2012-2013). Its popularity led to installations at the Museum of Modern Art (MOMA) in New York City (2013), the Los Angeles County Museum of Art (LACMA) in Los Angeles (2015-2017), the Sharjah outside of Dubai (2018-), the Yuz Museum in Shanghai (2015-), and the Australian Centre for the Moving Image (ACMI) in Melbourne (2020); it is a part of the permanent collections at the LACMA and the Sharjah. Rain Room has been described as the experience of being in a rain storm without getting wet. When it opened in 2012 at the Barbican in London, *The Guardian*’s Architecture and Design critic, Oliver Wainwright, said the following on camera [16]:

Not only is it raining indoors, but I'm not even getting the slightest bit wet wherever I go. It's almost like I'm giving off some kind of wind that's pushing the rain away. [It] somehow responds to me like I have a magnetic field. Wherever I go, it opens up around me.

Related to the surprise and excitement that Wainwright expresses during his walkthrough of the installation, are descriptions like the following in the Australian Design Review [17]:

Expressions of delight, surprise, disbelief – and often, children especially, rushing through the droplets with complete abandon – offer insights into visitors' personalities. The un-ticketed, temporary experience gives an immediate response and is also democratic; anyone can play God for 10 minutes, if only they're prepared to queue!

Related to eversion, the experience introduced by projects like Rain Room infuse some of the 'unreal' characteristics of the virtual with the real, contributing to changes in affect that are relayed at the symbolic level with words like delight, disbelief, and a sense of something freedom associated with the gods.

Technical specifications about the exact materials and design of Rain Room are difficult to find, but a general list includes the following: 2 500 liters of recycled water, a water-management system, injection-molded ceiling tiles, a grated floor (for water collection), steel beams, hundreds of computer-actuated solenoid valves (water nozzles or valves for the simulation of rain), custom software, and 3D, depth-tracking cameras. These materials are part of the choric infrastructure of the space.

Based on that list of materials, we can speculate that they would contribute to the moving or suasive experience as follows: the depth cameras around the installation space are used to detect and track the movement of people within the space; the custom software would be used to remap the 3D data related to people in the space with 2D grid of water valves in the ceiling above them, turning them off or on; and the grated floor would enable the rain fall to be collected, returned to, and recycled through the water-management system. The effect of all of these materials and processes is the experience of walking through a rain storm without getting wet. The water valves above one or more people in the installation space are turned off in "real time," so that a roughly six-foot radius around each user remains dry.

Rain Room is a compelling example of how the paradigm of physical computing can be used methodologically as a choric-like structure that *in-forms* its users toward new atunements – new feelings, new perceptions, new relations – with the world. As participants interact with the installation, they engage in and experience (read: feel) changes in the capacities of their bodies, and those changes can contribute to a change in perception that persists after they leave the installation. The project is a compelling example of the ways in which digital rhetors can design a suasive environment that leads to changes in the affective capacities of bodies, thereby contributing to an ontogenetic change or becoming. In fact, thinking a bit more granularly about the ways in which Rain Room as a choric space leads to ontogenetic changes, I will describe an experience of being caught in an unexpected rain storm. The feeling of unwanted rain drops touching my skin as well as the feeling of clothes that have become heavy, cold, and stuck to my body is baseline from which to appreciate what Rain Room accomplishes.

My memories of being caught unexpectedly in a rain storm are filled with mostly negative feelings and emotions, such as frustration or dread or panic. As the rain hits me, I have the sense

that I cannot escape it. Related to this feeling, the grandeur of the space in which I've been walking gives way to something far denser and more opaque. The taps of rain drops on my skin, the feeling of cold water streaming down my back, and the heavy feeling of my clothes, all contribute to a change in affect as I look for a shelter or the quickest way home. Before the rain, unless it's windy or the sun is very hot, I'm not usually as aware of my body as I walk around. But when it is raining, my body becomes conspicuous; I cannot escape it, either, and that idea contributes to feelings of frustration. It also contributes to an attenuation in my thinking; I'm less able to think broadly or deeply on a subject while caught unawares by a rain storm. Curiously, as the rain hits my body, I can intuit the size of the rain drops (and the 'heaviness' of the rain) by how hard they hit me and the ground; moreover, I can, at first, sense how cold the rain is. If its gusty, I can intuit the direction of the wind, too, based on the angle at which the drops hit my face, neck, and arms.

Virtually all of the sensations, feelings, and emotions associated with the (negative or stressful) experience of being caught unexpectedly in the rain relate to the human sense of touch. Touch, Matthew Fulkerson has argued, "involves a wider range of sensory transducers and informational channels than the other senses and has a complex structure closely aligned to both bodily awareness and exploratory action" (1). Touch is far more than skin deep, which is why Fulkerson states that the "shortcomings in our most basic understanding of the senses and sensory awareness" (3). In his book, *The First Sense*, Fulkerson explains that touch can involve noncutaneous forms of awareness, such as proprioceptive awareness as well as the awareness of movement (kinetic). It can include the feelings of aches and pains, tingles, itches, twitches, and various types of muscle tightness. And as far as concerns cutaneous touch, it can include sensations of objects and surfaces that are hot, cold, soft, hard, smooth, and rough. Touch can also be experienced distally, which means that we can experience objects with which we are not in direct contact. We can feel the roughness or smoothness of the paper on which we are writing from the pencil we are holding. And we can track the direction and progress of a pet, like a cat, as it makes its way from one end of our bed toward our pillow in the morning. It is not touching us directly, but we can "feel each step and track the cat as it navigates around obstacles and marches on toward our face" [18; p.145]. The pencil and the bed in these examples are media through which distal information is translated or transduced to our "sensory surfaces" [18; p.146].

In Rain Room, the experience of being caught in a rain storm – the anxious and negative feelings; the inescapability of our body; the frustratingly unstoppable feeling of rain drops hitting you; the coldness leaching under our skin; our sopping wet clothings dragging us down physically and emotionally – are attenuated. All of the anticipation of discomfort and agitation are gone, and in the place of those feelings and emotions are far more uplifting ones, like surprise and wonder and delight. The two-dimensional ceiling of water valves in the installation space turn off above us, creating a rain-free, three-dimensional space around us, like a spot light following us in the dark. Our expectations and the practices of life for which they relate are not matched, and the attenuation of the expected experience leads to a concomitant rush of joy and a sense of delight as we experience something unexpectedly positive, due to eversive technologies comprising the installation, which change the conventional ecological dynamic on which our bodies expect such an experience to occur.

The ways in which Rain Room everts the conventional experience of rain, thereby changing our expectations, can be further explained by late-19th century theory of the physiological origins of our emotions, which is oft-cited in affect studies. The theory is known as the James-Lange theory

because William James and Carl Lange independently published similar arguments within a year of each other. Both argued that our feelings and emotions originate in physiological changes in our bodies. Conventional wisdom has us believe that our feelings and emotions originate in a mental perception, but James and Lange argued that the emotions, i.e., the words that we have mapped onto specific ranges of affective changes in our bodies come after. A saying attributed to William James' explanation of the theory, which is found in his 1884 essay, "What is an Emotion?", is the following: we do not run away from the bear because we are scared; rather, we are scared because we are running away from the bear. The saying is derived from the following lines in James' essay:

Common sense says, we lose our fortune, are sorry and weep; *we meet a bear, are frightened and run*; we are insulted by a rival, are angry and strike. The hypothesis here to be defended says that this order of sequence is incorrect, that the one mental state is not immediately induced by the other, that the bodily manifestations must first be interposed between, and that the more rational statement is that we feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we cry, strike, or tremble, because we are sorry, angry, or fearful, as the case may be. [19; p.190] (*my emphasis*)

The point of the James-Lange theory is that the feelings of surprise, joy, and delight in Rain Room are expressive of the realization among participants that their expected emotional state is not matched by the anticipated 'bodily manifestations' of being wet and miserable. That is what makes projects like these (and the post-PC technologies on which they are based) so compelling for digital rhetoric. What these everting technologies offer digital rhetors is the opportunity to change the affective capacity of an interactive space, to change its choric capacities. The change in our affective state or capacity occurs before our perception of the event and our emotions about it. Rain is a compelling example of what a posthuman, rhetorical practice can be in a post-PC era of everting, sensory-based technologies.

CONCLUSION

As in most humanistic fields in the 21st century, changes in technology, especially those related to the new era of post-PC *everywares*, challenge digital rhetoricians to shift their inventional practices. Combining the scholarly approaches to concepts such as chora, eversion, and ontogenesis, allows us to view new and innovative possibilities for rhetorical practice. For example, rather than beginning (and ending) with an autonomous subject – one who is moved primarily by and through language, the origins for change now occur in the choric, metastable ecology of devices. From within this ecological milieu, digital rhetoricians design interactive environments that have embedded within their interactive logic a way for participants to self-amplify some of the relational capacities that in-form their sense of self. In other words, by interacting with a digital interactive project, like Rain Room, participants engage in their own suasion, their own becoming. Boyle's posthuman practice is a compelling approach to the ecology of devices in which we are now imbricated.

REFERENCES

- [1] Gibson, W.: *Google's Earth*.
The New York Times, 1 September 2010: A23,
- [2] Greenfield, A.: *Everyware: The Dawning Age of Ubiquitous Computing*.
New Riders Publishing, San Francisco, 2006,

- [3] Jones, S.E. *The Emergence of Digital Humanities*.
Routledge, New York, 2014,
- [4] Gabrys, J.: *How to Do Things with Sensors*.
University of Minnesota Press, Minneapolis, 2019,
- [5] Deleuze, G.: *Nietzsche and Philosophy*.
Translated by: Tomlinson, H. Continuum, New York, 1986,
- [6] Rickert, T.: *Toward the Chōra: Kristeva, Derrida, and Ulmer on Emplaced Invention*.
Philosophy & Rhetoric **40**(3), 251-273, 2007,
<http://dx.doi.org/10.1353/par.2007.0030>,
- [7] Gregg, M. and Seigworth, G.J., eds.: *The Affect Studies Reader*.
Duke University Press, Durham, 2010,
- [8] Plato: *Timaeus*.
Translated by: Bury. R.G. Harvard University Press, Cambridge, 1929,
- [9] Ott, B.L. and Keeling, D.M.: *Cinema and Choric Connection: Lost in Translation as Sensual Experience*.
Quarterly Journal of Speech **97**(4), 363-386,
- [10] Kristeva, J.: *Revolution in Poetic Thought*.
Translated by: Waller, M. Columbia University Press, New York, 1984,
- [11] Boyle, C.: *Rhetoric as Posthuman Practice*.
The Ohio State University, Columbus, 2018,
- [12] Mills, S. and Simondon, G.: *Information, Technology, and Media*.
Rowman & Littlefield International, Ltd, London, 2016,
- [13] O'Sullivan, D. and Igoe, T.: *Physical Computing: Sensing and Controlling the Physical World with Computers*.
Cengage Learning, New York, 2004,
- [14] Manning, E.: *Always More Than One: Individuation's Dance*.
Duke University Press, Durham, 2013,
- [15] Random International: *Rain Room*.
accessed 20th February 2020,
- [16] The Guardian: *Barbican's Rain Room: it's raining, but you won't get wet*.
<https://www.youtube.com/watch?v=EkvazIZx-F0>, accessed 20th February 2020,
- [17] In Review: *Rain Room*.
Australian Design Review. June 21, 2013, accessed 20th February 2020,
- [18] Fulkerson, M.: *The First Sense: A Philosophical Study of Human Touch*.
The MIT Press, Cambridge, 2014,
- [19] James, W.: *What Is an Emotion?*
Mind **9**(34), 188-205, 1884.

EFFECTIVENESS OF ENTREPRENEURIAL UNIVERSITIES: EXPERIENCES AND CHALLENGES IN DIGITAL ERA (A SYSTEMIC APPROACH)

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ABSTRACT

The modern world actively discusses the challenges that will lead to the Fourth Industrial Revolution. As the specialists assume, part of the jobs will be replaced by artificial intelligence. In addition, creation of completely new jobs is expected. As for the jobs that might be maintained in future, skills upgrading will be particularly important.

In such a turbulent environment of economic development, universities, and in particular entrepreneurial universities, play a significant role. We think so as these universities have special structures that promote form a university-industry-government triple helix, reskilling and commercialization of new ideas, etc. Due to the above-mentioned factors, they will neutralize the expected fluctuations in the best way. Later we will discuss the systemic links between the mutual influence of entrepreneurial universities and economy. We consider that continuous connection with such universities will enable business to adapt to the inevitable changes with minimal loss.

KEYWORDS

fourth industrial revolution, future of jobs, entrepreneurial university, triple helix, spin-offs, system, innovative development, patents, education system, entrepreneurial ecosystem

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INTRODUCTION

Since 2016 the World Economic Forum published several reports, where the main issues were connected with the Fourth Industrial Revolution. “With the 4IR, humanity has entered a new phase. The 4IR has become the lived reality for millions of people around the world, and is creating new opportunities for business, government and individuals” [1].

So facts relevant to this approach are as follows:

- “Across all industries, by 2022, growth in emerging professions is set to increase their share of employment from 16 % to 27 % (11 % growth) of the total employee base of company respondents, whereas the employment share of declining roles is set to decrease from currently 31 % to 21 % (10 % decline)” [2];
- “An estimates suggest that at least 54 % of all employees will require reskilling and upskilling by 2022. Of these, over a third will require more than six months of additional training. However, only around 30 % of employees in the jobs most exposed to technological disruption received any kind of training in the past year” [3];
- “In many industries and countries, the most in-demand occupations or specialties did not exist 10 or even five years ago, and the pace of change is set to accelerate. By one popular estimate, 65 % of children entering primary school today will ultimately end up working in completely new job types that don’t yet exist” [4];
- “The workforce transitions ahead will be enormous ... as many as 375 million workers globally (14 % of the global workforce) will likely need to transition to new occupational categories and learn new skills, in the event of rapid automation adoption. If their transition to new jobs is slow, unemployment could rise and dampen wage growth” [5]
- The global unemployment rate could rise to 24 percent (or more) in the year 2050. If we do nothing or nothing fundamental to adapt to the new realities of work, the social gap will continue to widen” [6];
- “As higher education leaders and policymakers think about how to prepare for the future of work, the educational system must be at the crux of any solution” [7].

The above-mentioned facts put on the agenda the necessity of finding the tools, which can be used to mitigate the potential challenges and apply to new opportunities. We consider entrepreneurial universities as one of these tools.

Universities have gone through several stages of development to reach their present state, with their roles and missions changing. In the late twentieth century, the term ‘entrepreneurial university’ appeared in the academic literature to describe universities that have improved various mechanisms by developing their local economy and increasing their incomes.

This article deals with the literature on entrepreneurial universities, discusses the role of the entrepreneurial universities in formation of an entrepreneurial ecosystem, analyzes the role of the universities in overcoming the challenges of the Fourth Industrial Revolution. Finally, the article schematically illustrates the systemic role of the entrepreneurial university for the development of the local economy.

METHODOLOGY

In preparing this article, we reviewed the literature on entrepreneurial universities, studied reports and reviews by international organizations and by recognized research centers (such as

European Commission, the World Economic Forum, the OECD, McKinsey Global Institute, the University Industry Innovation Network (UIIN), European Expert Network on Economics of Education (EENEE), the Global Entrepreneurship and Development Institute – GEDI (USA), and others). The findings relate to the economies of both developed countries and developing countries.

In addition to this, literature review on entrepreneurial universities was done in two directions, in particular:

1. The literature that deal with the experience of two and more countries in the activities of entrepreneurial universities;
2. The literature that analyze the case of one university in different countries.

In studying, entrepreneurial universities one of the main methods to compare, both in time (considering research conducted on universities over several years) and in space (considering research focusing one country, on a few countries, or throughout the World). Surveys were analyzed in detail to create a clear picture of the research topic.

The investigation of entrepreneurial universities is based on the views of many authors. To test the hypotheses, we employ synthesis, analogy, description and correlation methods, as well as a systemic approach. To help the reader become acquainted with the opinions expressed in the article, we present schemes developed by ourselves and other authors. We have adopted a system that reflects the interaction and interdependence between economy and entrepreneurial universities.

To explore the topic expressed in the title of the article, we put forward a research question: are the entrepreneurial universities effective for the innovative development in the digital era?

ENTREPRENEURIAL UNIVERSITY: A BRIEF LITERATURE REVIEW

At the end of the 20th century, a new term “entrepreneurial university” appeared in the scientific literature to describe universities that have improved various mechanisms to promote regional development and increase their incomes. Additionally, other terms used have been: University Technological Transfer, Innovative Universities, Business Universities and Market Universities. “The transformation of the university system is a worldwide phenomenon” [8]. “One significant European response is seen in the development, in concept and in practice, of the “Entrepreneurial University”. To find a single definition of the Entrepreneurial University which works across the European Higher Education Area is difficult and controversial” [9]. The characteristics of entrepreneurial universities are described interestingly by several authors [10-22].

In the article we shall try to analyze the scientific literature referring to the experience of different countries on entrepreneurial universities in several directions, namely:

1. The reports and reviews by international organizations and recognized research centers;
2. The literature that deal with the experience of two and more countries in the activities of entrepreneurial universities;
3. The literature that analyze the case of one university in different countries.

In the first direction of the literature review, we shall analyze government documents and state policy relevant to the topic. Studying such researches is interesting as the analysis is general, the experience of a number of countries has to be studied and global trends and expected changes are reflected.

In the Communication from the Commission is outlined, that “As centres of knowledge, expertise and learning, *higher education institutions can drive economic development in the*

territories where they are located” [23]. From the EENEE Analytical Report No. 18, Prepared for the European Commission we can read “Universities are encouraged to transfer their laboratory discoveries by patenting and licensing intellectual property to local firms. AUTM reported in 1999 that 82 % of firms from university licenses operated in the state where the university was located... 71 % of the entrepreneurs graduating from university start their business in the region where they were born. If the university was in the same region as they were born this probability increases to 87 %. Among those who moved to study at a university in another region, 51 % start up the business in the same region as the university. The university thus serves as a strong magnet to start-ups by alumni and breaks the otherwise very strong “home bias” that entrepreneurs have” [24].

By OECD are presented “a selection of 20 entrepreneurship education and start-up support initiatives developed by universities or their core partners in eastern Germany, Finland, the UK, Poland, South Africa, and the US. They provide useful guidance and inspiration to those in universities that are seeking to support entrepreneurship and the policy makers that are behind them” [25].

University Industry Innovation Network [26] through its publication strived to support and stimulate the development of university-industry interaction, entrepreneurial universities and collaborative innovation. As every environment is different (e.g. country, culture, stage of development, type of institution) UIIN collected good practices on various subjects and levels from 29 countries.

Table 1 shows the literature covering the cases of several countries. Conclusions provided by them are more specific. They reflect the challenges, differences and similarities of the countries being on different levels of development from cross-cultural aspect.

Table 2 shows the literature about the experience of one entrepreneurial university in different countries. Such analysis is interesting as the experience of the university is studied in details and specific conclusions are drawn.

The cases discussed in Tables 1 and 2 are from different continents of the world. This substantiates that the process of changing the university model has actively begun everywhere and in the countries at any level of development.

In general, the number of spin-offs and the duration they function in the market is one of the indicators of efficient functioning of entrepreneurial universities. “University spin-offs have remarkably strengthened the linkage between universities and industry. The number of technology patents and spin-offs coming out of university research has a significant impact on regional economic and social development” [47]. In this context, it will be interesting to consider the views of many authors [48-56].

Thus, we can conclude that, the key factors affecting efficient functioning of entrepreneurial universities are: creating entrepreneurial environment, entrepreneurial staffs as well as entrepreneurial teaching and learning; a strong entrepreneurial vision and the presence of leaders; the need of an aware environment to support spin-off creation; identifying factors that determine continuous organizational success, etc.

Table 1. Key findings of joint studies conducted by universities of several countries.

Reference	Country/countries	Number of Countries/Universities	Key findings
[27]	USA and UK	2 universities	an entrepreneurial university has the following five attributes: 1. Top-down vision, strategy and leadership; 2. Clearly defined entrepreneurship learning objectives that drive the curriculum. 3. Robust internal and external networks. 4. A culture of innovation. 5. Experiential learning and knowledge-transfer opportunities.
[28]	Austria and Germany	2 universities	the lower level of founding intentions among students in Munich and Vienna may be attributed to their less distinctive entrepreneurship education. This leaves a great deal of room for improvement [28].
[29]	Italy, Norway, and the United Kingdom	3 countries	three countries adopting differing approaches to framework conditions, to test whether national and university level initiatives have an influence on the number of spin-offs created and the quality of these spin-offs ... authors find that changes in the institutional framework conditions at both levels are conducive to the creation of more spin-offs, but that the increase in quantity is at the expense of the quality of these firms [29].
[30]	Belgium, France, Germany, Switzerland, the Netherlands, and the United Kingdom	16 case studies of universities	The article relies on 16 case studies of universities located in six European countries in order to address the pros and cons of the four types of TTOs. The results provide both a conceptual understanding and an empirical overview of how universities organize their technology transfer and intellectual property management [30].
[31]	Germany and Poland	2 countries	This article explores the development of University-Business Cooperation (UBC) both in Poland and in Germany, shining a spotlight on the various factors influencing UBC, as well as providing a comparison of the two countries [31].
[32]	Spain and Ireland	2 countries and 4 universities	Authors compare entrepreneurial universities in two European regions (Spain and Ireland) using an in-depth qualitative approach based on multiple case studies (two Spanish universities and two Irish universities) between 2006 and 2010. The findings provide organizational practices and approaches relevant to the transformation process of other regional universities seeking to become entrepreneurial [32].
[33]	Chile and Colombia	2 universities	Authors found that entrepreneurial education, the University environment, and the prior entrepreneurial exposure are mediated by the factors of the Ajzen`s model to generate entrepreneurial intention in higher education students [33].
[34]	Senegal and Spain	2 universities	Findings indicate the existence of cultural differences between both countries in the determination of entrepreneurial intention. Spain showed personal attitude as the main antecedent, whereas in Senegal, it was perceived behavioral control [34].

Table 2. Key findings of experience of one entrepreneurial university in different countries (continued on p.19).

Reference	Country	University	Key findings
[35]	USA	MIT	The article presents new possibilities for entrepreneurship education from the ecosystem perspective. ...the results show educational practices that go beyond the classical model of classrooms, involving student-led activities, mentorship programs, competitions, and others. Project-based courses, experience-based activities and active-based activities are well covered in the data presented [35].
[36]	USA	University of California, Berkeley	...the presence of leaders who marry strategic thinking and capabilities development enhance the likelihood of a university's competitive fitness and long-term survival [36].
[37]	Belgium	Université Libre de Bruxelles	The government at national and regional levels supports universities. In all the Belgian regions, universities spin-offs and science parks are funded through public funds and active venture capital firms. ...On the one hand, the need of an aware environment to support spin-off creation and on the other the need of the new firm to have resources from PRIs to build a sustainable, competitive advantage [37].
[38]	Netherlands	University of Twente	...a strong entrepreneurial vision and the adoption of a different concept of knowledge may be the key for other small and peripheral European universities, in order to reach both local economic relevance and international excellence [38].
[39]	Italy	ARCA consortium (University of Palermo incubator)	...demonstrate that academic incubators play a key role in firm viability [39].
[40]	Malaysia	Universiti Teknologi MARA	... discussed the efforts of the university in creating entrepreneurial environment, entrepreneurial staffs as well as entrepreneurial teaching and learning [40].
[41]	Sweden	Chalmers University of Technology	...the difficulties in creating the entrepreneurial university: transparency; organisation of the infrastructure for entrepreneurship; integration and the commercialization of the research [41].
[42]	Croatia	J.J. Strossmayer University in Osijek	The lack of connections between individual ...components of the model is the biggest obstacle to the emergence of integrative and then entrepreneurial university. Each university needs to find its own way to transform into entrepreneurial university depending on the situation it is in, resources and environment of the university [42].
[43]	East Africa, Tanzania	Iringa University College	The results of the study show that it is possible to identify factors that determine continuous organizational success in Africa, and that managers can be offered a framework that adds focus to improvement [43].

Table 2. Key findings of experience of one entrepreneurial university in different countries (continuation from p.18).

Reference	Country	University	Key findings
[44]	Canada	University of Waterloo	Universities generate and disseminate knowledge as a common good. Both of these functions co-exist at University of Waterloo. Because the process of knowledge transfer into the local economic community is multi-faceted, and largely person-embodied, universities cannot be viewed in such a dualistic way [44].
[45]	China	Northeastern University in China	The pathway to an entrepreneurial university begins with government pulled industry-university collaboration, to university-industry collaboration to interaction Triple helix. This may be followed by a gradually developing “university-industry collaboration” in which companies fund academic research with potential industrial use, the beginnings of a University-pushed triple helix [45].
[46]	Indonesia	Bogor Agricultural University	... Explore university entrepreneurial transformation and emphasized that the development of entrepreneurial activity, learning and teaching processes need more attention [46].

THE ROLE OF ENTREPRENEURIAL UNIVERSITIES IN FORMATION OF AN ENTREPRENEURIAL ECOSYSTEM

The World Economic Forum, in collaboration with Stanford University, Ernst & Young and Endeavor, surveyed over 1000 entrepreneurs from around the globe and in 2014 introduced the Report “Around the Globe and Early-Stage Company Growth Dynamics – the Entrepreneur’s Perspective”. In this report, there are given eight pillars and components of an Entrepreneurial Ecosystem [57]. This model builds on the previous work on entrepreneurial ecosystems by EY, the OECD, and Professor Daniel Isenberg (see Exhibit 1).

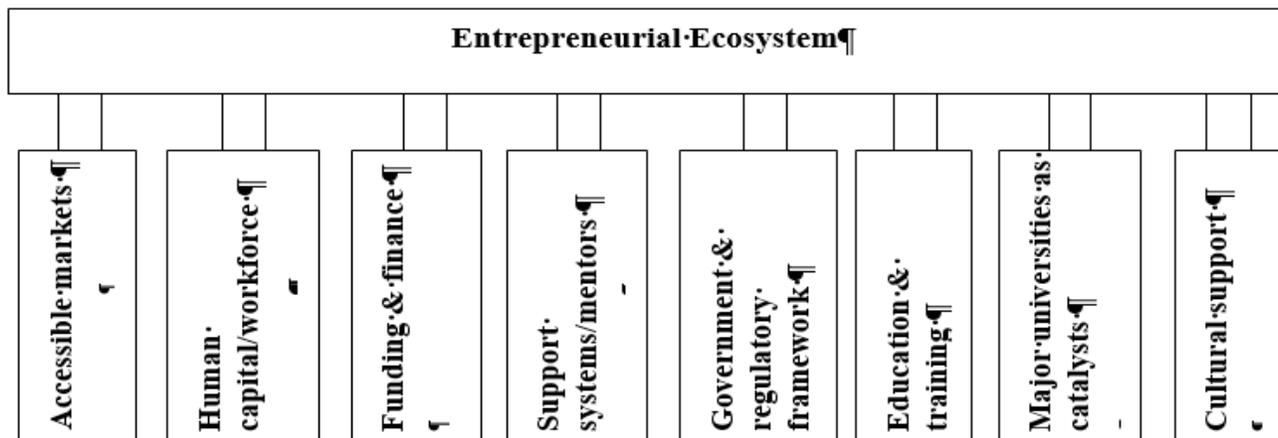


Figure 1. The eight pillars of an Entrepreneurial Ecosystem [57].

The pillars and components of an Entrepreneurial Ecosystem are [57]:

- Accessible markets (Domestic market: Large companies as customers; Small/medium-sized companies as customers; Governments as customers. Foreign market: Large companies as customers; Small/medium-sized companies as customers; Governments as customers);
- *Human capital/workforce (Management talent; Technical talent; Entrepreneurial company experience; Outsourcing availability; Access to immigrant workforce);*
- Funding and finance (Friends and family; Angel investors; Private equity; Venture capital; Access to debt);
- *Support systems/mentors (Mentors/advisers; Professional services; Incubators/accelerators; Network of entrepreneurial peers);*
- Government and regulatory framework (Ease of starting a business; Tax incentives; Business-friendly legislation/policies; Access to basic infrastructure; Access to telecommunications/broadband; Access to transport);
- *Education and training (Available workforce with pre-university education; Available workforce with university education; Entrepreneur-specific training);*
- *Major universities as catalysts (Promoting a culture of respect for entrepreneurship; Playing a key role in idea-formation for new companies; Playing a key role in providing graduates for new companies)*
- *Cultural support (Tolerance of risk and failure; Preference for self-employment; Success stories/role models; Research culture; Positive image of entrepreneurship; Celebration of innovation).*

The three strongest pillars for Europe are human capital/workforce (81 %), accessible markets (72 %) and education and training (60 %). The average percentages for ready availability across the eight pillars for region is on the first place by 86 %, US – Silicon Valley/Bay Area [57].

It should be noted that the entrepreneurial universities have direct positive impact on 5 components of the above 8 pillars. These components in the text are marked by the italic font. This opinion is strengthened by the fact that the region, where Stanford University is located, has the best indicator. This university is one of the most successful entrepreneurial universities in the world. Stanford alumni and faculty have created more than 39 900 companies since the 1930s.

In 2017-2018 Stanford University received \$40,96 million in gross royalty revenue from 813 technologies. Fifty-three of the inventions generated \$100,000 or more in royalties. Seven inventions generated \$1 million or more. In 2017–18, the Office of Technology Licensing (OTL) concluded 150 new licenses. Stanford has 18 designated independent laboratories, centers and institutes that provide a physical and intellectual intersection between schools and disciplines.

Thus, we can conclude that entrepreneurial universities play the significant role in the formation of an entrepreneurial ecosystem.

On the other hand, we would like to discuss one more report “The Global Entrepreneurship Index 2018” by the Global Entrepreneurship and Development Institute (USA). According to this report a range of entrepreneurial framework conditions are: “government, research and development, education, infrastructure, financial sector and the corporate sector” [58]. Since entrepreneurial university combines education, research and business in one space and has an effective dialogue with the local government; we can conclude that entrepreneurial universities improve the entrepreneurial framework, too.

ENTREPRENEURIAL UNIVERSITY – CORE SYSTEM FOR THE INNOVATIVE DEVELOPMENT OF ECONOMY

The turbulence of the economy brings about new demands on higher education systems across the world. In such environment of development, universities, and in particular entrepreneurial universities, play a significant role.

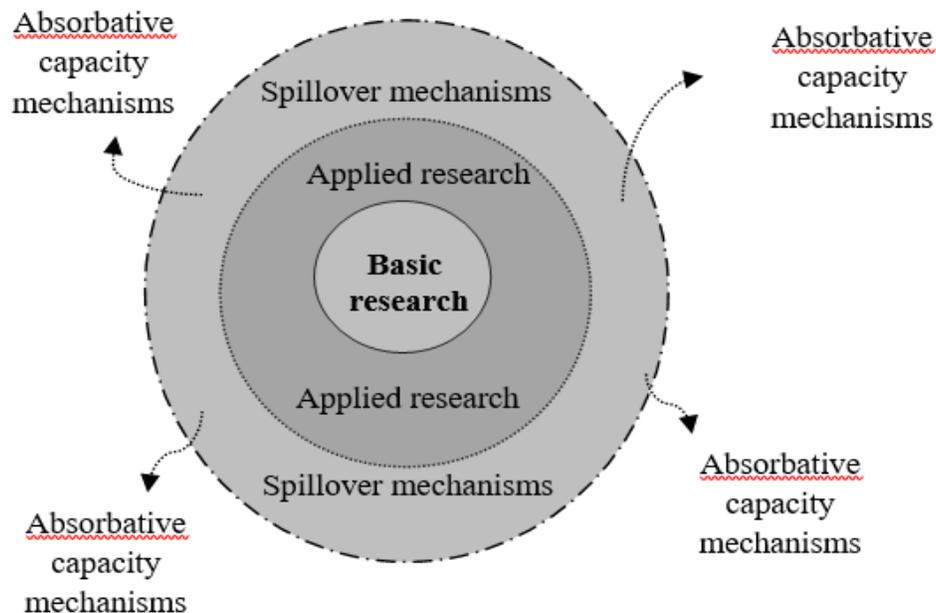


Figure 2. The entrepreneurial university [10].

The entrepreneurial university model is presented in Figure 1. Figure 1 shows that basic and applied research carried out at the universities requires “Third ring”, which consists of mechanisms to facilitate the spillover of knowledge from the research core and applied programs generating that knowledge to society where that knowledge would be commercialized or at least applied [10].

The outcomes of effective formation of “University-Industry-Government” (The Triple Helix) relations are the patents illustrated in Figure 2. Creation of patents in the university environment will provide businesses with the workforce equipped with all the necessary skills. The new knowledge rapidly flows into education and leads to the inspiration of new ideas.

According to Leydesdorff “patents are considered as positioned in terms of the three social coordination mechanisms of (1) wealth generation on the market by industry, (2) legislative control by government, and (3) novelty production in academia. *Whereas patents are output indicators for science and technology, they function as input into the economy*” [59]. The above factors make it clear that by creating patents entrepreneurial universities *serve as a core system and source for the innovative development of Economy* [60].

Figure 3 demonstrates the systemic impact of the entrepreneurial university on the innovative development of economy. The invention patented at entrepreneurial universities improves the possibility of starting a new business and /or functioning of existing business (this process is shown with dashed line n Figure 3). As a result, the culture of investing in research and development

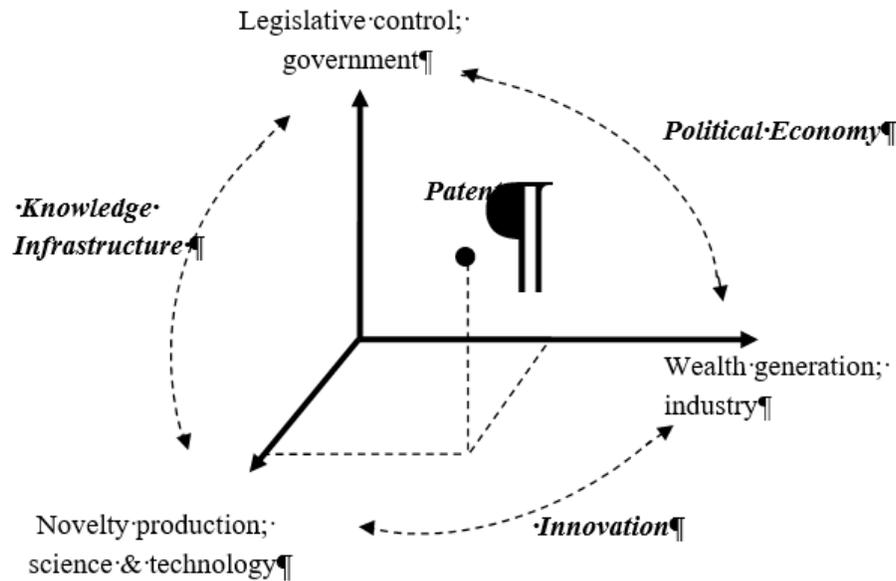


Figure 3. Patents as events in the three-dimensional space of Triple Helix interactions [59].

is gradually developed among the business organizations. They constantly try to have links with the universities and focus on innovative development (this process is shown with green dashed lines on Figure 3). Here emerges a new wave of activities finally resulting in Trademark and Patent applications.

The interests of economic development make the government allocate funds for research that is helpful for both business and universities. Under such circumstances, the time required to achieve government goals is shorter than with standard policy, as incentive measures can be introduced simultaneously in many areas through the university–industry–government triple helix. “This allows direct dialogue on education, science, and business in one area, making it possible to combine private and public funds to encourage the formation of new firms, with the assistance of incubators and spin-offs to provide a properly trained workforce needed by businesses to conduct intense research and other activities” [61]. These processes promote formation of the system in which entrepreneurial university ensures innovative development of the economy.

The entrepreneurial universities create a sort of micro-system around themselves and form a cluster after a certain period.

Why this is system? The relation, given in Figure 3, has all the features characteristic of the system among entrepreneurial university and the economy, features that have been described in the works of other authors. For the purposes of this article, we provide a definition based on Ackoff’s suggestion that “a system is a set of two or more interrelated elements with the following properties:

1. Each element has an effect on the functioning of the whole.
2. Each element is affected by at least one other element in the system.
3. All possible subgroups of elements also have the first two properties” [62]. Each part of the model in Figure 3 meets all these characteristics of a system.

Systemic links, as shown in Figure 3, might not be visible in the standard approach or the study of entrepreneurial universities. Thus, the real potential systemic links cannot be identified.

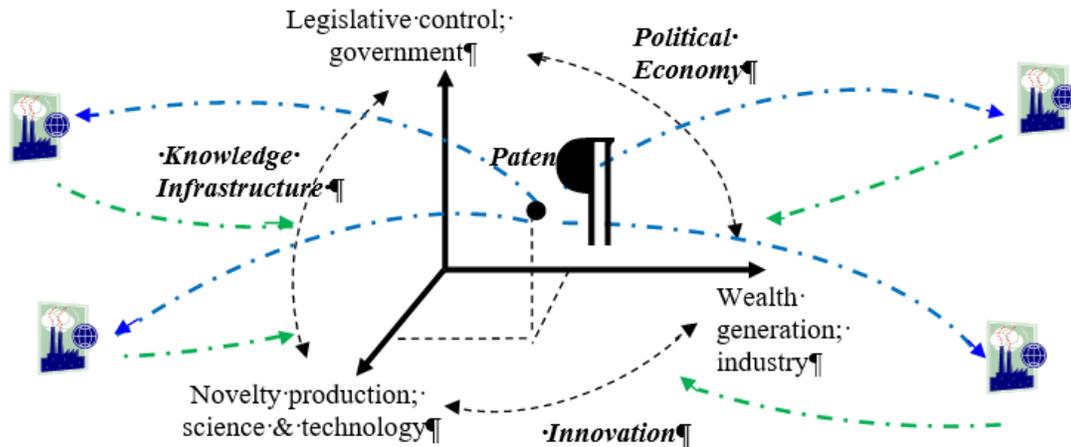


Figure 4. Patents – output indicators for science and technology and input into the economy (developed by Gagnidze based on [59]).

ENTREPRENEURIAL UNIVERSITY – ONE OF THE TOOLS FOR THE CHALLENGES OF THE 4TH INDUSTRIAL REVOLUTION

The World Economic Forum is introducing the new Global Competitiveness Index 4,0 as a much-needed economic compass, building on forty years of experience of benchmarking the drivers of long-term competitiveness and integrating the latest learnings about the factors of future productivity.

Table 3 presents the data of the old [63] and new [64] World Economic Forum reports for the 12th pillar. In the new Global Competitiveness Index 4,0 this Pillar includes 10 indicators (instead of previous 7). It is obvious that improvement of 9 out of these 10 indicators is supported by effective functioning of entrepreneurial universities. Due to this, the need for rethinking of the university system is one of the challenges of the modern education system. This process has actively started in developed and developing countries.

It should be noted that Schwab and Zahidi [65] identified “10 things you – and your government - should know about competitiveness in the Fourth Industrial Revolution”, namely:

1. “Competitiveness is not a luxury good;
2. Investing in people is good for social *and* economic outcomes;
3. Embracing globalization in the 4IR goes beyond free trade;
4. But open economies must also embrace social protection;
5. Creating an innovation ecosystem goes well beyond research and development;
6. Technology offers a path to economic leapfrogging but only in combination with other factors;
7. Institutions still matter;
8. As do infrastructure and the financial system;
9. In a time of constant change, there is a need for constant agility;
10. Achieving equality, sustainability and growth together is possible – but needs proactive, far-sighted leadership” [65].

The authors have also provided detailed explanation of each advice. This explanation makes it clear that entrepreneurial universities can have direct positive impact on the implementation of 7 of these 10

Table 3. Data of the sub-pillars of Innovation (capability) in the 2016-2018 Global Competitiveness reports of the World Economic Forum.

#	GCR 2016-2017	#	GCR 2018
	12th pillar: Innovation		12th pillar: Innovation capability
12.0 1	Capacity for innovation	12.0 1	Diversity of workforce
12.0 2	Quality of scientific research institutions	12.0 2	State of cluster development
12.0 3	Company spending on R&D	12.0 3	International co-inventions
12.0 4	University-industry collaboration in R&D	12.0 4	Multi-stakeholder collaboration
12.0 5	Government procurement of advanced tech. products	12.0 5	Scientific publications H Index
12.0 6	Availability of scientists and engineers	12.0 6	Patent applications
12.0 7	PCT patent applications	12.0 7	R&D expenditures
–	–	12.0 8	Quality of research institutions
–	–	12.0 9	Buyer sophistication
–	–	12. 10	Trademark applications

advices. Consequently, we can conclude that the model of entrepreneurial universities is effective and transition to this model is very essential in terms of expected 4th industrial revolution.

In general, the role of education is directly or indirectly critical in the leap-like development and it will continue to remain the same during the digital era.

CONCLUSION

In the nearest 5-10 years, the world economy will face a period of sharp changes predicted by recognized research organizations. This process is called the Fourth Industrial Revolution and is evaluated in two ways. On the one hand, the expected threats (disappearance of many jobs) are discussed and on the other hand, the expected opportunities (the emergence of many new professions) are evaluated. In addition, over half of those employed will need reskilling and upskilling.

The above-mentioned facts put on the agenda the necessity of finding the tools, which can be used to mitigate the potential challenges and apply to new opportunities. We consider entrepreneurial universities as one of these tools. These universities create an entrepreneurial ecosystem and develop the local economy. After a certain period the entrepreneurial universities create a sort of micro-system around themselves and form a cluster.

The literature review in the current article revealed the main difficulties that are associated with changing the university model and the activities of the third generation universities in different countries. We have developed the schemes created by prominent scholars and schematically showed the systemic role of universities in the development of local economy.

Thus, upon the studies provided by the world-renowned organizations, the ideas of well-known scholars and the example of the best practices from the various countries, we can conclude that Entrepreneurial University model is effective and leads to the innovative consequences in digital era. At the same time it should be noted that to move the University development at this level will require significant efforts.

The key factors affecting efficient functioning of entrepreneurial universities are: creating entrepreneurial environment, entrepreneurial staffs as well as entrepreneurial teaching and learning; a strong entrepreneurial vision and the presence of leaders; the need of an aware environment to support spin-off creation; identifying factors that determine continuous organizational success, etc.

The article is partly limited as it is a desk research. It does not include research on new methods of teaching, which is desirable to develop in HEIs. These issues were beyond our scope but are nonetheless very interesting. Our future research will therefore move towards these topics.

REFERENCES

- [1] Schwab, K.: *The Global Competitiveness Report 2018*. World Economic Forum, Geneva, 2018, <http://www3.weforum.org/docs/GCR2018/05FullReport/TheGlobalCompetitivenessReport2018.pdf>, accessed 23th November 2019,
- [2] Centre for the New Economy and Society: *The Future of Jobs Report 2018*. World Economic Forum, Geneva, 2018, http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf, accessed 24th November 2019,
- [3] World Economic Forum: *Globalization 4.0 Shaping a New Global Architecture in the Age of the Fourth Industrial Revolution*. World Economic Forum, Geneva, 2019, http://www3.weforum.org/docs/WEF_Globalization_4.0_Call_for_Engagement.pdf accessed 24th November 2019,
- [4] World Economic Forum: *The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution*. World Economic Forum, Geneva, 2016, http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf, accessed 23th November 2019,
- [5] Manyika, J. et al.: *Jobs lost, jobs gained: Workforce transitions in a time of automation*. McKinsey Global Institute, Amsterdam, 2017, <https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Future%20of%20Organizations/What%20the%20future%20of%20work%20will%20mean%20for%20jobs%20skills%20and%20wages/MGI-Jobs-Lost-Jobs-Gained-Report-December-6-2017.ashx>, accessed 24th November 2019,
- [6] Daheim, C. and Wintermann, O.: *2050: The Future of Work*. Findings of an International Delphi Study of The Millennium Project, 2016, https://www.bertelsmann-stiftung.de/fileadmin/files/BSI/Publikationen/GrauePublikationen/BST_Delphi_E_03lay.pdf, accessed 24th November 2019,
- [7] Desire2learn (D2L): *The Future of work and Learning In the Age of the 4th Industrial Revolution*. <https://www.d2l.com/wp-content/uploads/2018/01/The-Future-of-Work-and-Learning-D2L.pdf>, accessed 24th November 2019,
- [8] Etzkowitz, H. and Leydesdorff, L.: *The Dynamics of Innovation: From National Systems and “Mode 2” to a Triple Helix of University-Industry-Government Relations*. *Research Policy* **29**(2), 109-123, 2000, [http://dx.doi.org/10.1016/S0048-7333\(99\)00055-4](http://dx.doi.org/10.1016/S0048-7333(99)00055-4),
- [9] OECD: *A Guiding Framework for Entrepreneurial Universities*. European Commission, Better policies for better lives, 2012, <https://www.oecd.org/site/cfecpr/EC-OECD%20Entrepreneurial%20Universities%20Framework.pdf>, accessed 24th November 2019,

- [10] Audretsch, D.B.: *From the entrepreneurial university to the university for the entrepreneurial society*.
Journal of Technology Transfer **39**(3), 313-321, 2014,
<http://dx.doi.org/10.1111/phen.12077>,
- [11] Berggren, E.: *Researchers as enablers of commercialization at an entrepreneurial university*.
Journal of Management Development **36**(2), 217-232, 2017,
<http://dx.doi.org/10.1108/JMD-06-2016-0117>,
- [12] Di Fatta, D.; Caputo, F. and Dominici, G.: *A relational view of start-up firms inside an incubator: the case of the ARCA consortium*.
European Journal of Innovation Management **21**(4), 601-619, 2018,
<http://dx.doi.org/10.1108/EJIM-08-2017-0110>,
- [13] Etzkowitz, H. and Zhou, Ch.: *Introduction to special issue Building the entrepreneurial university: a global perspective*.
Science and Public Policy **35**(9), 627-635, 2008,
<http://dx.doi.org/10.3152/030234208X363178>,
- [14] Farsi, J.Y.; Imanipour, N. and Salamzadeh, A.: *Entrepreneurial University Conceptualization: Case of Developing Countries*.
International Journal Global Business and Management Research (GBMR) **4**(2), 193-204, 2012,
- [15] Gagnidze, I.: *The Role of International Educational and Science Programs for Sustainable Development (Systemic Approach)*.
Kybernetes **47**(2), 409-424, 2018,
<http://dx.doi.org/10.1108/K-03-2017-0114>,
- [16] Gogorishvili, I.; Gagnidze, I. and Papachashvili, N.: *Innovative Approaches in Higher Education System*.
6th Business Systems Laboratory International Symposium "Borders without Borders", Pavia, Italy, Ab.56, 2019,
<http://bslab-symposium.net/Pavia-2019/BSLAB-%20Book%20of%20Abstract-Pavia-2019.pdf#page=214>, accessed 24th November 2019,
- [17] Hsu, D.H.; Roberts, E.R. and Easley Ch.E.: *Entrepreneurs from technology-based universities: Evidence from MIT*.
Research Policy **36**(5), 768-788, 2007,
https://econpapers.repec.org/article/eeerespol/v_3a36_3ay_3a2007_3ai_3a5_3ap_3a768-788.htm, accessed 24th November 2019,
- [18] Muscio, A. and Pozzali, A.: *The effects of cognitive distance in university-industry collaborations: some evidence from Italian universities*.
The Journal of Technology Transfer **38**(4), 486-508, 2013,
<http://dx.doi.org/10.1007/s10961-012-9262-y>,
- [19] Rasmussen, E. and Wright, M.: *How can universities facilitate academic spin-offs? An entrepreneurial competency perspective*.
The Journal of Technology Transfer **40**(5), 782-799, 2015,
<http://dx.doi.org/10.1007/s10961-014-9386-3>,
- [20] Sharif, N. and Baark, E.: *Mobilizing technology transfer from university to industry, The experience of Hong Kong universities*.
Journal of Technology Management in China **3**(1), 47-65, 2008,
<http://dx.doi.org/10.1108/17468770810851494>,
- [21] Sperrer, M.; Muller, Ch. and Soos, J.: *The Concept of the Entrepreneurial University Applied to Universities of Technology in Austria: Already Reality or a Vision of the Future?*
Technology Innovation Management Review **6**(10), 37-44, 2016,
<http://dx.doi.org/10.22215/timreview1026>,

- [22] Walshok, M.L. and Shapiro, J.D.: *Beyond Tech Transfer: A More Comprehensive Approach to Measuring the Entrepreneurial University*. 2014, <https://extension.ucsd.edu/UCSDExtension/media/UCSDExtensionsMedia/community-and-research/center-for-research/Beyond-Tech-Transfer.pdf>, accessed 24th November 2019,
- [23] European Commission: *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the committee of the Regions. Supporting growth and jobs – an agenda for the modernisation of Europe's higher education systems*. <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0567&from=EN>, accessed 24th November 2019,
- [24] Veugelers, R. and Rey, E.: *The contribution of universities to innovation, (regional) growth and employment*. European Expert Network on Economics of Education (EENEE) **18**, 2014, <http://www.eenee.de/eeneeHome/EENEE/Analytical-Reports.html>, accessed 24th November 2019,
- [25] OECD: *Universities, innovation and entrepreneurship criteria and examples of good practice*. 2009, <https://www.oecd.org/cfe/leed/43201452.pdf>, accessed 24th November 2019,
- [26] Meerman, A. and Kliewe, T.: *UIIN Good Practice Series 2014 – Fostering University-Industry Relationships, Entrepreneurial Universities and Collaborative Innovation*. University Industry Innovation Network, Amsterdam, 2014,
- [27] Meyers, A.D. and Pruthi, S.: *Academic entrepreneurship, entrepreneurial universities and biotechnology*. Journal of Commercial Biotechnology **17**(4), 349-357, 2011, <http://dx.doi.org/10.1057/jcb.2011.22>,
- [28] Franke, N. and Luthje, Ch.: *Entrepreneurial Intentions of Business Students – A Benchmarking Study*. International Journal of Innovation and Technology Management **1**(3), 269-288, 2004, <http://dx.doi.org/10.1142/S0219877004000209>,
- [29] Fini, R.; Fu, K.; Mathisen, M.T.; Rasmussen, E. and Wright, M.: *Institutional determinants of university spin-off quantity and quality: A longitudinal, multilevel, cross-country study*. Small Business Economics **48**(2), 361-391, 2017, <http://dx.doi.org/10.1007/s11187-016-9779-9>,
- [30] Schoen, A.; Potterie, B.P. and Henkel, J.: *Governance typology of universities' technology transfer processes*. The Journal of Technology Transfer **39**(3), 435-453, 2014, <http://dx.doi.org/10.1007/s10961-012-9289-0>,
- [31] Baaken, Th.; Rossano, S.; Von Hagen, F.; Todd, D. and Arno, M.: *University-Business Cooperation and Entrepreneurship at Universities – An Empirical Based Comparison of Poland and Germany*. Optimum. Studia ekonomiczne **5**(77), 3-26, 2015, <http://dx.doi.org/10.15290/ose.2015.05.77.01>,
- [32] Guerrero, M.; Urbano, D.; Cunningham, J. and Organ, D.: *Entrepreneurial universities in two European regions: a case study comparison*. The Journal of Technology Transfer **39**(3), 415-434, 2014, <http://dx.doi.org/10.1007/s10961-012-9287-2>,
- [33] Soria-Barreto, K., et al.: *Prior Exposure and Educational Environment towards Entrepreneurial Intention*. Journal of Technology Management & Innovation **12**(2), 45-58, 2017, <http://dx.doi.org/10.4067/S0718-27242017000200006>,

- [34] García-Rodríguez, F.; Gil-Soto E.; Ruiz-Rosa, I. and Sene, P.M.: *Entrepreneurial intentions in diverse development contexts: a cross-cultural comparison between Senegal and Spain*. International Entrepreneurship and Management Journal **11**(3), 511-527, 2015, <http://dx.doi.org/10.1007/s11365-013-0291-2>,
- [35] Riberio, A.T.V.B.; Uechi, J.N. and Plonski, G.A.: *Building builders: entrepreneurship education from an ecosystem perspective at MIT*. Triple Helix, Springer Open **5**(3), 1-20, 2018, <http://dx.doi.org/10.1186/s40604-018-0051-y>,
- [36] Leih, S. and Teece, D.: *Campus Leadership and the Entrepreneurial University: A Dynamic Capabilities Perspective*. Academy of Management Executive **30**(2), 182-210, 2016, <http://dx.doi.org/10.5465/amp.2015.0022>,
- [37] Caiazza, R.: *Factors affecting spin-off creation: Macro, meso and micro level analysis*. Journal of Enterprising Communities: People and Places in the Global Economy **8**(2), 103-110, 2014, <http://dx.doi.org/10.1108/JEC-12-2012-0061>,
- [38] Lazzeretti, L. and Tavoletti, E.: *Higher Education Excellence and Local Economic Development: The Case of the Entrepreneurial University of Twente*. European Planning Studies **13**(3), 475-493, 2005, <http://dx.doi.org/10.1080/09654310500089779>,
- [39] Dominici, G. and Levanti, G.: *The incubation process for the creation of viable firms: The case of ARCA Consortium*. International Journal Markets and Business Systems **1**(1), 4-27, 2015, <http://dx.doi.org/10.1504/IJMABS.2015.070262>,
- [40] Rahim, H.L., et al.: *Entrepreneurial University: A Case of Universiti Teknologi MARA*. International Academic Research Journal of Social Science **1**(2), 224-231, 2015,
- [41] Jacob, M.; Lundqvist, M., and Hellsmark, H.: *Entrepreneurial transformations in the Swedish University system: the case of Chalmers University of Technology*. Research Policy **32**(9), 1555-1568, 2003, [http://dx.doi.org/10.1016/S0048-7333\(03\)00024-6](http://dx.doi.org/10.1016/S0048-7333(03)00024-6),
- [42] Peterka, S.O. and Salihovic, V.: *What is entrepreneurial university and why we need it?* Economy of Eastern Croatia: Yesterday, Today, Tomorrow **1**(1), 98-107, 2012, http://dx.doi.org/10.1057/978-1-349-95121-5_2934-1,
- [43] Waal, A. and Chachage, B.: *Applicability of the high-performance organization framework at an East African university The case of Iringa University College*. International Journal of Emerging Markets **6**(2), 148-167, 2011, <http://dx.doi.org/10.1108/17468801111119506>,
- [44] Bramwell, A. and Wolfe, D.A.: *Universities and Regional Economic Development: The Entrepreneurial University of Waterloo*. Paper presented at Canadian Political Science Association (CPSA) Annual Conference, The University of Western Ontario London, London, 2005, <https://www.cpsa-acsp.ca/papers-2005/Bramwell.pdf>, accessed 24th November 2019,
- [45] Zhou, Ch.: *Emergence of the entrepreneurial university in evolution of the triple helix: The case of Northeastern University in China*. Journal of Technology Management in China **3**(1), 109-126, 2008, <http://dx.doi.org/10.1108/17468770810851539>,
- [46] Mudde, H.L.M.; Widhiani, A.P. and Fauzi, A.M.: *Entrepreneurial University Transformation in Indonesia: A Comprehensive Assessment of IPB*. Journal on Business Review (GBR) **5**(1), 46-61, 2017, <http://dx.doi.org/10.1016/j.intell.2017.01.001>,

- [47] Pattnaik, P.N., and Pandey, S.C.: *University Spinoffs: What, Why, and How?* Technology Innovation Management Review **4**(12), 44-50, 2014, <http://doi.org/10.22215/timreview/857>,
- [48] Bak, K.: *Academic Entrepreneurship – Conceptual Framework and Example from Poland.* Forum Scientiae Oeconomia **4**(3), 105-114, 2016,
- [49] Bakouros, Y.L. and Samara, E.T.: *Academic Liaison Offices vs. Technology Transfer Units: Could they form a new joint mechanism towards the exploration of Academic/Research results?* International Journal of Innovation Science **2**(4),145-157, 2010, <http://dx.doi.org/10.1260/1757-2223.2.4.145>,
- [50] Beraza-Garmendia, J.M. and Rodríguez-Castellanos, A.: *Characteristics and effectiveness of university spin-off support programmes.* Academia Revista Latinoamericana de Administración **28**(1), 14-44, 2015, <http://dx.doi.org/10.1108/ARLA-09-2013-0139>,
- [51] Berbegal-Mirabent, J.; Sabaté, F. and Cañabate, A.: *Brokering knowledge from universities to the marketplace: The role of knowledge transfer offices.* Management Decision **50**(7), 1285-1307, 2012, <http://dx.doi.org/10.1108/00251741211247012>,
- [52] Corsi, Ch., et al.: *The effect of parent university on firm growth: an analysis of the Spanish and Italian USOs.* Journal of Management Development **36**(2), 233-249, 2017, <http://dx.doi.org/10.1108/JMD-06-2016-0108>,
- [53] Gagnidze, I. and Dominici, G.: *Effectiveness of an Entrepreneurial Universities and Spin-offs: Experiences and Challenges.* 6th Business Systems Laboratory International Symposium *Borders without Borders*. Pavia, Ab.61, 2019, <http://bslab-symposium.net/Pavia-2019/BSLAB-%20Book%20of%20Abstract-Pavia-2019.pdf#page=234>, accessed 24th November 2019,
- [54] Gübeli, M.H. and Doloreux, D.: *An empirical study of university spin-off development.* European Journal of Innovation Management **8**(3), 269-282, 2005, <http://dx.doi.org/10.1108/14601060510610153>,
- [55] Sciarelli, M.; Landi, G.; Turriziani, L. and Tani, M.: *Diversity Management in Academic Business Venturing: Empirical Evidences from Italian Universities.* International Journal of Academic Research in Business and Social Sciences **9**(3), 43-62, 2019, <http://dx.doi.org/10.6007/IJARBS/v9-i3/5627>,
- [56] Vesperi, W. and Gagnidze, I.: *Rethinking the university system: Toward the entrepreneurial university (The case of Italy).* Kybernetes, 2019, <http://dx.doi.org/10.1108/K-12-2018-0662>,
- [57] World Economic Forum: *Around the Globe and Early-Stage Company Growth Dynamics – the Entrepreneur’s Perspective.* World Economic Forum, Geneva, 2014, <http://reports.weforum.org/entrepreneurial-ecosystems-around-the-globe-and-early-stage-company-growth-dynamics/wp-content/blogs.dir/34/mp/files/pages/files/nme-entrepreneurship-report-jan-8-2014.pdf>, accessed 24th November 2019,
- [58] Ács Z.J.; Szerb, L. and Lloyd, A.: *The Global Entrepreneurship Index, 2018.* Global Entrepreneurship and Development Institute, Washington, D.C., 2017, http://dx.doi.org/10.1007/978-3-030-03279-1_3,
- [59] Leydesdorff, L.: *The Triple Helix of University-Industry-Government Relations.* In: Carayannis, E. and Campbell, D.: *Encyclopedia of Creativity, Innovation, and Entrepreneurship.* Springer, New York, 2012,

- [60] Gagnidze, I.: *Entrepreneurial University – core system for the innovative development of Economy*. Innovative Methodologies: International Art & Science Conference, Academy of Dramatic Art, Zagreb, pp.35-38, 9-11 April 2019,
- [61] Gagnidze, I.: *From clusters to entrepreneurial universities and vice versa: ways of developing the local economy: a systemic approach*. International Journal of Markets and Business Systems 3(2), 181-196, 2018, <http://dx.doi.org/10.1504/IJMABS.2018.10011650>,
- [62] Ackoff, R.L.: *Creating the corporate future*. John Wiley, New York, 1981,
- [63] Schwab, K.: World Economic Forum: *The Global Competitiveness Report 2016-2017*. World Economic Forum, Geneva, 2016, http://www3.weforum.org/docs/GCR2016-2017/05FullReport/TheGlobalCompetitivenessReport2016-2017_FINAL.pdf, accessed 24th November 2019,
- [64] Schwab, K.: *The Global Competitiveness Report 2018*. World Economic Forum, Geneva, 2018, <http://www3.weforum.org/docs/GCR2018/05FullReport/TheGlobalCompetitivenessReport2018.pdf>, accessed 24th November 2019,
- [65] Schwab, K. and Zahidi, S.: *10 things you - and your government - should know about competitiveness in the Fourth Industrial Revolution*. World Economic Forum, 2018, <https://www.weforum.org/agenda/2018/10/10-things-you-and-your-government-should-know-about-competitiveness-in-the-fourth-industrial-revolution/?fbclid=IwAR031UxBa6yn901YqITjS4bWMyChUoop2KjYZYjOeHSqOoJAKB123grOwoQ>, accessed 24th November 2019.

EMERGENT RULES OF COMPUTATION IN THE UNIVERSE LEAD TO LIFE AND CONSCIOUSNESS: A COMPUTATIONAL FRAMEWORK FOR CONSCIOUSNESS

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ABSTRACT

We introduce a computational framework for consciousness. We hypothesize that emergent rules of computation in the Universe lead to life and consciousness. We live in a Universe that has a substrate capable of computing or information processing. We suggest that in principle, any Universe that is capable of supporting information processing and has energy can evolve life and consciousness.

We hypothesize that the Universe encodes rules in the form of physical laws that allow for the emergence of both life and conscious organisms. A key insight is that there are different levels of consciousness starting from atoms to organisms to galaxies. We propose a metric of complexity that can quantify the amount of consciousness in a system by measuring both the amount of information and the capability to process that information.

We hope that this framework will allow us to better understand consciousness and design machines that are conscious and empathetic. Consciousness and life may be a general phenomenon in our information rich Universe and their maybe other structures designed or otherwise that may be capable of it. Consciousness is an emergent property of an information rich Universe that is capable of processing that information in complex myriad ways.

KEY WORDS

emergence, consciousness, computation

CLASSIFICATION

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INTRODUCTION

Consciousness has intrigued humanity for centuries. It is only now with the emergence of complex systems science and systems biology that we are beginning to get a deeper understanding of consciousness.

Information and a computational substrate to process that information is fundamental to our Universe. We hypothesize that the rules of computation in our Universe lead to emergence of life [1] and consciousness [2]. Consciousness is an emergent property of an information rich Universe that is capable of processing that information in complex myriad ways.

CONSCIOUSNESS, INTELLIGENCE AND LIFE: PERSPECTIVES FROM INFORMATION PROCESSING

We hypothesize that consciousness, intelligence and life are different forms of information processing [1, 2]. Information and a computational substrate to process that information serve as the basis of life, intelligence and consciousness.

The minimal computational unit can be an artificial neuron or reaction diffusion computers [1]. In principle, any of these computing substrates can be used to implement the architecture presented above.

We hypothesize that consciousness, intelligence and life are all different forms of information processing. Consciousness is what information processing “feels” like. Feedback in a complex information processing is consciousness (shown in Figure 1).

We also hypothesize that consciousness is what information processing feels like in a complex system. There is a continuum or different levels of consciousness. Consciousness is also an emergent property of a complex information processing system with feedback. Consciousness and life may be general properties of our information rich Universe.

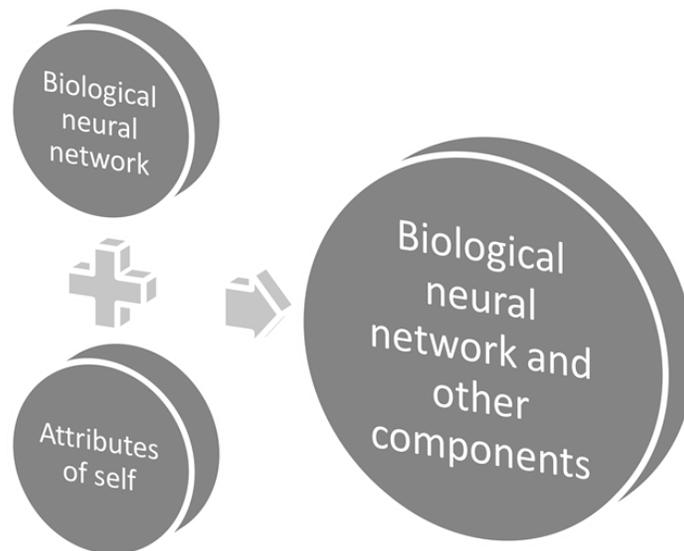


Figure 1. Architecture of consciousness. A biological neural network analyzes the input and output of the core engine and all other modules. This is a simple model with feedback. This is combined with all the attributes of this organism (colour, physical characteristics, the fact that it is not a smartphone, it is not a bird, etc.). The hidden layers of the biological neural network in the brain of an organism will represent the concept of self.

We argue that consciousness is what information processing feels like. A biological neural network can analyze itself. This module would feedback into itself. For example, a small organism like a snail would have some level of consciousness. There are different levels of consciousness. The amount of complexity of this feedback module will determine the level of consciousness.

We note that there are links to quantum theory. In quantum theory, an observer can perturb system just by observing it. Does the Universe only exist if there is an observer? [3]. There are also relationships to the Computable Universe Hypothesis which posits that not only is the Universe a mathematical object, it is composed of computable functions (functions which can be computed and would halt) [4].

Finally, it has been hypothesized before that matter is conscious [5] and that consciousness is a state of matter [3]. Ultimately, consciousness, information and quantum theory may all be related to each other. You need to observe something to make it real (similar to what happens in the double slit experiment). So, somebody must be observing the Universe to make it real. This can be compared to a Universal consciousness (all matter in the Universe is conscious).

The hard problem of consciousness relates to the nature of reality in our Universe. For example, an ant can only observe its surroundings and the Earth is only full of ants. The ant cannot see the Andromeda galaxy. Does it mean that the Andromeda galaxy does not exist for the ant? The hard problem of consciousness argues for the fact that the consciousness is what brings everything in our Universe into existence. Merely knowing more about the underlying physical laws and the state of all particles in it will not help answer the question of why these particles exist and why or how our consciousness can bring them into existence. Monism and panpsychism argue that all matter is conscious.

We argue that there are different levels of consciousness in all matter. Consciousness and information and information processing are different sides of the same coin. It is difficult to answer the question of if the Universe exists without an observer. It may be that conscious beings bring it into existence or that matter exists and different conscious beings see different forms of matter based on their own consciousness. For example, an ant may be able to guide by the stars and will have a different concept of a star than we do. The star exists for both of us. We get different views of the object based on our own consciousness and knowledge [5].

To summarize, we argue that consciousness is what information processing feels like. All matter is conscious but there are different levels of consciousness. The question of whether consciousness brings matter into existence (see ant and star analogy above and discussion below) is truly difficult to answer comprehensively.

Everything we see or observe is interpreted by our brain. Everything is a concept. Let us ask the question did stars exist before anyone could observe them; stars are a concept we created. In a sense that concept could not have existed before the conscious entities that created them exist. Later we argue that conscious entities that have more knowledge have higher levels of consciousness. If we hypothesize that consciousness brings matter into existence, we may be led to additionally speculate that consciousness, knowledge, concepts and matter are related to each other.

Finally, our universe can also be conceived of as a computer [6]. The software is the laws of physics and that along with the hardware (subatomic particles, atoms and molecules) is sufficient to lead to life and consciousness. The laws of physics are software and the physical universe is the hardware. Both hardware and software lead to emergence of life and consciousness.

Emergent rules of computation in the Universe lead to life and consciousness [1, 2]. There may be Universes where there is no life and no consciousness; either the physical laws are not conducive or the physical hardware is non-existent. There may be Universes where the laws of physics are different and there may be no life and no consciousness.

FEEDBACK LOOPS, EMERGENCE AND AN INFORMATION THEORETIC VIEW OF ARTIFICIAL CONSCIOUSNESS

Consciousness is characterized by feedback loops in a complex system. Consciousness is what information processing feels like when there are feedback loops in a complex system that processes information.

It is thought that feedback loops characterize consciousness. There are also different levels of consciousness. Ultimately consciousness is characterized by feedback (analysis of information processing and what information processing feels like), Figure 1. Consciousness is also an emergent property of a complex information processing system with feedback [7].

Consciousness also has been hypothesized to be an emergent property of a complex system. It is like asking what makes water liquid; it is not only a property of the water molecule but also an emergent property.

FEEDBACK LOOPS AND LEVELS OF CONSCIOUSNESS

Feedback loops can lead to consciousness in a complex system. Many different levels of feedback can lead to levels of consciousness [8].

The smallest limit of this maybe in atoms which move around, collide with other atoms, and can be said to perform computation (and hence also have a certain level of consciousness).

Even plants are intelligent and they can compute and have some level of consciousness [9]. They have some rudimentary intelligence and a computational capability. They can compute where is the Sun, in some cases move their leaves towards the Sun, make toxins when under stress, and calculate when to release seeds. They can sense their environment, build a minimal model of the environment and then act on it.

We hypothesize that intelligence, computational capability and consciousness are related. There are different levels of consciousness which is related to the amount of complexity and information processing capability of the complex system. For example, atoms move when they collide with each other. The rules of movement are dictated by the laws of physics; hence in a sense atoms can be said to compute where to move. This is a rudimentary form of computation. Hence it can be argued that atoms have a very elementary level of complexity and an elementary level of consciousness.

Similar arguments can be made for bacteria and ants which represent a higher level of complexity than individual atoms. It is of note that the complexity in bacteria is dependent on the efficient computation in atoms. Higher organisms build on the complexity and information processing capabilities of their constitutive components.

Individual insects are components of social colonies, and humans themselves are part of societies and a planetary level Gaia [10] that has a higher consciousness. These arguments can be extended to the entire Universe which can be argued to have the highest level of consciousness.

We propose internal model complexity as a metric of consciousness. More levels of feedback and more complexity in information processing may lead to higher levels of consciousness. Information and the capability to process information is a critical component of consciousness and life. The amount of complexity in information processing is a metric of the level of consciousness. Consciousness is what this information processing feels like. A higher level of consciousness is having a higher metric of complexity of both information and the capability to process that information. This metric also naturally suggests that consciousness is a continuum. All beings have some amount of consciousness in them starting from atoms to the whole Universe.

A LINK BETWEEN CONSCIOUSNESS, KNOWLEDGE AND MEMORY

Consciousness and knowledge are inter-related. At some point in time we were not aware of atoms or the other planets. Now we have the knowledge and we are aware of these concepts. It makes us more conscious of our Universe. For example, animals are not aware of planets. They are not conscious of them. But we are because we have the knowledge. Hence, we have a higher level of consciousness. Animals are also conscious. With more knowledge, we can get access to higher levels of consciousness (see Fig. 3 for levels of consciousness and connection with knowledge). There maybe things we are not aware of yet. There may also be other structures that are more intelligent and have access to these higher levels of consciousness.

What does a dog and a human feel like? A dog might wonder why the owner leaves at 8 AM and returns at 6 PM. The concept of work or office is beyond his or her comprehension and consciousness. Similarly, a human also wonders about cosmology and discerns that there are many mysteries that are currently beyond his or her comprehension; these may be accessible to other conscious structures in the Universe.

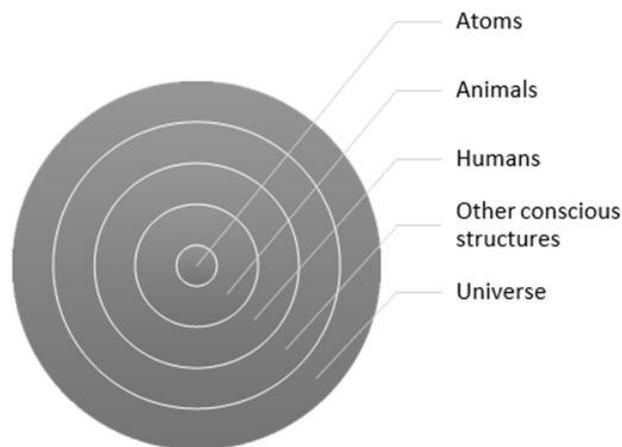


Figure 2. Levels of consciousness and connection with knowledge.

Organisms store information on past actions in memory. They use memories to learn from them, generate new future scenarios from past data and train on this data (Fig. 3). These “reveries” will allow intelligent organisms to effectively combine past actions with newly acquired knowledge. We hypothesize that this leads to more intelligence and ultimately lead to a form of consciousness.



Figure 3. Using past memory to generate new knowledge. Past data is used to generate training data which is combined with new models. This yields new insights and knowledge into a system of interest. This “reverie” model generates new knowledge by combining stored information with a capability to mutate and process that information.

ROLE OF COMMUNICATION IN CONSCIOUSNESS AND INTELLIGENCE

Communication has had an important role in shaping the trajectory of humans. Human brains grew to better communicate with others. This amplified our collective intelligence [1].

We hypothesize that the more intelligent organisms connect these disparate sources of information and form concepts, the more knowledge it will have and the more intelligent and conscious it will become. Humans and other organisms can connect disparate sources of information by communicating with others. Other humans share their own data and information. Collectively they piece together all this information. They advance their understanding. They use these concepts to then further build on, combine with new data and further advance understanding. We can imagine this as a combinatorial epidemic process to explain consciousness as a social emergent phenomenon. The result is intelligence increases over time and so does consciousness.

Combined with memory and reveries (see preceding Section and Figure 3), communication provides a way to progressively increase the level of intelligence and consciousness of a complex system (biological or engineered). Due to this feedback process, consciousness can be gradually built up over time. A similar mechanism was proposed in the bicameral theory of mind [11].

Other animals like birds have primitive communication. At some point in their evolutionary history humans evolved ability to vocalize; this was a more efficient way to communicate. A niche opened in Africa; they could populate that niche. This also co-evolved with the ability to process all this vocal information (communication processing) and a larger brain evolved in humans. Those with larger brains could communicate more and could process that more and had a selective advantage. The formation of societies led to social and collective information processing. This had a runaway effect on vocal and written capability and a brain capable of processing all this information. Furthermore, the evolution of agriculture and collective living likely opened more time to focus on other problems like astronomy and philosophy. Studying these problems would confer long-term benefits on humans. Millennia later these events would culminate in the Industrial Revolution and would lead to even further scientific progress.

SUBJECTIVE EXPERIENCE

We hypothesize that subjectivity is like trying to exhaustively specify the initial conditions and all parameters characterizing a complex non-linear dynamical system (in this case a biological brain) [2]. This is hard to accomplish because we may never have the full dynamical systems model of the brain and even if we did it is exceedingly difficult to simulate it from initial conditions.

We note that there may be conditions we can never fully simulate; even if we had the complete model or dynamical system and determined the initial conditions, using a brain or a machine to simulate another complex system or a Turing machine is in general undecidable. The subjective experience of other conscious animals has been explored before [12]. A bat has sonar. We cannot fully simulate that. We can get a conception of what we think a bat feels [12]. Similarly, we can only get a vague conception of a person who is born deaf or blind.

There may be conceptual structures that are currently beyond comprehension of the biological human brain. The union of the biological brain with machines may allow us to access these structures and higher levels of consciousness.

It may not even be possible to fully simulate another person's or species mental state; in the completely general case it is undecidable. In specific cases, we may have some hope, like explaining the concept of color to a person who is visually impaired [12].

Some people experience snowflakes in their vision all the time. They think it is normal and that everyone also sees them. How do you define a rose to a person who cannot see and who has never seen a rose? They have their own world view and it is locked in (just like a person seeing snowflakes).

Another example is a dog (who is conscious) but is baffled by a cat who is on the other side of a glass door and he cannot reach. He is wondering how can an object be transparent? It is obvious to us but not to the dog. Similarly, there are other phenomenon that are mysterious to us now.

These are perhaps obvious to other conscious structures and may also become obvious to us in the future also.

ARE THERE OTHER STRUCTURES THAT CAN BE CONSCIOUS?

We ask are there are other complex systems that can be considered to be conscious? For example, is the immune system conscious? It has memory: it remembers pathogens it has seen before. It can adapt to different challenges [13-19] and it has a sense of self (it does not attack cells in the body of the host) [20].

We could also argue that any complex system with feedback can be considered to have a level of consciousness. Other structures based on non-carbon based or other novel computing substrates may be capable of higher levels of consciousness.

WHY DO WE NEED CONSCIOUSNESS?

Could natural selection have selected for consciousness? Empathy is intimately connected with a sense of self. Having a sense of self is essential for survival and it may be why evolutionarily it is important to have consciousness.

There are people called synesthete who have a heightened sense of compassion for other people. They feel intense emotions and empathy for other people to the point where human interactions exhaust them and they can become homebound. Essentially, they are simulating other people and feeling what other people are feeling. They also find it difficult to separate their own self from other people.

Hence the reason we have a sense of self. We hypothesize that having a sense of self aids survival and delineates self from prey or predator. This may also be the reason we do not have a lot of empathy. If we did, we would not have a strong sense of self and may be at a selective disadvantage.

Empathy and consciousness are also related. Apart from being undecidable in general, empathy is also inversely related to a sense of self and hence maybe at a selective disadvantage [2].

Empathy may also confer an evolutionary advantage. The ability to understand others, understand the group, can react to and escape from predators if one can understand that others are also fleeing.

RELATIONSHIP TO A SENSE OF TIME AND SELF

Consciousness also has a relationship to a sense of time [21, 22]. Time maybe a construction of consciousness and a human mental construct. Without space and matter there is no time. Without the subject (self), there is also no sense of time [23].

DISCUSSION

We hypothesize that consciousness is what information processing feels like in a complex system. There are many levels of consciousness and all that is needed for consciousness is a substrate that is capable of computing or information processing.

For example, when atoms collide they can be said to compute what to do next based on the laws of physics; it can also be argued that this is a very basic level or unit of consciousness.

Consciousness pervades our Universe. In principle, any universe that is capable of supporting information processing and has energy can evolve life and consciousness in the current star forming (stellariferous) phase [1, 2].

Consciousness is what information processing feels like in a complex system. There is a continuum or different levels of consciousness. Consciousness is also an emergent property of a complex information processing system with feedback. Consciousness is also like having a sense of self. Consciousness and life may be general properties of our information rich Universe.

Our work is complimentary to integrated information theory [24]; a key difference is we emphasize the dual role of both information and a computational substrate that can process that information.

We hypothesize that there are different levels of consciousness and everything starting from atoms to the entire Universe is conscious. An insight is that there are different levels of consciousness starting from atoms to organisms to galaxies (just as the mystics had said that the entire Universe is conscious). The Universe encodes rules in the laws of physics that allow for the emergence of life and conscious organisms.

We hypothesize that there are different levels of consciousness and we propose a metric that can quantify the level or amount of consciousness in a system. We hope this work will challenge us to come up with new ethical structures that accommodate the fact that we inhabit a Universe that is teeming with conscious structures that deserve our empathy. There is a religion called Jainism that tries not to hurt any living organism including bacteria.

There may be conceptual structures that are currently beyond comprehension of the biological human brain. The union of the biological brain with machines may allow us to access these structures and higher levels of consciousness.

Consciousness can also be gradually built up over time as has been hypothesized before [11] due to learning, a communication language and feedback (bicameral theory of consciousness).

Dreams and voices also have a role in our consciousness as proposed in the bicameral theory of mind [11]. Consciousness is also linked to knowledge. As we know more about our Universe, we become conscious about these phenomena (Fig. 2). Finally, dreams help form concepts and create knowledge and understanding; concepts help us be conscious of phenomenon, Figure 3.

In the words of Marvin Minsky, different “suitcase words” are used to describe consciousness [25, 26]. We can break up consciousness into a lot of steps. For example, let us take the case of someone who crosses the road, turns, and moves. There are a lot of steps involved in this complex process of locomotion. There is nothing magical about it. We do not completely understand it; hence we say it cannot be explained by physical laws [25, 26].

We are also not always conscious (for example, during sleep we are not conscious of our breathing). Sometimes we must meditate to be conscious of these phenomena. We are also not conscious of atoms. Consciousness is what our brain tells us and what natural selection has given us. It is a sense of self.

Empathy and consciousness may also be related to each other. The ability to run a simulation of what another person is feeling like (simulate another person’s mental state) is empathy [2]. Apart from being undecidable in general, empathy is also inversely related to a sense of self and hence maybe at a selective disadvantage [2].

In summary, more levels of feedback and more complexity in information processing may lead to higher levels of consciousness. Information and the capability to process information is a critical component of consciousness and life [1, 2]. The amount of complexity in information processing is a metric of the level of consciousness. Consciousness is what this information processing feels like. A higher level of consciousness is having a higher metric of complexity of both information and the capability to process that information. This metric also naturally suggests that consciousness is a continuum. All constituents have some amount of consciousness in them starting from atoms to animals to the entire Universe. Consciousness is an emergent property of an information rich Universe that is capable of processing that information in complex myriad ways.

This also raises the hope of emulating consciousness in machines [2]. We may be able to engineer higher levels of consciousness. Computing paradigms that are not constrained by physical space or our computing substrate (as proposed before [1, 27]) may be capable of higher levels of consciousness. Our greatest contribution as a species may be that we introduce non-biological consciousness into the Universe.

How can we encode these principles and design consciousness in a computer? A tentative basic definition of a conscious machine is “A computing unit that can process information and has feedback into itself”. These strategies can be used to design a basic level of consciousness and self-awareness in computers. Previous work has used these design principles to propose a strategy for engineering consciousness in machines [2]. Consciousness can be emulated in machines due to the computational nature of mind [28].

Consciousness may be a general phenomenon in our information rich Universe and their maybe other structures designed or otherwise that may be capable of it. We hope that this framework will allow us to better understand consciousness and design machines that are conscious and empathetic.

Our aim is not to dehumanize what we deem as quintessentially a human phenomenon by casting consciousness as computation. Our hope is that it will give us a sense of wonder and appreciation for our Universe, which is capable of supporting computation which ultimately leads to conscious beings.

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REFERENCES

- [1] Banerjee, S.: *A Roadmap for a Computational Theory of the Value of Information in Origin of Life Questions*. Interdisciplinary Description of Complex Systems **14**(3), 314-321, 2016, <http://dx.doi.org/10.7906/indecs.14.3.4>,
- [2] Banerjee, S.: *A framework for designing compassionate and ethical artificial intelligence and artificial consciousness*. PeerJ Preprints 6:e3502v2, 2018, <http://dx.doi.org/10.7287/peerj.preprints.3502v>,
- [3] Tegmark, M.: *Consciousness as a State of Matter*. Chaos, Solitons & Fractals **76**, 238-270, 2015, <http://dx.doi.org/10.1016/j.chaos.2015.03.014>,
- [4] Tegmark, M.: *Our mathematical universe: My quest for the ultimate nature of reality*. Vintage, New York 2014,

- [5] Morch, H.H.: *Is Matter Conscious? Why the central problem in neuroscience is mirrored in physics.*
Nautilus 047, 2017,
- [6] Zuse, K.: *Rechnender Raum, Elektronische Datenverarbeitung.*
Elektronische Datenverarbeitung **8**, 336-344, 1967,
- [7] Hofstadter, D.R.: *Gödel, Escher, Bach.*
Vintage Books, New York, 1980,
- [8] Kaku, M.: *The future of the mind: The scientific quest to understand, enhance, and empower the mind.*
Anchor Books, 2015,
- [9] Mancusco, S.: *Are Plants Conscious?*
<https://www.youtube.com/watch?v=gBGt5OeAQFk>, accessed June 2018,
- [10] Lovelock, J.: *Gaia: A new look at life on earth.*
Oxford Paperbacks, Oxford, 2000,
- [11] Jaynes, J.: *The origin of consciousness in the breakdown of the bicameral mind.*
Houghton Mifflin Harcourt, Boston, 2000,
- [12] Thomas, N.: *What is it like to be a bat?*
The Philosophical Review **83**(4), 435-450, 1974,
<http://dx.doi.org/10.2307/2183914>,
- [13] Drew, L. et al.: *A spatial model of the efficiency of T cell search in the influenza-infected lung.*
Journal of Theoretical Biology **398**(7), 52-63, 2016,
<http://dx.doi.org/10.1016/j.jtbi.2016.02.022>,
- [14] Banerjee, S. et al.: *Estimating biologically relevant parameters under uncertainty for experimental within-host murine West Nile virus infection.*
Journal of the Royal Society Interface **13**(117), 2016,
<http://dx.doi.org/10.1098/rsif.2016.0130>,
- [15] Banerjee, S. and Moses, M.: *Scale Invariance of Immune System Response Rates and Times: Perspectives on Immune System Architecture and Implications for Artificial Immune Systems.*
Swarm Intelligence **4**, 301-318, 2010,
<http://dx.doi.org/10.1007/s11721-010-0048-2>,
- [16] Banerjee, S.: *Scaling in the immune system.* Ph.D. Thesis
University of New Mexico, Albuquerque, 2013,
- [17] Banerjee, S.: *A computational technique to estimate within-host productively infected cell lifetimes in emerging viral infections.*
PeerJ Preprints **5**, e2621v2, 2017,
- [18] Banerjee, S.: *An artificial immune system approach to automated program verification: Towards a theory of undecidability in biological computing.*
PeerJ Preprints **5**, e2690v1, 2017,
- [19] Banerjee, S.: *An Immune System Inspired Theory for Crime and Violence in Cities*
Interdisciplinary Description of Complex Systems **15**(2), 133-143, 2017,
<http://dx.doi.org/10.7906/indecs.15.2.2>,
- [20] Banerjee, S. and Chapman, S.J.: *Influence of correlated antigen presentation on T-cell negative selection in the thymus.*
Journal of the Royal Society Interface **15**(148), 2018,
<http://dx.doi.org/10.1098/rsif.2018.0311>,
- [21] Kanai, R.: *We Need Conscious Robots. How introspection and imagination make robots better.*
Nautilus 047, 2017,
- [22] Popova, M.: *A New Refutation of Time: Borges on the Most Paradoxical Dimension of Existence.*
<https://www.brainpickings.org/2016/09/19/a-new-refutation-of-time-borges>, accessed June 2018,

- [23] Jorge, L.B.: *Labyrinths: Selected Stories and Other Writings*.
New Directions, New York, 1962,
- [24] Oizumi, M.; Albantakis, L. and Tononi, G.: *From the phenomenology to the mechanisms of consciousness: integrated information theory 3.0*.
PLoS computational biology 10, e1003588, 2014,
<http://dx.doi.org/10.1371/journal.pcbi.1003588>,
- [25] Minsky, M.: *The Emotion Machine*.
<https://web.media.mit.edu/~minsky/eb4.html>, accessed June 2018,
- [26] Minsky, M.: *Discussing consciousness in The Emotion Machine*.
<https://www.webofstories.com/playAll/marvin.minsky?sId=53155>, accessed June 2018,
- [27] Clarke, A.C.: *The wind from the Sun*.
Vista, McBride, 1996,
- [28] Putnam, H.: *Brains and behavior*.
Readings in philosophy of psychology **1**, 24-36, 1980.

CONTRIBUTION TO QUANTIFICATION OF COMMUNICATION*

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ABSTRACT

Communication among humans is one of crucial human activities. Yet, its importance is not accompanied with the accurate and precise formal measure. Two starting points of this article are: (i) treating the communication among humans as a means to convene diverse individual and collective stimuli and needs; (ii) partitioning human environment into available, well-characterised communication modes, most of which makes possible mediated communication. Based on these starting points, a generic model of human communication between individuals and their environment is formulated and discussed. It is argued that there is a definite relation between the utilised communication modes and intensity of convened matter.

KEY WORDS

communication, mediator, information, information rate

CLASSIFICATION

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INTRODUCTION

Communication is profoundly intertwined with humans, on both the individual level and the level of whole specie. In this article the emphasis is put on its formal description, in particular using the mathematical expressions for relevant quantities attributed to communication.

There are several reasons motivating such an approach. First, it can bring about more precise and more detailed description of communication, and its diverse aspects. One example of its aspects is the link between the individual communication pattern and underlying characteristics of that individual. Secondly, it can be optimised in ways ranging from education, to common practices to ergonomic elements of our artificial environment.

This article is a continuation of a series of articles devoted to formal description of human-human interactions, the communication in particular [1-3]. Here the emphasis is put onto aggregated measure of communication.

In section two basic notions are introduced and described. Section three contains description of a conceptual model of human communication presented using notions from section two. Section four summarises the article.

COMMUNICATION MEDIATED BY OUR ENVIRONMENT

Communication is considered to be mediated, but in a sense which differs from the attribute mediated as it is usually encountered in the communication. Here, mediated is character is described from the systemic point of view, as utilisation of some, specifically prepared part of the environment (for a more detailed description see [1, 2]). That part of the environment includes diverse types of electromagnetic waves. Light is one of these waves the exchange of which contributes to visual communication. Then, the prepared part of environment heavily utilises air, a physical medium through which waves are transmitted making possible auditory communication, or a physical medium through which smells diffuse thus contributing also to olfactory sensing (which can contribute to communication, but more as an exception than as a regular communication mode). Furthermore, prepared environment includes other types of electromagnetic radiation, especially radio waves. Along with these, for communication qualitatively different parts of our environment are utilised in the form of objects, based on paper but including also other objects that can serve for transmitting pieces of information, eventually contributing to the communication; stones, soil, trees, etc. All these listed parts of the environment are accompanied with the complex additional objects (magnifiers, speakers, electronic devices, ...) that further contributes to communication.

The mediated communication, in this article, does not imply that there exist a person conducting a communication between two individuals, or groups, that otherwise do not communicate directly, or tends to avoid that in a too intensive way.

Overall, the notion of mediated communication here represents that considerable portion of overall communication is realised using additional parts of our environment, spontaneously present parts or specifically prepared objects, for human-human communication. It, then, excludes direct tactile communication, and various broad approaches to communication [4].

Qualitative differences in realisations of mediated communication, which originate in qualitatively different utilised parts of our environment, are in fact huge so one may ask

whether it has any substantial meaning to collect, or even unify such differences into a coherent picture. It is precisely what is further conjectured – that it is substantially meaningful.

Mediators differ in the underlying energy needed to utilise them for communication (treated here, as well as other purposes treated in more general approach), their overall inertia, recognition by humans, etc. Examples of mediators, the communication units of our environment, are found described in literature.

Before proceeding, it should be emphasised that contemporary interpretation of our environment as a sea of mediators utilisable for communication, is valid for present level of our civilisation. In ancient times and in far future, our adaptation to environment, our understanding of the environment, and finally the very environment, differs considerably.

While such an approach introduces certain set of additional notions, its fundamentals are well developed, and understood from the point of view of other disciplines [5, 6]. Art, in particular, is a human activity which encompasses considerably large number of different communication forms; differing by duration, intensity, mode of realisation etc. One can argue that it may serve as a prepared testing ground, yet with a significant portion of spontaneity and organic approach, for hypotheses stated after additional development of concept of mediated communication.

MODEL OF MEDIATED COMMUNICATION

The aspect, up to this point implicit, which unifies all these considerably different parts of our environment, incorporates individual humans, who represent the beginning and the end of communication-related process in our environment. Certainly, different individuals introduce additional variety in the conducted communications. Yet, on the average one can assume that a significant portion of constantly conducted communications is purposeful, willing, with active contribution of involved individuals. Onto that portion of communication I concentrate here.

The aforementioned statements might look rather naïve, having in mind the profound thoroughness of otherwise reached understanding of communication. On the conceptual level such a naïve, introductory approach makes easier understanding of unification of diverse parts and processes in our environment for the communication.

Further assumption is that humans can form, create or utilise otherwise existing mediator, with a rather precisely determined characteristics, so that a specific, temporary important contribution to the communication process, can be conducted. Naturally, being a process, such an endeavour cannot be conducted with maximal admissible efficiency, so some residual uncertainty (i.e. ambiguity in communication) must be assumed.

Another look on the previous text brings about its interpretation in the constant removal of any, almost all of the characteristics that differentiate mediators. Let us assume that we continue with that removal and find the essence, the kernel of a mediator.

It is conjectured here that the essence of mediators from the point of view of its utilisation for communication, is their **capacity**. Similarly, from the point of view of individual humans utilising them for a communication, mediators are characterised (and mutually differentiated) by their capacity. Here, capacity is the maximal set of characteristics (knowledge, emotions, ...) attributed to an individual, that can be **conveyed** in a given time interval. Naturally, additional parameters are attributable to that, e.g. durability of such a transfer: individual human thoughts, emotions and other characteristics, can be transferred either rapidly and temporary, or in a rather durable and resistant way, with a dense

gradation of existing durability. Before proceeding let me emphasise two underlying implications and/or restrictions of the formulated approach at this level of precision. First, this is an averaged approach, so some individuals have characteristics that prevent their use of some of the otherwise utilisable mediators. That can be because of the lack of knowledge related to these mediators, or because of the individual physical and psychical characteristics. Secondly, the society has awareness and accepts mediators, a fact that changes during time, and will probably continue to change gradually.

In the context of individuals willing to communicate (thus to participate in a non-materially realised exchange), with a sufficient level of knowledge of available modes of conveying the communication, the mediators exploited in a given time unit correspond to the individual characteristics (desire, will etc.) to participate in the exchange bringing about the communication.

It is conjectured here that the stated correspondence means that larger desire for communication brings about the use of mediators with larger capacity. Additionally, it is conjectured that during the communication, involved individuals change or try to change, the utilised mediators so that they follow the changes in the individuals' characteristics. In that sense, changes of willingness or desire for communication brings about the corresponding changes or tendencies for change in the utilised mediators. First conjecture denotes a particular state, independently of its duration. It can be considered as a conjecture about the communication stationarity. Second conjecture treats changes in the communication so can be considered as a conjecture about the communication dynamics. Duration of an interval, during which the significant changes in communication pattern are observed, here is not specified. On the one hand, extreme of a short change, it is a small part of a single event of communication, while on the other hand it may span through several, time-separated events of communication.

CONCLUSION

Mediated character of communication can serve as a general concept, valid for the majority of the types of communication. Initial considerations of that concept resulted in two conjectures, that can be further developed into hypotheses and correspondingly tested. One is conjecture about the relation between the communicating individuals and the set of utilised mediators. The other relates changes in characteristics of communicating individuals with the changes in the currently utilised mediators.

In the text, for clarity it was assumed that two individuals communicate. There are individuals for which some of the stated assumptions are not valid. Along with that, there are collectives, institutions etc. for which the stated assumptions are valid.

REFERENCES

- [1] Stepanić, J.: *Notion of Mediators in Human Interaction*. Interdisciplinary Description of Complex Systems **1**(1-2), 41-53, 2003,
- [2] Stepanic, Jr. J.; Bertovic, I. and Kasac, J.: *Mediated Character of Economic Interactions*. Entropy **5**(2), 61-75, 2003, <http://dx.doi.org/10.3390/e5020061>,
- [3] Stepanić, J.: *Human Communication as Mediating the Units of Parameterised Environment*. Interdisciplinary Description of Complex Systems **2**(1), 61-69, 2004,
- [4] Hay, M. and Leach, M.: *Things taken as obvious ... distort. The speaking dancer and the Question of Being*. Cultural Exchanges Festival, De Montfort University, Leicester, 2018,

- [5] Petlevski, S.: *Beyond Identity: the Dynamic Self at the Intersection of Performance Philosophy and the Philosophy of Science*.
Interdisciplinary Description of Complex Systems 12(3), 187-209, 2014,
<http://dx.doi.org/10.7906/indecs.12.3.1>,
- [6] Petlevski, S., et al.: *How Practice-Led Research in Artistic Performance can Contribute Croatian Culture*.
Project No. IP-2014–09-6963, Croatian Science Foundation, 2015-2019.

ON THE CONTEXT OF BENEVOLENCE: THE SIGNIFICANCE OF EMOTION IN MORAL PHILOSOPHY

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ABSTRACT

In this article, I argue that the principle of benevolence occupies a unique place in moral theory where duty and emotion both have equal importance, and moral philosophers generally are divided into two camps regarding the role of emotion in morality. Kant clarifies his position while introducing the deontic notion of benevolence. He only regards the moral value in which the duty of benevolence has been performed with 'good will'. Some defenders of Kant's ethics are Herman, McMurray, Meyers, and Tannenbaum who argue that acting purely based on duty is far more superior to acting from emotions. On the other hand, several contemporary theorists such as Bernard Williams, Blum, Oakley, Stocker, Stohr, Foot, Korsgaard, Hursthouse, and Sherman refute Kant's views towards emotion in the domain of morality. Following this Kantian and Non-Kantian debate, this article aims to explore the role of emotion and rationality in the moral context of benevolence.

KEYWORD

benevolence, emotion, duty, rationality, Kantian, non-Kantian

CLASSIFICATION

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INTRODUCTION

Benevolence is regarded as a virtue of being disposed to act for the benefit of others in moral philosophy. Benevolence which holds significant moral value is sometimes regarded as moral emotion and sometimes as duty. Kant clarifies his position while introducing the deontic notion of benevolence. He differentiates between a naturally sympathetic person and a cold-hearted philanthropist and holds that, although both of them perform their duty of benevolence, Kant only regards the moral value in the latter case as there the duty of benevolence is performed purely for the purpose of duty. A naturally sympathetic person performs her duty based on her natural inclination to help others which gives her satisfaction. However, for Kant, such pathological emotions are situation-specific and subjective according to one's own personal preferences. On the contrary, a cold-hearted philanthropist who is not driven by sympathetic inclinations performs her duty of benevolence since it is her duty to do so. Such a cold-hearted philanthropist will stay calm and indifferent in any situation and perform her duty universally. Hence, Kant regards only duty-based benevolent actions as having moral value.

KANTIAN AND NON-KANTIAN DEBATE

Kant strongly rejects any emotional involvement within the domain of morality. He devalues any pathological and sensible feelings and denies them as motivations for moral actions. For instances, according to him, 'Sympathetic joy and sorrow are really sensuous feelings of a pleasure or pain at another's state of happiness or sadness' [1; p.456]. Modern Kantians like Barbara Herman, C. D. Meyers, Julie Tannenbaum, and W. Ashley McMurray defend Kant's view and forward his way of thinking regarding duty devoid of emotion in morality. Nevertheless, thinkers like Bernard Williams, Lawrence Blum, Karen Stohr, M. Baron and contemporary virtue ethicists such as Justine Oakley, M. Stocker, Christine Korsgaard, R. Hursthouse, Nancy Sherman reject Kant's degraded view on emotion and argue strongly for the enormous value of emotion in morality. Therefore, a detailed discussion on the role of emotion in morality in the context of benevolence is essential. I will develop and analyze their arguments in this article.

HERMAN'S IMPARTIAL VIEW VS BLUM'S PARTIAL VIEW OF MORALITY AND EMOTION

Barbara Herman [2] defends Kant's position on emotion in morality. According to her, Kant regards duty as the motive of all moral actions and discards emotions as they lead to the right action only by chance. Alike other nonmoral motives emotion leads to the right action only when it is aligned with the motive and circumstances of the action otherwise it will lead to the reverse of morality. Herman illustrates her point with the example of shopkeeper. It is a moral duty to treat every human being honestly as an end. A moral shopkeeper will return the proper change to an inexperienced customer since it is his moral duty. Again, a shopkeeper can do the same action not from duty but from a self-interest of profit for expanding his business. Although both actions are the same, there is a moral difference between a shopkeeper's dutiful action from his self-motive of profit. In the former case, he treats all his customers equally as moral duty requires to do so. However, for the latter case he treats everyone equally but not as an end but as a means of his selfish purpose of business profit. Here the shopkeeper acts morally circumstantially due to fulfilling his self-interest. Here his motive of business profit controls his action, and so it is unreliable and contingent to act morally always since 'while it is always morally correct to serve

people honestly, acting from an interest in making a profit will require honest actions in only *some* circumstances-there may be times when honesty is not the best policy' [2; p.363]. Conversely, the motive of duty includes in itself the interest or good will of the rightness of the action. So, actions that are motivated from duty always necessarily include its rightness. This concern and interest of the agent always lead to the right action not by chance but due to the obvious relation between the duty-motivated actions and the rightness of the action. On the above instance the shopkeeper who is motivated by self-interest acts morally by chance but not in obvious manner, and it may also possible that he acts in nonmoral manner if it serves his self-interest. However, the shopkeeper who is motivated from moral duty presupposes the rightness of his action since his motivation comes as a command of categorical imperative from the good will which is universal and absolute. Emotion cannot be the moral motive as it does not include the necessary interest of the rightness of moral action and the concern which will 'guarantee that the right action will be done' [2; p.363]. Hence emotion is conditional, contingent and unreliable. According to Herman, Kant rejects emotion as moral motive not only because it lacks the interest of the rightness of moral actions but also because emotion implies no moral interest in the part of the motive. Emotion-motivated-action leads to moral rightness luckily only when emotion is aligned with the motive and circumstances of the action. Hence, she concludes that Kant rejects emotion as moral motive not only because it has no moral interest in itself, but because it often leads us to immoral actions.

We may object that following Kantian view, if a person helps others only because duty requires to act on that manner, the person is overlooking the prime motive of this action which is the concern for other's well-being. In contrast when a person is concerned for others' well-being, she is motivated to help others from that concern to promote well-being for others. The categorical imperative of the duty of benevolence is derived from the good will. If the person who is doing the duty of benevolence only for duty's sake, she fails to realize the real moral value or the good will of the duty of benevolence and performs that duty without internalizing its moral worth. In the helping-other situation, one will treat the receiver as end in itself, if she has the concern or good will to promote the well-being of others. Absence of this concern implies that the person uses the receiver as a means to fulfill her duty requirements.

Herman replies that this objection raised from the error of viewing the motive (the duty) and end (the object of action) as reciprocal concepts [3]. The motive is what directs or moves a person to do certain actions, whereas, the end or object of an action is the state of affair which the person aims to bring about. However, these are not always reciprocal. The motive of the object is something that moves the agent into action for a certain object of interest. For example, suppose an object of action is buying my new jacket. Now this object of action may have different motives, such as a genuine requirement of a jacket which can save me from the cold or it can be the desire to show-off to some of my acquaintances or it can be just because the holiday sale is happening. My acts will be affected by these different motives and the meaning of the state of affairs which I bring about. Again, a different choice of actions can be prompted from the same motive based on agent's other interests and circumstances. So, it is necessary to include the full account of both motive and end in the domain of morality. According to Herman, the motive of duty is different from the motive of the object. A person can be motivated to help others from the duty of benevolence while she is emotionally concerned for the person's welfare which is the object of her action. She claims that emotionally motivated action has not any extra moral value which the critics claim for, writing,

A compassionate person (one to whom it is a good that he is moved by feelings of compassion) does not act in order to be compassionate or to do the compassionate thing. His actions are expressions of his compassion. In a similar way, when Kant describes the actions of the moral person, they are presented as expressions of his "respect for duty". Being unable to help while acknowledging the claim of need, it will be natural to feel regret at being unable to satisfy the need [3; pp.374-375].

Another objection has been raised by Bernard Williams [4] that a person who is motivated to help others from emotion, will have the natural, immediate human gesture which comforts the recipients, whereas the person who helps others only to fulfill the requirement of moral principle is devoid of this natural human gesture. Williams regards this natural human gesture to help others as holding intrinsic moral value.

In response Herman nullifies this objection by arguing that Kantian morality of duty does not devalue the emotion-based helping action because Kant would emphasize that the agent who is motivated by emotion also acts permissibly but such emotion-based helping action is conditional in contrast with the unconditional duty of benevolence. Finally, for Herman [5] helping others is unconditional and universal only when it is guided by duty but it is conditional and temporary when helping others is guided by one's own emotion towards others since personal preferences affects the rightness of the impartial duty of helping others.

To the contrary of Herman's impartial view, Lawrence Blum [6] on one hand, rejects the Kantian impartial notion of morality and, on the other hand argues for the moral relevance and significance of altruistic emotions such as sympathy and compassion. These feelings emerge out of concern for others and are directed to the 'weal and woe' of others and thus play their particular role in our understanding of moral life and action. These altruistic emotions themselves can provide the motive of good actions and can provide the appropriate response of the beneficent act to others who are in need and suffering. According to Blum, the appropriate response of the beneficent act for others can be motivated either by such altruistic emotions or by Kantian notion of duty. These altruistic emotions which express their emotion to recipients hold intrinsic moral worth not only because these emotions are the motivation for good action, but also due to the concern these emotions hold and express for the good of others. For Blum, these altruistic emotions build the central aspects of our moral character and thus such altruistic emotions become the proper objects of moral assessments and of moral striving. The Kantian position denies the significance and moral worth of these altruistic emotions and hence somehow distorts the moral character of pure duty. The Kantian position identifies morality with duty and obligation and finds the moral worth of action within an agent's unconditional obedience to rationality and to the universal principle of duty based on rationality. However, Blum establishes friendship as a representation of the moral character based on the altruistic emotions and recognizes friendship as the locus of moral worth and moral actions. Here, he distinguishes the altruistic emotions from mere non-moral inclination. Friendship, for him, is neither constituted with mere non-moral inclinations nor from the Kantian universal notion of duty, but from the moral emotion which emerges from the concern for others and directed to the weal and woe of others. By rejecting the Kantian notion of emotions, Blum argues that altruistic emotions are not necessarily self-interested or unreliable. Altruistic emotions should not be seen as irrational or non-rational motives since these are also capable of satisfying the fundamental requirements of morality. The moral goodness of the altruistic emotion for one's friend consists in the selfless act one does for one's friend's sake. The moral worth of such actions consists within the willingness and readiness to help one's friend for the friend's own sake. These selfless other regarding

altruistic acts for one's friend satisfy the fundamental requirement of morality and absence of this selfless willingness and concern for one's friend is considered as moral failure. Blum regards one's true genuine selfless concern for one's friend and the selfless willingness to help friends for their own good as one's moral excellence. The moral requirements in Kantian ethics are only limited to the criteria of universality and impartiality. Nevertheless, the requirements of universality and impartiality are relevant for certain limited contexts of morality, we cannot reduce the whole concept of morality in terms of duty or obligation or agent's unconditional obedience to them. In the contrast to Kant's impartial view towards every human being, Blum accepts the special concern which we pose for our family and friends. In his own words, 'In friendship one desires and acts for the good of the friend, not simply because he is another human being but precisely because he is one's friend'[6; p.44]. Blum argues that the special concern and duty which require selfless concern and willingness to help one's family and friend for their own sake is the foremost obligation of morality and failure of which is morally blamable and not accepted. For him, altruistic emotions belong to the different discourse of moral worth and that is why they are not limited within the direct control of rationality. So, unlike Kant's emotion-less moral theory, Blum argues that it is morally necessary to have altruistic emotions.

I also believe that as a human being we are not devoid of emotions, rather as a moral human being we should acquire such altruistic emotions which motivate us to do benevolent acts for others' sake. Human beings should have the special concern for their family, friends and loved ones. In the cases of benevolent actions, I believe that one first moves from her altruistic dispositions to help others and that these altruistic dispositions serve the motive of the duty of benevolence. For example, when I heard that my friend had an accident, I immediately felt concern, and due to this concern for my friend's well-being, I wanted to do something for her well-being. So, this moral concern for the well-being of others serves as a motivation of benevolent act. However, unlike Blum, I believe in some emergency situations one feels that concern of well-being for strangers as well. Such concern should be present within every moral being, and the absence of this moral concern can be regarded as a moral deficiency. For example, when I see a stranger fall down from a bus and got injured, I feel that immediate concern for the person's well-being and act benevolently for the person's sake. These altruistic emotions which serve the motive of benevolent duty for others are essential for one to be moral. Moreover, even when we cannot actively act benevolently due to our spatial and other material limitations, we should dispose the altruistic concern and emotions for our farthest neighbor who are in adversity. For example, whenever we hear the miserable conditions of the babies of Syria we immediately feel sorry for them and pose moral benevolent concern for their well-being. This altruistic emotion for others' welfare is the core of morality since it is imbued with the very essence of humanity.

KANTIAN VIEW VS VIRTUE ETHICISTS' VIEW ON EMOTION

Alike Blum, M. Stocker [7] also argues that the problem with the modern rule-based theory is that it considers the same reason as motive for morally right actions in every context, despite that, such universal reason or rule-based motive should not be considered as our motive for morally right actions in certain contexts like benevolence. If an agent helps someone cold-heartedly simply for the sake of duty and devoid of any compassionate feelings, then that person's attitude appears that she is treating the other person externally which devalues the other person's autonomous moral worth. Stocker considers that such a person is morally deficient, and her treatment towards her beneficiary goes against Kant's second maxim which commands us to never treat a rational human being only as a mean since rationality implies that every human

being is an end-in-itself. Treating other people as ends-in-themselves evokes the responsibility to treat those persons with proper respect. To treat other persons with proper respect, Stocker emphasizes those human gestures which include love and friendship. The absence of these proper emotional responses makes a person devoid of these moral virtues. A cold-hearted benefactor devoid of these altruistic emotions following Kantian theory treats other people instrumentally and not as ends-in-themselves. He illustrates this point with an example where a person visits his friend in the hospital only out of duty and devoid of any feelings of love, sympathy and concern. According to Stocker, there is something wrong with his action. It seems that the person may be motivated from some wrong purpose as there is a genuine moral deficiency in his action. The action is morally deficient not because it is wrong since here the person performs his duty properly which is right, however, there is something lacking in his action that is the virtue of love. A genuine friend should visit his injured friend out of love, sympathy, and concern rather than simply with a cold-heart which is solely motivated from duty and devoid of any such feelings. The person devoid of any such feelings lacks moral value and merit and so, in such cases, it is wrong to regard duty as the only motive of morality.

Following Kantianism, there is nothing wrong with the person who visits his friend in the hospital as she perfectly performs her duty. There is nothing more to claim for her morality. The problem with Kantianism is that here duty is regarded as the one and the only motive for morality, however, Stocker objects that it is morally devaluing in such above-mentioned cases where the agent is only motivated from duty alone. The person lacks the emotional motive of sympathy, love, and concern which she should have for her friend, absence of which affects the moral value regardless of whatever she does for her friend by only motivated from duty alone. Friendship evokes some expectations which are beyond the notion of rule-based stringency of duty and so we cannot explain this within the limits of the rule-based deontic notion of duty. So, Stocker rejects the exclusive claim of reason-based deontology where duty is generally regarded as the sole motivation for all situations and concludes that sympathetic inclinations for a friend should be regarded as the moral motivation specifically in the context of benevolence.

Again, for Philippa Foot [8], benevolent action holds 'positive moral worth.' An action which holds a 'positive moral worth' 'is action that is in accordance with virtue and also displays a virtue that has moral worth' [8; p.174]. Foot finds that since benevolence or charity is a virtue of attachment and sympathy, such a virtue makes it easier to attach one person with the other person. For example, a sympathetic person tends to act for others since they can sympathize with the miserable condition of other people. It makes the person more easily attached to other people and disposes someone to act benevolently for others. Following Foot, the person who acquires the moral virtue of sympathy and compassion holds moral worth since these virtues not only make easier to perform the duty of benevolence but increases the moral value of such benevolent actions. Now, Kant's philanthropist who is devoid of any such emotions but performs her duty based on the sense of duty is not to be undervalued, however, the person who most shows virtue to others while performing the duty, the most moral worth this person holds by showing positive emotion to others as a key part of virtue. As charity is both the virtue of attachment as well as action, when sympathy is a key part of the virtue, it is easier to act in accord with the duty of charity. According to Foot, a deeper analysis on Kant's dutiful philanthropist reveals that that person who feels no sympathy and finds no happiness by seeing the good of others as his mind is full of despair and sorrow of his own, and so, she adds that 'this is the kind of circumstance that increases the virtue that is needed if a man is to act well' [8; p.174]. However, for me, the person who despite of his mind full of sorrow for his own adversity, performs the duty of benevolence

for his duty's sake without any sympathetic or compassionate attachment with other beings, fails to attach the morally required connection to the person he is showing kindness. He is not showing the morally required gesture of kindness towards the beneficiaries and hence, he is not treating those persons as ends-in-themselves, rather he is using them as means only to perform his own duty for his duty's sake. To be precise, the duty of benevolence occupies a different domain of morality where performing the mere duty itself does not hold the moral worth of these actions. To be moral, these actions require the virtue of sympathy, compassion, concern of well-being, and love for others, not only because such virtues make it easier to perform the duty of benevolence, but the absence of these virtues nullifies the moral worth of these duty-based actions.

On the contrary, Kant argues that the person who is by nature cold and strong and who is not easily affected by any distress of life can imagine the same for others. And if one's emotionally controlled nature does not affect her duty, there is nothing to be morally deficient about her. Moreover, he mentions that human beings with limited rationality and embodied emotion often struggle with conflicting inclinations, however, it will not happen with a fully rational being who is always guided by her reason.

However, this is an inadequate approach of Kant since a normal human being cannot cut all her emotions and inclinations from her life. Human beings due to their very humanness must combine reason and emotion. Only rationality or only emotion cannot build a person as human. So, we need these both; and, as I have argued before, altruistic emotions are necessary for a moral being. According to Christine M Korsgaard [9] and Rosalind Hursthouse [10], while performing benevolence, the Kantian moral agent exhibits mere continence or *enkrateia* rather than full virtue or *arete*. According to Hursthouse, the Aristotelian distinction, *enkrateia* holds the higher moral worth rather than *akratia* or incontinence. An *akratic* person can be driven by emotional feelings or pathos which goes against her rational choice. Although like the *akratic*, an *enkratic* person experiences the dilemma between reason and such emotional feelings which are contrary to reason, unlike the *akratic*, the person acts in accordance with reason. But the deficiency of an *enkratic* person is that she experiences passions that conflict with her rational choices. Now, a fully virtuous person who develops the highest moral virtue or *arete* does not face the dilemma within rational and irrational emotions. However, Kant fails to recognize this Aristotelian weighting of the *enkrateia/arete* distinction, and so he holds a partial view for emotion. He is concerned about the misleading nature of emotion which may misdirect a person from morality. However, from a virtue perspective, only a continent person always struggles with rival inclinations while performing her duty based on obligation, whereas, a fully virtuous person performs her action easily without doing any struggle against rival emotions since a virtuous person always chooses the right action. It can be assumed that a cold-hearted benefactor can perform her duty with grudge and dissatisfaction while struggling with rival inclinations. Aristotle makes this distinction between *enkratia* and *akrete* and claims that mere continence follows moral deficiency within moral agents. I also believe that Kant is only concerned about the misleading features of emotion. Firstly, emotions, unless conjoined with good will, may misdirect us from doing the right duty. Again, excessive emotional outburst leads to heteronomy which subdues the prime obligation of performing any duty. So, it seems that Kant accepts a continent moral being who can perform her duty properly only due to the obligation of duty's sake despite her cold-heartedness or lack of moral impulses.

Furthermore, Justin Oakley [11] argues that in these cases of helping others, the agent is not only motivated from mere compassionate impulses, but the person also cognitively recognizes another

person's distress which motivates him to help the person. Consequently, emotions can have such cognitive dimensions that have worth by themselves to motivate some actions. Thus, emotional capriciousness may not be a sign of the inadequacy of emotions themselves as moral motives, so much as an indication of a kind of moral failing in the particular person whose emotions are typically capricious' [11; p.445]. He argues that, while we are performing the beneficent actions, our object should be to help others rather than only fulfilling the moral duty as helping others from altruistic emotions which include unconditional attachment towards the needy person and which are morally required in these cases rather than merely performing beneficent actions only from duty. He emphasizes that a sympathetic person is more capable of performing the beneficent act than the person who is motivated purely from duty since "having sympathy or compassion for another is often necessary to gaining a proper understanding of what actually needs to be done in order to help her" [11; p.454].

Bernard Williams also argues against Kant's impartial moral position which abstracts the particularity of individual people by categorical imperative and overlooks a person's personal standpoint. This position often leads to confrontation between the moral and non-moral point of view in the context of intimate attachments. He elaborates his view by an instance. Suppose a man is in the middle of a position where he can only save his wife or a stranger at the same time. Here, according to Williams, it is not only morally permissible for him to save his wife, but it will be morally deficient if he does it only out of duty's sake. According to him, if he saves his wife because it is consistent with moral principles, then it 'provides the agent with one thought too many: it might be hoped by some (for instance, by his wife) that his motivating thought, fully spelled out, would be the thought that it was his wife, not that it was his wife and that in situations of this kind it is permissible to save one's wife' [4; p.18]. His action which is resulted out of duty and not out of love makes the person devoid of moral virtues which underlies the necessary requirements to be a human. The Kantian position which acts solely from duty alone fails to express the deep attachment and love an individual holds towards his/her intimate relations.

Marcia Baron [12] extends Williams's illustration where a person finds himself in the middle of a critically injured stranger with his mildly injured wife at the same time with the dilemmatic position where he can only save one of them. Here Baron points out that, in this situation it will be morally right for the person to assist the critically injured stranger rather comforting his mildly injured wife, however, she points out that, something will be morally deficient for the person if he easily leaves his wife to assist the stranger without showing her any genuine sympathy or compassionate concern.

According to her, Kant is misjudged in his *Doctrine of Virtue* [1]. For Kant, the moral character of an individual flourishes from the moral worth of good will which is committed to performing what moral law requires and this should be the primary motive of duty which is directly action-guided. Again, duty operates as a secondary motive that directs agent towards something else rather than the main duty, and these motives presuppose some emotional motivations of moral duty, such as pleasing someone presupposes love and care or helping someone presupposes sympathetic inclination. So, this secondary motive has an important role in determining morally acceptable inclinations. Baron, following Kant, accepts that moral actions are motivated from duty, but for her, Kant does not deny the secondary role of emotion as a motivator for moral actions.

Karen Stohr [13] replies that, although Baron makes the right claim, it is problematic for Kantians to clarify why without required moral feelings an action is regarded as morally deficient. Baron identifies the lack of moral deficiency in the Kantian position where the man is

perfectly morally right, however, he lacks sympathy and fails to motivate from care which makes him the cold-hearted benefactor. In this context of intimate attachment, the man's sympathetic and loving heart for his wife motivates him to comfort his loved ones whereas his compassion for the poor stranger motivates his sense of duty to help the stranger who needs immediate assistance. According to Stohr, it is intuitively true that sympathetic feelings are obvious for beneficent actions. To her, feelings are essential for human good and for developing virtues. No actions or persons will be fully moral without the necessary moral feelings. Stohr points out that, Kantianism claims duty as the sufficient reason for motivating moral actions, whereas they do not regard the necessity of sympathetic emotions for motivating moral actions. He illustrates this point by an example of a boy named Jim who born and grown up in a racist environment with a parental lesson that black people are not competent and not up to his level and so they are the subject of distrust. Jim manages to overcome this ignorant parental lesson by realizing that these attitudes are morally wrong, and he mingles with black people freely and also helps them in their need. However, he cannot help but secretly finds racist jokes as funny. Although he immediately responds to a joke-teller with appropriate moral indignation, he cannot help himself to be amused with these racist jokes. According to Kantian standpoint, he is doing everything to fulfill his duty by treating black people as ends and cultivate sympathies which help him to perform his duty. But the matter of fact is that Jim can be a morally better person if he does not find those racists jokes funny as it is a moral failure for his character to find those jokes funny. However, Kantians can never point out this moral failing as according to them, Jim has done everything with his good will and if something is beyond control for a person, he is not obligated to do so. Similarly, if acquiring some particular feelings is impossible for a person, lack of it, is not a moral deficiency. However, Jim can try not to find the racist jokes funny by developing himself towards a more morally virtuous person. Consequently, from the standpoint of virtue ethics, actions fail to be virtuous if the agent performs them in absence of appropriate moral feelings or attitudes. So, according to virtue ethicists, cold-hearted benefactors are morally deficient since they fail to feel sympathy for those whom they help.

The place of emotion is different in Kantian ethics and in virtue ethics. According to Kantianism, sympathetic inclinations are helpful while performing a duty, however, one who is thoroughly committed to duty, may not require any such inclinations to motivate herself to perform her duty. Both Kantian ethics and virtue ethics consider a place for emotion, but they differ in their standpoints. Sympathetic feelings, for Kant, are primarily instrumental as they help to motivate duty when human beings due to their finite, imperfect capabilities fail to act fully rationally. For Kant, cultivating such feelings is helpful to perform other duties as nature has 'implanted in us to do what the representation of duty alone would not accomplish' [13; p.195]. Again, Kant claims that such sympathetic feelings or inclinations are not required for the fully rational being who is completely imbued with holy rational will. On the contrary, the fact there is no such conception of pure holy will in virtue ethics, however, virtue theorists consider only human beings who have emotions and inclinations along with rationality. Here, emotions are valuable in morality but in a different way from Kantianism. Stohr concludes that morality requires that the generosity of the benefactor will not only be motivated from the rightness of the action, but that it should be motivated from the appropriate emotions such as love, care and concern which the Kantian agent lacks and this cold-hearted Kantian agent without these feelings represents moral deficiency while performing all of her beneficent acts.

On the contrary, Julie Tannenbaum [14] defends the Kantian position by distinguishing between

an action's manners from its motive, i.e., the reason of action. Her aim is to establish how emotion can be present in the action's manner without being its motive. To establish her standpoint, she demonstrates how compassion can comfort other-beings without being motivation. She formulates the critics' arguments as,

1. Sometimes one is morally required to express an emotion.
2. The expression of an emotion must be done from an emotional motive.
3. Thus, the expression of an emotion cannot be done from the motive of duty alone.
4. Thus, sometimes one cannot do what is morally required from the motive of duty alone [14; pp.322-323].

Summarily, critics argue that compassionate actions are incompatible with the motive of duty and so, compassionate actions should be motivated from compassion. In response, many Kantians, including Herman, Baron, Sherman, do not deny the mutual exclusiveness of duty and compassion. Herman accepts two different roles of duty where the primary role is to motivate a person in acting which is morally required and to limit such actions which are morally impermissible. Hence, in such compassionate actions, Herman and the other two thinkers consider duty as a limiting condition and regard emotion as an important motivational objective for such actions. For example, when a person helps a stranger by being motivated from one's compassionate emotions towards others, she does so since helping from compassion is not morally forbidden. To be precise, when compassion leads to help others it is morally permissible. Hence, here she acts from two motives, compassion and the limiting motive of duty which controls and directs the emotionally driven actions into the morally right path. However, if we accept emotion as the primary motive and duty as a limiting condition, another problem arises regarding the goodness of such emotionally-motivated actions. For Kant only those actions hold moral worth or goodness which are motivated from duty alone. Tannenbaum claims that previous defenders of Kant having failed to notice that emotions can only shape an action's manner, duty is the only moral motivation. Hence, there is no point in arguing about the moral goodness of such actions. She makes the distinction between the manner of action and with the motive of the action, writing: 'the manner of an action is how it is done, and the motive delineates the agent's reason for acting' [14; p.324]. By demonstrating different examples, her aim is to establish here that, 'how an emotion can influence the manner of an action without also serving as the motive' [14; p.325]. For example, she mentions the profession of nursing where nurses might act compassionately out of their need for pay raises. This financial motive is not incompatible with or mutually exclusive from compassionate actions. Again, when someone assists her weak grandmother, one must be extra careful and concern regarding 'not to bruise on her tender arm' and not 'to humiliate her' by any means. So, 'helping in such way' is morally required, and helping her for this reason implies helping from the motive of duty. Here my expression of helping her involves genuine compassionate passion.

Critics may argue that helping the grandmother is motivated from compassion only rather than motivated by duty. Tannenbaum serves two replies here. Firstly, if we act only following the reason that I will not bruise on my grandmother's arm as it will cause her pain, both the motive of acting from duty and the motive of acting from compassion require nothing more than considering this fact of not bruising her arm. Hence, if 'I act from one motive, this motive can be appropriately called duty, and so I can act with compassion from duty alone' [14; p.330]. Secondly, there is always a reason for every reasonable motive. Here, helping my grandmother with compassion from the motive of duty is grounded with the reason that helping her in such a way will avoid unnecessary pain as avoiding unnecessary pain is morally required. On the

contrary, helping my grandmother with compassion from the motive of compassion provides a reason for helping in such way that I will avoid unnecessary pain to her. So, my reason for helping my grandmother includes avoiding unnecessary pain which, Kant would claim, a person can do compassionately by being motivated from duty alone. Again, one may argue that acting from genuine compassion implies that the agent must feel compassionate towards other beings, but Kantians do not have such feelings in their conception of duty, although morality requires such feeling. Tannenbaum and many other Kantians claim that 'ought implies can' and if morality requires such feelings, we must develop compassionate feelings towards the recipients while acting compassion from duty. So, it is blamable if one fails to develop such morally required feelings as Kant himself also argues for developing such sympathetic feelings to be a morally better person. One can strive to be a sympathetic person as well as can act sympathetically by expressing those feelings in the right manner.

Thus, Tannenbaum provides the justification of developing emotional faculties within a Kantian perspective where the moral status of action depends in part of emotional manifestation. However, she holds that, 'since some emotional manners may be morally required while others are morally forbidden, it is important that an agent work towards developing the right kind of emotional dispositions' [14; p.335,]. Thus, Tannenbaum establishes that, one can act with compassion from duty as it is morally required, and duty-based motivation does not undermine one's compassionate capability of acting in such manner. Hence, she concludes by establishing 'the possibility of acting compassionately from duty alone' [14; p.336] and simultaneously replies to the critic by showing that, 'acting from duty precludes acting in emotional ways that we value' [14; p.336].

Against this view, C.D. Meyers [15] defends the Kantian position strongly by claiming that, there is nothing wrong or morally deficient to act from duty alone rather people should be motivated always from duty alone. According to him, the person who visits his friend motivated from duty and not from love or sympathy 'is self-absorbed and reveling in her own moral superiority' [15; p.236]. He assumes that the sick person may be admitted to the hospital due to his own fault of reckless behavior, despite repeated warnings from the reluctant visitor. In such a situation, we cannot blame him to feel less sympathy, rather praise him as he controls his temptation and visits his friend in the hospital for the sake of his duty towards his friend. Hence, our intuitions can change due to different background details, so we can disapprove of those details rather than disapprove of merely acting from duty. Critics argue such a person with a lack of sympathetic inclination is not morally blamable but morally deficient, however, Meyers finds such claim confusing as if he is not morally blamable due to his lack of sympathetic inclination, so he is not morally deficient. This kind of person may ignore his wife to help a stranger in Baron's example. We can say that, he is not a good husband, but we cannot claim that he is morally deficient. Hence, for Meyers critics' objections are misdirected as 'objections to acting from duty alone may be based on a confusion between moral virtues and other socially desirable character traits that have no moral' [15; p.237].

Moreover, Meyers recognizes cold-heartedness as a virtue rather than as a moral deficiency. Sympathetic feelings, unlike moral sense of duty, can lead an agent to do something wrong or something which may fail to do what should be morally right. So, for him, a sense of duty is always morally superior to love and sympathetic feelings, consequently, lack of these feelings or cold-heartedness can be recognized as a desirable character trait than as a vice. He illustrates this notion with an example that we generally feel moved by observing the images of starving people in television. But sympathetic people with their sensitive feelings may not bear the sight and

change the channel, whereas, cold-hearted philanthropist can do his duty by donating for the sufferers. Similarly, social workers can maintain distance with their clients to do their work properly, otherwise their sight of distress may deeply affect them emotionally that they cannot perform their duty properly which is actually required for them in those situations rather than simply showing some sympathy. People can avoid their actual duty by showing mere sympathetic gesture. These people are less virtuous with less moral worth in general as they are not disposed to do the right thing.

Kant distinguishes between practical love which lies in our will and pathological love. Pathological love cannot be commanded, whereas, practical love of doing benevolence from duty comes as a command of will even where inclination of practical love is not intended. Following Kant, Meyers also distinguishes between two types of sympathy. Pathological sympathy, for him, arises from pain by perceiving others' miserable condition. Yet, practical sympathy directs the agent to do something which alleviates the other person's suffering; however, it might not include any sympathetic emotions. Consequently, failure to help those in need indicates a lack of practical sympathy rather than a lack of a pathological sympathy.

A person guided with emotions often is inclined to do what is morally wrong, whereas, a cold-hearted benefactor is always guided by the sense of duty, and capable of avoiding such emotional misguidance of pathological love and sympathy. So, a cold-hearted benefactor is virtually also a better person than an emotionally driven sympathetic benefactor. Here, the benefactor is cold-hearted, since he is motivated by his sense of duty which is morally more desirable, rather than by mere emotional feelings of love and care. The above instance is a case of justice for Meyers where a man chooses to help a severely injured stranger than his mildly injured, beloved wife. 'The issue here is the distribution of a limited resource - namely his own ability to render immediate assistance. Fairness dictates that, in life-or-death situations like this one, we should administer help to those who need it most- even if that means forsaking a mildly injured loved one to help a critically injured stranger' [15; p.240]. Similarly, the duty of practical love or benevolence often conflicts with the feelings of pathological love, such as a king faces dilemma while punishing his rude and vicious son to protect his countrymen. None can blame the king if he performs justice by punishing his son. Here he overcomes his pathological sympathetic feelings for his practical love for duty. Thus, cold-hearted persons are morally better than emotionally driven persons as they are always guided by the sense of duty which 'unlike feelings, cannot lead someone to do what she knows is wrong or fail to do what she knows she ought' [15; p.241]. The cold-hearted benefactor is more virtuous than a sympathetic benefactor as she always guides with the sense of duty and is able to absorb her emotions which might create a problem for performing her duty and often could have misguided her in doing something wrong. Hence, Meyers concludes that we should cultivate and practice practical sympathy, and it is this kind of sympathy that gives agents and their actions moral worth.

McMurray [16], another defender of Kantian notion of duty, recognizes that Stohr's position can be understood by following the impartial standpoint of Nagel and the Aristotelian thinkers who differentiate between "doing good" and "living well". To achieve a good life duty is not sufficient, one needs to develop one's sympathetic feelings for others and neither duty alone nor good will alone are sufficient to be moral. Following this view, Stohr claims the cold-hearted benefactor is a morally deficient person. However, McMurray replies that there is no such simple consistency between the right thing and good life as doing right often requires a significant sacrifice from the good life. Nagel [17] from his impartial standpoint of morality claims that, as

all people are end-in-themselves, we cannot ignore their claim simply because they do not contribute good in our life. So, there is a genuine conflict between moral life and the good life in Aristotelian doctrine. It seems that there is a connection between moral life and good life, however, they are not dependent upon or implied by each other. Kant recognizes these two as separate and independent from each other as there are many who deserve the good life but are unfortunately deprived. However, rational human beings by their own nature aim to obtain the highest good, consequently, the absence of this good seems to be inconsistent with one's human nature. Similarly, this problem also occurs with the case of Stohr's cold-hearted benefactor. The cold-hearted benefactor seems morally deficient not because she fails to act morally but because she fails to contribute to the highest good which is consistent with human nature. Beneficent actions following general human nature require sympathetic feeling to achieve the highest good of happiness, and absence of such feeling is inconsistent with our natural sympathetic bond of humanity. However, Stohr has argued that a fully moral action should be done from sympathetic feelings and a fully moral person should have these feelings and not just try to obtain them. According to McMurray, morality only concerns what individuals are capable of doing. Since people cannot control the spontaneity of emotions, a lack of sympathetic feelings cannot be objected to as a moral deficiency. He recognizes this lack of feeling as a human deficiency. Since the highest good is every rational human being's objective end and sympathetic feelings are needed to achieve that end, absence of such feelings is to be regarded as a genuine human deficiency but not as moral deficiency. Moreover, since sympathetic feelings are essential to achieve the highest good, these are regarded as good-in-themselves. But Kant limits the relation of the feelings with morality and adopts only their instrumental value. However, it is inaccurate to accept their instrumental value in general as sympathetic feelings are essential to achieve the highest good and regarded as the objective end for every individual. On the one hand, Stohr, following the Aristotelian view, recognizes that the absence of these feelings is morally deficient; on the other hand, McMurray following Kantian notion of highest good recognizes that the absence of those feelings within individuals is a human deficiency.

Another view comes from Nancy Sherman [18] who tries to conjoin Aristotelian virtue ethics and Kant's deontology and establishes the role of emotion as a necessary condition to motivate an agent towards duty. She argues that, although Kant is aware that emotion may drive towards heteronomy, he accepts the fact that human beings who are partly rational and partly embodied with emotion can face the continuous turmoil between these two. So, Kant finds it is necessary to avoid the conflicting desires while performing moral action since such conflicting desires will affect the autonomy of the person. However, finite beings with limited rational capabilities often fail to be motivated from duty alone. For this reason, Kant introduces the concept of prudence in his *Doctrine of Virtue* where he accepts the fact that the good cheer or pleasure has a supporting motivational role for performing duty. Kant claims such emotions or inclinations are practical and not pathological. One should try to cultivate such practical emotions and inclinations which can be regarded as a duty itself as these emotions can help to accomplish what a sense of duty alone may not fulfill. However, Kant is aware of these accidental facts that natural pathological emotions often coincide with moral law. Kant distinguishes these emotions from the practical emotion of duty which comes as a reverence for the moral law and motivates human beings to do the right actions. Actions that are motivated from this moral emotion are always accorded with the rightness of moral law as here people are motivated to perform duty not only on the basis of their ultimate aim of duty but also on the basis of avoiding the limiting conditions on the expression of these emotions.

Unlike fully rational beings, all humans who are embodied with partly reason and partly emotion often fail to be motivated from duty alone. Here the practical reverence for the command of moral law motivates those persons both valiantly and cheerfully. So, it is essential to cultivate such emotions and inclinations which harmonize with the moral law and develop virtue as well.

CRITICAL EVALUATION

Throughout the detailed discussion, we have observed that emotion has an undeniable role in the context of benevolence. Empathy and sympathetic emotions play a crucial role in developing the virtue of benevolence. We can illustrate this point by analyzing that famous example of Bernard Williams. As I have mentioned above, Williams gives an illustration where a person is stuck in the dilemma of helping his mildly injured wife or a severely injured stranger. The person usually holds a special concern and sympathy for his wife along with the special duty of a husband towards his wife. However, as a rational human being he also holds a general concern and duty towards every rational individual, and this rationality raises the duty of benevolence within the person for the severely injured stranger. If the person only has concern for his wife and ignores the severely injured stranger, he fails to perform his rational humanitarian duty towards the others, and so, he is morally blamable. Again, if he totally ignores his wife's injury and runs to help the stranger, he fails to perform his special duty as a husband towards his wife as well as a humanitarian duty towards others and so he is also morally blamable. So, he needs a balance between these two people according to the requirements of the situation. Here, as the stranger is severely injured, he needs to pay more concern towards him and should act to arrange the immediate help. However, it does not imply that he overlooks his minutely injured wife. He should sympathetically help his wife before running to help the stranger.

For me, sympathetic emotions and reason both are the important factors for performing the duty of benevolence. Often emotion may affect a sympathetic person so deeply that one may not be able to perform her duty properly. In the above situation if the person becomes emotionally affected by the sight of accident and the injury of his wife or of that severely injured stranger, he cannot be able to perform his duty. He may have so much emotionally engrossed that he starts panicking and even may break into tears. The situation will be even worse if the person faces a nervous breakdown or serious panic attack as he becomes so much emotionally distraught by the injured people. Such an emotionally driven person cannot handle these emergency situations. However, in our daily lives, we often find ourselves within such emergencies and dilemmas where sympathetic outcomes are *essential but not sufficient*. In the above-mentioned emergency situation where the husband hypothetically is the only non-injured person and in proper physical condition should act fast to rescue others. He should call the ambulance for the immediate medical help of the injured people and also run to ask help from the localities. Hence, besides his special sympathetic concern for his wife and general concern for the stranger, as a rational individual the person should perform his required responsibilities. So, here we need a proper balance of both emotion and reason. Reason can control one's emotional outburst and helps to focus oneself to perform one's duty. In general, morality requires actually both emotion and reason. For me, the duty of benevolence comes as a moral ought from our core of humanity due to our moral, sympathetic concern for other beings.

Again, only reason-based duty lacks the required emotional sophistication, absence of which may show *disrespect to the person* for whom we perform our duty of benevolence since the moral virtue of *benevolence presupposes genuine empathy and concern for other-beings*. I want to

justify this point by analyzing Stocker's example where a person visits his sick friend in the hospital. Here Stocker argues that the person who comes to visit his friend should be sympathetic and pose genuine concern for his friend otherwise his behavior will be morally deficient. Generally, we all have that special love and concern towards our close ones; and when our loved ones are in danger the duty of benevolence arises from that love and sympathetic concern we have towards them. Hence, absence of this concern is definitely moral deficiency. These are the most important moral virtues which one should develop for all. Now, a deficiency of these primary virtues towards one's close relative or friend never goes along with one's moral behavior. Only duty for duty's sake is the necessary condition but not the sufficient one. It also requires the moral concern and empathy for other beings for the successful application of our duty. If the person visits his friend only for duty's sake, the lack of concern and sympathy affects his sick friend and consequently the friend feels uncomfortable, neglected and becomes hurt. If someone lacks this moral concern, the motive behind his dutiful action raises a question. It's not only the dutiful visit for its duty's sake but the genuine concern and sympathy for a sick friend should be the motive of this visit. These emotions spring naturally from our genuine humanitarian concern for other-beings and love for humanity in general. So, these emotions hold equal moral worth along with reason to motivate one to help others. On the contrary, Meyers argues that the friend who is in hospital may be paying the penalty for his own heedless lifestyle and despite of repeated cautions he continues his rash driving and now he is suffering the consequences of his own reckless behavior. The person may be angry at his friend for this and so he is less sympathetic, but he comes to visit him in the hospital for the sake of duty. Again, despite of his friend's calloused behavior, there should be a genuine concern for his friend as a motivator behind his dutiful visit in the hospital; without this concern and sympathy it can be assumed that his motivation is something else but definitely not moral.

We can justify this point by following Kant. Since every person, being an end-in-itself, is worth their own moral value, we have the moral responsibility to respect every person and her dignity and never let anyone feel degraded or disrespected by our behavior towards them. Now, while performing the duty of benevolence we are directed to some actions which will help the recipients who are in adversity, danger or in some position from where we hypothetically stay in a better position. So, it is our duty not to make the person feel disrespected or uncomfortable as we provide aid. Sympathetic emotions are essentially associated with the duty of benevolence since it never makes the beneficiaries feel degraded or uncomfortable; moreover, it provides them emotional comfort which is equally required while performing the duty of benevolence in that adverse situation. Sympathetic emotions and the duty of benevolence complement each other. And it is our moral duty to love all that develops the notion of universal benevolence. We require a proper balance of both reason and emotion while performing these actions. No doubt, duty is a very complex concept. Generally, individuals are first moved by their empathetic feelings towards other beings. Such empathetic emotions for others create the obligation to do some benevolent actions which alleviate the sufferers of their pain. The whole emotional process serves as the motivation to perform benevolent actions. Gradually, our repetitive, similar actions in every similar situation develop the concept of duty when we help others purely from the sense of duty, internalizing the virtue of empathetic feelings from our moral humanitarian concern for others.

So, I prescribe a new version of benevolence which has the proper balance of reason and emotion and which arises from the very root of our humanitarian essence. Humanity is in itself is the embodied combination of both reason and emotion. The compulsion of benevolence arises from one's own deeply rooted humanitarian nature. Humans strive to be morally benevolent from in-

side, and this version of benevolence believes in this inward reformation of humans by appealing to its inner humanitarian root. The disposition of benevolence unites other beings inwardly by touching other human's heart through its intrinsic nature, and it develops a person towards a morally better human being. The disposition of benevolence is stronger since it arises from the very essence of humanity, and also this disposition transcends an individual from one's own self-ego towards others and gets into other human's heart through its humanitarian appeal.

REFERENCES

- [1] Kant, I.; Paton. H.J. and Greogor, M.J., eds.: *Doctrine of Virtue*. Harper & Row, New York, 1964,
- [2] Herman, B.: *On the Value of Acting from the Motive of Duty*. The Philosophical Review **90**(3), 359-382, 1981, <http://dx.doi.org/10.2307/2184978>,
- [3] Herman, B.: *Rules, Motives, and Helping Actions*. Philosophical Studies **45**(3), 369-377, 1984, <http://dx.doi.org/10.1007/BF00355444>,
- [4] Williams, B.: *Persons, character and morality*. In: *Moral luck: Philosophical Papers 1973-1980*. Cambridge University Press, Cambridge, pp.1-19, 1981, <http://dx.doi.org/10.1017/CBO9781139165860>,
- [5] Herman, B.: *Integrity and Impartiality*. The Monist **66**(2), 233-250, 1983, <http://dx.doi.org/10.5840/monist198366216>,
- [6] Blum, L.A.: *Friendship, Altruism, and Morality*. Routledge & Kegan Paul, UK, 1980, <http://dx.doi.org/10.2307/2960086>,
- [7] Stocker, M.: *Schizophrenia of Modern Ethical Theories*. The Journal of Philosophy **73**(14), 453-466, 1976, <http://dx.doi.org/10.2307/2025782>,
- [8] Foot, P.: *Virtue and Vices*. In: Crisp, R.; Slote, M, eds.: *Virtue Ethics*. Oxford University Press, New York, pp.163-178, 1997,
- [9] Korsgaard, C.: *From Duty and for the Sake of the Noble*. In: Engstrom, S.; Whiting, J. eds.: *Aristotle, Kant, and the Stoics: Rethinking Happiness and Duty*. Cambridge University Press, Cambridge, pp.203-236, 1996,
- [10] Hursthouse, R.: *On Virtue Ethics*. Oxford University Press, Oxford, 1999,
- [11] Oakley, J.: *A Critique of Kantian Arguments against Emotions as Moral Motives*. History of Philosophy Quarterly **7**(4), 441-459, 1990,
- [12] Baron, M.W.: *Kantian Ethics Almost Without Apology*. Cornell University Press, Ithaca, N.Y., 1995,
- [13] Stohr, K.: *Virtue ethics and Kant's cold-hearted benefactor*. Journal of Value Inquiry **36**, 187-204, 2002, <http://dx.doi.org/10.1023/A:1016192117676>,
- [14] Tannenbaum, J.: *Acting with Feeling from Duty*. Ethical Theory and Moral Practice **5**(3), 321-337, 2002, <http://dx.doi.org/10.1023/A:1019627428116>,
- [15] Meyers, C.D.: *The Virtue of Cold-Heartedness*. An International Journal for Philosophy in the Analytic Tradition **138**(2), 233-244, 2008, <http://dx.doi.org/10.1007/s11098-006-9034-3>,

- [16] McMurray, W. Ashley.: *Morality, the Good Life, and the Cold - Hearted Benefactor*.
Aporia **25**(1), 11-20, 2015,
- [17] Nagel, T.: *The Possibility of Altruism*.
Clarendon Press, Oxford, 1970,
- [18] Sherman, N.: *Making a Necessity of Virtue: Aristotle and Kant on Virtue*.
Cambridge university Press, Cambridge, 1997.

THE RELATIONSHIP BETWEEN RELIGIOSITY OF PARENTS AND CHILDREN IN CATHOLICS – THE ROLE OF PARENTS IN ADOLESCENTS RELIGIOUS PRACTICE

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ABSTRACT

This article is based on the “Religion and Human Rights 2,0” research, a survey carried out in Croatia ($N = 1286$) conducted on high school, Gymnasium, students 17-19 years old. It examines the influence of parents’ religiosity on the religious practice of adolescents among Catholics ($N = 1097$). There are three dominant questions to be addressed in the article: a) how much and how does the religiosity of their parents influence the religious practice of young people? b) how much does the religiosity of parents affect the specific dimensions of religious practice (the frequency of prayer, the frequency of going to church) of young people? c) does the impact of the parent’s religiosity on the child differ in cases where they are both the same sex and in cases in which they are not? The results, obtained by a series of linear regression analyses show that in a) and b) there is some influence of the religiosity of parents on young people. It is also shown that c) there is a dominant influence of the same-sex parent on the child in this respect (mother-daughter, father-son), while the incentive or compulsion to go to mass shows the effect only in the father-daughter dyad. The findings confirm the importance of parental religiosity for youth religiosity a little bit more for church attendance than for the frequency of prayer. They call for the use of elements of parental religiosity in the research of youth religiosity. They also point to the greater effect of parents’ religious beliefs and the importance they attach to their child’s religiosity than the coercion/incentive to religious practices.

KEY WORDS

youth religiosity, adolescent Catholics, parental religiosity, religiosity of parents

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INTRODUCTION

The impression of “eluding religion” in the face of trying to define it, to understand it and explore it weakens when we approach it in a way suggested by Esad Ćimić in 1988. “There are three possible levels of approach to religion, i.e. there are three basic forms of existence of religion: religion *per se*, religion as a *socio-historical fact* and religion as a *personal experience*. Religion *per se* is the ideal form of the existence of religion. It does not exclude and renounce the value of historical and personal forms of the appearance of religion, but rather designs them, serving them as a benchmark. Religion in itself is an ideal option that constantly reminds us of the difference between sacred and secular. Entering social and historical life, religion takes on the qualities of the world and its laws. Then we talk about religion as a socio-historical fact”... [1; p.854] “Personal religious experience is a substrate of non-church religiosity. Religion as a personal experience implies the level of an individual who can understand a religious message only when he lets it through the filter of his own time-changing experience” [1; p.854]. The most common definitions are reduced to the first two (lower) levels. One of these is English & English’s “A system of understanding, belief, behavior, rituals and ceremonies by which an individual or community puts themselves in a relationship with God or with the supernatural world and often in a relationship with one another, and from which (the system) a religious person receives a series of values according to which the natural world is governed and judged [2; p.21]. Religion, in sociology, is most often defined in two ways: *substantively and functionalist*¹. The first approach is characterized by an attempt to unify all common (essential) elements without which religion cannot exist. The most famous such definition is that of Durkheim: “Religion is a strongly connected system of beliefs and customs that refers to the holy, that is, separate and forbidden things, namely a system of beliefs and customs that unite all their adherents into the same moral community called the church” [3; p.101]. The role of religion in society, at the time of the emergence of discipline (and today) seemed fundamental and omnipresent, it received a lot of attention from the “founding fathers” of sociology and this is evident in the fact that all of them wrote about it. The social role of religion found its place in the texts of Comte, Durkheim, Simmel, Marx and Weber, as well some later sociological classics such as Parsons and Luhmann [4]. The understanding of its function was different in each of them, from integrative (Comte, Durkheim, Parsons), enslaving (Marx), socio-transformative (Weber) to psychological (Freud, Marx, Durkheim). For sociologists, religion can be researched in the immanence, i.e. in elements of social practices, experiences, rituals, symbols, beliefs and knowledge.

Religiosity, on the other hand, is what Simmel described as “a life’s drive... subjective experience of connection with the secretive code of life itself” [5; p.63]. It is necessary to distinguish the concepts of religion and religiosity. “While the concept of religion implies a whole system of ideas, beliefs, and values, the concept of religiosity implies a subjective, individual attitude that arises as a result of the adoption of certain religious beliefs, and which does not have to be associated with only one particular religion (which is the case in new religious movements). Religion is external, public, objective, established and rational, religiosity is internal, private, subjective and emotional” [1; p.854]. Religiosity means the subjective dimension of belonging to a religion. Authors such as Hood Jr., Hill and Spilka count as many as 46 different instruments for measuring religiosity [6; pp.40-41], and this article will specifically explore one of its dimensions by an instrument constructed by Glock and Stark [7]. This instrument is multidimensional and approaches religiosity as a complex phenomenon whose components do not necessarily have to be inter-independent or related, and they are: a) Knowledge (intellectual dimension), b) practice – dimension relating to binding religious practices (mass, prayer, confession, etc.), c) belief – common religious beliefs of members of a religion, d) experience – feelings that a person associates with a

religious experience (intensity and quality can be very different), e) consequences – a reflection of other dimensions of the daily life and lifestyle of the individual, understanding themselves and others and acting accordingly [2, 4, 5, 8, 9].

Several research studies conducted on religiosity in Croatia were dedicated to the subject of religiosity in the general sense. Some of these will be presented later. This article, however, will be specifically dedicated to the relationship of religiosity of parents and the religiosity of their children.

Other than this relationship, what is there to be seen in terms of the relationship of the type of religiosity that is recognizable in parents and the religious practices of young people? More precisely, can young people be expected to practice religious rituals more if they are encouraged/coerced by their parents to do so, or is it more reliable in this sense to rely on how much of a role religion plays in their parents' lives? Furthermore, the question is, does the religiosity of parents have the same effect on both genders of youth? Is there any role played by the parent's gender and the gender of the child? If we articulate these questions as objectives that this article is trying to achieve, they are a) to investigate whether the religiosity of parents shows an effect on the religious practice of children, if so b) in what way, c) whether this effect differs if we take into account the gender of the child and d) whether the parent's gender is relevant. To answer these questions, the following briefly outlines the broader religious picture of Croatian society with a special emphasis on Catholicism, then an overview of the indicative research on (primary) religious socialization and its effects and its reception mechanism is presented. Finally, we show the results of the survey in light of these studies and the expectations based on them. The results and findings of this study should indicate the importance of including the religiosity of parents in future research of the religiosity of young people, to take into account which parental techniques (or characteristics of parental style) show effects on the religiosity of young people. They should also open up space for further examination of how much and what kind of impact perception and "playing" of parental roles have in the context of religious socialization regarding the gender of the child.

RELIGIOSITY AND RELIGIOUS SOCIALIZATION IN CROATIA

Croatia is a religiously-homogeneous country. Catholics as a religious group have been the dominant majority for many years with more than 75 % of the population, and in the last 20 years, this proportion is closer to 90 % (87,9 % according to the 2001 census and 86,3 % in 2011 census)². In a society of such a distinct cultural characteristic, it would be unusual not to recognize it in the practices, institutions, rituals and daily lives of its members. Catholic religious teaching is an elective school subject, Catholic holidays are non-working days, institutions of humanitarian character (Caritas) operate, religious rites of transition are highly represented, Catholic media are active and free, as well as declarative towards Catholic social movements, etc. In short, Catholicism permeates Croatian society on multiple levels. Previous research has shown this, and it is particularly reflected in the acceptance of religious rites of transition (at birth, marriage, and death) even in those who declare themselves non-religious and atheists [10-12]. Extensive research on young people 15 years ago showed that 79 % of young people (15-29 years) attended Catholic religious teaching, and 69,5 % said they were sending or would send their children to same [13; p.90]. European Values Study has also shown that in terms of religious rituals 25-30% of Croats go to Mass once a week or more often. 31,4 % in 1999 and 26,4 % in 2008, while 55-60 % pray more than once a week (60,1 % in 1999 and 55,2 % in 2008), with around a third of them (37,3 % in 1999 and 32,6 % in 2008) praying every day [14; p.451, 456]. It is important to point out that in 1999 around 10 % of Croats prayed with their family once a week or more often (every Sunday or daily), about 50 % on special occasions (holidays, baptism, death) and 39,6 % had never prayed together or did not pray at all. Attention is also drawn to the fact that religious teaching in the family was highlighted as important in 79,6 % of respondents (84,9 % in Catholics) and was an essential part of traditional educational values [15], while 37 % in 2008 felt that it was especially

important for children to learn religious beliefs in the family³. Research by Leutar and Josipović [16] shows that about 76 % of young people (Faculty of Philosophy of the Society of Jesus) pray regularly or often and about 52 % of them go to mass once a week. All the data presented here outlines the context of religious socialization in Croatia; therefore, socialization in the Catholic spirit will intersect all dimensions of society and, especially important in this work, family.

PARENTAL RELIGIOUS SOCIALIZATION AND SOCIAL LEARNING THEORY

Society socializes its members through its institutions and actors in social reality. Individuals learn the rules of the game (norms) in society or its relatively bounded spheres through family, school, friends, acquaintances, church, media, professional groups, etc. It is a process by which society maintains and allows the transfer of culture between generations. It can be seen in two ways: a) as a process by which an individual adopts social rules themselves and accepts them as part of their personality, b) a process in which individuals direct their actions according to the expectations of others (in the second part of this article it is clear that in this study the emphasis is precisely on this process of external “socialization pressure”) [17; p.363]. When individuals accept these “rules of the game” as their own, we say they've internalized them. Religious socialization is therefore about nurturing values and learning and adhering to the norms of a religion. It takes place in a different way and a different environment through different agents, e.g. in the family – by praying together, celebrating religious holidays, reading holy books, talking about religious topics; in school – by religious education, etc. Primary socialization, i.e. the process by which language and culture are taught in the family, is crucial for the further course of the individual's life, which means that their life is permanently marked by who and what their parents are, what they teach the child and how they teach them, how they treat them, etc. Although primary socialization refers to childhood, family, and especially parental socialization, influence does not cease with the end of childhood. Parents will leave a strong influence on the characteristics and behaviors of their children, reflected in sayings such as “the apple does not fall far from the tree” and “like father, like son”. One could expect that religious parents would wish for their children to be religious too (although it does not have to be that way).

These are the issues that are addressed by the social learning theory [18, 19] which implies that people learn to behave by “modelling” towards those they look up to or those who provide them with ideas and ideals essential for achieving their desired goal [6]. Such role models are provided by all the agents of socialization listed above, and among them parents stand out as the first and most important source of religious socialization (parental religiosity is one of the strongest predictors of adolescent religiosity), and a significant majority of research confirms this [20]. It should be borne in mind that groups of adolescents, especially those belonging to the religious statistical majority are quite specific because there is a noticeable decrease in religiosity compared to other age groups during this period, which makes the examination of parental influence and religiosity a specific task, as evidenced by the large number of studies [6]⁴. The results for Croatia show the exact opposite. In a study that covered the end of the adolescent period (15-29 years) of life, Marinović Jerolimov [13; p.104] shows that young people are very religious during this period, although not as religious as they were in childhood, which can be read from data that 63 % (2008) – 70 % (1999) of Croats went to Mass once a week or more often when they were 12 years old and 26 % (2008) – 30 % (1999) in the later period of life, which is a decrease of almost 40 % [14; p.450].

OVERVIEW OF RESEARCH ON PARENTAL RELIGIOUS SOCIALIZATION AND RELIGIOSITY OF CHILDREN

Since the mid-1950s and Allport's study on the mediation of children's identification with parents in the intergenerational transmission of prejudice (1954), a clear one-line research model

(parents – child) has gained great significance [21; p.11]. Indeed, except for short-term actuality of “Generational gap thesis” which, for the most part, has proved to be inaccurate [22; p.107], the various studies in its conclusions suggest the firm consensus in the assertion that parents influence their children’s beliefs and practices, only differ in the degree of this impact [23]. The literature review and available research trends in this direction. Moreover, family (parental religiosity and religious worldview) alongside peers/friends (especially spouses in the case of adults) and church (religious community, religious education) is taken as a part of the “big three” of religious socialization adolescents [20, 24–26]⁵. In the long tradition of research, the primary interest in this work – parental socialization has proved to be extremely important in terms of religiosity and religious activities of children in general. Earlier studies showed the whole range of effects of parental religiosity on the religiosity of children from weak, through moderate to strong [23]. In addition to the diversity of results, related but different subjects were examined in these studies (some of them tried to determine whether there was a link between the social and religious values of parents and children, and others how much parental religious practices affected those of children, etc.). Potvin & Sloan show that adolescents whose parents regularly go to church practice religious rituals five times more often themselves than those whose parents do not go to church or go irregularly, and Hunsberger finds the connection of apostasy and rejection of parental religious teachings [23]. Four years later, together with Bruce, he found that the relevance of religion in the family during childhood was decisive for remaining attached to religion [27]. In a longitudinal study in the US, Wink, Ciciolla, Dillon, and Tracy showed that as they grow up/age, children increasingly embrace the religious values of their parents [6; p.90], but also that religiosity in the post-adolescent years is a good predictor of spirituality in the continuation of life, which is why they claim that spirituality in adulthood/older age is associated with religious socialization at a young age [28; p.1066]. The reason that stands out is that the value congruence, i.e. attribution of a similar level of importance to some value by parents and children is usually high for religious values and low for all of the others [29]. Interestingly, findings of Himmelfarb in 1979 [24], according to Cornwall [24, 30] confirm the “channeling hypothesis”, i.e. that parents socialize their children by channeling them into other groups or experiences (such as school and marriage) that will amplify (have an additional impact) what was learned at home and channel them further into similar adult activities [24; p.nn]⁶. However, recent results from longitudinal studies involving parents and children have shown a strong parental impact on religious beliefs and practices, not only through childhood, but also throughout the lives of children [25], but at an older age when parents are more dependent on the knowledge and information of their children a *vice versa* process takes place [25].

Most people are likely to say that a role model in terms of social learning for adolescents will be a parent of the same gender and the research generally confirms that thought. On this trail, Troll and Bengtson (1979) find that: 1) fathers have a greater influence on the formation of values in children than mothers, 2) there is a greater similarity in children and parents of the same gender, than in the opposite, c) daughters are more sensitive to the influence of parents than sons [29; p.257]. However, although there are no unambiguous findings on this topic, in most of the studies the assumption is that the relationships of the parent – the child in various dyads (mother-daughter, mother-son, father-daughter, father-son) are specific⁷. The more gender roles are expected to differ in a society, especially in the case of family roles and work roles, whereby such difference can be expected in Croatian society [31], the stronger connection between the same genders of parent and child in terms of the transfer of personality traits, values and behaviors we can expect [29]. In other words, it is more accentuated that the father will serve as an example to the son, and the mother to the daughter in learning appropriate and desirable social practices.

THE RESEARCH

The survey “Religion and Human Rights” (RHR)⁸ was conducted in November and December 2014 in more than 25 countries and with 25 000 respondents/students, most of them European (see more about the research and project in Appendix A).

SAMPLE AND RESPONDENTS

Non-probabilistic quota sample was used, consisting of 1286 pupils (out of 13 063 pupils from 4th grade) from 20 counties of the Republic of Croatia and the City of Zagreb (more details on sample in Appendix A). We used the deliberate sampling method. Students of grammar schools were proportionally represented in the sample by counties according to the proportion of grammar school students at the state level. 75,4 % of respondents were 18 years old, and 23,4 % younger while the remaining 1,2 % had turned 19. Girls were represented in the share of 63,6 % ($N = 816$), and boys in 36,4 % ($N = 468$); this is almost the same gender distribution as in grammar schools nationally where girls are represented 62 % to 38 % according to the Croatian Bureau of Statistics⁹. This article refers to Catholics only ($N = 1097$) because they are the main research interest, i.e. their religious practices and religiosity of their parents.

INSTRUMENTS AND METHODS¹⁰

Descriptive statistical methods were used in the first part of the study, i.e. a description of the obtained frequencies and the proportion of results in terms of confessional affiliation and religious self-identification, the frequency of going to mass and the frequency of prayer. Confessional affiliation and religious self-identification is presented by a category variable, and respondents were to mark belonging to one of the religious communities offered – Roman Catholics, Protestants, Anglicans, Pentecostals, members of another Christian tradition, Muslims, Sunnis, Shiites, Alawites, members of another Islamic tradition, Jews, Buddhists, Hindus, other religious affiliations, religious without belonging to a community, non-religious. The frequency of going to mass was measured by the question: “How often do you participate in religious services in a church or mosque or another place?”, the range of answers offered was: 1 – never, 2 – barely ever, 3 – several times a year, 4 – once to three times a month, 5 – once a week, 6 – more than once a week, 7 – once a day, 8 – several times a day, 9 – I do not know. The frequency of prayer was measured by asking: “How often do you pray?” with the same range of possible answers as for the prior question.

In the second part of the research we used an instrument we called the religiosity of parents. It has already been used in the works of Cornwall [24, 30], Myers [32], Ziebertz and Reindl [33] as religious socialization. In most of these articles more variables and different ones than in our case were included, which was especially the case in Myers’ [32]¹¹. To distinguish our instrument from the former, a new name was given. It consists of six variables in total (three related to each parent): “How would you describe your mother/father’s (or foster parent) faith in God or a higher reality?” with the answers offered: 1 – absolutely unbelieving, 2 – rather unbelieving, 3 – doubtful, 4 – believe, 5 – believe absolutely, (6 – I do not know, 7 – not applicable)¹²; Furthermore, “How important is it to your mother/father (or foster parents) that you adopt their faith/belief?” with possible answers: 1–not at all important, 2 – not important, 3–fairly important, 4 – very important, (5 – I do not know, 6 – not applicable) and “Does your mother/father (or foster parent) want you to attend religious services?” with the answers: 1– no, they leave me totally free in this regard, 2- not really, but they do appreciate it, 3–yes, they insist on it, (4 – I don’t know, 5 – not applicable).

The religiosity of parents was represented by a set (6) of predictors in the linear regression model that was performed six times. The first two times for all Catholics, where the dependent

variables were (1) the frequency of going to church and (2) the frequency of prayer. Following the Glock and Stark model these two variables represent religious practice. The other two times were sub-samples separately for boys and girls using the same independent variables.

Thus, the sequence of analysis is first to show the proportion of Catholics in the population surveyed and their frequency of religious practice, both prayer and going to mass. Then, by using inferential statistical methods, i.e. linear regressions, determine 1) the relationship between the religiosity of the parents and the religious practice in young Catholics in both of the examined aspects (in terms of the frequency of going to mass and the frequency of prayer), 2) the relationship between the religiosity of the individual parent and the religious practice of the child in the case of a daughter and son (i.e. on the sub-samples by gender). The analyses were done in IBM's SPSS version 20.

THE RESULTS

To get an idea of the proportion of young Catholics in the youth population, it is useful to look at the proportion of Catholics in the entire population according to 1999 and 2008 EVS (European Values Study) data.

Table 1. Confessional affiliation and religious self-identification of young people¹³.

	EVS 1999.	EVS 2008.	RHR 2014. (17–19 yrs.)
Roman Catholics, %	86,8	80,6	85,8

Table 1 shows the percentage of Catholics represented in this sample, they are the target group in this article, and their percentage is slightly higher in the Religion and Human Rights project than that in the entire population recorded in the last wave of EVS. It should be said that this deviation is not great and that it clearly outlines the dominance of Catholics as a confessional group among young people. All the other confessional groups occupy only 2,2 % of the sample, religious without belonging to a community 2,1 %, and 9,9 % of respondents expressed as non-religious.

RELIGIOUS PRACTICE OF YOUNG PEOPLE (CATHOLICS)

If we present components of religious practice according to the frequency of their practice, the results are as follows in the table below.

Table 2. Frequency of going to church and prayer.

	Frequency of going to church			Frequency of prayer		
	<i>f</i>	%	Cumulative	<i>f</i>	%	Cumulative
Never	83	8,1	8,1	26	2,5	2,5
Barely ever	129	12,6	20,8	71	6,9	9,4
Several times a year	246	24,1	44,9	68	6,6	16,0
Once to three times a month	165	16,2	61,1	88	8,5	24,5
Once a week	314	30,8	91,9	81	7,8	32,3
More than once a week	80	7,8	99,7	143	13,8	46,2
Once a day	2	0,2	99,9	401	38,8	85,0
Several times a day	1	0,1	100,0	155	15,0	100,0
Total	1020	100,0		1033	100,0	
I do not know	30			37		
No answer	47			27		
Total with "do not know" and "unanswered"	1097			1097		

Table 2 shows that around 39 % of young Catholics go to mass once a week or more often, while around 75 % pray once a week or more often.

RELIGIOSITY OF PARENTS AND RELIGIOUS PRACTICE OF YOUNG PEOPLE (CATHOLICS)

In the first case the linear regression model had the frequency of going to mass as a criterion variable, and in the second the frequency of prayer. A set of predictors previously listed under the name of the religiosity of the parents, for the sake of the overview, is somewhat concise and shown below, and both models are presented in the same table for better visibility of the essential elements.

Table 3. Religiosity of parents and frequency of prayer and going to church.

	Frequency of going to church	Frequency of prayer
Believing in God - father		0,114*
Believing in God - mother		
Accepting his beliefs - father		0,152*
Accepting her beliefs - mother	0,195**	0,126*
Degree of incentive/coercion to mass – father	0,186**	
Degree of incentive/coercion to mass – mother		
R ²	0,239	0,153
Adj, R ²	0,233	0,146
	*p<0,05, **p<0,005, ***p<0,00	

From this table, by the quantity of variance explained, it is read that the regression model is more appropriate to predict the frequency of attendance at mass (about 23 % of the variance explained) than the frequency of prayer (about 15 % explained variance). All the predictors are positive, which means that the effect of independent variables is the increase in dependent variables (stronger belief of parents, more importance that children adopt their religious beliefs and a higher degree of encouragement results in greater religious practice, i.e. going to mass and prayer). The table also indicates that the best predictor for participation in mass is the importance that the mother attaches to her child accepting her beliefs ($\beta = 0,195$), and then the father's desire to go to mass ($\beta = 0,186$). It is also evident that in addition to the importance that the father ($\beta = 0,152$) and the mother ($\beta = 0,126$) attach to the child accepting their beliefs, the father's faith in God is a good predictor of the frequency of prayer ($\beta = 0,114$). The only common significant predictor for both models is the importance that a mother attaches to a child accepting her beliefs. These results point to several things a) the religiosity of parents shows an effect on the religious practice of adolescents (there is a respectable percentage of variance explained in both cases) b) effect is stronger on the frequency of going to mass than on the frequency of prayer, c) in terms of prayer, the effect of the father's religiosity is somewhat stronger, as it manifests itself in two spheres (the belief and importance it attaches to the child to adopt his beliefs) than the mother's (the importance of accepting her religious beliefs), and d) the importance that the mother assigns to accepting her beliefs and the degree of encouragement/coercion of the father show relevance in attendance at mass. To find out whether the claims c) and d) stand for both genders of adolescents, a more detailed analysis is needed on the subsamples (groups) of young men and girls separately.

PARENTS' RELIGIOSITY AND RELIGIOUS PRACTICE BY GENDER

In the following case, two regression models were used that had the frequency of going to mass for the criterion variable, the first for girls (left column), the second for young men (right column). The religiosity of parents is a set of the same predictors as in the previous case. Both models are in the same table below.

Table 4. Religiosity of parents and frequency of going to church by gender.

	Girls	Boys
	Frequency of going to church	
Believing in God - father		
Believing in God - mother		
Accepting his beliefs - father		0,313*
Accepting her beliefs - mother	0,265***	
Degree of incentive/coercion to mass – father	0,230**	
Degree of incentive/coercion to mass – mother		
R ²	0,244	0,248
Adj, R ²	0,234	0,23
* $p < 0,05$, ** $p < 0,005$, *** $p < 0,00$		

Equally explained variances (about 23 %) for girls and young men indicate that parental religiosity proves to be important in going to mass equally for both genders. However, the influence of mother and father on boys and girls is different. For boys, a significant predictor ($\beta = 0,313$) is only the importance that the father attaches to the acceptance of his religious beliefs and, for girls, the importance that the mother attaches to the acceptance of her religious beliefs ($\beta = 0,265$) comes first and then the father's incentive/coercion ($\beta = 0,230$). In short, the frequency of going to mass for young men can be foreseen based on how much the father cares for their sons to adopt their religious beliefs, while this practice can be predicted in girls based on the importance that mothers place on their daughters to adopt their religious beliefs. Their father's encouragement/coercion to mass plays a fairly important role in the case of girls.

As in the case of going to church, two regression models were used, only this time the criterion variable was the frequency of prayer. The first for girls (left column), the second for young men (right column). Religiosity of parents is a set of the same predictors as in all previous cases. Both models are shown in the same table (5).

Table 5. Religiosity of parents and frequency of prayer by gender.

	Girls	Boys
	Frequency of prayer	
Believing in God - father		0,179*
Believing in God - mother	0,141*	
Accepting his beliefs - father		0,235*
Accepting her beliefs - mother	0,184*	
Degree of incentive/coercion to mass – father		
Degree of incentive/coercion to mass – mother		
R ²	0,171	0,163
Adj, R ²	0,16	0,144
* $p < 0,05$, ** $p < 0,005$, *** $p < 0,00$		

Once again, the religiosity of parents proves equally important for the frequency of prayer in both genders. This time, the dyads effects of parents and same-gender children are clearly seen. The more their mothers expect from girls to adopt their beliefs ($\beta = 0,184$) and believe in God more ($\beta = 0,141$) the more often they pray. The more important it is for their fathers to accept their beliefs ($\beta = 0,235$) and believe in God more, boys pray more ($\beta = 0,179$). It is shown that the incitement/coercion to attend mass does not show an effect on frequency of prayer in any gender. Although some of this betas (β) are not particularly strong, they give us clear indication of forming these dyads.

DISCUSSION

As a general conclusion, it can be drawn that parental religious context plays a very important role in young people's religious practice. It seems like Church attendance as a visible and public ritual owes its share to mothers' "role modeling" and fathers' direct incentive. This can be plainly articulated as soft and hard stimulus from mother and father which somewhat corresponds to stereotypical parental personality traits, namely permissive and gentle mothers vs strict and rough fathers. Since religiousness in the institutional sense (church attendance) represents desirable behavior in Croatia it does not surprise that it's partly a consequence of fathers' direct push for a child to represent his family appropriately i.e. care about its reputation. This also partly explains the weaker relationship of religiosity of parents and frequency of prayer. Forcing someone to prayer does not make any sense and is almost impossible. This kind of intimate act and relationship with God results from more intrinsic factors and habitualized family rituals. Believing in God and accepting parent's beliefs plays a greater role in the frequency of prayer as it presents an inextricable element of the greater family religious context.

Going to church in the case of boys can be seen as the most convincing "religious role modeling" in this research. Young men either look up to their fathers in this sense or modern dads are good at communicating their beliefs to their sons, or both. The same can be said about mothers and daughters in this respect, although the father's coercion/incentive to daughters cannot be left out. It could be stated that fathers "press" girls harder to represent the stereotype of more polite and conformist children in public spaces (church) as this is expected from young girls. On the other hand, it could not be omitted that "it takes two to tango" as young girls do conform to fathers' requirements more. The more conspicuous rebelliousness in creating an autonomy from *pater familias* could be the reason for the insignificance of this factor in boys' church attendance [34].

If we rule out the degree of incentive or coercion to mass as a factor in prayer frequency because of its analytical and rational disconnectivity, the leftovers are exactly what could be expected. On the one hand, the same gender parent-child relationship should be similar in this regard to that in other spheres of social life such as household and work roles. The greater similarity of social position and expected social behavior (gender roles) from mother and daughter rather than mother and son binds them together and makes them more alike especially because women and men have different roles in some religious rituals. Therefore it can be presumed that young men will look up to their fathers, i.e. young women to mothers as they already know established patterns of behavior well and provide them first-hand experience and example. An important remark considering the weaker relationship of parent's religiosity and their children's prayer frequency is that prayer is more intrinsic and difficult to subject to external social forces, hence it is a reflection of "religious personality" to a greater extent. Generally speaking, the greater efficiency of parental soft stimuli in children religious practice is partly the result of "religious parental style" because it presents religious practices as pleasant and warm (family) activities which do not need emphasized external control and request for obedience [35].

LIMITATIONS OF THE RESEARCH

The first restriction and call for caution in generalizing the results arises from the sampling method. The target is a “narrowly focused” age group (17-19 yrs.), and only in one type of secondary school – Gymnasium. For this reason, it should be borne in mind that this work does not apply to all young people. Also, it applies only to those declared as Catholics. The inability of researchers to be in the field and give appropriate instruction for teachers raises the question of ensuring the necessary conditions for filling out questionnaires such as whether the respondents had sufficient time, whether any ambiguities were resolved, and how effective social facilitation or social inhibition could have been due to (un)controlled conditions for filling out the questionnaire. The international character and multinational leadership of the research resulted in the inability to adapt certain variables/questions to the Croatian context, e.g. the example of confessional affiliation/religious self-identification, and examination of perceptions like tension and discrimination between races. In the instruments used, it would not be resentful if they were more substantive. More specifically, the variables (predictors) presented here as the religiosity of parents expressed a) how much do the respondents estimate that the father or mother “believe”, i.e. how strong are their religious beliefs, b) how much do the respondents estimate that their parents care to adopt their religious beliefs and c) to what degree they are encouraged/forced to go to church. The question arises as to how more usable the instrument would have been if it contained more variables about parents’ religious practices and family religious activities. Besides, it is to note that the assessment/attribution of the subjects on the religiosity of their parents calls for caution when concluding on the “actual” religiosity of parents, as it may be that respondents exaggerate or underestimate the level of their religiosity¹⁴. The longitudinal character would largely be helpful in research such as this, as it could make it possible to monitor variability in the religiosity of the subjects on the one hand, and their parents on the other as well as their interaction at various periods of life.

CONCLUSION

Firstly, it is pointed out that the number of people who declare themselves as Roman Catholic in Croatia is stable, at least since 1999 and is between 80 % and 90 % of the population. In this case, in the age group of high schoolers (17-19 years old) it is 85,8 %. Although the period of adolescence in comparison to childhood is a period of decline in the frequency of the practice of religious practices, it is also more intense compared to mature age, and grows again in old age [14, 36]. The frequency of going to mass once a week or more often is for Catholics as it was in 2002 for this age group (38 %) and all confessional affiliations [13]. A share of 39 % indicates the relative stability of attendance of mass in young people over the last 15 years (although this data could differ if all high school students were surveyed). Furthermore, the data on 75 % of the subjects praying once a week or more often seems quite large, but again it is (only) about Catholics in an age group for which a high degree of religiosity¹⁵ is characteristic. In other words, young Catholics are quite religious and this is primarily seen in the frequency of prayer. Such a large gap between the frequency of going to mass and praying can be explained by an aversion to institutionalized (or ecclesiastical) forms of religiosity which favour Balaban’s thesis on declining and distant ecclesiolatry [12], and the feature of prayer as a private act that is direct and personal communication with God.

The results of the relationship between parents’ religiosity and the religious practice of young people can be summed up by the following assertions: a) the more religious parents are, the more importance they give that their children adopt their religious beliefs, the more frequent religious practice among young Catholics is, b) their influence is greater in terms of going to mass than on the frequency of prayer, c) the practically exclusive dyads of father–son and mother–daughter crystallized, i.e. the religiosity of mothers and the importance they place on

their daughters to adopt their beliefs are reflected in prayer and going to mass, the same being the case in the relationship between father and son, d) the degree of incentive or coercion of parents for their children to attend mass shows an effect only in the case of father-daughter.

The results summarized in a) remind us that family, namely, parents are still a strong factor in the religiosity of young people. This can be concluded because the percentage of variance explained is high, considering only six selected predictors. In fact, a number of other studies presented in the article included far more elements of family religious socialization like how often parents pray and go to church, how often they read the Bible, religious texts, and watch religious media shows, how much they agree on their religious beliefs, etc. In addition to religiosity and religious practices of parents, as Roberts and Yamane [26; pp.95-97] show, the quality of family relationships (warmth, closeness, and marital happiness), the unity of tradition (common confessional belonging of parents) and the stability of the family structure (both biological parents) are important for the outcomes of religious socialization. The transfer of values in the family, and consequent practice of children is influenced by its position in social stratification and class status [37] as well as cultural specificities of some society [37]. Even without these all these, factors that included 23 % variance for going to church and 15 % for prayer were explained in this study.

The rationale for claim b) can go in at least two directions: 1) it is easier for parents to gain a greater degree of control over going to mass, 2) a rare common prayer in the family provides less opportunity for a stable pattern of behavior. Findings in c) and d) point towards the conclusion that parents serve primarily as a model for learning to children of the same gender in terms of religious socialization. This could be assumed in the context of the previous research and findings presented above on the high probability of transfer of values and patterns of behavior in same-gender dyads typical of societies with relatively separate gender roles [29, 31]. However, it indicates that the degree of encouragement/coercion of going to church shows only the effect on girls by fathers, which can be attributed to the generally increased restrictive control of girls at that age [22, 35]. In this context, in future research, repercussions of elements of parental style such as authoritarianism, but also the personality traits of children such as conformism, authoritarianism, and rebelliousness in the exploration of religiosity should be taken into account.

REMARKS

¹For more on the topic, see Dillon [38], Zrinščak [39], Beyer [40; pp.45-60].

²In 1991, two censuses were conducted, one Yugoslavian and one after the independence of the Republic of Croatia, with both accounting Catholics for just over 75 % of the population. Data for 2001 and 2011 was obtained from www.dzs.hr and are accessible in the category of “population censuses” (accessed 25.10.2017).

³From EVS, 2008, as shown in <http://www.atlasofeuropeanvalues.eu/new/europa.php?ids=178&year=2008&country=HR>, accessed 25th October 2017.

⁴The data relates to North America and Europe.

⁵For the full list here should be added school, religious community, religious tradition, and media, namely it turns out that everyone in the literature recognizes the agents of socialization important in different contexts, whilst parental religious socialization is the most reliable and persuasive predictor of the religiosity of adolescents.

⁶The page number cannot be entered because it is an online version of the book: Thomas, D.L., ed.: *The Religion and Family Connection: Social Science Perspectives*. [41], available at <https://rsc.byu.edu/archived/religion-and-family-connection-social-science-perspectives/chapter-11-influence-three>, accessed 25th October 2017.

⁷Russell & Saebel [42] warn, therefore, of three groups of factors that significantly affect them: a) The individual characteristics of children such as gender, age, temperament, and social competences; b) Individual characteristics of parents such as personality, social competences, gender and belief, and values; c) Socio-contextual factors such as the type and quality of the marital relationship, sources of stress, social networks and the level of support.

⁸Data in this survey obtained from the international project “Religion and Human Rights”, more details on: http://www.rp.theologie.uni-wuerzburg.de/research/religion_and_human_rights_2012_2019.

⁹Statistical Press release, April 2014, https://www.dzs.hr/Hrv_Eng/publication/2014/SI-1521.pdf, accessed 30th March 2020.

¹⁰The questionnaire was standardized by an international team of experts so that the scales and instrument are not exactly in line with the local tradition of measuring confessional affiliation and religious self-identification by two variables.

¹¹Contains questions/variables: 1) Daily influence of religious beliefs, 2) Bible reading frequency, 3) Frequency of viewing of religious TV shows, 4) Frequency of prayer, 5) Frequency of participation in church-related activities (excluding Mass), 6) Frequency of going to Mass [33; p.861].

¹²Values in parentheses are excluded from the analysis (in the first two questions under 6 and 7, the other two under 5 and 6 and in the fifth and sixth under 4 and 5).

¹³EVS data available in: Rimac [14; p.449].

¹⁴Illustrative case in this sense is the research of Acock and Bengston [43] indicating the discrepancy between the children’s perception of their parents on the series of social, political and religious questions and the “real” answers (scores) of the parents.

¹⁵See Marinović Jerolimov, [13; p.104].

APPENDIX A – DETAILS ABOUT THE RESEARCH AND SAMPLING

The project was funded by the University of Würzburg and it aimed at: a) discovering theoretical and socially relevant relationships (religious beliefs and practices) and attitudes towards human rights, b) determining the direction of these relationships as regards the influence of religion on attitudes to human rights, c) analyzing differences within and between religious groups and countries of northern, western, eastern and southern Europe, d) theoretically and empirically formulating legitimate hypotheses on the influence of religion on human rights attitudes that will be tested in future research. About 1,300 respondents participated in the survey in Croatia. Because the target group was young, high school students who were assumed to continue their education and fill prominent places in society, project managers decided to choose grammar school students for respondents. In the words of the project manager “we chose young people for the target group... because this population is a litmus paper that outlines social trends well ...” [44; p.VII]. In total, 45 grammar school fourth grades participated in the survey. Questionnaires were sent by mail. For each gymnasium that participated in the survey, written consents from their principals were obtained. Questionnaire fulfillment was conducted in class, during the social sciences and religious education classes. The questionnaire instructions were accompanied by a questionnaire package and were further clarified by telephone in the event of ambiguity. Responding time was 45 minutes. The questionnaire contained 211 questions divided into thematic blocks on confessional affiliation, religiosity, the public role of the church, attitudes towards human rights, values, political orientation, the scale of authoritarianism, orientation to social domination, empathy, trust in social and state institutions and the perception of justice etc. The answers to these questions were given on the Likert scales of five or seven-degree stacking. Among these questions was a block of questions about the sociodemographic

Table 6. Characteristics of the sample.

County name	Sample share, %	Frequency, N of respondents
The City of Zagreb	27,5	354
Splitsko-dalmatinska	14,2	149
Osiječko-baranjska	7,3	94
Zadarska	5,6	62
Zagrebačka	4,7	61
Primorsko-goranska	4,7	60
Dubrovačko-neretvanska	4,6	59
Istarska	3,9	50
Vukovarsko-srijemska	3,4	44
Brodsko-posavska	2,7	35
Sisačko-moslavačka	2,5	32
Koprivničko-križevačka	2,4	31
Međimurska	2,3	30
Krapinsko-zagorska	2,3	30
Šibensko-kninska	2,3	30
Požeško-slavonska	2,3	30
Karlovačka	2,3	30
Bjelovarsko-bilogorska	2,2	28
Virovitičko-podravska	1,9	24
Varaždinska	1,7	22

characteristics of subjects such as gender, age, city of high school attendance, mother tongue and country of birth, parents' education levels.

Ličko-senjska County was omitted from the sample because only five respondents were available.

REFERENCES

- [1] Marinović Bobinac, A.: *Non-church religiosity in Croatia*. In Croatian. Društvena istraživanja 4(6), 853-866, 1995,
- [2] Ćorić, Š.Š.: *Psychology of religiosity*. In Croatian. Naklada Slap, Jastrebarsko, 2003,
- [3] Durkheim, E.: *Elementary forms of religious life*. In Croatian. Jesenski i Turk, Zagreb, 2008,
- [4] Knoblauch, H.: *Sociology of Religion*. In Croatian. Demetra, Zagreb, 2004,
- [5] Acquaviva, S. and Enzo, P.: *Sociology of Religion - Problems and Perspectives*. In Croatian. Societas, Zagreb, 1996,
- [6] Hood, R.W.; Hill, P.C. and Spilka, B.: *The Psychology of Religion*. The Guilford Press, New York, 2009,
- [7] Glock, C.Y. and Stark, R.: *American Piety: The Nature of Religious Commitment*. University of California Press, Berkeley and Los Angeles, 1968,
- [8] Marinović Bobinac, A.: *The consequent dimension of religiosity*. In Croatian. Sociologija sela (38), 111-124, 2000,
- [9] Marinović Jerolimov, D. : *Multidimensional approach in the research of religiosity: Guidelines for research in Croatia*. In Croatian. Društvena istraživanja 4(6), 837-852, 1995,
- [10] Črpić, G. and Kušar, S.: *Some aspects of religiosity in Croatia*. In Croatian. Bogoslovska smotra 68(4), 513-563, 1998, <http://dx.doi.org/10.1086/603019>,

- [11] Baloban, J. and Črpić, G.: *Certain aspects of ecclesiology*. In Croatian. Bogoslovska smotra **70**(2), 257-290, 2000, <http://dx.doi.org/10.1126/science.290.5490.257>,
- [12] Crnić, D.: *Ritual dimension of ecclesiology in Croatia*. In Croatian. Riječki teološki časopis **20**(1), 87-102, 2012, <http://dx.doi.org/10.1080/0907676X.2011.632683>,
- [13] Marinović Jerolimov, D.: *Religiosity, non-religiousness and some values of young people*. In Croatian. In: Furio R., et al.: *Mladi uoči trećeg milenija*. Institut za društvena istraživanja u Zagrebu, Zagreb, pp.79-125., 2002,
- [14] Rimac, I.: *Comparative Review of Answers to Questions in the 1999 and 2008 European Values Survey*. In Croatian. Bogoslovska smotra **80**(2), 425-525, 2010, <http://dx.doi.org/10.1016/j.carbpol.2009.12.020>,
- [15] Črpić, G. and Hobljaj, A.: *Essential values in the education of young generations with special reference to school religious education*. In Croatian. Bogoslovska smotra **70**(2), 359-393, 2000, <http://dx.doi.org/10.3366/afr.2000.70.3.359>,
- [16] Leutar, Z. and Josipović, A.M.: *Some dimensions of youth religiosity*. In Croatian. Nova prisutnost **6**(3), 373-395, 2008,
- [17] Abercrombie, N.; Hill, S. and Turner, B.S.: *The Penguin Dictionary of Sociology*. Penguin Books, London, 2006,
- [18] Bandura, A.: *Social learning theory*. Prentice Hall, Englewood Cliffs, 1977,
- [19] Bandura, A.: *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall, Upper Saddle River, New Jersey, 1986,
- [20] Yamane, D.: *Handbook of Religion and Society*. Springer, Switzerland, 2016,
- [21] Schönplflug, U.: *Cultural Transmission: Psychological, Developmental, Social, and Methodological Aspects*. Cambridge University Press, Cambridge, 2009,
- [22] Lacković Grgin, K.: *Psychology of adolescence*. In Croatian. Naklada Slap, Jasterbarsko, 2006,
- [23] Stott, G.N.: *Familial Influence on Religious Involvement*. In: Darwin L.T.: *The Religion and Family Connection: Social Science Perspectives*. UT, Religious Studies Center, Brigham Young University, Provo, pp.258-271, 1988,
- [24] Cornwall, M.: *The Influence of Three Agents of Religious Socialization: Family, Church, and Peers*. In: Thomas, D.L.: *The Religion and Family Connection: Social Science Perspectives*. Religious Studies Center, Brigham Young University, Provo, pp.207-231, 1988,
- [25] Sherkat, D.E.: *Sources of Influence and Influences of Agency*. In: Delanty, G. and Isin, E.F.: *Handbook of the Sociology*. Cambridge University Press, Cambridge, pp.151-163, 2003,
- [26] Roberts, K.A. and Yamane, D.: *Religion in Sociological Perspective*. SAGE Publications, Los Angeles, 2011,
- [27] Hunsberger, B. and Brown, L.B.: *Religious Socialization, Apostasy, and the Impact of Family Background*. *Journal for the Scientific Study of Religion* **23**(3) 239-251, 1984, <http://dx.doi.org/10.2307/1386039>,
- [28] Wink, P.; Ciciolla, L.; Dillon, M. and Tracy, A.: *Religiousness, Spiritual Seeking, and Personality: Findings from a Longitudinal Study*. *Journal of Personality* **5**, 1052-1070, 2007,

- [29] Knafo, A. and Schwartz, S.H.: *Accounting for Parent–Child Value Congruence: Theoretical Considerations and Empirical Evidence*.
In: Schönplflug, U., ed.: *Cultural Transmission- Psychological, Developmental, Social, and Methodological Aspects*. Cambridge University Press, Cambridge, pp.240-268, 2009,
- [30] Cornwall, M.: *The Determinants of Religious Behavior: A Theoretical Model and Empirical Test*.
Social Forces **68**(2), 572-592, 1989,
<http://dx.doi.org/10.1093/sf/68.2.572>,
- [31] Brajdić Vuković, M.; Birkelund, G.E. and Štulhofer, A.: *Between Tradition and Modernization: Attitudes Toward Women's Employment and Gender Roles in Croatia*.
International Journal of Sociology **37**(3), 32-53, 2007,
<http://dx.doi.org/10.2753/IJS0020-76593703002>,
- [32] Myers, S.M.: *An Interactive Model of Religiosity Inheritance: The Importance of Family Context*.
American Sociological Review **61**(5), 858-866, 1996,
<http://dx.doi.org/10.2307/2096457>,
- [33] Ziebertz, H.G. and Reindl, M.: *Religious Socialisation and Values as Predictors of Human Rights Attitudes: An Empirical Study among Christian and Muslim Adolescents in Germany*.
In: van der Ven, J.A. and Ziebertz, H.G., eds.: *Tensions within and between Religions and Human Rights*. Lieden, Brill, pp.223-224, 2012,
- [34] Berk, L.E.: *Development through the Lifespan*. In Croatian.
Naklada Slap, Jasterbarsko, 2008,
- [35] Čudina Obradović, M. and Obradović, J.: *Psychology of marriage and family*. In Croatian.
Golden marketing - Tehnička knjiga, Zagreb, 2006,
- [36] Bezinović, P.; Marinović Bobinac, A. and Marinović Jerolimov, D.: *Short scale of religiosity: validation on a sample of adolescents*. In Croatian.
Društvena istraživanja **14**(1-2), 135-153, 2005,
- [37] Hitlin, S.: *Parental Influences on Children's Values and Aspirations: Bridging Two Theories of Social Class and Socialization*.
Sociological Perspectives **49**(1), 25-46, 2006,
<http://dx.doi.org/10.1525/sop.2006.49.1.25>,
- [38] Dillon, M.: *Handbook of the Sociology*.
Cambridge University Press, Cambridge, 2003,
- [39] Zrinščak, S.: *What is religion and why religion: a sociological approach*. In Croatian.
Bogoslovska smotra **78**(1), 25-37, 2008,
[http://dx.doi.org/10.1016/S0212-8241\(08\)70869-7](http://dx.doi.org/10.1016/S0212-8241(08)70869-7),
- [40] Beyer, P.: *Social Forms of Religion and Religions in Contemporary Global Society*.
In: Dillon, M.: *Handbook of the Sociology of Religion*.
Cambridge University Press, Cambridge, pp.45-60, 2003,
- [41] Thomas, D.L.: *The Religion and Family Connection: Social Science Perspectives*.
Religious Studies Center, Brigham Young University, Provo, Utah, 1988,
- [42] Russel, A. and Saebel, J.: *Mother–Son, Mother–Daughter, Father–Son, and Father–Daughter: Are They Distinct Relationships?*
Developmental Review **97**, 111-147, 1997,
<http://dx.doi.org/10.1023/A:1004918402670>,
- [43] Acock, A.C. and Bengston, V.L.: *Socialization and Attribution Processes: Actual versus Perceived Similarity among Parents and Youth*.
Journal of Marriage and Family **42**(3), 501-515, 1980,
<http://dx.doi.org/10.2307/351895>,
- [44] Ziebertz, H.G.: *Preface*.
In: *Religion and Human Rights*. Springer, Heidelberg, pp.v-viii, 2015.

“THE GOOD, THE BAD, AND THE UGLY” OF PROFESSIONS: OVERVIEW OF THE THEORETICAL DEVELOPMENTS IN THE SOCIOLOGY OF PROFESSIONS

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ABSTRACT

This article offers a brief overview of the history of research in the field of the sociology of professions. It presents the development of sociological theoretical approaches in the study of professions, its main research areas, basic concepts over time, and changes in the definition of profession itself over time. Beginning with a short outline of the classical theories in which sociological studying of professions finds its origins, the article proceeds with a more detailed presentation of the three main approaches and development stages of sociology of professions – the functionalist, the interactionalist and the social conflict. Apart from presenting the main research focuses of these approaches, this article also explores different concepts and views of profession, beginning with the “profession” in functionalism, moving on to the “professionalization” in interactionism and ending with the “professionalism” in the social conflict phase. Following this transformation, the article also describes the shift from profession’s initially socially constructive to rather obstructive image over the years and across the approaches. Finally, it reflects on the thesis of the “death” of the discipline and research field of the sociology of professions and reviews contemporary approaches to the subject that are either turning mainly into micro studies of specific professions or falling out of the field of sociology and becoming the research focus of disciplines seeking to maintain or establish the status of being a profession themselves.

KEY WORDS

profession, sociology of professions, functionalism, interactionalism, social conflict, micro studies

CLASSIFICATION

JEL: J44

INTRODUCTION

Although there is no generally accepted definition of the term profession and there is a controversy in the scientific community about what distinguishes it from the term “occupation”, what can be said with certainty is that the roots of the research of professions, as well as of professionalization and professionalism, can be found in sociology [1; p.9]. In fact, it is precisely on the basis of establishing that specific distinction between occupation and profession, that sociology of professions developed as a separate discipline within the wider field of sociology of work [2; p.47]. The rise of the sociology of professions can be traced to the 1950s and 1960s [3, 4] when efforts were made to identify all of the traits that characterize a profession, but also to finally clarify its differences from occupation, with researchers mostly focusing on researching specific professions and the characteristics of their representatives. By doing so, some of the researchers have completely bypassed providing a definition of the profession and instead focused on listing relevant occupational groups that can be called professions. Some have however used this disagreement over the definition of profession to challenge the very need of existence of the specific study field as such, thus equating the concept of profession with that of occupation [3; p.135]. Along with this contrasting and even contradictory use of the term profession in the sociological literature [5; p.399], some authors, such as Broadbent et al. in 1997, Krause in 1996, Kritzer in 1999, and Nolin in 2008, go as far as claiming that the sociology of professions as a field has been perishing since the 2000s, marking the period after as the end of professions and the death of professionalism [6]. Despite that, even a basic inquiry of the Scopus and Web of Science databases indicates that the number of sociological papers, as well as those in other related disciplines, covering the topics of professions and professionalism have been increasing in the last 15 years [7, 8].

For that very reason the review of the development and history of research in the sociology of professions, and thus the overview of the basic shifts in the definition of profession and its distinction from occupation, will be the main focus of this article. Beginning with a short outline of the classical theories of Durkheim and Weber which represent the theoretical basis, this article proceeds with a more detailed presentation of the three main theoretical streams, i.e. approaches and development stages of the sociology of professions, and the different definitions of profession and research focuses present in periods of their respective prevalence. The article also reflects on the thesis of the “death” of the discipline and research field of the sociology of professions and concludes with an overview of its more contemporary approaches.

CLASSICAL THEORIES – THE INCEPTION OF PROFESSIONS RESEARCH IN SOCIOLOGY

The theoretical origin of the sociological study of professions is found in Durkheim’s theory of the division of labour in society, originally published in 1893, which explains the processes of the growing complexity of social structure. The theory is based on the differentiation of traditional and modern societies, where the former are defined by low levels of division of labour and by mechanical solidarity, while the latter are characterised by a high division of labour and organic solidarity. This high division of labour and the increasingly important role of knowledge lead to the creation of a new social group as its holder – professionals [9; p.9]. According to Durkheim, this social group was supposed to represent a paragon of moral order and the solution to anomie through the existence of professional associations as voluntary organisations that manage the practical activities of professions thorough a clearly established code of conduct and an acquired sense of duty and responsibility towards the community [10; p.693]. Through control and education, such associations promote conduct in accordance to professional standards and ethics, but also have the power of prohibiting the practice for

individuals who do not comply to these regulations. Professionals are therefore obliged to act in the best interest of their clients or the society in general, not in their own, and it is precisely this altruism, thoughtfulness, and overall contribution to society that, according to Durkheim, justify professionals' high income and status [10].

Income and social status are also some of the characteristics of professional groups mentioned by Weber who views occupations as a status group holding different extent of wealth, prestige, and power in society. In that way the members of some professional group are rewarded with a similar level of honour and have the same social status, i.e. they have a similar lifestyle, they identify with, and feel they belong to their status group, while often being quite restrictive regarding the ways outsiders and non-members of the group can interact with them [10; p.37]. Weber viewed professions from structural, processual, and power perspective, and as an important factor in development of Western rationalization, capitalism, and bureaucracy, but also of a variety of institutions. In fact, he viewed the relationship between professions and institutions as two-sided, where "professionals contributed to the rationalization of these institutions and, conversely, the rationalizing institutions contributed to the development of the professions" [11; p.628]. On the example of law and priesthood, he demonstrated how the rational legal and church systems developed out of trained specialists' cooperation, while the consequential ever-increasing need for specialized knowledge and vocational qualifications created professional lawyers and priests [11]. Like Durkheim, he emphasized the importance of professional training system that distinguishes e.g. priests and lawyers who possess it from sorcerers and "legal craftsmen" and their irrational and empirical training [11; p.631]. In that way, he also defines characteristics the occupation must have to become a profession. However, unlike Durkheim, Weber claimed that in reality, as with all the ideal types, there is no clear difference between profession and occupation. Apart from that, he stated the power as the main factor for occupation's position on that professional continuum. It's exactly this that denotes the main difference between Weber's and Durkheim's, and later the Weberian and functionalist, understanding of professions and professionals' role in the society.

The functionalist approach is thus based on the assumption that entering a profession implies acquiring systematic and general knowledge applicable to a wide spectre of problems, but also caring for and acting in the interest of society. The presence and sustainability of these professional traits are ensured by the existence of a code of ethics, created and re-evaluated by professional associations, which keep the behaviour of professionals under strict control since its violation can be sanctioned by the expulsion from the association and/or the ban of practice. According to the functionalist approach this is the main reason professionals enjoy social rewards in the form of prestige and high income which reflects professionals' contribution to society's well-being [10; p.60].

Contrary to this understanding of professions and professionals as socially beneficial, the Weberian approach rests on the premise that professional groups act primarily in their own interest, not society's. According to this approach professionals manage to gain control over a particular segment of the labour market and later manipulate it to secure their own profits. The profession thus, in some way, represents a strategic control of a particular occupation over some specific form of economic activity or practice, all to advance the interests of its representatives. This control is secured by the profession's entry restriction achieved through education and gained qualification supervision but also through the maintenance of a steady number of professionals in order to ensure a high demand for their services and consequently the retention of their social rewards. While functionalists believe the role of professional associations to be a mechanism of professionals' control of behaviour and insurance of their societal contribution, the Weberian approach sees their goal in the advancing of the

professional group’s interests while falsely presenting the professional conduct as impeccable and committed to public service. Even the sanctioning of members who violate professional regulations is, by the Weberian approach, perceived as a way in which professionals prevent public questioning of their actions and maintain a positive image in society, again all with the purpose of justifying high income and reputation. Apart from that, this approach highlights that the development of a profession itself implies establishing the monopoly of its members on the supply of certain services which consequently deters competing occupational groups threatening that monopoly. Therefore, the basic difference between professional groups enjoying greater social rewards and other occupational groups that do not, lays in the fact that the former were more successful in controlling their own market setting [10; p.61].

Although, as mentioned earlier, Durkheim’s and Weber’s classical theories represent the origins of sociological study of professions, professions themselves were not in their focus, but were placed in the broader context of comprehensive sociological theories. The beginnings of sociology of professions as a separate discipline can be found in the first half of the 20th century [6] and its main research streams and theoretical approaches will be the central focus of the next chapter.

MAIN RESEARCH STREAMS IN THE FIELD OF THE SOCIOLOGY OF PROFESSIONS

Although the early development of sociology of professions can be traced back to the 1930s, when the first research on professions as specific forms of occupation began, more elaborate attempts in defining professions’ development, at least in the West, began between the 1950s and 1960s with the emergence of the so-called taxonomic approach which implies that professions possess a range of characteristics which distinguish them from other occupations [3-4, 12].

A simple search of the term “profession” in the Scopus citation database also sets the beginning of research on professions in the 1950s, when the number of articles on the subject reached 267, and in 1951 even 585, which is a significant increase compared to 1949 when their number was 58, or previous years when it averaged 30 per year [7]. The same search in the Web of Science database shows that the number of papers with this topic in 1950 and 1951 was 221 and 563, while only one year earlier, in 1949, number of such papers was 67 [8]. This is in line with Tracey L. Adams’ research [13] of Sociological Abstract and SocIndex databases using the terms “professions”, “sociology of professions” and “professions and professionalization” that also showed a steady growth of such publications since the 1950s.

Although listed by different names and with different prevalence periods, most authors divide the field of sociology of professions into three phases or three basic theoretical approaches – the functionalist, interactionist and the conflict one [1, 2, 6, 11, 14]. Each of these phases can be linked to a then prominent key research concept from which a paradigm shift in the sociology of professions over the years can be clearly seen. While the first phase was associated with the concept of “profession” and its representatives mostly focused on its definition, the second one was defined by the concept of “professionalism” and its authors concentrated on the development of professions. Finally, the third phase tasked itself with conceptualizing “professionalism” and problematizing issues of different power levels among occupations. Because of that, the mentioned phases are sometimes referred to as the “trait approach”, the “process approach”, and the “power approach” [2], as will be described in more detail in further text.

Apart from that, as it will also be seen further on, the very perception of profession and its role in society across these approaches shifted significantly, beginning with the confidently constructive and community serving one in functionalist phase, and ending with the (at least for other occupations) obstructive one in the social conflict phase. In that way, the functionalist, and

to an extent the interactionist, approach perceive professions as occupations with significant contribution to society and certain characteristics that rightfully set them apart from other occupations and provide them with different social rewards. The conflict or power approach, on the other hand, rests on the idea that there is no great difference between occupations and professions, apart from the power the latter managed to gain at the expense of former. Hence, it can be said that through the years and across different phases in the development of the sociology of professions the image of professions was slowly shifting from “good” to “bad”.

THE GOOD: FUNCTIONALISM AND “PROFESSION” (1930-1970)

The, previously briefly described, functionalist approach in the sociological research of professions, dominant in the period from the 1930s to the 1970s, is also called the trait or taxonomic approach, as it seeks to determine the attributes and characteristics that distinguish professions from other occupations, thus classifying occupations according to the attributes they do or do not possess [2]. This approach, as some authors [3, 4, 6, 13] also call Anglo-American approach, is based on Durkheim’s perception of the profession, and its origin, as the one of the discipline of sociology of professions itself, can be found in the work of Alexander Carr-Saunders and Paul Wilson from 1933, who sought to identify the similarities of 30 occupations with a similar organization and scientifically based knowledge [1, 11, 14].

The very concept of **profession**, according to this approach, represents a special and generic category of occupation, which is exactly why the period from 1930 to 1970 was marked by authors who sought to provide a definition of the profession and determine what distinguishes it from occupation and makes it unique [4].

The most influential representative of the functionalist period was Talcott Parsons who in 1954 argued that professions possess certain criteria, such as emotional neutrality and equal treatment of all clients (universalism), working for the common good, not one’s own interests (impartiality), loyalty to a professional group, specialization for certain issues and the acquisition of social status based on the ability of professionals rather than inheritance, which separates them from the practitioners of other occupations. Parsons in some way set the “ideal type” of the profession [12], and numerous other researchers, e.g. Greenwood in 1957, Wilensky in 1964, and Etzioni in 1969 [3-4], following him, tried to identify “real” professions and compile lists of their attributes. These lists mainly included higher education and expertise, but also other less obvious characteristics, such as a positive impact on the community, the existence of a code of ethics, altruism, rationality, and credentials [12].

In that way, Greenwood in his work [15], referring to the enduring efforts of social workers in transforming their occupation into a profession, compiled an influential list of profession’s criteria which includes systematic knowledge, professional authority and credibility, member regulation and control, ethical code, and professional culture. Greenwood argued that although some occupations require more complicated and more difficult skills to master than professions, the most important distinction between professional and nonprofessional skills lies in the fact that former ones arise from and are supported by theoretical knowledge usually gained in the academic system [15; p.46]. It is precisely this extensive theoretical knowledge, as opposed to the general ignorance of the average person, that becomes the basis of professional authority which is, according to Greenwood, apparent through some curious features, one being the fact that occupations have customers and profession clients. The customer has the freedom to choose which service or product he wants to purchase because it is assumed that he has the capacity to accommodate his needs. The client on the other hand does not have that choice and must agree to what professional estimates is in his best interest [15; pp.47-48]. Following the professional authority, the formal and informal control the profession

establishes, and society then supports, is the next professional trait on Greenwood's list. This control encompasses the regulation of the education system, i.e. the number and place of institutions, curriculum, and lecturers' selection, and the regulation of the very entry into the profession, i.e. completion of the required education and obtaining a license. It is important to emphasize that the societal support of this control is reflected in the fact that violations of the said regulation are sanctioned, not only by the ethical professional committees, but also by government bodies. This points out to an essential aspect of profession's power, its monopoly, supported by the community in which it operates [15; p.49]. Like profession's control, professional code of ethics, as the following criteria, can also be both formal and informal. The first refers to the written code itself to which many professionals give an oath to, while the second implies unwritten rules. Both are there to ensure professionals' commitment to the common good and consequentially maintain community's trust and their monopoly. All codes of ethic describe the relations between professionals and their client, but also among professionals themselves. Here Greenwood highlights the importance of professionals obeying what Parsons called the elements of universalism and disinterestedness while working with clients, in a sense that they must provide their service to whomever requests it in a best possible way. The elements that should be an essential part of the relationship between colleagues are cooperation, equality, and support through knowledge and theoretical and practical advances, sharing, referral and consultations [15; p.49]. Finally, Greenwood's last element of profession refers to the membership and interactions in numerous formal and informal professional groups. These groups, such as professional associations and educational or research centres, generate and maintain professional culture which comprises values, norms, and symbols. The values of a professional group in that sense mark the basic beliefs shared by its members, norms include behavioural instructions for specific situations, while symbols encompass different markings, emblems, characteristic clothing and uniforms, history, specific jargon, stereotypes, etc. [15; pp.51-52].

Greenwood, among other representatives of the taxonomic approach, claimed that the differences between occupations are more quantitative than qualitative, meaning that there is no clear line between occupation and profession and rather that some occupations are simply closer to or further from the ideal type of profession. This and latter similar lists of professional characteristics have in some way set the normative standard for occupations and their representatives who seek to acquire the status of profession [9, 1]. Similarly, in 1958 Hughes argued that the basic difference between occupation and profession is not in their categorization or kind, but in their gradation [3-4]. This kind of functionalistic reasoning of trait approach eventually led to the definition of not only professions, but also semi-professions [9, 1] that, unlike other occupations with a low degree of professional traits development, possess some professional attributes, but not all as do "pure" or real professions.

Since, for that reason, many occupations have sought to gain a professional status, the research focus in sociology of professions slowly started to shift from that of profession and its traits to that of professionalization [1]. This occurred in parallel with the emergence of numerous critics directed functionalism as a sociological theory in general and thus the functionalist approach in sociology of professions and its search of differences between occupations and professions which are, by the 1960s, starting to be considered useless and futile [2].

STILL QUITE GOOD: INTERACTIONISM AND "PROFESSIONALIZATION" (1960-1980)

As one of the first and best-known critiques of the functionalist approach to professions interactionism can be singled out. As already mentioned, this approach builds on the concept of profession and professional attributes and turns to **professionalization** as a dynamic process through

which occupations obtain the status of profession [1, 2, 4]. This is exactly the reason why this approach is sometimes referred to as the process one. Such a process encompasses efforts in achieving the closure of occupation and its maintenance, all in order to attain the interests of its members in terms of higher salary and social status and power, but also to protect the monopoly over that occupation's jurisdiction [4]. With this kind of research focus, interactionism also moves away from the observation of differences between occupations and professions and turns to their similarities instead. In that way interactionism representatives perceive functionalist traits and characteristics of professions as deceptions that legitimize professional domination and specialty without empirical verification [12]. The concept of profession is thus, in the period from the 1960s to the 1980s, viewed as an ideological construct [4].

Despite their strong criticisms directed at the functionalist or taxonomic approach, authors who focused on professionalization also borrowed some of its key postulates. Accordingly, one of the most prominent representatives of this phase, and sociology of professions in general, Eliot Freidson defines a profession as "an occupation which has assumed a dominant position in a division of labour, so that it gains control over the determination of the substance of its own work" [16; p.xv]. In his work he focuses on medicine because, according to him, it only, even considering law and priesthood that are also considered to be traditional professions, can be viewed as a prototype of profession to which all the occupations seeking a privileged status look up to. Freidson thus believed that a better understanding of medicine will enable him to better understand all the problems of professionalization of other occupations as well, especially those in the health and social care systems, such as nursing and social work [16; p.xvi].

By studying medicine and its development, Freidson determines the criteria, i.e. steps, that occupations must go through in order to become a high-status profession, with the first and most important one being autonomy and self-management combined with the possession of a certain authority from which the control of education, clients and other occupations, that is competition elimination, arises. Similar to the approach of taxonomic representatives, Freidson emphasizes that the profession enjoys a special status in the community and has its trust, but also that it demands the ethical conduct and the possession of certain knowledge and specific skills. Like Greenwood, he states that professions enjoy the status of the most reliable authority in a certain labour market sphere which is reflected in the inherent "professional" treatment of the client and their problems. In that way the profession creates a new social reality and with its own autonomous position in society gains the power to change the lay world [16; p.xv]. It is precisely because of the above mentioned that Freidson assumes that the sociologists' job is primarily to determine the way in which the profession acquires, organizes and maintains this type of autonomy and self-regulation, and secondly to gain insight into the relationship of professional knowledge with its organization and the community in which it operates [16; pp.xv-xvi]. Aware of the impossibility of fully generalizing the conclusions derived from the observation of one profession (in his case the medicine), Freidson emphasizes the necessity of studying professions on an abstract level which will prevent the mixing of general characteristics of all professions with those of a particular one. He also advocates the use of analytical concepts that enable the comparison of professions and highlights that sociological study of professions should not focus on variable professional elements, such as specific knowledge, beliefs, and skills, but on the means of professional organizations. The generality of professional organization arises from its authoritarian position in society and its autonomy that enables the profession to transform and create the content and conditions of its work even when it is partially under the state's control, as is the case with the medicine [16; p.xvii]. Although Freidson's work manifests an apparent shift from the work of authors of the taxonomic phase and shows indications of the

upcoming conflict phase, which will be presented later, it still emphasizes certain criteria occupations should meet to become professions.

In a similar manner other authors of the interactionist approach use successive models according to which occupations become professions by going through certain steps, such as organization of full-time work, acquisition of knowledge and skills in the specialised institutions, foundation of professional associations, adoption of professional standards, and licence obtainment [2]. However, in addition to enumerating the steps in the process of professionalization some authors of this approach, such as Abbott in 1988, claim that occupations evolve according to a certain structural and cultural pattern of professional control. The structural part, in that sense, consists of numerous associating, control and working organizations, which, according to some authors, develop exactly in that order. In a cultural aspect, professions gain control by attaching their expertise to universally accepted values, to be exact, those of rationality, efficiency, and science. Abbott also enumerates the stages of profession's development which include the existence of (national) professional association, licence, professional exam, university-based education clearly separated from the education for other occupations, ethical code, and national level journal [1].

Since professions have not had an equal development in different countries, Abbott's idea of the natural evolution of professions has proven itself to be based on the assumption that occupations evolve only in one direction, the one towards the ideal type of professions. In this way the process of professionalization is viewed as independent of external factors, such as the socio-historical context and the relationship between competing occupations [1].

Precisely this disregard of the influence of context-specific factors presents the principal critique of the interactionist approach. It rests on the fact this universalistic view of professionalism in interactionism did not take into consideration the specificities of different professions and the context of their economic activity which is, according to critics of this approach, largely marked by the struggle to gain power amongst other occupations.

THE BAD: SOCIAL CONFLICT AND “PROFESSIONALISM” (1980-1990)

Because of that power struggle this period of criticism, both of the researchers' focused on profession's characteristic and those studying the process of professionalization, is called the conflict or power approach or sometimes even neo-Weberian or neo-Marxist one. It is marked by the view of professions as actors in the economic space who gain or lose the exclusivity on providing some sort of service, but also the jurisdiction over certain segment of the service market through monopolization and its closure [2]. Unlike the taxonomic approach, this one offers an empirical basis for the assessment of the real role of knowledge, expertise, and other traits of profession, while unlike interactionism, in its analysis of professions it includes the macrostructural and historical processes that support or prevent the process of professionalization [12].

Authors representing this phase, such as Parry and Parry in 1976, Larson in 1977, and Collins in 1990, build on Weber's concept of status groups, recognizing their important role in the division of labour and market structuring. Starting from this, their theories highlight the fact that occupational structures are constantly changing and that there is a constant struggle between different occupations over various resources and privileges [1]. In other words, according to the conflict approach, professions are exclusive groups effective in closing off some part of the labour market, while the professionalization in that way represents a successful legal regulation and an establishment of boundaries that preserve the position of the profession in the market, but also the position of its members in society, i.e. their income, status and power. In that way, for example, in 1972 Johnson describes the profession as the control producers (of

services) establish over their customers. Parry and Parry in 1976 define it as a self-governing group's market control over certain services, while Freidson in 1994 sees it as their legitimate and organized autonomy over specific techniques and organization of work [12].

In their book Parry and Parry link professionalism with class theory within the wider context of collective social mobility again, like Freidson in the interactionist phase, on the example of the medical profession [17]. According to the authors, medicine represents the middle-class occupation that was, considering the domination of the Marxist perspective and the prevalent polarization thesis, neglected at the time since sociological research was mainly focused on the working and higher class. Parry and Parry emphasize that, unlike the individual, the group aspect of social stratification has often been neglected in sociology [17; p.3]. They go on to say that the middle-class mobility is a group rather than individual phenomenon and that turning to the group aspect of middle-class mobility enables a better understanding of its newly acquired bourgeois status. Through the review of previous work on professional mobility (e.g. Glass in 1954 and Sorokin in 1927), authors come to the conclusion that it is its individual aspect that was predominantly studied in the context of an individual acquiring a certain status upon entering the profession regardless of the one he gained by birth [17]. Parry and Parry do not deny this ability of breaking into the higher status group, they merely extend it to the professional groups themselves. In that way they define professionalism as a strategy of controlling the occupation within which colleagues, equal to each other, establish a system of self-management, and they see it as a mean of simultaneously raising the reputation of both the individual and the profession itself. Similarly to the previous two approaches, the strategy of controlling the profession here also refers to the control over the entrance to the profession through the control of education, training and acquired qualifications, but also through the formal and informal management of its members' behaviour [17; p.83]. Finally, authors thus introduce the concept of professionalism which they define as the mobility, that is, the establishment of exclusivity and closure of an occupation, i.e. a profession.

From Parry and Parry's interpretation it is evident that, contrary to the taxonomic approach, theories of the social conflict perspective in sociology of professions omit the role of knowledge and expertise, although both can be used in the legitimisation of the status of prestige of a particular profession. Unlike interactionist theories, on the other hand, conflict ones concentrate much more on the protected position of professions in the market [12]. Since the focus of power approach analysis has moved away from the concept of profession, as a specific and generic category of occupation, but also from the professionalization, as a process that seeks to establish and maintain the closure of a certain occupation, it can be said that it has shifted to the concept of **professionalism**, representing the instrument applicable on a wide range of occupations that implies occupation's change and the establishment of social control at the macro, meso and micro levels, and is [4].

Despite the fact that the conflict perspective proved itself to be very useful in the context of understanding the relation of profession and power, it however, unlike the previous phases, did not produce new norms of profession, professionalization or professionalism, that is, it did not further develop the so-called ideal type of the profession nor the criteria occupations should possess in order to be defined as such. In a way this produced a gap in the theoretical basis, considering that the occupations that are called professions are still present, but the discipline of sociology of professions does not define them as different from other occupations [1]. That non-discrimination between professions and "basic" occupations is the exact reason for the emergence of a contemporary discussion on the need of existence of the sociology of professions as a separate discipline and its annexation to the related sociology of occupations or the sociology of work.

It is exactly this discussion and the related surge of micro studies of specific professions, both inside and outside the sociology, that mark the "ugly" part of the study of professions, since it is precisely these two issues which represent insurmountable difficulties in the development of the sociology of professions to this day.

THE UGLY: THE DEATH OF THE RESEARCH AREA OR THE RE-EVALUATION PERIOD

The discussion on the need of existence of the sociology of professions actually begins with the very emergence of a conflicting perspective, which interrupts the so-called "golden age" of both professions and professionalization and the sociological study of these concepts [18]. This "golden age" spanned over the periods of the strongest influence of functionalist and interactional approach and the largest production of works in the field of sociology of the profession in the middle of the 20th century. Its end can be marked in the 1970s and 1980s when the professions themselves entered a period of dramatic changes, with the most significant one concerning the transfer of professional activity from private practices and smaller partners to large organizations, and consequently the imposing of external control over professional work [18; p.280]. Other changes are related to the growing transnational character of professional work and its demographic transformation resulting from the inclusion of previously excluded groups such as youth, women, and racial minorities [18; p.280]. Finally, previously banned advertising, client solicitation, and competitive bidding among representatives of the same professions were permitted [18; p.280] and professionals became part of the open market where new occupations that offer services based on expert knowledge, but without the autonomy and social reputation characteristic for professions, were also emerging.

Although the sociologists' interest for these changed characteristics of the profession grew, as was already mentioned in the description of the conflict perspective, they were not able to go beyond the research framework of the "golden age". Thus, their main response to these changes was setting the thesis of "deprofessionalization"¹ and questioning whether "true" and traditional professions, as they lose control of their knowledge and activities, are professions at all [18; p.280]. Following this, many sociologists have, by the 1990s, "concluded that existing theoretical frameworks had become implausible" and that the research of professions in some way "fell out of fashion", which in some way extinguished sociology of professions as a separate discipline [18; p.281]. Due to this conceptual and theoretical death of professions, it has frequently been said that sociologists move away from researching professional power and prestige and focus more on the institutional aspect of experts' work in the form of studying the organizations they work in, trends in their deprofessionalization, and their changing careers. In doing so, the broad theoretical frameworks characteristic of earlier phases, were being abandoned [18; p.290].

Other authors, such as Evetts [3] or Sciulli [14], however saw the 1990s as a kind of turning point. This period after 1990, characterized by a re-examination of professionalism and its positive and negative consequences for clients and professionals, but also for social systems in general, was called a period of re-evaluation [3]. As this period implies a growing transformation of the phenomenon of profession, it is not uncommon for it to be marked as a new professionalism, post-professionalism, post-modern professionalism, etc. [2], as it is also not uncommon for it to be understood as a period that, in some way, returns to the normative understanding of professionalism like the functionalist approach [3].

The thesis of the survival of the sociology of professions as a discipline can be somewhat supported by a basic search of the Scopus database, according to which the number of papers whose title or abstract mention "profession" or that word is one of the keywords has, in the

new millennium, jumped significantly compared to the 1990s. The average number of such papers in 1990s ranged between 1,500 and 2,000 per year, while, for example, between 2000 and 2010 it varied from 2,500 to even 5,000 papers per year, and between 2010 and 2020 from 5,000 to 8,000 papers [7]. The same topic search in the Web of Science database also shows an increase in the number of papers in this field, where the average number of papers in the 1990s was 1,200 to 1,800, from 2000s to 2010s it ranged between 2,000 and 4,500 and from 2010 onwards between 5,000 and almost 9,000 [8]. The review of the Sociological Abstract and SocIndex databases also indicates similar growth [13]. Of course, this kind of growth cannot be attributed only to the growth of scientific contributions to the sociology of professions and other disciplines' research on professions, but part of it must be ascribed to the development of science in general, globalization, and an increasing number of scientific journals and their digitization.

However, this increase in numbers and the growing literature it represents indicates that the research of professions is not a "dead end", as some authors have suggested, and that, despite the many problems this area has encountered, authors persist in its empirical and theoretical development. Apart from that, the interest in questions that sociologists of previous phases sought the answer to, such as the development of a profession, its organization, its relationship with the state, and its role and power in society, has also been renewed [13].

The main issues that the articles of the last 20 years have addressed include gender, ethnic and social inequalities in accessing the professional praxis and the rewards it implies; the process of professionalization and the formation of professional groups; challenges faced by the dominant professions, such as the deprofessionalization and the loss of autonomy; professional regulation, the impact of political changes on professions and the relationship of professions with the state; and the characteristics of professionals, their work experience, and their job satisfaction. Less represented topics covered in recent papers are professional work in organizations or the application of organizational theory to its research; relations between different professions, their jurisdiction and mutual conflicts; the professionalism, professional ethics and the public trust professionals enjoy; and finally the professional knowledge and expertise [13; pp.155-156].

It is important to note that these studies build on the numerous theories and prominent authors of previous stages of development of sociology of professions. In that way many authors see the Weberian approach as the one that most enables an objective research of the important relations between professions and the state [13], and social processes through which professions acquire and maintain status and privileges, but also variations of such processes and their outcomes in different socio-historical contexts [13]. Weber's approach, or to be more precise, his typology of organizational structure, were the starting point for theories that pointed to the particularities of professions within organizations and the need for inclusion of the organizational analysis in the sociology of professions [13]. Although to a lesser extent, contemporary research, in addition to Weberian, follow the traces of functionalist and interactionist approaches as well. Sciulli's work from 2009 in such a way refers to Talcott Parsons, while for example those of Collins, Dewing and Russell from 2009, Currie, Finn and Martin from 2009 and Schinkel and Noordegraaf from 2011 show great interest in Abbott's work [13].

EVER UGLIER OR THE WAY FORWARD: MICRO STUDIES OF THE SPECIFIC PROFESSIONS

By the aforementioned simple search of the term "profession" in the Scopus and Web of Science citation databases, in addition to the general growth of research on professions, it is possible to get an insight of the spheres in which this development takes place, i.e. identify which disciplines, apart from sociology, study professions and in what manner. Interestingly,

even a superficial overview of scientific fields and the related articles' keywords shows that the research of professions is mainly focused on the study of individual professions, and often crosses the boundaries of sociology and social sciences in general. By far the majority of that kind of research can be found in the field of medicine and nursing, followed by the education and librarianship, social work and law, and engineering, in that order. In a lesser extent studies on professions are present in the fields of economics and management, psychology, biochemistry, pharmacy, veterinary medicine, dentistry, and communication. Even when limiting the search results to the social sciences or sociology, the largest number of research remains related to the aforementioned occupations and/or professions [7-8].

Linking the mentioned number of articles in certain disciplines and the previously presented research streams in the sociology of professions shows that both sociology and other disciplines are, even in the period of the last ten years, to a large extent still preoccupied with exploring specific profession (or occupations seeking to become one) and their traits, as it was the case in the 1950s and 1960s. Likewise, the most frequently analysed professions remain the same as they were in the very beginnings of the development of the sociology of professions, differing according to their degree of professionalization, but also their social status, reputation, and income. Thus, the most commonly researched professions still remain the traditional or classic ones (e.g. doctors and lawyers) that enjoy a high reputation because of their distinguishability, then newer professions as the product of industrialization and organizational needs (e.g. engineers) that enjoy a high reputation because of the social need for their expertise, and finally semi-professions (e.g. nurses, social workers, teachers, librarians) that continue to struggle for the social recognition and the market sphere for their activity and consequently for higher status, reputation, and income than they currently possess [9].

Earlier theoretical and empirical contributions to the sociology of professions were focused either on researching the archetypal professions of medicine and law or on assessing how close are other specific occupations, such as teachers, social workers or nurses, in meeting the criteria of these professional ideal types [5-6]. This was done either in an earlier context of studying different social functions of professions, their specific education, and various responsibilities, or in a later context of concentrating on their gaining of monopoly and social power. After a, what seemed to be, short period of turmoil in the discipline, modern contributions are also turning back to dealing with the same occupational groups, such as those in the health care (doctors and nurses), but also law and social work, education, engineering, architecture, journalism and accounting [13]. Apart from that, the mentioned groups are more frequently becoming the carriers of the research on the professionalization of their occupations, often completely bypassing sociological theoretical origins and its conceptual problems and gaps.

The latter indicates that the research of professions, professionalization, and professionalism, although arising from sociology, did not remain in it, but became characteristic of disciplines that seek to maintain or establish the status of professions. On the other hand, the research remaining within the sociology of professions have in fact become micro studies of individual professions.

CONCLUSION

As mentioned in the introduction, the main goal of this article was to sketch out and summarise the history of research in the sociology of professions, while providing readers with an overview of the basic shifts in the definitions of profession and explanations of its distinction from occupation. By focusing on the three major sociological approaches in studying professions (functionalist, interactionist and social conflict) and by providing the approximate periods of their prevalence, the goal of the article was not to oversimplify the presentation of the sociology of professions as a research field. The intention was simply to systematically reflect on the

dominant theoretical basis in specific periods. That being said, the presented main research streams in sociology of professions, although the most prominent and referenced ones, especially in the mentioned time periods, are certainly not the only approaches to the subject nor are they so perfectly and ideal-typically linear and exclusive as it might seem to be. This also means that in the period of one theoretical stream's dominance, there were, however, authors who studied professions, professionalization, or professionalism from another perspective. Likewise, authors' work does not have to necessarily belong to only one of the mentioned approaches, but can instead, as it often does, encompass elements of multiple research streams.

Apart from providing an insight into the previous and current scientific development in sociology of professions, the article also reflected on the thesis of the "death" of this very specific discipline with an indisputably great interdisciplinary potential, but also with a lot of long-lasting internal and external issues.

In the effort to provide a definition of the profession and explain its development path, this discipline in some way also offers instructions for occupations to transform themselves into a profession. Thus, it can be said that sociology of professions is a field of research which directly or indirectly affects the very subject of its study [1].

In addition, most of the research in this discipline, both the traditional ones that developed it in a first place and the contemporary ones, include case studies of a single specific profession in a distinctive social, political, and economic context. This certainly did not contribute to the resolution of the conceptual problems this discipline had from its start and, together with the growing number of occupations reaching for the status of professions and the difficulties of distinguishing profession as specific form of occupation in general, gradually led to a kind of stagnation of the discipline itself.

The lack of a unique definition of professions and their distinctiveness compared to occupation, the large representation of micro studies of specific professions and other limitations of available theoretical frameworks and previous research certainly make it difficult to theoretically and conceptually elaborate future work in the discipline of sociology of professions and beyond.

REMARK

¹Deprofessionalisation can be simply defined as the "loss of elements that constitute classical professions, such as a monopoly over expert knowledge, working autonomy and authority, social exclusiveness, privileged status, value system and ethical behaviour, etc." [6; p.11].

REFERENCES

- [1] Nolin, J.: *In search of a new theory of professions*. University of Borås, Borås, 2008,
- [2] Monteiro, A.R.: *Sociology of the Professions*. In: Monteiro, A.R., ed.: *The Teaching Profession: Present and Future*. Springer International Publishing, pp.47-60, 2015, <http://dx.doi.org/10.3138/jsp.47.1.03>,
- [3] Evetts, J.: *Short Note: The Sociology of Professional Groups: New Directions*. *Current Sociology* **54**(1), 133-143, 2006, <http://dx.doi.org/10.1177/0011392106057161>,
- [4] Evetts, J.: *The Concept of Professionalism: Professional Work, Professional Practice and Learning*. In: Billett, S.; Harteis, C. and Gruber, H., eds.: *International Handbook of Research in Professional and Practice-based Learning*. Springer, Berlin, pp.29-56, 2014,

- [5] Evetts, J.: *The Sociological Analysis of Professionalism: Occupational Change in the Modern World*.
International Sociology **18**(2), 395-415, 2003,
<http://dx.doi.org/10.1177/0268580903018002005>,
- [6] Švarc, J.: *The knowledge worker is dead: What about professions?*
Current Sociology **64**(3), 392-410, 2015,
<http://dx.doi.org/10.1177/0011392115591611>,
- [7] Scopus: *Document search*.
<https://cutt.ly/KIHFxxd>, accessed 28th February 2021,
- [8] Web of Science: *Web of Science Core Collection – Basic search*.
<https://cutt.ly/qlHD9pv>, accessed 28th February 2021,
- [9] Šporer, Ž.: *Sociologija profesija: ogleđ o društvenoj uvjetovanosti profesionalizacije*. In Croatian.
Sociološko društvo Hrvatske, Zagreb, 1990,
- [10] Halarambos, M. and Holborn, M.: *Sociology: topics and perspectives*. In Croatian.
Golden marketing, Zagreb, 2002,
- [11] Ritzer, G.: *Professionalization, Bureaucratization and Rationalization: The Views of Max Weber*.
Social Forces **53**(4), 627-634, 1975,
<http://dx.doi.org/10.1093/sf/53.4.627>,
- [12] Saks, M.: *Defining a Profession: The Role of Knowledge and Expertise*.
Professions and professionalism **2**(1), 1-10, 2012,
- [13] Adams, T.L.: *Sociology of professions: international divergences and research directions*.
Work, employment and society **29**(1), 154-165, 2015,
<http://dx.doi.org/10.1177/0950017014523467>,
- [14] Sciulli, D.: *Continental Sociology of Professions Today: Conceptual Contributions*.
Current Sociology **53**(6), 915-942, 2005,
<http://dx.doi.org/10.1177/0011392105057155>,
- [15] Greenwood, E.: *Attributes of a Profession*.
Social Work **2**(3), 45-55, 1957,
- [16] Freidson, E.: *Profession of Medicine: A Study of the Sociology of Applied Knowledge*.
University of Chicago Press, Chicago, 1970,
- [17] Parry, N. and Parry, J.: *The Rise of the Medical Profession: a Study of Collective Social Mobility*.
Croom Helm, London, 1976,
- [18] Gorman, E.H. and Sandefur, R.L.: "Golden Age", *Quiescence, and Revival: How the Sociology of Professions Became the Study of Knowledge-Based Work*.
Work and Occupations **38**(3), 275-302, 2011,
<http://dx.doi.org/10.1177/0730888411417565>.

EMPIRICAL ANALYSIS OF THE ELASTICITY OF EMPLOYMENT TO OUTPUT GAP IN THE REPUBLIC OF CROATIA

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ABSTRACT

This article deals with the impact of cyclical activity of GDP on employment in the Republic of Croatia in the period from 2000 to 2020. According to the prevailing economic paradigm, employment growth follows GDP growth in the long run, but cyclical changes in GDP are also an important factor in monitoring economic developments and require adjustments by economic policy makers in the short term. Okun's law, based on the natural unemployment rate, is often used as a guide for the purpose of determining corrective economic policy measures. In practice, the unemployment rate is not a particularly reliable labour market variable, so this study sought to empirically examine how cyclical GDP activity affects a much more reliable labour market variable - the number of employed. Empirical studies of the impact of the income gap on employment are very rare compared to those dealing with the impact of GDP growth on employment, so this study on the example of the Republic of Croatia aimed to show that employment elasticity with respect to income gap can serve as a measure of the impact of cyclical economic activity on the number of employees. Empirical analysis of the impact of the income gap on employment was conducted using the vector error correction model (VEC). The results of the analysis indicate a statistically significant impact of the cyclical component of GDP on cyclical employment in the Croatian economy and therefore the authors suggest that this approach should be used as a complementary to Okun's law.

KEY WORDS

employment, output gap, vector error correction model, Okun's law, employment intensity of GDP growth

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INTRODUCTION

The number of employees and labour productivity are among the most important factors in generating GDP in the economy. Many theoretical and empirical analyses deal with their relationships and correlations, as well as with estimates of the degree of labour intensity of economic growth [1]. The income gap represents the difference between current and potential GDP. Potential GDP is considered to be the aggregate level of economic activity at which the optimal use of all economic resources is established. The optimum use of productive resources is established at so-called full employment [2], which represents the level of employment corresponding to the current intensity of economic activities. Such a definition of full employment does not mean that there are no unemployed. On the contrary, the complete disappearance of the unemployed would upset the market balance and cause inflationary pressures. This occurs when current GDP is higher than potential, which is a sign that economic activity is so strong that demand outweighs supply and puts pressure on the general price level to increase [3].

That the correlation between cyclical changes in the labour market and cyclical changes in GDP is a very important factor at the macroeconomic level is also confirmed by Okun's law [4]. Since neither potential GDP nor full employment are directly measurable quantities, their relation is subject to various interpretations, but, despite controversies and exceptions, Okun's law is accepted as a useful guide for assessing the impact of cyclical economic activity [5, 6].

The relevance of this topic is given by the recent expert controversy over the methodology of measuring the income gap at the level of the European Union, in which a number of economic experts criticize the income gap assessment methodology on the one hand [7], while on the other hand the European Commission defends its views. From this controversy, a research question arises about the justification of observing the income gap as a macroeconomically relevant variable if the methods of its assessment are so questionable. The authors of this article believe that it is not so much important how precisely determined last year's income gap, but more important to determine whether and with what approximate intensity its variability affects, for example, labour market movements over a longer period. This can provide a new macroeconomic characteristic of an economy, which improves macroeconomic forecasts and provides comparative values when considering the accuracy of one-year income gap estimates. Therefore, this article contributes to the ongoing expert discussion, by empirically investigating the relevance of observing the income gap through its impact on the most reliably measurable labour market variable – employment. This, in addition to confirming the usefulness of income gap monitoring, eliminates the possibility of the impact of the lack of measuring the unemployment rate on the assessment of the impact of the income gap on the labour market and improves the orientation value obtained by applying Okun's law.

The aim of this article is to empirically investigate whether the cyclical activities of GDP in the Republic of Croatia have an impact on the number of employees. The existence and intensity of this impact indirectly indicates the quality of long-term domestic economic policy.

The article is structured in six parts. The introductory part is followed by the theoretical background of this research. The following is a review of the relevant literature, whose data will also serve as a source for comparison with the results obtained by our research. In the fourth part, we present the economic model that is empirically researched, the data used and their preparation, and the statistical research method used. The fifth part consists of the results of the analysis of the set model, and the article ends with the sixth part in which we make our conclusions and recommendations.

THEORETICAL BACKGROUND OF OUTPUT GAP

In theoretical terms, there are important differences between the neoclassical school of economics and the Keynesians in interpreting the way GDP is generated. According to neoclassical economic theory, a stable balance in the labour market is established at full employment and the aggregate supply is the initiator of economic activities. In doing so, a natural unemployment rate is established in the long run, which corresponds to equilibrium conditions in the labour market, and this level of equilibrium unemployment is price inelastic in the long run [8]. Keynes's theory disagrees with this explanation and argues that aggregate demand is the most important factor driving economic activity, and labour market equilibrium is a dynamic phenomenon, accompanied by cyclical GDP activity, in which GDP often shifts between the inflationary and recessive gap [9]. It is this cyclical activity of GDP, called the GDP gap or income gap, that reflects the constant oscillations of economic activity, which according to Keynesians are immanent to a market economy.

Bad experiences related to economic recessions throughout economic history have prompted members of the progressive group of economic experts in the United States to propose that the state should influence the cyclical behaviour of the economy without monetary measures through appropriate fiscal policy. Expansive fiscal policy should be used in the event of a recessive income gap and restrictive fiscal policy should be used in the event of inflationary income gap [10]. In doing so, Keynes goes the furthest and argues that in the absence of rational investment opportunities for the government, it is better to take irrational forms of spending money, just to stimulate market demand.

In addition to theoretical considerations of the employment-to-GDP ratio, there are also empirically derived guidelines for assessing their interrelationship. Okun [4] states that the point of full employment is at the level of unemployment of about 4 %, and for every 1 % increase in unemployment, the current GDP will decrease by 2 % compared to the potential. Okun emphasizes that the potential GDP is not the maximum product that the economy can reach in the observed period, but the highest GDP at which there are no inflationary pressures. Current GDP may therefore be lower than potential because aggregate supply may sometimes be insufficient to bring the economy to full employment. This concept of the income gap is often called Keynesian, although Okun did not look at the income gap identical to Keynes [11]. Okun believed that the income gap, except in emergencies, always takes on positive values in terms of the existence of a recessive income gap and that government intervention is almost always needed to achieve an optimal situation.

After Okun's law, the concept of the income gap was given an alternative in the form of a monetarist approach, initiated by Milton Friedman and shaped by Perloff and Wachter [12]. According to the monetarist concept, the income gap can take on both positive and negative values, and is positive in the case of an inflationary income gap. The monetarist concept of the income gap is prevalent today, and in most countries it is considered better to use monetary than fiscal measures to achieve short-term price stability and aggregate demand because it is more a technical than a political issue [11].

Today, the income gap is one of the important factors monitored by aggregate economic activity and is an argument for the action of the central political and monetary government. However, the determination of potential GDP is not reliable enough for many authors [13], so taking appropriate monetary policy measures and the quality of economic policy action in the event of an income gap depend significantly on the income gap calculation error [14]. Responsible economic policy would require timely and effective measures to prevent too long periods of under capacitated economy and excessive cyclical unemployment, and to curb inflationary pressures in the event of a longer duration of the positive income gap. In theory,

employment should increase in the long run at approximately the rate at which GDP grows, and the elasticity of employment in relation to GDP growth and the income gap should be lower the higher the level of economic development.

LITERATURE REVIEW

Most empirical studies of employment elasticity to date have focused on the relationship between employment and economic growth. For example, the ILO, OECD, WBG, and IMF [15] conducted a comprehensive analysis of the impact of economic growth on employment, on a sample of G20 countries, from 1991 to 2014. Employment elasticities relative to GDP growth were close to 0,2 in that period, with a smaller decline during the global financial crisis. Since the G20 mostly includes the world's most developed economies, it can be argued that the analysed level of employment elasticity is characteristic of a high degree of technological development which reduces the labour intensity of GDP growth. Compared to the group of the most developed countries in the world, the average global coefficient of employment elasticity in relation to GDP growth, measured on data from 139 countries, is slightly higher and according to Kapsos [1] ranges from 0,30 to 0,38. At the same time, the weakest economically developed countries have employment elasticities well over 0,40.

Crivelli, Furceri, and Toujas-Bernate [16] published the results of their global study on a sample of 167 countries and argued that there is large variability in employment elasticity coefficients relative to GDP between regions. The values of the elasticity coefficients ranged between 0 and 1, while most countries were in the range of coefficients from 0,3 to 0,8. African Development Bank [17] analysed 47 African countries and found that in the period from 2000 to 2014 in Africa the average elasticity of employment in relation to GDP was 0,41. Among the analysed countries, lower employment elasticity coefficients were found in better economically developed countries and higher employment elasticity coefficients are found in underdeveloped and slow-growing economies. For example, in 19 % of the least economically developed African countries, the coefficient of elasticity of employment in relation to GDP is above 1, while in the most developed African countries it is below 0,41. Asian Development Bank [18] investigated the elasticity of employment to GDP in 45 Asian countries and found that elasticities range from 0,2 to 0,8, with an average employment elasticity coefficient of about 0,6. During the observed period, most Asian countries had a decrease in employment elasticity coefficients, which is attributed to the increase in labour productivity. Hanusch [19] found a range of employment elasticity coefficients to GDP from 0,22 to 0,42 in a sample of 8 more developed East Asian countries. On a sample of 25 developing countries Prieto, Ghazi and An [20] find that in 88 % of the analysed developing countries there is a positive correlation between employment and real GDP.

Among the very few studies on the impact of the income gap on employment is Seyfried [21]. Seyfried [21] investigated the relationship between employment elasticity and economic growth on two comparative models, one with economic growth expressed through GDP growth and the other with economic growth expressed as the income gap. The study, based on the example of the 10 largest US states, gives results that show that the coefficients of employment elasticity in relation to the income gap, after correcting autocorrelation in employment data series, are usually at levels close to the coefficient of employment elasticity in relation to GDP growth, and both approaches result in the same signs of elasticity coefficients.

There is also a large number of sceptics in the scientific community regarding the usefulness of measuring the income gap and the accuracy of its assessment. Brooks and Fortun [8] problematize the method of estimating potential GDP and thus the income gap, making a

comparison among the contradictory results of the income gap assessment for several countries, by the IMF, OECD and the European Commission. They are among the initiators of a major campaign to change the methodology for estimating potential GDP. These are important issues that persistently remain outside the public perception. Dunkelberg and Scott [22] argue that data from the late 1990s cannot be used as a basis for comparisons in calculating the income gap because of the unusual psychological impact that prevailed during that period, causing particularly irrational consumption and employment levels. If excess employment is overestimated in determining the size of the income gap, there is a high risk of miss-timing the implementation of economic policy decisions.

The income gap assessment model, used by the European Commission, has a dominant role in setting fiscal rules at EU level and has therefore been the subject of much controversy recently. Barkema, Gudmundsson and Mrkaic [23] analysed the movement of the income gap in 197 countries in the period from 1995 to 2018. The results showed the existence of a median income gap of $-0,7\%$ and a mean income gap of -1% . This means that in the period of the observed 23 years, the world economy functioned on average below the optimum. Such predominantly negative values of the income gap were also confirmed by a study by Kangur, Kirabaeva, Natal and Voigts [24], conducted on a sample of European countries. This empirically confirms Okun's more than half-century-old belief in the predominantly recessive characteristic of the income gap. Since the authors of the mentioned studies additionally found that during the observed period the median amount of the estimated income gap is constantly declining, this indicates the need for special caution in determining fiscal and monetary policy positions when they are based only on the current income gap estimation.

There are also many authors who, in their empirical studies, assess the applicability of Okun's law. In most cases they identify significant or large discrepancies in the results of the application of the Okun's law between the analysed countries. Balakrishnan, Das and Kannan, [25] analysed a sample of 21 countries, over a period of 20 years, and found there are significantly different effects of GDP on unemployment among the observed countries, with all unemployment elasticity coefficients between 0 and 1 in absolute value. In addition, they found evidence of an average increase in the unemployment elasticity coefficients in each of the countries during the observed period, which increased from an average of 0,25 in the 1990s to an average of 0,36 in the 2000s. Ball, Furceri, Leigh and Loungani [6] in a sample of 20 countries, over a period of 21 years, also find large variations in the coefficients of elasticity of unemployment to changes in GDP. Their results show that for every 1 % increase in GDP, unemployment in most of the observed countries fell by 0,23 % to 0,54 %, and an average coefficient of elasticity of unemployment in developed countries was twice as large compared to developing countries.

Such large variations in the results of the analysis of the impact of GDP trends on labour markets require additional research of new ways to determine this impact more reliably, which was one of the motivating factors for the authors of this research.

METHODOLOGY

Previous literature in this area has analysed the empirical basis of Okun's law and the relationship between employment and GDP growth, but paper that deal with the impact of the income gap on employment are very rare. The impact of the income gap on cyclical employment has not previously been analysed in empirical literature. That kind of analysis of the impact of the income gap on the labour market could be complementary to Okun's law and serve as a supplement for assessing the impact of cyclical economic movements.

DATA

The estimated proposed economic model assumes causality between variables in such a way that the income gap is an independent variable and employment is a dependent variable.

Authors used quarterly data on GDP and the number of employees from the first quarter of 2000 to the second quarter of 2020, which were downloaded from the Eurostat website [26, 27]. Data on gross domestic product refer to the quarterly calculation of gross domestic product according to the expenditure method at constant prices of the previous year, where the reference year is 2015 [26]. Data on the number of employees refer to the total number of employees in thousands aged 15 to 64 according to the Labor Force Survey [27].

In order to eliminate the problem of heteroscedasticity, a logarithmic transformation of variables was performed. The income gap was estimated based on a time series of logarithmic values of gross domestic product using the Hodrick-Prescott [28, 29] filter. The cyclical component of logarithmic values used for the employment variable is also extracted using the Hodrick-Prescott [28, 29] filter. The value of the smoothing parameter is $\lambda = 1600$, according to the original values of Hodrick and Prescott [28, 29] for quarterly data.

MODEL

To examine whether there exists cointegration between the income gap and the rate of change in the number of employees, Johansen's approach to cointegration is used.

Although the vector autoregression model (VAR) model is general enough to analyse variables with stochastic trends, it is not appropriate if the interest is on cointegration relations, since they are not explicitly observable [30]. Specific parameterization which allows analysis of the cointegration structure is required [31]. The resulting models are called vector error correction (VEC) models.

The vector model of error correction is given by [31]:

$$\Delta y_t = \Pi y_{t-1} + \Gamma_1 \Delta y_{t-1} + \dots + \Gamma_{p-1} \Delta y_{t-p+1} + u_t, \quad (1)$$

where $\Pi = -(I_k - A_1 - \dots - A_p)$ and $\Gamma_i = -(A_{i+1} + \dots + A_p)$ for $i = 1, \dots, p-1$, and I_k is a unit matrix of order k . The part Πy_{t-1} contains cointegration relations. Parameters Γ_j for $j = 1, \dots, p-1$ are short-run parameters, and Πy_{t-1} is long-run model. A detailed description of the VEC model is given in Lütkepohl [31] and Enders [32].

Cointegrated variables are related in the long-run, i.e. there is a long-run equilibrium between them. A set of economic variables that are in long-run equilibrium is observed:

$$\beta_1 x_{1t} + \beta_2 x_{2t} + \dots + \beta_n x_{nt} = 0. \quad (2)$$

Let β and x_t denote vectors $(\beta_1, \beta_2, \dots, \beta_n)$ and $(x_{1t}, x_{2t}, \dots, x_{nt})$. The system is in long-run equilibrium $\beta x_t = 0$. The deviation from long-term equilibrium is given by:

$$e_t = \beta x_t. \quad (3)$$

If there is equilibrium, the deviation e_t is a stationary process. It should be noted that the term "equilibrium" is used differently in the econometric sense in relation to how the term is used in the field of economic theory. Economic theorists use this term in terms of equality between real and desirable states of economic phenomena. In econometric terms, this term refers to the long-run relationship of nonstationary variables. Cointegration does not require long-run equilibrium to be the result of a market mechanism. The components of a vector are cointegrated of order d, b if all components of the vector are integrated of order d and there is a vector such that the linear combination:

$$\beta x_t = \beta_1 x_{1t} + \beta_2 x_{2t} + \dots + \beta_n x_{nt} \quad (4)$$

is integrated of order $(d-b)$, where $b > 0$. Vector β is called cointegration vector [32] from (1).

To determine the number of cointegration relations, the Johansen procedure is used, according to which it is necessary to determine the rank of the matrix Π from equation (1). If the rank of the matrix Π is equal to the number of variables in the model, the Z_t is stationary. If the rank of the matrix Π is equal to r , where r is less than the number of variables in the model, the matrix can be decomposed into:

$$\Pi = \alpha\beta', \quad (5)$$

where α and β are matrices of order $k \times r$. In that case y_t is nonstationary vector and there exist r cointegration relations among variables in the model. Thus, if matrix Π is a zero-matrix or a regular matrix whose rank is equal to the number of variables k , then there is no cointegration between the variables. When matrix Π is a singular matrix whose rank r is less than the number of variables k , there exist r cointegration relations between the variables. Matrix β is called a cointegration matrix and its columns contain the parameters of the corresponding long-run equations. Matrix α is the error correction speed matrix, and its elements are interpreted as the speed of adjustment of the variables to the equilibrium state. The number of cointegration relations is determined using the Johansen procedure based on determining the rank of the matrix Π using the eigenvalues of the estimated matrix $\hat{\Pi}$. The rank of the matrix is equal to the number of eigenvalues of the matrix which are different from zero. The VEC model is estimated, and the eigenvalues of the matrix $\hat{\Pi}$ are calculated [30].

THE RESULTS OF EMPIRICAL ANALYSIS

DETERMINING THE NUMBER OF COINTEGRATION RELATIONS

Initially, an appropriate model was selected with respect to the existence of deterministic components (constants and trends) in the VEC model (see, for example [32]).

Table 1. The results of the trace test and the maximum eigenvalue test. Source: authors' calculation using EViews 9.

Number of cointegration vectors	Eigenvalue	Test statistic (Trace test)	Critical values (Trace test) (5 %)	Test statistic (Maximum eigenvalue test)	Critical values (Maximum eigenvalue test) (5 %)
0*	0,205732	24,72041	20,26184	17,50541	15,89210
1*	0,090567	7,214997	9,164546	7,214997	9,164546

*rejection of the null hypothesis at a significance level of 5 %

A comparison of the information criteria for selecting one of the five possible models was performed. A model in which the constant is present only in the long-run model (cointegration space) is selected. In the selected model, the constant is not present in the short-term model (VAR model). The influence of the constant in the VEC model is reflected through the error correction term. After selecting the model, the number of cointegration relations was determined using the trace test and the maximum eigenvalue test, as shown in Table 1. Both tests indicate that the number of cointegration relations is equal to one.

LONG-RUN MODEL ESTIMATION

Based on the estimated cointegration vector, conclusions about the long-run relationship of the variables are drawn. The cointegration relation, i.e. the long-run equation with the corresponding t-ratios in parentheses is given by:

$$N = 0,000109 + 1,3938 \cdot GAP \quad (3,837). \quad (6)$$

In the long-run equation, the GAP variable has a statistically significant positive effect on the N variable. The positive effect of the output gap on employment is consistent with the empirical results reported in Seyfried [21], where authors pointed to the positive elasticity of employment to output gap on average equal to 0,31, after correcting autocorrelation in the employment data series. The research was conducted for ten largest US states, using a model with pooled data from all countries, in the period 1990-2003. It should be noted that the labour intensity of economic growth decreases with increasing degree of economic development, so today's values of employment elasticity for countries recording long-run economic growth, such as the United States, will be lower than values a few decades ago.

The error correction term (ECT) in the model is $-0,8675$ or $86,75\%$ with a corresponding t-statistic equal to $-2,70$, which indicates the significance of ECT. A negative sign gives information about the return of variables to the equilibrium, and the amount of ECT indicates the rate of return to equilibrium. Therefore, the variables should return to equilibrium by approximately 1,16 quarters, which is about 3,5 months.

Moreover, the variance decomposition shows the proportion of the variance of the prognostic error due to variations in the variable itself versus variations in other system variables. In empirical research, it is common for the variable itself to explain a large proportion of the variance of its prognostic error over a short period of time. With increasing time horizon, the proportion of prognostic error variance explained by the variable itself decreases [32]. Decomposition of variance allows the analysis of the relative proportion of each of the variables in explaining the variation of the variable in future periods. In case the values of a variable can be adequately predicted based on its previous values, the variance of the prognostic error will be explained by the prognostic errors of the variable itself.

Table 2. Variance decomposition of employment. Source: authors' calculation using EViews 9.

Period	JAZN	JAZY
1	100,0000	0,000000
2	95,90015	4,099853
3	90,38809	9,611905
4	86,03984	13,96016
5	79,78624	20,21376
6	73,61348	26,38652
7	70,56037	29,43963
8	66,86679	33,13321
9	62,26134	37,73866
10	59,61176	40,38824
11	58,70249	41,29751
12	57,79394	42,20606

Table 2 shows the decomposition of the prognostic error variance of the employment variable. After the first quarter, the variable itself explains 100 % of the variation of its prognostic error. However, after one year (4 quarters) that percentage drops to 86,04 %, while after 12 quarters (3 years) that percentage equals 57,69 %. The shock of output gap after one year explains 13,96 % of the variation of the prognostic error in employment, and after three years the percentage is increased to 42,21 %.

MODEL DIAGNOSTICS TESTS

Furthermore, model assumptions tests are performed. The result of the White heteroscedasticity test is shown in Table 3, and the Chi-square test statistic of equals 82,1736 with the corresponding empirical level of significance equal to 0,7092, hence at any reasonable level of significance the null hypothesis of homoscedasticity of variance is not rejected.

Moreover, the result of the Serial Correlation Lagrange multiplier (LM) Test is given in Table 4. The LM test of autocorrelation of error terms indicates that, at the significance level of 5 %, the null hypothesis of non-existence of autocorrelation of relation errors up to lag 12 cannot be rejected, since the empirical significance levels are greater than 0,05.

Table 3. VEC Residual Heteroscedasticity Test. Source: authors' calculation using EViews 9.

Chi-square statistic	Degrees of freedom	p-value
82,1736	90	0,7092

Table 4. VEC Residual Serial Correlation LM Test. Source: authors' calculation using EViews 9.

Lags	LM statistics	p-value
1	4,050951	0,3992
2	4,093157	0,3935
3	3,266763	0,5142
4	1,841723	0,7648
5	9,929733	0,0416
6	3,877676	0,4228
7	0,085080	0,9991
8	4,180200	0,3822
9	6,030904	0,1969
10	0,259182	0,9923
11	3,923050	0,4165
12	0,195171	0,9955

The stability of the error correction model is assessed by calculating the inverse roots of the characteristic AR (1) polynomial using EViews 9. The estimated model with r cointegration relations is stable if $k-r$ roots are equal to one and the remaining roots have a modulus less than 1, where k is the number of endogenous variables, and r is the number of cointegration relations [33]. The analysis showed that there is 1 unit root and the remaining roots have a modulus of less than one. Since the model contains two variables, with the existence of one cointegration relation, the model with one unit root is stable.

DISCUSSION, IMPLICATION AND CONCLUSION

Despite the accelerated technological development, labour is still the most important component of the overall productivity of the economy and it is justified to look at economic indicators primarily focused on employment. In this article the impact of cyclical activity of GDP on cyclical employment in the Republic of Croatia is analysed in the period from 2000 to 2020, using the vector error correction model (VEC). The results of the analysis indicate a statistically significant impact of the cyclical component of GDP on cyclical employment in the Croatian economy.

The elasticity of cyclical employment in relation to the income gap in this analysis for the Republic of Croatia in the observed period was 1,39. First conclusion of this study is therefore that there is a clear, statistically significant, influence of output gap on the employment in Croatian economy, which allows an assessment of the potential use of fiscal and monetary policy measures to increase employment over shorter periods marked by the impact of the cyclical component of economic activity. Moreover, the decomposition of the prognostic error variance of the employment variable indicates that the shock of output gap after one year explains 13,96 % of the variation of the prognostic error in employment, while after three years that percentage is increased to 42,21 %. Since a positive correlation between the income gap and employment gaps was found, this conclusion is indirectly in accordance with the results of studies cited in the literature review, in particular Kapsos [1] and ILO, OECD, WBG and IMF [15]. Since the number of employees, compared to the number of

unemployed, and especially compared to unemployment and employment rates, is the most accurately measurable variable in the labour market and this analysis empirically proves the relationship between employment and income gap, it can be additionally concluded that employment elasticity in relation to income gap, from the point of view of the number of employees, gives probably more precise indicative estimates of the impact of cyclical activity of GDP on the labour market than is the case with Okun's law.

The results of this study and the proposed different approach to observing the impact of the income gap may have implications in practical terms as comparative values for possibly correcting the impact of the income gap on the labour market in the coming periods, and in academic terms opens new topics for discussion in economic analysis.

There are several ways to estimate the income gap. Only the Hodrick-Prescott filter was used in this study, which is a limitation of this article, and in the case of other estimation methods, such as the structural estimation approach using the production function or the use of Kalman filter for unemployment data, the results may differ slightly from the results obtained by this research. Alternative ways of estimating the income gap in the model from this research may be the subject of future studies, after which the comparison of the results will provide new insights into the possibility of using the model. One possibility, in the case of obtaining different results in relation to the results of this study, is to determine the approximate reliability intervals of the coefficients of elasticity of employment in relation to GDP, obtained by different methods of estimating the income gap.

REFERENCES

- [1] Kapsos, S.: *The employment intensity of growth: Trends and macroeconomic determinants*. International Labor Organization, 2005, http://www.oit.org/wcmstp5/groups/public/---ed_emp/---emp_elm/documents/publication/wcms_143163.pdf,
- [2] O'Sullivan, A. and Sheffrin, S.M.: *Economics: Principles in Action, Upper Saddle River*. Pearson Prentice Hall, New Jersey, p.335, 2003,
- [3] Frisch, H.: *Theories of Inflation*. Cambridge University Press, Cambridge, pp.229-234, 1983,
- [4] Okun, A.M.: *Potential GNP: Its Measurement and Significance*. American Statistical Association, Proceedings of the Business and Economics Statistics Section, Washington, 1962,
- [5] Knotek, E.S.: *How Useful Is Okun's Law*. Economic Review **92**(4), 73-103, 2007, <http://dx.doi.org/10.1179/kiv.2007.73.1.005>,
- [6] Ball, L. et al.: *Does One Law Fit All? Cross-Country Evidence on Okun's Law*. <http://unassumingeconomist.com/wp-content/uploads/2016/08/cross-country-evidence-on-okun-sep-2016-paris-workshop-draft-with-tables-and-charts.pdf>,
- [7] Brooks, R. and Fortun, J.: *Campaign against nonsense output gaps*. Institute of International Finance, Washington, 2019, https://www.iif.com/Portals/0/Files/4_IIF05232019_GMV.pdf,
- [8] Latham, R.W. and Peel, D.A.: *The Determinants of the Natural Rate of Unemployment in the Neoclassical Model*. Economic Record **51**(3), 308-319, 1975, <http://dx.doi.org/10.1111/j.1475-4932.1975.tb00256.x>,
- [9] Lipsey, R.G.: *An introduction to positive economics*. ELBS with Weidenfeld and Nicolson, London, p.573, 1992,
- [10] Tcherneva, P.R.: *Keynes's Approach to Full Employment: Aggregate or Targeted Demand?* Levy Economics Institute, Bard College, New York, 2008,

- [11] Congdon, T.: *Two Concepts of the Output Gap*.
World Economics **9**(1), 147-175, 2008,
- [12] Perloff, J.M. and Wachter, M.L.: *A Production Function-Nonaccelerating Inflation Approach to Potential Output: Is Measured Potential Output Too High?*
Rochester-Carnegie Conference, Journal of Monetary Economics **10**, 113-163, 1979,
[http://dx.doi.org/10.1016/0167-2231\(79\)90007-1](http://dx.doi.org/10.1016/0167-2231(79)90007-1),
- [13] Gordon, R.J.: *A comment on the Perloff and Wachter paper*.
Carnegie-Rochester Conference Series on Public Policy **10**(1), 187-194, 1979,
[http://dx.doi.org/10.1016/0167-2231\(79\)90010-1](http://dx.doi.org/10.1016/0167-2231(79)90010-1),
- [14] Orphanides, A. et al.: *Errors in the Measurement of the Output Gap and the Design of Monetary Policy*.
Board of Governors, Federal Reserve System, Washington, 1999,
- [15] ILO, OECD, WBG and IMF: *G20 Labor Markets in 2015: Strengthening the Link between Growth and Employment*.
https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_398025.pdf, accessed 2nd December 2020,
- [16] Crivelli, E.; Furceri, D. and Toujas-Bernat , J.: *Can Policies Affect Employment Intensity of Growth? A Cross-Country Analysis*.
International Monetary Fund, 2012,
<http://dx.doi.org/10.5089/9781475505689.001>,
- [17] African Development Bank: *African Economic Outlook 2018*.
African Development Bank Group, 2018,
https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/African_Economic_Outlook_2018_-_EN.pdf,
- [18] Asian Development Bank: *Asian Development Outlook 2012, Confronting Rising Inequality in Asia*.
Asian Development Bank, Mandaluyong city, 2012,
<https://www.adb.org/sites/default/files/publication/29704/ado2012.pdf>,
- [19] Hanusch, M.: *Jobless Growth? Okun's Law in East Asia*.
The World Bank, 2012,
<http://dx.doi.org/10.1596/978-0-8213-9568-4>,
- [20] An, Z.; Ghazi, T.; Gonzales Prieto, N. and Ibourk, A.: *Growth and Jobs in Developing Economies: Trends and Cycles*.
IMF Working Paper 17/257, International Monetary Fund, 2017,
<https://www.imf.org/en/Publications/WP/Issues/2017/11/17/Growth-and-Jobs-in-Developing-Economies-Trends-and-Cycles-45412>,
- [21] Seyfried, W.: *Examining the Relationship Between Employment and Economic Growth in the Ten Largest States*.
Southwestern Economic Review **32**, 13-24, 2005,
- [22] Dunkelberg, W. and Scott, J.A.: *The "Output Gap" and Excess Labor Employment*.
Business Economics **40**(3), 23-30, 2005,
<http://dx.doi.org/10.2145/20050303>,
- [23] Barkema, J.; Gudmundsson, T. and Mrkaic, M.: *What do we talk about when we talk about output gaps?*
IMF Working Paper 2020/259. International Monetary Fund, 2020,
<http://dx.doi.org/10.5089/9781513561257.001>,
- [24] Kangur, A.; Kirabaeva, K.; Natal, J. and Voigts, S.: *How Informative are Real Time Output Gap Estimates in Europe?*
IMF Working Paper 19/200. International Monetary Fund, 2019,
- [25] Balakrishnan, R.; Das, M. and Kannan, P.: *Unemployment Dynamics during Recessions and Recoveries: Okun's Law and Beyond*.
International Monetary Fund, 2010,
<https://www.elibrary.imf.org/abstract/IMF081/10502-9781589069152/10502-9781589069152/ch03.xml?rskey=C8Tcqf&result=45&redirect=true>,

- [26] Eurostat: *National Accounts: Quarterly accounts, GDP and main components-volumes*.
http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=namq_gdp_k&lang=en, accessed 27th November 2020,
- [27] Eurostat: *Employment and activity by sex and age - quarterly data*.
https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfsi_emp_q&lang=en, accessed 6th November 2020,
- [28] Hodrick, R. and Prescott, E.C.: *Postwar U.S. Business Cycles: An Empirical Investigation*.
Carnegie Mellon University discussion paper 451, 1980,
- [29] Hodrick, R. and Prescott, E.C.: *Postwar U.S. Business Cycles: An Empirical Investigation*.
Journal of Money, Credit, and Banking **29**(1), 1-16, 1997,
- [30] Palić, I.: *Econometric analysis and calibration of dynamic stochastic models of the general equilibrium of the Croatian economy*. In Croatian. Ph.D. Thesis.
Faculty of Economics and Business, University of Zagreb, Zagreb, 2015,
- [31] Breitung, J.; Brüggemann, R. and Lütkepohl, H.: *Structural Vector Autoregressive Modelling and Impulse Responses*.
In: Lütkepohl, H. and Kräzig, M., eds.: *Applied Time Series Econometrics*.
Cambridge University Press, Cambridge, 2004,
- [32] Enders, W.: *Applied Econometric Time Series*.
John Wiley & Sons Inc., London, 2015,
- [33] Lütkepohl, H.: *New Introduction to Multiple Time Series Analysis*.
Heidelberg, Berlin, 2005.

THE GIG IS UP: WHO DOES GIG ECONOMY ACTUALLY BENEFIT?

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ABSTRACT

This article takes on the task of exploring gig economy in its various forms and definitions, starting from its economic origins as a way to reduce transaction costs and overheads in firms making use of modern technology, and working up to some of its social consequences, such as the transforming of employees in just-in-time resources, fragmenting their labour and eroding their ability to organize and unionize in order to better defend their rights. Focussing on the influence platforms have on their users, be it in the role of workers or customers, it questions their far-reaching impacts on society and economy in terms of their positive, neutral or negative consequences for workers, as most of the literature agrees on the heavily skewed positive consequences for businesses. In order to make sense of existing research made on “giggers” this article tries to provide a scope of the gig economy using, which has been difficult to achieve as numerous researchers, institutions, and even states, define gig economy in different ways, with their data varying depending on definitions, dates, and methodological approaches. Finally, the article explores three distinct “selling points” of gig economy, namely: the possibility to generate (not always) steady income, the flexibility it offers to its users, and its consequences on workers’ social and emotional state, putting into question their benefits for workers, for the profit of platforms and businesses.

KEY WORDS

gig economy, platform economy, work force, precarity

CLASSIFICATION

JEL: J21, J22, J23, J28, J46

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IN SEARCH OF DEFINITIONS

Crowd working, freelancing, gig economy, sharing economy, on-demand economy, platform economy, those are just a few names by which this new business/employment/economy model goes by [1, 2] depending which authors, institutions, and disciplines one refers to the most.

Although it's given name may vary, precarious work by any other name would still smell as insecure, and the rules of the game would still be much the same for all the (not)employees and (not)employers playing it.

By definition, gig work is “short term, task based, insecure, and precarious” [1; p.755], and, although it has been around long before our hyperconnected contemporary society, is now mostly dependent on digital/online platforms, such as Airtasker, Fiverr, Uber and many more [1]. Such digital platforms, also referred to as “marketplaces” or “transaction platforms” “are characterized by their open business models that inherently rely on independent participants to co-create value” [3; p.319]. Although the authors [3] offer a taxonomy of 6 different types of platforms, depending on their participants, values, transaction and goods types, and revenue models, platforms do share a common denominator – they provide a marketplace where labour demand and supply can meet via apps or internet browsers, in order to link workers of any background and age with clients or corporations of any country or scale, for a fee.

While Churchill and Lyn [1], in their research, found that the most common tasks gig workers performed were driving, for men (27,8 %), and photography and design related tasks for women (24,1 %), following the broad eligibility gig workers enjoy, it does not come as a surprise that they can be found operating in a myriad other occupations. The same authors [1] found gig workers performing tasks such as caring, cleaning, designing software or graphics, delivering, driving, maintaining, repairing, gardening, building, and numerous others, while Friedman [4; p.172] finds that “they work for low wages as personal care attendants, dog walkers, and day laborers for landscapers, and for high wages as managers of IT installations, accountants, editors, lawyers, and business consultants”.

As various authors note [1, 5, 6], gigs, although mediated via apps and platforms, do not necessarily have to be worked online to qualify as such. Consequently, gigs could be either physical or digital tasks performed locally or remotely, depending on whether or not the workers need to be physically present [1, 6], and referred to as “work on demand” or “crowd work” depending on their nature.

De Stefano, for instance, defines crowdwork as “completing a series of tasks through online platforms” [5; pp.471-472], while comparing work on demand to a more standard view of work, if ever more fragmented, “such as transport, cleaning, and running errands...” in which giggers apply for tasks through apps owned by firms that exert at least a minimum of control regarding the quality of service and selection of workforce [5; pp.471-472].

Although one would expect the firms who own the apps to be considered employers, or at least intermediaries between workers and employers, such a relation never comes to fruition in the gig economy. As Urzi Brancati et al. put it “the object of each mediation is not a job in the traditional sense, but a single task or service” [7; p.4], so the worker never actually becomes an employee, as he “is not paid a wage or salary, does not have an implicit or explicit contract for a continuing relationship, and does not have a predictable work schedule or predictable earnings when working.” [8; p.357] but is instead considered self-employed.

As self-employed individuals, giggers find themselves playing under a completely different set of rules compared to “standard” employees with unsatisfactory levels of job security and planning [9], which are, only sometimes and in some measure counterbalanced by the level of

flexibility they could possibly achieve, and, while popular culture and mass media tend to promote such a mode of “employment” as a “be your own boss” culture which allows them a level of flexibility unattainable to the population working “from 9 to 5”, being a gigger often comes with more challenges than benefits, as it will be further discussed in the *Benefits and beneficiaries* chapter of the article.

In the next sections of the article we will turn to examining the individuals comprising the gig workforce as well the economic processes that accelerated its rise, and the social consequences that come with it.

WHO CONSTITUTES THE GIG WORKFORCE?

Measuring gig economy has been a challenge to researchers worldwide, which is not surprising as it is difficult to measure something that’s yet to be defined. Are giggers unemployed, employed (and if so, under what kind of contract?) but with a side job, independent contractors, or all of the above? De Stefano [5] notes that a vast majority of giggers are usually classified as independent contractors but, as Manyika et al. [9] put it, there is not a single criterion that can be used to classify independent workers. Focussing on three factors, namely, a high degree of autonomy, payment by task, assignment or sales, and short-term relationships between the worker and the client [9], the authors argue that there’s a, more or less clear difference between independent workers and other types of employment. Excluding (sub)contractors or temporary workers like “permatemps who have long-term contracts and are expected to work regular hours” [9; p.21], franchise owners and other representatives of fissured work, they attempt to measure the scope of gig economy somewhat more conservatively compared to, e.g. Gallup [10] who include (independent) contractors, on-call workers, online platform workers, and temporary workers. Depending on the definition of the population of gig workers, and confining results to all-encompassing research provided by market research agencies such as Manyika et al. and Gallup [9, 10], the gig workforce ranges from 10 to 36 percent of the working age population, depending on country, year and usage of gigs (as primary or supplementary income). It should be noted here, that, as Manyika et al. and Gallup [9, 10] integrate different independent workers in their analyses, and do so in different years, this article will be confined to data provided by Manyika et al. [9] who, although is surely outdated by now (published in 2016), provides data for both the EU and the U.S.A., unlike Gallup [10] who only examines the U.S.A. albeit a few years later.

The McKinsey report [9] estimates the number of gig workers from 84 to 130 million people in both the U.S.A. and five European countries examined (France, Germany, Spain, Sweden and the U.K.), raising the estimate to 60-93 million when generalizing data to EU-15 – which would account for 18-28 % of the European working-age population.

Exploring the structure of these independent workers, McKinsey report results [9] show that gig work is the primary source of income for 46 % American and 42 % of European independent workers, although it should be noted and taken as a mitigating circumstance that the majority of independent workers engage in gig activity by choice rather than out of necessity, with “only” 28 % of Americans and 32 % of Europeans gigging because they need to.

Depending on the reason of gig work engagement, the McKinsey report differentiates between four types of giggers: *free agents* who derive their primary income from independent work and prefer it that way, *casual earners* who gig in order to supplement their income, also by choice, *reluctants* whose primary income comes from gigs but would prefer a traditional job, and *the financially strapped* who gig for supplemental income, but would prefer not having to [9]. Analysing the results, the McKinsey report concludes that, although the majority of giggers engage in such activities on their own volition, with 70-75 % of earners

falling in the category of free agents or casual earners, the sheer number of 50 million Americans and Europeans who engage in gig work to make ends meet is a problem that's even more striking if we consider the 20 million of people whose primary income comes exactly from that kind of temporary and insecure employment [9].

In the next sections of the article, we will focus on analysing the birth and rise of gig work, its benefits, and drawbacks, as well as try to describe it.

ITS ECONOMIC ORIGINS

In order to understand how this new economic model came to be, one must go as back as the birth of the firm and the first and second industrial revolutions because, as Manyika et al. put it, "the future of independent work looks a lot like its past" [9; p.23].

Although some authors see gig economy's main selling point in its high levels of work flexibility, autonomy, and "work/life balance", in which enterprising individuals can use their skills and technological innovations to supplement their incomes [1], not everyone sees it as such an employee-oriented model. In fact, Friedman [4] argues that it is employers, not workers, who are actually pushing for it, as it is them who are able to control markets, modes of production, and employment in order to minimize costs and maximize profit, like they've been doing since the vast majority of the workforce shifted from self-employment to employment during the second industrial revolution.

As it often goes, economics' main concern is profit, and one of the surest ways to boost profit is lowering production costs which, as Zheng and Yang [2] put it, citing authors like Coase, Smith and Marx, was made possible firstly through the establishment of firms in the industrial era. Seen mainly as an economic approach in reducing the cost of recurring activities, such as transaction and production costs, firms were seen as a simple way to "internalize a large number of external transaction contracts, thereby greatly reducing transaction costs and realizing the uniform allocation and sale of all their resources and products." [2; p.3].

Following Coase's explanation of the birth of firms, Zheng and Yang [2] explain the rise of gig economy via a transformative combination of both the development of science and technology, as well as new insights in the fields of economics and social sciences, concerning human resources, management, and contemporary customers' needs.

While Coase's importance of firms in the era of industrialization was based on (1) an understanding of labour force being homogeneous, rational, economic, and in the pursuit of maximization of individual economic benefits, where (2) employers were free to segment production chains as market demand was homogeneous and massive, which (3) lead to an increase of the complexity of labour division, with workers being ever more low-skilled, and (4) where employers did not have readily available information about relative prices in order to set their own, Zheng and Yang [2] argue that a lot has changed since then.

Workers are no longer considered rational drones but are seen as "complex individuals with social, psychological, and democratic needs" [2; pp.4-5] who, in order to successfully cater a diversified market in which customers and consumers are demanding ever more personalized products and services, need to actively work on their skills, picking up more, and more diverse knowledge, every day. Firms, in their theory, are no longer the pinnacle of human economics, nor are they inevitable in order to successfully conquer the market as both the rise of information technology, and the micro-segmentation of markets lead to a reduction in production and transaction costs (thanks to the former), and to a need to deliver personalized products, which makes large-scale production much less useful (thanks to the latter).

Following Zheng's and Yang's [2] approach, in this new economic model, where niches are norm, and technology permeates every part of entrepreneurship, gig economy has risen as a sensible response. Roy-Mukherjee and Harrison [11] summarize this "demand side" advantage of gig economy as a model that's able to provide goods and services at a lower price, while maintaining a greater variety of said goods and services, and deliver them faster and more customized compared to the traditional economy.

Even though such an explanation is surely plausible in terms of a lean management perspective, where firms ever so often seek to trim their non-essential personnel, or a "just-in-time" perspective, where firms try to reduce their non-productive inventory to a minimum, restocking everything they need, as they need it; it is questionable how much this gig economy benefits giggers, and how much it benefits their non-existent employers.

ITS SOCIAL CONSEQUENCES

Although it only recently came to the attention of both academic and journalistic research, gig economy, in its "offline" version, along with other forms of non-standard employment, has been around for more than a few decades. As Muntaner [12] puts it, it has been more than four decades of shifts in labour markets in which contracts with unlimited duration, 40-hours per week, including benefits, have seen a steady decline as a "standard" form of employment.

There are two complementary explanations to this shift from standard to non-standard mode of employment with the foremost being a relative loss of workers' bargaining leverage due to the economic crisis of 2008 as put forward by Friedman, and Vallas and Schor [4, 13] and the second being a proliferation of information technology, enabling employers to make the most of their current advantage, as documented by statistics in app production [14, 15], as well as interviews with platform CEO-s [5, 16] (De Stefano – Biewald, Arcidiacono).

In the past 13 years, since both the iOS app store and the Google Play store opened for business, the number of apps available to download has risen dramatically, with the iOS app store counting almost 4,5 million apps in 2020 [14], and its counterpart almost 3 million [15]. Such a meteoric rise in the app markets opened a lot of doors for both giggers and users of gig services. As Arcidiacono et al. put it, quoting Robin Chase, "everything that can become a platform, will become a platform" [16; p.276]. With work platformizing ever more under the "participatory ethos of Internet culture" [16; p.276], the authors see gig economy as the newest economic paradigm.

Even though such a platformization of work is undeniably giving more flexibility to both workers and employers, Friedman [4] argues that the gig economy only sees its rise when workers lose their bargaining power with employers. Comparing the recent rise of the number of giggers to the decline of gig economy during the second Clinton administration and the employment boom caused by the internet, Friedman [4] sees the expansion of gig economy as a response to the global recession of 2008, in which labour market's forces of supply and demand were particularly skewed in favour of employers as lots of people lost their jobs, and were consequently flooding the market looking for another one. Such a view on the emergence of gig economy is shared by Vallas and Schor [13] who see the expansion of companies like Uber and Airbnb right after the Great Recession by making use of a "ready pool of workers" and question whether these platforms can be profitable or retain employees when labour markets are tight.

Building on his theory, Friedman [4] notes that long-term contracts, ever less present in contemporary employment, were a strategy companies used to "protect" themselves from employee shortages during times of high employment, as well as protecting their investments in human capital, and stabilizing wages which benefit employers in times of high employment and employees in times of low employment. Such practices are seen as

unnecessary expenses during times of low employment. Arguing that not a lot of healthy, well, trained and responsible workers would accept precarious positions such as gigs, Friedman finds that, in order to hire “labour on the spot, they [corporations] need a reserve army of the unemployed available to work at stable wages.” [4; p.180].

Combining a labour market of low employment, linked to a rise in app and platform technology, various businesses have found it economically logical to shift, at least in some part, from standard to non-standard employment, especially crowd work and on demand work, in order to boost their profits at the expenses of employees which are seen as pricey investments in times of high unemployment. As Friedman puts it, by “making employment and wages more flexible, gig employments shift the risk of economic fluctuations onto the worker” [4; p.172], which is mostly made possible by the economic strand this reserve army is dealing with, being willing to train, get educated or specialize at their own expenses, or being willing to work tasks to make ends meet.

That change has been recognized both by academics, with De Stefano arguing that “gig economy technologies provide access to an extremely scalable workforce” [5; p.476], and by the private sector controlling firms who provide platforms giggers use to find work. Two curious, almost villain worthy, examples of CEOs talking about their approach to workers can be found in De Stefano’s [5] work, quoting the founder of CrowdFlower, Lukas Biewald, and the CEO of Amazon, Jeff Bezos. While Biewald is somewhat exalted by this incredible opportunity to find workers, “pay them the tiny amount of money, and then get rid of them when you do not need them anymore” [5; p.476], as such a type of employment would not have been possible before the internet, Bezos shows a much uglier face of gig work, referring to its practices as giving access to “humans as a service” [5; p.477].

Although such practices are criticised by authors [5, 6] as commodifying either humans, where workers are found as nothing more than expendable resources, or labour, as institutional changes that shift the risks of market competition on workers instead of employers, not everyone shares these grim perceptions of the gig economy. In fact, Vallas and Schor, in their work [13] show four competing approaches to platform work, adding their own, and analysing their key positions, as it will be presented in the following chapter.

FORMS OF PLATFORMS

Depending on schools of thought, gig economy can be viewed as a positive, negative or neutral (in terms of being nothing more than a symptom of much larger and longer existing changes in the labour market) phenomenon.

Having said that, it is highly discouraging when authors, writing about the positive aspects of gig economy end the chapter comparing entrepreneurs to a “herd that, like livestock, can be milked or sheared to extract revenue.” [13; p.277]. In their review of platforms as “Incubators of Entrepreneurialism” Vallas and Schor showcase the advantages platforms offer compared to a traditional economy. Quoting numerous authors, they reach the conclusion that platforms help reduce transaction costs, enable various segment of people to participate in gig work (i.e. residents from rural areas, people with disabilities or stay-at-home caregivers), as well as unlock the possibility for people to monetize their assets like cars, homes, tools or knowledge, which is also supported by research done by Churchil and Lyn [1]. Another kind of advantage in gig work is found in the trust building between customers and providers, enabled by the scoring system put in place by platforms in order to better understand, or control the quality of service provided and the needs of their (but not actually their) customers. Somewhat criticizing authors who argue that the shift in employment relations, due to platforms, is leading to a “networked society of microentrepreneurs” and that giggers

are afforded a level of flexibility out of reach to those working 9-5 jobs, Vallas and Schor argue that it is “unlikely that platforms will foster crowd-based capitalism or lead power and control to assume horizontal, peer-based configurations.” [13; p.278], as it is much more likely that platforms, thanks to network effects, will scale, monopolize, and dominate markets.

Moving from that “optimistic” view of gig economy, Vallas and Schor [13] explore the literature pertaining to grimmer aspects in which workers have to actively try to find ways to unionize informally, gaming the algorithms controlling them, and form social bonds of support with people they never met and, most likely, will never meet. Calling this segment “The Digital Cage” the authors describe a school of thought united in criticizing corporate human management, outcomes in evaluations and ranking systems, and the undermining of transparency, comparing platforms to a private version of the social credit systems, analogous to the one active in China. Platforms are, in this sense, seen as a barrier that effectively discourages and weakens workers’ ability to challenge corporate rules by controlling available data, being constantly gathered but rarely fully shared with workers. Apart from that information control, platforms are seen as gamifying work by offering symbolic rewards in order to boost attachment to the app or platform, and implementing a modern day “divide et impera” approach by individualizing and dispersing workers which are rarely in contact with each other and consequently can not unionize or even gather to discuss their problems, and strengthening competition between them, as tasks are not always plentiful.

Vallas and Schor [13] argue that, although algorithms are definitely being used to corporate advantage, and that unionizing over social media leads to questionable achievements, such a view of the gig economy is overestimating and reifying the power of digital technology, adding examples of various tactics workers deploy in playing, defeating and even avoiding algorithms and company rules, more often than not, using the same technology that’s used against them.

A third approach is found in exploring gig economy as an “Accelerant of Precarity” in which the digitalization and platformization of work is merely a drop in the bucket of work arrangements flexibilization that’s been underway for decades; in other words, it is not the technology that’s the problem, but the underlying societal and economic imbalances of power which leave workers in precarious positions. Coming back to the position of power of corporations, authors in this approach find firms externalizing risks at the expense of workers, much like Friedman and De Stefano [4, 5] would argue. Building on the “divide et impera” principle mentioned in the previous approach, this one’s key feature can be found in the commodification of labour time, and disembeddedness of the worker from systems of social protection which is provided by platforms for firms to use in an attempt to limit their obligations to the workforce. Vallas and Schor [13], citing Harvey, argue that this approach is just another way of capital “accumulation through dispossession” in which businesses find legal and financial mechanisms to cut workers’ rights. Agreeing with authors of this approach insofar that platforms are successfully avoiding the risks and costs of doing business by externalizing them to giggers, including “responsibility for bodily injury, damage to tools and assets, coverage between paid gigs, financial malfeasance by customers, and harassment” [13; p.280], Vallas and Schor [13] argue that analysing the gig workforce in this way is overly simplistic. Not every gigger uses platforms as the only source of income, and not every gigger ends up working low-paying tasks, consequently, depending on their dependency status, which they explain as how reliant on platform income giggers are, gig economy “could” decrease the precarity caused by other forms of employment. Although this approach very much seems like fighting fire with fire, statistics in the European Union and U.S.A. seem to support this conclusion with 58 % and 54 % independent workers respectively doing gigs as a way to supplement their income with 32 % and 28 % respectively doing it out of necessity in 2016 [9]

The fourth approach present in literature finds platforms to be “Institutional Chameleons”, in other words, the (be it positive or negative) effects of platforms vary depending on the macro-institutional surroundings they operate in. As an example, Vallas and Schor [13] quote research on Uber done in various countries, and the effects it had as a *disruptive technology*, with the U.S.A. faring far worse than some European countries because it was seen as a threat to employment status (as it’s linked to social insurance), whereas countries as Germany and Sweden had somewhat less problematic after-effects, linked to systems of urban-transportation (prominent in Germany) and the amount of tax revenue for the welfare state (prominent in Sweden). Authors representing this approach argue that the same technology that’s being used to provide gigs and tasks could very easily be used to provide giggers with protection and work regulations, or, as Vallas and Schor put it, “given adequate institutional guidance, platforms could provide mechanisms for worker voice and social inclusion” [13; p.281]. Criticizing this approach, Vallas and Schor [13] note that platforms are not that malleable, and that they actually have a notable dose of power with which they, in fact, can shape institutional environments, especially in a globalizing world, pointing to a growing literature exploring differences between gig workers throughout the world and finding few or none.

Having found inconsistencies in each of the analysed approaches, Vallas and Schor [13] opt in giving one of their own. Calling it “Permissive Potentates” they “argue that platforms constitute a new type of governance mechanism with which employers can conduct economic transactions” [13; p.282] differing from hierarchies, markets or networks, in so far they do not centralize power like the first, nor do they disperse it like the seconds, or parcel it out to collaborators like the third. Platforms, in their opinion “exercise power over economic transactions by delegating control among the participants” [13; p.282], retaining authority over functions like allocation of tasks, data collection, pricing and revenue collection. In this form of power, platforms manage to remain powerful, even though, and perhaps because of ceding control over specific aspects of the labour process in order to externalize risks, while maintaining a position of “permissive predators” and letting giggers gig before exerting their power to exploit and profit.

Expanding on the notion of permissive power, Vallas and Schor [13] define four distinctive features of platforms pertaining to (1) their business model, (2) their transformation of employment, (3) supervision, and (4) spatial organization of work.

Concerning their business model, the authors note that platforms bring a novelty in the form of profiting from mediations done between workers and customers while completely avoiding the messiness of fixed costs and capital or direct employment. Their model depends on externalizing conventional costs but comes also in the added value of data mining. According to the authors, the astonishing growth of such firms rests also on their non-existent infrastructure, as they are not bounded by mortar and pestle, but can keep expanding without investing heavily in material structures. The second novelty is seen in the transformation of employment where platforms, unlike conventional firms, have little to no interest in control over work methods and schedules, as well as personnel selection criteria, to the point they not only allow giggers to work for how much and whenever they want, in most cases they even allow them to work for competing platforms as well. That kind of flexibility (as corroborated by Zheng and Yang [2]) is the most prominent selling point of platforms and it’s been well researched by numerous authors mentioning both sides of the coin - workers who are thrilled by being their own boss [1, 5, 7, 17, 18], as well as those who think this kind of freedom is a mirage [1, 4, 5]. That selling point will be further discussed in the next section of this article. The third novelty platforms introduced was a fictitious *laissez-faire* management with little to no supervision. Vallas and Schor [13] explain that, although platforms do not employ hierarchical controls and do not have a hands-on management like classic firms, leaving giggers with little to no scripting in terms of how to manage their time and tasks, they do

have mechanisms of control in terms of algorithms and surveillance technology. That kind of control is also mentioned in the work of Glavin et al. [19] who explain that platform control is indirect, through monitoring and surveillance, with freelancing platforms monitoring screens and keystrokes of workers, or rideshare companies collecting data on driving, behaviour and transactions, as well as customer evaluations of giggers, which is both an important control mechanism as well as yet another expense platforms do not have to deal with – regular employee evaluations. The fourth and final feature Vallas and Schor [13] identify is the spatial (re)organization of work. Noting how, “ironically, the sharing economy leaves workers with reduced opportunities for a shared experience at work” the authors argue how, unlike firms in the industrial era, digital platforms need to disperse labour in order to be able to provide just-in-time service. The authors connect this spatial dispersion to two different phenomena, the first being that it fosters competitiveness and inequality between workers, and the second that it suppresses the ability for collective action among giggers.

Concluding their evaluation of platforms, Vallas and Schor [13] remain uncertain about the resilience of platforms over time, wondering whether they will be able to exert more control over giggers if need be, and how that would affect potential users, as well as their accountability in case classifications of giggers as employees becomes something laws from different countries decide to implement legally. On the other hand, if even more firms decide to abandon standard employment practices, platforms could very well further erode that kind of employment, having an even greater army of the unemployed at disposal. Finally, while refusing to speculate on the possible outcomes of platforms as an economic model of capital accumulation, the authors enumerate four possible futures – one with platforms consolidating in superplatforms, with an ever increasing monopoly, surveillance ability and corporate rule, a second with states successfully regulating them and balancing the interests of workers, users and owners, a third where platforms and social media will become intertwined, destabilizing the former and empowering both users and giggers, and a fourth, where platforms will be owned by their users as cooperatives, competing with capitalist firms.

Finally, we turn to examining the good sides and bad sides of gig work with a small caveat regarding these two adjectives: as both of them often carry different meanings depending on the recipient, this article will take the point of view of gig workers, rather than that of platforms or customers.

BENEFITS AND BENEFICIARIES

Starting from the most obvious one, generating revenue, gig economy can surely be seen as a star, in BCG matrix terms, by platforms and firms since it enables them to make full use of lean management and just-in-time economics, be it regarding tools, be it regarding people. On the other side giggers are not always faring better than their 9-5 counterparts. Although, as Friedman notes, “free to market their labour broadly, some middle-aged and well-educated independent contractors have high earnings...on average...most gig workers earn less than their equally educated counterparts on traditional contracts...” [4; p.178], not all gig workers are blessed with high incomes and steady cash flow. After all, the McKinsey report [9] notes low-income households are more likely to participate in independent work, with almost every second household with earnings amounting to less than 25 000 \$ doing so, and 37 % of them doing it out of necessity. Compared to high-income earners, that’s a significant difference as only every third household with earnings over 75 000 \$ engages in gig work, and less than 25 % of them doing so out of need. Additionally, and although not directly linked to income, profiting from gig work does not come cheap, as independent workers often need to pay for their means of production (houses to rent, cars to drive people in, education to attain higher-paying gigs etc.), contribute to their own pensions and health insurance, and are unable to take paid

sick leave or holidays. As Wood et al. note in their interview results, only “a handful of workers...could afford health insurance, but the vast majority were without any access to healthcare.” [6; p.943] which, although is not a crucial problem in countries with regulated and subsidized healthcare, could definitely be a problem in countries with less prosocial regulations. Time spent searching, applying, and waiting for tasks also goes unpaid, as well as breaks, training or learning new skills to compete with workers globally, summarize Wood et al. [6].

Overall, gig work, at least in its currently unregulated state, seems to be benefiting different actors in different proportions, with platforms scooping the cream of the crop, highly educated and established independent contractors faring fairly well, as long as they have a stable list of clientele, while low-skilled or low-educated workers having to grind hours in order to make a stable profit, and where “income stability remains a mirage” [5; p.480] for the majority.

Another well-known selling point of gig economy is the ability to “be your own boss!”, again, benefiting different actors in different ways. Being one’s own boss is roughly equated to potential flexibility in work but, as De Stefano astutely notes, “this flexibility on the workers’ side is often assumed to equate the undisputable flexibility the gig economy generally affords to businesses.” [5; p.479]. It should not come as a surprise that a model made by business benefits business most, but why would a model that allows freedom of temporal and spatial flexibility be bad for gig workers? After all, Bessa and Tomlinson note how “a range of studies show that employees are more motivated, perform better and even work harder when they have some control over their working time, location of work or schedule.” [20; p.157].

Explaining spatial flexibility, Zheng and Yang [2] note, it could be seen as a win-win condition for both workers and employers, where the former can choose their own workplace, improving efficiency and satisfaction, while the latter save on operating costs by not needing to rent working space. Although it could be argued that workers, in some cases, benefit from that spatial flexibility, not having an office is not an advantage in all cases, especially for people who do not live alone, do not have the possibility to equip a home-office, or do not have the financial possibilities to pay for all day long usage of utilities, externalized by businesses.

On the other hand, temporal flexibility is seen as “undoubtedly the embodiment of laborers’ control over the working process” [2; p.8], although they do allow the possibility of giggers overworking themselves in times of economic strains, compromising their health, safety, and output quality. Unfortunately, both flexibilities are criticized by some authors. De Stefano, for instance, argues that competition between workers, which is sometimes led on a global scale, “pushes compensations so down that people may be forced to work very long hours and give up a good deal of flexibility in order to make actual earnings.” [5; p.479]. Such a viewpoint is shared by Friedman, who argues that, as employment and income become more variable, workers are forced to work extra hard when they do manage to find tasks in order to compensate for down-times [4].

Wu et al. [21] openly challenge this fictitious flexibility arguing that, at least in the specific case of Uber in China, workers are left with far less flexibility than thought, all due to labour control strategies implemented by the platform. Enumerating three systems of “soft” control, namely economic control, emotional labour, and consent making, Wu and co-authors [21] argue that “being one’s own boss” is not always that simple. Explaining how platforms need to “actively manipulate drivers’ online time in order to accommodate the relatively high ride demands that accrue during peak hours” [21; p.584], the authors note that bonuses function as a highly effective economic control method. By offering bonuses, and guaranteeing a certain amount of money if the drivers did not meet their quotas, Uber successfully regulated flexibility by making drivers abide to simple conditions like working a set amount of minutes during peak periods, having high (above 4,7) customer ratings, completing at least 10 trips in

the previous week, and having a ride-completion (accepting requests and completing the ride) higher than 45 %. Quoting Wu et al. “such bonuses and subsidies constituted a major proportion of an Uber driver’s daily income, and in order to win these various bonuses, a driver would voluntarily extend online time and increase the number of rides offered beyond their own personal preferences” [21; p.585], we can easily see how fragile temporal flexibility can be in some cases, especially if we take into account their finding that drivers (especially those whose primary income came from Uber) would adapt their work schedules in order to accommodate customers during peak hours. Apart from economic control, another managerial method was found in the need of doing emotional labour to satisfy the customer evaluation system. As Wu and co-authors [21] note, the evaluation system, present, but by no means unique to Uber, functioned as a way to achieve hierarchical control without instituting organizational hierarchies by ranking drivers based on their customers’ satisfaction and disciplining them if and when needed. Such a point of view is shared by other authors like Glavin et al. [19] and De Stefano, who argues that “the technology-enabled possibility of receiving instant feedbacks and rates of workers’ performance is pivotal in ensuring businesses both flexibility and control at the same time.” [5; p.478]. Not only did this kind of surveillance serve to increase drivers’ trustworthiness, the authors argue it manipulated drivers insofar it was linked to bonuses (with low scores meaning no bonuses, which is seen as an economic punishment), which were in turn linked to peak hour bonuses, but it also pushed drivers with low scores to take on more work in hope to raise their ratings as they were calculated based on the last 500 rides, again, eroding temporal flexibility. Finally, through the process of consent making, Wu and others [21] argue that Uber used flexibility as a method to manufacture consent to its managerial strategies enabling drivers to retain a feeling of entrepreneurs by owning their own means of production and, at least to some extent, manage their own schedules. This nominal flexibility, authors argue, was used in order to make drivers more complacent when encountering reductions in pay rates, and less willing or able to unionize.

Finally, flexibility, much like profit generation, seems to be attainable only in some cases. Businesses will likely gain an economic advantage from this flexibilization, but gig workers do not always follow suit. This seems to be the case especially for those whose main source of income comes from gigging and cannot, like in China’s Uber example, take the liberty to refuse riding in peak times and for long hours just in order to make as many bonuses as possible. Being one’s own boss and working flexibly, be it temporally or spatially, does not seem to deliver on its promises of better balancing work-life relations. Sometimes, on the contrary, as Bessa and Tomlinson argue, these types of flexible contracts can even be “a source of anxiety for working parents, as these contracts prevent them from being able to plan and manage their finances and ‘fragmented’ time” [20; p.159]. In the end, even the sense of independence that comes with such flexible work arrangements can be put into (perhaps not that paranoid) question if one awakens to the ability platforms have of “uninterrupted 24/7 real-time monitoring of workers, likely raising the mental stress produced by close monitoring”, as Muntaner notes [12; p.599].

Finally, one last understated, and perhaps not enough researched aspect of gig work is one’s mental resilience and social needs. Although Churchill and Lyn note how “gig workers are able to avoid some of the more challenging aspects of the modern work-place, such as schedules, supervision, and *co-workers*” [1; p.742, emphasis added], with the absence of supervision already being questioned, the absence of co-workers and social relations at work is something that should not be undervalued. Urzì Brancati et al. argue that the atomization of jobs into tasks and the subsequent shifting of jobs into gigs would have an impact “beyond work organizations, as jobs are not only contracts for the provision of labour services, but, in

Durkheim's words, they are a crucial anchor of 'organic solidarity', a system of representation rooted in and reflective of concrete social groups." [7; p.4]. Trying to explore the social and psychological ramifications of mostly working alone, and not having stable co-workers, in the wake of many researchers considering "the workplace as a key setting for forging social connections and a sense of belonging" [19; p.9], the authors conducted research on Uber drivers based on powerlessness, and loneliness. Fully aware that isolation can be used to prevent collective actions and that it can lead to the erosion of social contact between workers and organizations, they found that, perhaps unsurprisingly, platform workers report indeed greater levels of powerlessness and loneliness compared to the "standard" working force. Although few in numbers, research like these should find their place in exploring the, sometimes unexpected, far reaching effects of "gigging alone" and its consequences on workers, their social capital and overall work-life satisfaction.

CONCLUSION

As the use of technology permeates social and work life at an increasing pace, giving us ever more possibilities and ways to conduct business and socialize, sometimes for the better, sometimes for the worse, sociological thought must find its place in analysing, questioning and, when necessary, criticizing novel modalities of work.

Although gig work, or platform work, or independent work or any other name it goes by, is not a new phenomenon, it did indeed gain traction in the previous decade with the rise of global and powerful platforms and corporations. As such, gig work provided a lot of inspiration for social scientists and researchers, spanning across the borders of law, economics, sociology, political sciences, psychology, as well as philosophy. While the problem of gig work research does not seem to be its lack of documentation (one could argue its problem being the exact opposite) gig work does seem to be a phenomenon that, a few decades from its origin, is yet to be defined coherently and, if needed, merged with other types of independent work in order to be better understood.

Unfortunately, defining gig work does not seem to be under the jurisdiction of social sciences but it finds itself in the hands of policy makers whom, numerous authors, urge to regulate its meaning, rights and obligations, not only in order to make it easier to research but in order to pull gig workers out of their limited financial security.

Although the scope of this article was to shed some light on the definitions of gig work and its evolution, as well as to question its benefits and its beneficiaries, this matter will, at least in part, remain unresolved yet again. As definitions of gig work vary with every author and every research adding or subtracting some details, its origin (and consequently its goal) seems to be less elusive. Finding it in a combination of economics and information technology gig work's mission is seen in lowering expenditures and boosting flexibility in the contemporary economy. Unfortunately, that kind of mission does come with a price, and with lack of regulations platforms currently enjoy, that price is easily externalized to workers. Said workers, although expecting (and sometimes being promised) flexibility in both space and time of work, a healthy work-life balance, the possibility of being their own boss while gaining constant and high profits are not always able to achieve all, if any of the promised benefits. And while it is true that some independent workers, under some very specific circumstances, do enjoy this kind of gig, the majority of benefits is still reserved for the platforms and their owners who, in the process of commodifying and automatizing work, are paying little to no attention to the possible consequences of a major platformization of the economy.

REFERENCES

- [1] Churchill, B. and Lyn, C.: *Gender in the gig economy: Men and women using digital platforms to secure work in Australia*.
Journal of Sociology **55**(4), 741-761, 2019,
<http://dx.doi.org/10.1177/1440783319894060>,
- [2] Zheng, Q. and Yang, W.: *The Characteristics of The Gig Economy*.
Cambridge Open Engage, 2020,
<http://dx.doi.org/10.33774/coe-2020-ldcpg>,
- [3] Täuscher, K. and Laudien, S.M.: *Understanding platform business models: A mixed methods study of marketplaces*.
European Management Journal **36**(3), 319-329, 2018,
<http://dx.doi.org/10.1016/j.emj.2017.06.005>,
- [4] Friedman, G.: *Workers without employers: Shadow corporations and the rise of the gig economy*.
Review of Keynesian Economics **2**(2), 171-188, 2014,
<http://dx.doi.org/10.4337/roke.2014.02.03>,
- [5] De Stefano, V.: *The Rise of the “just-in-time workforce”: on-demand work, crowdwork, and labor protection in the “gig-economy”*.
Comparative Labor Law & Policy Journal **37**(3), 471-504, 2016,
<http://dx.doi.org/10.1080/01442872.2016.1188913>,
- [6] Wood, A.J.; Graham, M.; Lehdonvirta, V. and Hjorth, I.: *Networked but Commodified: The (Dis)Embeddedness of Digital Labour in the Gig Economy*.
Sociology **53**(5), 931-950, 2019,
<http://dx.doi.org/10.1177/0038038519828906>,
- [7] Urzì Brancati, M.C.; Pesole, A. and Fernández-Macías, E.: *New evidence on platform workers in Europe*.
Results from the second COLLEEM survey, EUR 29958 EN, Publications Office of the European Union, Luxembourg, 2020,
- [8] Abraham, K.G.; Haltiwanger, J.C.; Sandusky, K. and Spletzer, J.R.: *Measuring the Gig Economy: Current Knowledge and Open Issues*.
AEA Papers and Proceedings **109**, 357-361, 2019,
<http://dx.doi.org/10.1257/pandp.20191039>,
- [9] Manyika, J. et al.: *Independent work: choice, necessity, and the gig economy*.
McKinsey Global Institute, San Francisco, 2016,
- [10] Gallup: *Put the Gig Economy to Work for You*.
Gallup, Washington, 2018,
- [11] Roy-Mukherjee, S. and Harrison, M.: *The Shifting Boundaries of Capitalism and the Conflict of Surplus Value Appropriation within the Gig Economy*.
In: Page-Tickell, R. and Yerby, E. eds.: *Conflict and Shifting Boundaries in the Gig Economy: An Interdisciplinary Analysis*.
Emerald Publishing, Bingley, pp.45-62, 2020,
- [12] Muntaner, C.: *Digital Platforms, Gig Economy, Precarious Employment, and the Invisible Hand of Social Class*.
International Journal of Health Services **48**(4), 597-600, 2018,
<http://dx.doi.org/10.1177/0020731418801413>,
- [13] Vallas, S. and Schor, J.B.: *What Do Platforms Do? Understanding the Gig Economy*.
Annual Review of Sociology **46**, 273-294, 2020,
<http://dx.doi.org/10.1146/annurev-soc-121919-054857>,
- [14] Statista: *Number of available apps in the Apple App Store from 2008 to 2020*.
<https://www.statista.com/statistics/268251/number-of-apps-in-the-itunes-app-store-since-2008>,
accessed 6th March 2021,

- [15] Statista: *Number of available applications in the Google Play Store from December 2009 to December 2020*.
<https://www.statista.com/statistics/266210/number-of-available-applications-in-the-google-play-store>, accessed 6th March 2021,
- [16] Arcidiacono, D.; Gandini, A. and Pais, I.: *Sharing what? The 'sharing economy' in the sociological debate*.
The Sociological Review Monographs **66**(2), 275-288, 2018,
<http://dx.doi.org/10.1177/0038026118758529>,
- [17] Abraham, et al.: *Measuring the Gig Economy: Current Knowledge and Open Issue*.
Social Science Research Network (w24950), 1-52, 2018,
- [18] Findlay, P. and Thompson, P.: *Contemporary work: Its meanings and demands*.
Journal of Industrial Relations **59**(2), 1-117, 2017,
<http://dx.doi.org/10.1177/0022185616672251>,
- [19] Glavin, P.; Bierman, A. and Schieman, S.: *Über-Alienated: Powerless and Alone in the Gig Economy*.
The Canadian Quality of Work and Economic Life Study (C-QWELS) Project,
- [20] Bessa, I. and Tomlinson, J.: *Established, accelerated and emergent themes in flexible work research*.
Journal of Industrial Relations **59**(2), 153-169, 2017,
<http://dx.doi.org/10.1177/0022185616671541>,
- [21] Wu, Q.; Zhang, H.; Li, Z. and Liu, K.: *Labor control in the gig economy: Evidence from Uber in China*.
Journal of Industrial Relations **61**(4), 574-596, 2019,
<http://dx.doi.org/10.1177/0022185619854472>.

CORPORATE SOCIAL RESPONSIBILITY OF EXPORT ORGANIZATIONS: RELATION BETWEEN STRATEGY, ACTIVITIES AND COMMUNICATION ON FOREIGN MARKETS

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ABSTRACT

The concept of corporate social responsibility has been recognized as a successful differentiation strategy for European export organizations in foreign markets. In the time of unprecedented global social, humanitarian, and economic challenges that we face today, the concept comes into the focus of most global stakeholders as never before in history. Still, the existing literature lacks a deeper analysis of differentiation on foreign markets based on corporate social responsibility. This article aims to analyse the relation between socially responsible strategy, activities and communication of export organizations in foreign markets. Empirical research was done on a sample of 78 medium and large sized Croatian export organizations. Research results reveal the importance and positive influence of inclusion of corporate social responsibility in organizational strategy on socially responsible activities and communication channels and principles in foreign markets.

KEY WORDS

corporate social responsibility, export, foreign market, CSR strategy

CLASSIFICATION

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INTRODUCTION

As the EU is moving strongly towards the achievement of the Sustainable Development Goals (SDGs) and Europe's climate neutrality by 2050, corporate social responsibility (CSR) becomes a necessity. In today's highly challenging business global environment, management strategic orientation on the concept of CSR becomes even more important, that the concept is strategically and operationally aligned with the social economic, ethical and moral values of the broader community [1]. As stakeholders become more and more exposed to the effects of the global online market in most industries on a daily basis, individuals' awareness of social issues is no longer local or national but global. Such a global level of awareness continually increases pressure on companies to strategically effectively implement and communicate social responsibility to all stakeholders [2].

When export organizations move beyond their domestic market, they have to comply with internationally required safety, quality, and CSR standards [3]. Moreover, they face the issue of liability of foreignness [4], as of their non-native status in the foreign market, thus CSR can help them overcome this obstacle [5]. Besides this, their CSR activities on foreign markets, can also be motivated by the fact that CSR can help create or reinforce corporate image [6], gain higher visibility, mitigate risk, have greater availability of funds, optimise ideas and increase innovative solutions for stakeholders [7].

Differentiation of products and services based on CSR, as an important element of the organizational strategy, is becoming an increasingly important factor in achieving strategic goals in foreign markets. It implies that a unique position in the market can be achieved by having a reputation of the responsible organization, offering responsible products or services, and by consideration of multiple stakeholders in organizational value chain [8]. It is necessary to ensure that the entire supply chain of the company functions in accordance with social and environmental standards [9]. Still, the question is how to design and coordinate CSR activities and multiple shareholder relations, as well as to priorities them [10].

In that existing literature, there is a scarcity of research that investigates differentiation based on CSR and how it is linked with CSR activities and communication on foreign markets. In that sense, this article aims to analyse the relation between CSR strategy, activities and communication of export organizations in foreign markets. We test for the effects of inclusion of CSR, as a crucial part of organizational strategy, on CSR activities and communication when organizations operate in host markets. The theoretical part of the article is supplemented with empirical research on a sample of 78 export organizations from Croatia. This is followed by a discussion of the main research results and implications of the conducted research.

IMPORTANCE OF CORPORATE SOCIAL RESPONSIBILITY ON FOREIGN MARKETS

Globalization and international interconnectedness of foreign markets have enabled profit and non-profit organizations, perceived in the global community as socially responsible entities, among other things, to further strengthen their competitive advantage by successfully differentiating through the concept of CSR [11]. As the range of socially responsible activities will expand daily, the management of export companies must find methods to create coherence in the strategic and operational part of CSR because it is a necessary postulate for maintaining competitive advantage in the global market and social sustainability [12]. To successfully differentiate in domestic or export markets, it is necessary to ensure that the entire supply chain of the company, but also the sales and marketing activities in the markets,

function in accordance with social and environmental standards. In that way stakeholders, through communication with the company, successfully differentiate that kind of organization from domestic or foreign competition [13].

CSR activities are viewed as a tool that creates a positive impact of business activities on society and the environment, which in turn leads to a better reputation and higher profitability rates in different markets [14]. The concept of CSR is a perfect tool for export companies to transfer a positive reputation to foreign markets [15]. CSR creates a more positive reputation with internal and external stakeholders, ensures higher profitability rates, and attracts sophisticated and socially responsible investors [16]. As this is a process that can take several years, it is very difficult for competing companies to mimic the process of CSR differentiation efficiently and in a short time [17].

Differentiation based on social responsibility is also suitable for smaller companies because it does not require, as opposed to differentiation based on innovation or quality, a strong innovation structure and associated high costs [18]. The benefits of differentiation based on CSR, emerge as a result of consumers' willingness to pay more for products and services marketed by socially responsible organizations [19].

The most difficult task of management is to determine the financially justified limit at which investing in CSR achieves the highest financial returns because misjudging that limit will create additional costs which can steer the entity toward the abyss, both reputational and financial [20]. The greatest harm to export companies can occur if the concept of CSR is approached philanthropically or spontaneously. Only with a strategic approach based on new digital technologies does the company's management control the environmental, social, and economic line of business, regardless of whether it is a domestic or foreign market [21].

CORPORATE SOCIAL RESPONSIBILITY STRATEGY ROLE IN ACTIVITIES AND COMMUNICATION IN FOREIGN MARKETS

CSR strategy presents an agenda for managing organizational impacts on society and the environment [10], creating social and economic value, with the inseparability of these two values. It presents activities and policies unique to organizational context, and that take into consideration the needs of stakeholders and the triple bottom line of economic, social, and environmental performance [22, 23].

A successful differentiation in the eyes of stakeholders can be achieved when CSR strategy becomes an integral part of the company's business strategy. This strategy of differentiation through the concept of CSR is more often a logical choice because even smaller strategic investments in certain CSR activities can generate the greatest benefits through strengthening consumer loyalty who are willing to pay even higher margins to support such management policy [24]. For such loyalty and connection between the organization, consumers, and other stakeholders, it is important that management, in addition to conducting socially responsible activities, knows how to communicate the same activities transparently using primarily digital media, but also traditional media on certain markets, so that stakeholders can successfully identify with the organization and its ideas [25].

A prerequisite for successful differentiation based on CSR activities is the awareness of internal and external stakeholders about the implementation of the concept of social responsibility in business processes. In this context, the choice of communication channels for reporting on CSR activities and the content of the message to stakeholders are key factors for successful and sustainable differentiation [26]. To succeed in communicating CSR in

domestic and foreign markets, management is required to identify target stakeholders and their interests. Furthermore, management has to develop the most effective communication channels through which dialogue with stakeholders allows management to understand which community problems are most important and sometimes even how to solve them [27]. The growing power of global stakeholders and the emergence of digital communication have created an environment in which new strategic models of approaching the concept of CSR are continuously being developed [28]. Just as profit and non-profit organizations have internationalized their operations over the past decade, stakeholders are becoming global players creating perceptions of organizations by following digital international media and social networks and increasingly rewarding socially responsible companies around the world by buying their products through online markets [29].

METHODOLOGY OF RESEARCH

STUDY DESIGN AND MEASUREMENT ITEMS

To test for the relation among CSR strategy, activities and communication of export organizations on a foreign market, empirical research was designed and conducted. Two main research propositions (RP) were tested for:

RP₁: Inclusion of CSR in organizational strategy has a positive effect on CSR activities in foreign markets.

RP₂: Inclusion of CSR in organizational strategy has a positive effect on CSR communication in foreign markets.

A survey method and an anonymous questionnaire as a research instrument were used for data gathering.

To assess the level of *inclusion of CSR in organizational strategy*, a construct measuring the representation of CSR in the company's strategy was formed. This construct is based on the main dimensions of CSR as defined by ISO 260 000 [30], as well as definitions of organizational strategy and its characteristics as defined by Galbreath, [31] and Tipurić [32]. By using the Likert 5-point scale (1 – strongly disagree, 5 – strongly agree), we asked respondents from each participating organization to evaluate their level of agreement with the provided statements.

CSR activities in foreign markets were analysed through seven dimensions defined by ISO 26000: environment, human rights, labour practices, organization governance, fair operation practices, consumer issues problems and contribution to the community and society [30]. By using the Likert 5-point scale (1 – not being implemented at all, ..., 5 – continuously implemented), we asked respondents to rate the presence of each activity in their organization.

Communication of CSR in foreign markets was measured by the intensity of use and degree of development of communication of the export company with groups of stakeholders in foreign markets. Intensity and degree of development refer to:

- use of communication channels – four main channels of CSR communication analysed were: social responsibility reports, web pages, social networks, and advertising [33]
- development of communication assessed through the implementation of the principles of communication: 1) balance; 2) comparability; 3) accuracy; 4) timeliness; 5) clarity, and (6) reliability [34].

Each participant was asked to assess the statements referring to the level of development of each communication channel and the principles of communication by using the Likert 5-point scale (1 – not being implemented at all, ..., 5 – continuously implemented).

SAMPLE CHARACTERISTICS

Empirical research was sent to medium and large export companies in Croatia that had an income from their export activities at a minimum of 25 % of total revenue. Sampling was done based on the data provided by the Croatian Exporters Association. Responses were obtained from 78 of the 220 companies that met the criteria. The study was conducted over a period of three weeks. In companies, the survey was answered by the owners or management of the company.

Sample characteristics are provided in Table 1.

Table 1. Sample characteristics.

Size				
Medium (50 to 250 employees)		Large (more than 250 employees)		
48,7 %		51,3 %		
Industry				
manufacturing	wholesale and retail trade	repair of motor vehicles and motorcycles	services	other
48,7 %	14,1 %	14,1 %	10,3 %	12,8 %
Ownership				
domestic	< 25 % foreign	25-50 % foreign	50-75 % foreign	75 % > foreign
59,0 %	5,1 %	9,0 %	3,8 %	23,1 %
Market orientation				
B2B market		B2C market		
75,6 %		24,4 %		
Share of exports in total revenue				
between 21 and 40 %	between 41 and 60 %	between 61 and 80 %	between 81 and 100 %	
29,5 %	19,3 %	19,2 %	32,1 %	
Main export markets				
South East Europe	European Union	NAFTA (Canada, USA, Mexico)	Other	
34,6 %	46,2 %	5,1 %	14,1 %	

RESEARCH RESULTS

DESCRIPTIVE STATISTICS

Results of descriptive statistics indicate respondents give on average high grades for different variables oriented towards measuring representation of CSR within the organizational strategy (Table 2). The highest average value is indicated for CSR being incorporated within company strategy as one of key strategy elements (CSR_STRATEG_1) and CSR being represented in company mission which is the key element of company strategy (CSR_STRATEG_2).

Table 2. Descriptive statistics for variable inclusion of CSR in organizational strategy (1 – strongly disagree, ..., 5 – strongly agree).

Variable	Description	Average	St. Dev.
CSR_STRAT_1	CSR is incorporated within company strategy as one of the key strategy elements	4,23	0,805
CSR_STRAT_2	CSR is represented in the company mission which is the key element of company strategy	4,19	0,722
CSR_STRAT_3	CSR is represented within the analysis of internal and external influences which is the key element of company strategy	3,82	0,936
CSR_STRAT_4	CSR is represented within the market analysis which is the key element of company strategy,	3,69	0,944
CSR_STRAT_5	CSR is represented within the consumer analysis, as primary stakeholders, which is the key element of company strategy,	3,85	0,823
CSR_STRAT_6	CSR is represented during the allocation of key company resources necessary for conducting socially responsible activities,	3,71	0,941
CSR_STRAT_7	CSR is planned as an activity which contributes to achieving competitive advantage,	3,95	0,952

With regard to CSR activities, results reveal export organizations on foreign markets implement different CSR activities significantly (Table 3). Mostly implemented are activities regarding labour practices (average 4,60), human rights (average 4,54), and environment (average 4,51).

Table 3. CSR activities of export organizations in foreign markets (1 – not being implemented at all, ..., 5 – continuously implemented).

Variable	Average	St. Dev.
Organization governance	3,95	1,068
Human right	4,54	0,733
Labor practices	4,60	0,631
Environment	4,51	0,698
Fair operation practices	4,22	0,832
Consumer issues and problems	4,28	0,788
Contribution to the community and society	3,92	0,894

Table 4. CSR communication channels and principles of communication (1 – not being implemented at all, ..., 5 – continuously implemented).

Dimension	Variable	Average	St. Dev.
Communication channels	CSR reports	3,81	1,228
	Web pages	3,68	1,274
	Social networks	3,23	1,395
	Advertising	2,69	1,332
Principles of communication	Balance	3,49	0,894
	Comparability	3,65	0,914
	Accuracy	3,86	0,785
	Timeliness	3,55	0,949
	Clarity	3,68	0,785
	Reliability	3,82	0,879

Table 4 presents the CSR communication channels and principles of communication. CSR reports (average 3,81) together with web pages (average 3,68) as communication channels are mostly used. As to communication principles defined by Global Reporting Initiative (GRI) guidelines, results reveal companies in their communication are guided by principles of balance, comparability, accuracy, timeliness; clarity and reliability, as average marks for all principles are high (ranging from 3,49 to 3,86).

For further analysis sum values of construct CSR representation in organizational strategy, CSR activities, and CSR communication, have been developed and presented in table 5. Internal consistency of items within the scales, indicated their reliability, as the values of Cronbach's alpha are higher than 0,7 as recommended by Kim and Feldt [35].

Table 5. Descriptive statistics for sum values of constructs used.

	N	Average	St. Dev.	Cronbach's Alpha
CSR_STRAT	78	3,92	0,66	0,873
CSR_ACTIVITY	78	4,29	0,63	0,844
CSR_COMMUNICATION	78	3,55	0,68	0,841

Multicollinearity has been analysed using correlation analysis and by calculating VIF coefficients. Since none of the correlation coefficients among independent variables was lower than 0,85, and since VIF coefficients were lower than the threshold value of 5, it was concluded that multicollinearity is not present in the dataset.

TESTING OF RESEARCH PROPOSITIONS

Our first research proposition analyses if the inclusion of CSR in organizational strategy has a positive effect on CSR activities in foreign markets. To test this, we used a regression model.

Table 6 presents a model summary of a regression model with CSR activities as a dependent variable. The adjusted coefficient of determination indicates that the model explains a 63,2 % variance in dependent variable CSR activities. The Durbin-Watson coefficient is 2,007, which indicates that there is no problem with autocorrelation in the model.

Table 6. Regression model summary (dependent variable: CSR activities; independent variable: inclusion of CSR in organizational strategy).

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0,816	0,666	0,632	0,380	2,007

Table 7. Coefficients of the regression model (dependent: CSR activities; independent variable: inclusion of CSR in organizational strategy).

	Unstandardized Coefficients		Standardized Coefficient	t	Sign.
	B	Std. Error	Beta		
(Constant)	1,443	0,304		4,752	0,000***
CSR_STRAT_1	0,240	0,073	0,308	3,281	0,002***
CSR_STRAT_2	0,089	0,079	0,102	1,121	0,266
CSR_STRAT_3	0,168	0,071	0,251	2,368	0,021**
CSR_STRAT_4	0,154	0,073	0,232	2,124	0,037**
CSR_STRAT_5	-0,037	0,065	-0,048	-0,569	0,571
CSR_STRAT_6	-0,038	0,069	-0,057	-0,552	0,583
CSR_STRAT_7	0,134	0,061	0,203	2,186	0,032**

*** statistically significant with 1 % probability, ** statistically significant with 5 % probability

As ANOVA test has been statistically significant at the probability level of 1 %, ($F(7, 70) = 19,924$) leading to the conclusion that at least one independent variable has a statistically significant impact on dependent variable CSR communication, we further tested each particular variable related to the inclusion of CSR in organizational strategy (as an independent variable) and its effect on CSR communication (dependent variable). Table 7 presents the coefficients of this regression model.

Results indicate that variables CSR_STRAT_1 (CSR is incorporated within company strategy as one of the key strategy elements), CSR_STRAT_3 (CSR is represented within the analysis of internal and external influences which is the key element of company strategy), CSR_STRAT_4 (CSR is represented within the market analysis which is the key element of company strategy) and CSR_STRAT_7 (CSR is planned as an activity which contributes to achieving competitive advantage) have a statistically significant influence on CSR activities of export organizations on foreign markets.

Our second research proposition analyzes if inclusion of CSR in organizational strategy has a positive effect on CSR communication in foreign markets.

Table 8 represents a regression model summary with CSR communication as the dependent variable. The adjusted coefficient of determination indicates that the model explains 48,3 % variance in the dependent variable CSR communication. The Durbin-Watson coefficient is 1,688, which indicates that there is no problem for autocorrelation in the model.

Table 8. Regression model summary (Dependent variable: CSR communication; Independent variable: inclusion of CSR in organizational strategy).

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0,729	0,531	0,483	0,487	1,688

As ANOVA test has been statistically significant at the probability level of 1 %, ($F(7, 69) = 11,161$) leading to the conclusion that at least one independent variable has a statistically significant impact on dependent variable CSR communication, we further tested each particular variable related to the inclusion of CSR in organizational strategy (as an independent variable) and its effect on CSR communication (dependent variable). Table 9 presents the coefficients of this regression model.

Table 9. Coefficients of the regression model (dependent: CSR communication; independent variable: inclusion of CSR in organizational strategy).

	Unstandardized Coefficients		Standardized Coefficient	t	Sign.
	B	Std. Error	Beta		
(Constant)	0,618	0,393		1,575	0,120
CSR_STRAT_1	0,090	0,094	0,107	0,959	0,341
CSR_STRAT_2	0,101	0,101	0,108	0,997	0,322
CSR_STRAT_3	0,147	0,091	0,202	1,615	0,111
CSR_STRAT_4	0,112	0,093	0,155	1,204	0,233
CSR_STRAT_5	0,160	0,083	0,193	1,925	0,058*
CSR_STRAT_6	-0,069	0,088	-0,096	-0,787	0,434
CSR_STRAT_7	0,207	0,078	0,290	2,644	0,010**

** statistically significant with 5 % probability, * statistically significant with 10 % probability

Results indicate that variables CSR_STRAT_5 (CSR is represented within the consumer analysis, as primary stakeholders, which is the key element of company strategy) and CSR_STRAT_7 (CSR is planned as an activity which contributes to achieving competitive

advantage) have a statistically significant influence on CSR communication of export organizations on export markets.

DISCUSSION AND CONCLUSION

It is clear that modern society needs to change, how to bridge the sustainability gap through rewiring the economy becomes the most important question for modern leaders. The EU's Green Deal, a 1 trillion-euro investment plan to reduce greenhouse gas emissions by 55 % in 2030 (relative to 1990 levels), has been recognized as the first comprehensive plan to achieve climate neutrality at a continental scale. As the green economy becomes a new paradigm in the EU, the struggle for stakeholder support in all industries is growing. As of the growing importance of the concept of CSR, the emergent complexity of the challenges facing the global community, but also a growing number of stakeholders, it is clear that companies operating internationally will need more financial and non-financial resources for the concept of CSR to survive on the global stage and maintain targeted profitability [24]. In addition to strategic investments in the concept of CSR, the key to entry and sustainable growth in foreign markets through differentiation based on CSR can be achieved only through dialogue and open communication with internal and external stakeholders. A one-way communication towards stakeholders can be counterproductive and jeopardize the reputation and consequently the entire investment [36].

This article was oriented towards analysis of the relation between CSR strategy, activities, and communication of export organizations. We tested for the effects of inclusion of CSR, as a crucial part of organizational strategy, on CSR activities and communication of 78 medium-sized and large export organizations from Croatia operating in foreign markets. The results of the empirical research point towards the importance and positive influence of inclusion of CSR in organizational strategy, on CSR activities and communication channels and principles in foreign markets. More specifically, when CSR is incorporated within a company strategy, when it is represented within the analysis of internal and external influences and within the market analysis but also when CSR is planned as an activity that contributes to achieving competitive advantage this can have a statistically significant influence on CSR activities of export organizations on foreign markets. Also, results show, that regarding communication channels and principles, when CSR is represented within the consumer analysis, and when CSR is planned as an activity that contributes to achieving competitive advantage this has a statistically significant influence on CSR communication of export organizations on foreign markets.

However, results have to be seen in the light of research limitations, primarily relating to sample size and its characteristics, such as the inclusion of only medium and large-sized organizations from Croatia. Furthermore, many mediating and moderating variables can affect the CSR behaviour of export organizations on the foreign markets which were not included in this research. For instance, it would be interesting to see if specifics of foreign market itself, such as its regulatory framework can have a higher effect on the level and type of CSR activities and communication on a foreign market. Also, to further understand the behaviour of export organisations in terms of their CSR, it would be interesting to compare its CSR behaviour on the both domestic and export markets.

Despite these limitations, it can be concluded that this article provided some additional insight into the relationship between the inclusion of CSR in organizational strategy on CSR activities and communication channels and principles in foreign markets. And that research results can be seen as a starting point for further research on this subject. It has to be emphasized that the growing focus of consumers on the concept of CSR can be considered a global phenomenon that in the upcoming years will be even more important, and

consequently continue to be an increasingly important topic for top management of companies operating globally, regardless of industry or domicile market [37, 38]. Therefore, additional research is necessary. Not only financial benefits but also new market opportunities, in both domestic and foreign markets, long – term business profitability and continued stability are expected for companies that will know how to incorporate CSR in their organizational strategy and take into consideration the needs of their internal and external stakeholders [29], activities and communication.

REFERENCES

- [1] O'Connor, A. and Meister, M.: *Corporate social responsibility attribute rankings*. Public Relations Review **34**(1), 49-50, 2008, <http://dx.doi.org/10.1016/j.pubrev.2007.11.004>,
- [2] Di Giuli, A. and Kostovetsky, L.: *Are red or blue companies more likely to go green? Politics and corporate social responsibility*. Journal of Financial Economics **111**(1), 158-180, 2014, <http://dx.doi.org/10.1016/j.jfineco.2013.10.002>,
- [3] Reis, G.G. and Molento, C.F.M.: *Emerging market multinationals and international corporate social responsibility standards: bringing animals to the fore*. Journal of Business Ethics **166**(2), 351-368, 2020, <http://dx.doi.org/10.1007/s10551-019-04144-5>,
- [4] Campbell, J.T.; Eden, L. and Miller, S.R.: *Multinationals and corporate social responsibility in host countries: Does distance matter?* Journal of International Business Studies **43**(1), 84-106, 2012, <http://dx.doi.org/10.1057/jibs.2011.45>,
- [5] Bai, X.; Chang, J. and Li, J.J.: *How do international joint ventures build legitimacy effectively in emerging economies? CSR, political ties, or both?* Management International Review **59**(3), 387-412, 2019, <http://dx.doi.org/10.1007/s11575-019-00382-x>,
- [6] Zyglidopoulos, S.; Williamson, P. and Symeou, P.: *The corporate social performance of developing country multinationals*. Business Ethics Quarterly **26**(3), 379-406, 2016, <http://dx.doi.org/10.1017/beq.2016.41>,
- [7] Godos-Díez, J.L.; Cabeza-García, L. and Fernández-González, C.: *Relationship between corporate social responsibility (CSR) and internationalisation strategies: a descriptive study in the Spanish context*. Administrative Sciences **8**(4), 57, 2018, <http://dx.doi.org/10.3390/admsci8040057>,
- [8] Cruz, L.B.; Boehe, D.M. and Ogasavara, M.H.: *CSR-based differentiation strategy of export firms from developing countries: An exploratory study of the strategy tripod*. Business & Society **54**(6), 723-762, 2015, <http://dx.doi.org/10.1177/0007650312473728>,
- [9] Boehe, D.M. and Cruz, L.B.: *Corporate social responsibility, product differentiation strategy and export performance*. Journal of Business Ethics **91**(2), 325-346, 2010, <http://dx.doi.org/10.1007/s10551-010-0613-z>,
- [10] Markota Vukić, N. et al.: *Leadership for Sustainability: Connecting Corporate Responsibility Reporting and Strategy*. In: Dođru, C.: *Leadership Styles, Innovation, and Social Entrepreneurship in the Era of Digitalization*. IGI Global, pp.44-72, 2020,

- [11] Lee, C.K. et al.: *The impact of CSR on casino employees' organizational trust, job satisfaction, and customer orientation: an empirical examination of responsible gambling strategies.*
International Journal of Hospitality Management **33**(1), 406-415, 2013,
<http://dx.doi.org/10.1016/j.ijhm.2012.10.011>,
- [12] Lim, J.S. and Greenwood, C.A.: *Communicating corporate social responsibility (CSR): Stakeholder responsiveness and engagement strategy to achieve CSR goals.*
Public Relations Review **43**(4), 768-776, 2017,
<http://dx.doi.org/10.1016/j.pubrev.2017.06.007>,
- [13] Chun, S. and Cho, E.: *Differentiation strategy, CSR, and real activities earnings management: Evidence from Korea.*
Journal of Applied Business Research (JABR) **33**(4), 669-692, 2017,
<http://dx.doi.org/10.19030/jabr.v33i4.9988>,
- [14] Kanji, G.K. and Chopra, P.K.: *Corporate social responsibility in a global economy.*
Total Quality Management **21**(2), 119-143, 2010,
<http://dx.doi.org/10.1080/14783360903549808>,
- [15] Gjoberg, M.: *The origin of corporate social responsibility: Global forces or national legacies?*
Socio-economic Review **7**(4), 605-637, 2009,
<http://dx.doi.org/10.1093/ser/mwp017>,
- [16] Beardsell, D.J.: *The influence of CSR disclosure on corporate governance and company performance.*
SMC Working paper., 2008,
<http://dx.doi.org/10.2139/ssrn.1302314>,
- [17] Cruz, L.B. and Boehe, D.M.: *CSR in the global market place: Towards sustainable global value chains.*
Management Decision **8**(46), 1187-1209, 2008,
<http://dx.doi.org/10.1108/00251740810901381>,
- [18] Boulouta, I. and Pitelis, C.N.: *Who needs CSR? The impact of corporate social responsibility on national competitiveness.*
Journal of Business Ethics **119**(3), 349-364, 2014,
<http://dx.doi.org/10.1007/s10551-013-1633-2>,
- [19] Reinhardt, F.L. *Environmental product differentiation: Implications for corporate strategy.*
California Management Review **40**(4), 43-73, 1998,
<http://dx.doi.org/10.2307/41165964>,
- [20] Samet, M. and Jarboui, A.: *How does corporate social responsibility contribute to investment efficiency?*
Journal of Multinational Financial Management **40**(C), 33-46, 2017,
<http://dx.doi.org/10.1016/j.mulfin.2017.05.007>,
- [21] Marques-Mendes, A. and Santos, M.J.: *Strategic CSR: an integrative model for analysis.*
Social Responsibility Journal **12**(2), 363-381, 2016,
<http://dx.doi.org/10.1108/SRJ-04-2015-0055>,
- [22] Aguinis, H.: *Organizational responsibility: Doing good and doing well.*
In: Zedeck, S. ed.: *APA handbook of industrial and organizational psychology.*
American Psychological Association, Washington, DC, pp.855-879, 2011,
- [23] Aguinis, H. and Glavas, A.: *What we know and don't know about corporate social responsibility: A review and research agenda.*
Journal of Management **38**(4), 932-968, 2012,
<http://dxdoi.org/10.1177/0149206311436079>,
- [24] Li, J.; Zhang, F. and Sun, S.: *Building consumer-oriented CSR differentiation strategy.*
Sustainability **11**(3), 664, 2019,
<http://dx.doi.org/10.3390/su11030664>,

- [25] Kim, S.: *The process model of corporate social responsibility (CSR) communication: CSR communication and its relationship with consumers' CSR knowledge, trust, and corporate reputation perception.*
Journal of Business Ethics **154**(4), 1143-1159, 2019,
<http://dx.doi.org/10.1007/s10551-017-3433-6>,
- [26] McWilliams, A. and Siegel, D.S.: *Corporate social responsibility: a theory of firm perspective.*
The Academy of Management Review **26**(1), 117-127, 2001,
<http://dx.doi.org/10.5465/amr.2001.4011987>,
- [27] Golob, U. and Podnar, K.: *Corporate social responsibility communication and dialogue.*
In: Ihlen, Ø.; Bartlett, J.L. and May, S., eds.: *The Handbook of Communication and Corporate Social Responsibility.*
Wiley, New York, pp.231-251, 2011,
- [28] Cho, C.H.; Phillips, J.R.; Hageman, A.M. and Patten, D.M.: *Media richness, user trust, and perceptions of corporate social responsibility.*
Accounting, Auditing & Accountability Journal **22**(6), 933-952, 2009,
<http://dx.doi.org/10.1108/09513570910980481>,
- [29] Anastasiadou, E.; Lindh, C. and Vasse, T.: *Are consumers international? A study of CSR, cross-border shopping, commitment and purchase intent among online consumers.*
Journal of Global Marketing **32**(4), 239-254, 2009,
<http://dx.doi.org/10.1080/08911762.2018.1528652>,
- [30] ISO: *Guidance on social responsibility, International Standard, ISO/FDIS 26000.*
ISO, Geneva, 2010,
- [31] Galbreath, J.: *Building corporate social responsibility into strategy.*
European Business Review **21**(2), 109-127, 2008,
<http://dx.doi.org/10.1108/09555340910940123>,
- [32] Tipurić, D.: *Iluzija strategije - Razotkrivanje socijalno konstruirane zbilje poduzeća.* In Croatian.
Sinergija nakladništvo, Zagreb, 2014.
- [33] Birth, G.; Illia, L.; Lurati, F. and Zamparini, A.: *Communicating CSR: Practices among Switzerland's top 300 companies.*
Corporate Communications **13**(2), 182-196, 2008,
<http://dx.doi.org/10.1108/13563280810869604>,
- [34] Global Reporting Initiative (GRI): *Sustainability Reporting Guidelines.*
GRI, Boston, MA, 2002,
- [35] Kim, S. and Feldt, L.S.: *A comparison of tests for equality of two or more independent alpha coefficients.*
Journal of Educational Measurement **45**(2), 179-193, 2008,
<http://dx.doi.org/10.1111/j.1745-3984.2008.00059.x>,
- [36] Zhao, Z.; Meng, F.; He, Y. and Gu, Z.: *The influence of corporate social responsibility on competitive advantage with multiple mediations from social capital and dynamic capabilities.*
Sustainability **11**(1), 218, 2019,
<http://dx.doi.org/10.3390/su11010218>,
- [37] Marin, L.; Martín, P.J. and Rubio, A.: *Doing good and different! The mediation effect of innovation and investment on the influence of CSR on competitiveness.*
Corporate social responsibility and environmental management **24**(2), 159-171, 2017,
<http://dx.doi.org/10.1002/csr.1412>,
- [38] Roblek, V.; Pejić Bach, M.; Meško, M. and Kresal, F.: *Corporate social responsibility and challenges for corporate sustainability in first part of the 21st century.*
Cambio. Rivista sulle trasformazioni sociali **9**(19), 31-46, 2020,
<http://dx.doi:10.13128/cambio-8486>.

APPLICATION OF GAMIFICATION AS A DRIVER FOR BETTER BUSINESS PERFORMANCES: CASE OF GROUPER

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ABSTRACT

Gamification appeared in the realm of marketing and became popular after 2010. The use of gaming applications has become a significant trend in the business world, as an opportunity for alternative interaction with users, particularly applicable in e-commerce. The goal of this study is to examine the effects of using gamification on increasing the customer database and sales or identifying the ability of gamification in turning visitors to users and users to customers, as well as the effects on event promotion and awareness. The research instrument used in this study to develop the game "Birthday slot machine" is the D6 design framework for gamification. Data used in this study is collected for a period of 15 days when the game was implemented, starting January 15 to January 30, 2014, from Grouper's customer and sales database. Descriptive analysis and T-test are used to analyze the effects of gamification application. The findings showed that the application of a well-structured game was effective, resulting in an increase in the number of new customers during the game by 318 %, an increase in monthly sales by 45 %, and well-created awareness for the company and event that was promoted.

KEY WORDS

gamification, e-commerce, group buying, 6D framework, North Macedonia

CLASSIFICATION

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INTRODUCTION

Advanced technologies enable the use of new marketing tools to promote and increase customer engagement. Using a game element in the context of doing business or achieving appropriate business goals is a worldwide trend and is called gamification. Gamification has become a buzzword, widely used by the mass media to describe the addition of game mechanics to serious business activities. Gamification can be a challenge for managers as a tool for achieving business goals such as: increasing the number of users, stimulating and motivating employees to sell, increase sales, strengthen the brand, solve problems, increase customer engagement etc. The use of gaming applications or so-called "Gamification" has become a significant trend in the business world as an opportunity for alternative interaction with users. The use of this tool is particularly applicable in e-commerce which challenges all traditional methods of work and opens up a wide range of subjects that organizations must consider. E-commerce is a huge field with lots of different business practices, ways to market products and reach customers. Simply defined, "electronic commerce is a system of online shopping and information retrieval accessed through networks of personal computers" [1; p.29]. Marketing is a broad field, which encompasses many different goals and disciplines. Kotler and Keller [2] define marketing management as "the art and science of choosing target markets and getting, keeping, and growing customers through creating, delivering, and communicating superior customer value". Managers and marketers today need to search for new ways to engage customers, communicate their brand and differentiate from competitors. One approach that has gained tremendous popularity after 2010 is gamification that changed not only marketing strategy, but also affected consumer behavior. It became a marketing tool that apart from aiming to boost sales and increase profit, also affects improvement in customer engagement, enhances product/brand identification and helps in building loyalty [3-6]. The rationale behind deploying video game elements in business context is that they have already captured the attention of millions of loyal players all over the world and in United States, about 58 % of the population played video games [7]. When players engage the gamified environment, they willingly immerse themselves in virtual challenges for the purpose of achieving fun and play; elements deeply rooted in human beings: "Intrinsically motivated activities are those that the individual finds interesting and performs without any kind of conditioning, just by the mere pleasure of carrying them out" [8; p.114]. Increased engagement is claimed to have numerous benefits like improved performance and greater user satisfaction [9]. The basic mechanics of gamification are closely related to the mechanics of game design: addressing the human desire for socializing, learning, mastery, competition, achievement, status, altruism, self-expression, or closure [10]. Reeves and Read in their work meticulously maps game elements like avatars, leaderboards, leveling and reputation to general business processes [11]. Despite the large amount of hits on the topic, there is a dearth of coherent understanding on what kind of studies have been conducted under the term gamification, with which methods, what kinds of results they yield, and under which circumstances. Understanding whether gamification is effective is also a pertinent practical issue [3].

The goal of this study is to examine the effects of using gamification on increasing the customer database and sales, or identifying the ability of gamification in turning visitors to users and users to customers, as well as the effects on event promotion. To reach the goal this study uses a designed web application called "Birthday Slot Machine" introduced by Grouper in 2014, and evaluates the results achieved with its solution. The gamified solution in the

form of a web application aimed to create engagement, increase brand awareness, reward existing customers, increase the number of customers, promote an event and increase sales.

The research questions are focused on:

1. Can application of gamification increase the number of users?
2. Can application of gamification increase sales?
3. How effective was the applied gamification for the promotion of the event and awareness, word-of-mouth and buzz?

The remainder of the article is organized as follows. Section 1 presents the literature review on gamification. Section 2 provides a description of the model of Grouper. Section 3 gives methodology and data. Section 4 presents empirical analyses with the results regarding the effects of the application of gamification. The last section gives concluding remarks.

THEORETHICAL BACKGROUND

Games are an expression of some basic parts of human nature and are an integral part of all societies. The history of games dates back to ancient times [12]. Traditional marketing authorities emphasize that marketing is about identifying and meeting human and social needs [2, 13]. The purpose of marketing is to understand the need of the customer [13], which will be expressed in the customer who has a desire to buy as result. Throughout history, marketers have used games to use one of the most powerful behavioral motivators. Managers and marketers must look for new ways to engage their customers, communicate their brand, and stand out from the competition by creating a competitive advantage. Gamification may be a new term, but the idea of using thought and game mechanics to solve problems and engage audiences is not new [5]. The Internet has opened up new possibilities for introducing game elements into business activities. Gamification is becoming a significant trend that has emerged since 2010 and has significantly changed the way businesses communicate and interact with their customers. The term gamification is coined by computer programmer/game designer Nick Felling in 2002, and was defined as the use of game elements and mechanics in non-game context [14]. Huotari and Hamari [15] redefine the definition of gamification in terms of service marketing experiences as: "a process of improving services through gaming experiences to support overall value creation". This definition begins with the goal of gamification, instead of defining only its use as a tool in a business context. Gamification is almost universally accepted by all authors as simply defined as the use of game design elements in a serious or not-for-play context. This practice does not mean that the whole game should be designed, but assumes the use of only those elements of the game that are considered useful for the given context [14]. It can be used by almost all companies as well as non-profit organizations and by the government, all in order to achieve various goals. Gamification revolutionizes business thinking and practices and according to Zicherman and Linder [6] game mechanics integrated with business strategy, serve as an invaluable change agent for the management to motivate employees and customers. Regardless of various definitions of gamification, its main purpose is to create fun, to stimulate significant motivation, to encourage engagement.

For the purposes of this article, gamification is defined as "**Designing and applying game elements in a business activity created to achieve a company's predetermined goals.**"

Hamari [3] provides a literature review of empirical studies on gamification showing that the appearance of the term "gamification" in article titles has been increasing even more rapidly than general search hits suggesting that gamification is becoming a more popular subject for academic inquiry.

Gamification is the process of introducing game mechanics to business software and is defined, e.g., as “[applying] the mechanics of gaming to non game activities to change people’s behavior. When used in a business context, gamification is the process of integrating game dynamics (and new game mechanics) into a website, business service, online community, or marketing campaign in order to drive participation and engagement” [16]. Three key relationship marketing concepts are relevant in the gamification context: engagement – “high relevance of brands to consumers and the development of an emotional connection between consumers and brands” [17], brand loyalty – “the relationship between relative attitude and repeat patronage” [18] and brand awareness – “the rudimentary level of brand knowledge involving, at the least, recognition of the brand name” [19]. Engagement in particular is often mentioned as the main goal of gamification [20-22].

Gamification is an emerging marketing discipline that provides a means of influencing the behavior of people online. It borrows key concepts from a number of related areas, including game design, customer loyalty programs, behavioral economics, and community management.

THE MODEL OF GROUPER

The business model of daily deal web sites also called group buying was introduced in 2008 by the leader in the industry Groupon from Chicago. In this sense, the new business model for group discounts for daily deals can be considered as a new type of electronic intermediary. This business model is a mediation between retailers and consumers in order to meet and trade online. It supports and coordinates the trading processes between retailers and customers through various functions. Daily deal sites act as intermediaries between the merchants and the end customers, by selling discounted deals in the form of coupons. Companies get promotion of their business’s product/services while customers get great discounts via deals for new things to discover in their city. Daily deal sites bring hundreds of new customers to the doors of the companies and for return get a share of the price of each sold coupon. Grouper was launched in January 2011 as the first daily deal site on the Macedonian market and holds the leading position in the industry with 40 % of the e-commerce market share in Republic of Macedonia in 2013 [23, 24]. Furthermore, it was announced to be the best e-commerce web site in 2013 in the country [25]. Its creative culture and use of new trends such as gamification are part of its marketing strategy. Grouper practiced game mechanics to reach different company goals. It launched a Facebook app called “Sell your friend via Grouper Deal” in 2012 to familiarize users with the constituent parts of its deals and create brand awareness and engagement. For its 3rd birthday celebration in 2013 it launched a deal selling scratch tickets where customers could win free coupons for deals or get a free drink at the celebration [23]. The new business model of group buying through daily deals, launched by Groupon, has sparked worldwide interest and has quickly spread through its clones in many countries around the world. In the Republic of Macedonia, this concept was introduced by Grouper, and then the concept is applied by other group buying websites.

By playing the intermediary role in group purchasing activities, Gruper is responsible for coordinating the work during the entire process, including initiating, negotiating, arranging, executing and most importantly satisfying both sides, companies and end-customers.

METHODOLOGY AND DATA

As one of the most commonly used designs in the field of business, case study is used in this study as a research design. Defining a strategy for gamification implementation that will best fit into effectively achieving the company’s goals is a challenging task. Research instrument

used in this case study to develop the gamification system is the D6 design framework for gamification, proposed by Werbach and Hunter [26; p.86]. The choice of this framework, as a method, is based on the detail of the model and its scientific support. The steps of the D6 model are: 1. Define business objectives; 2. Delineate target behaviors; 3. Describe your players; 4. Device activity loops; 5. Do not forget the fun element; and 6. Deploy appropriate tools.

Defining business goals must be a starting position, because the introduction of the elements of the game in the business, above all, should lead to their achievement. Good understanding of the goals set, is a critical point for the effectiveness of the applied gamification. If the goals are well understood the game will be designed to achieve them. The value of the solution lies in the design aiming to achieve the determined business goals, instead of creating a solution that is just fun for the end-users.

Behavior Targeting suggests that it should be defined what exactly is required of users to do and how that behavior will be measured. Two ways are suggested to measure that behavior: points and winning states. However, they do not indicate how to motivate the participant to perform the desired behavior, but how to measure it.

Describing the participants in the game is important because they are the ones who will use the game system, so it is good to know what type of players they are. Better knowledge of the type of game-participants will help create the game system that will best suit them.

Activity loops move the action of the gamification system forward and give structure to the main aspects of the game. The concept is that one action provokes another, which in turn leads to the next action. There are two kinds of cycles to develop: engagement loops and progression loops. Engagement loops describe, at a micro level, what the players do, why they do it, and what the system does in response. Progression loops give a macro perspective on the player's journey. The goal is that users always know when they are doing something good and receive instant feedback to let them know they are progressing. Of course, it is not enough just to get feedback, because the participant in the game will not know whether s/he is moving forward or not and this requires progression loops that will give the impression that the experience changes with the movement of the participants through the game.

Fun elements are important, because having fun is the basis of games and gamification. The whole idea is to create a solution that is as fun as possible and engages the participants in the game as much as possible.

After defining and revealing all the previous steps, in the last step the appropriate tools are deployed to apply the most relevant and effective elements and structures in the game system. Any elements applied in any system does not mean that they will give a positive effect by default. Only the right use of the right elements can lead to success. In the sixth step, the pyramid of game elements, developed by Werbach and Hunter [26], can be used to best fit the goals, the targeted behavior, the types of participants in the game, the activity and the fun (Fig. 1).

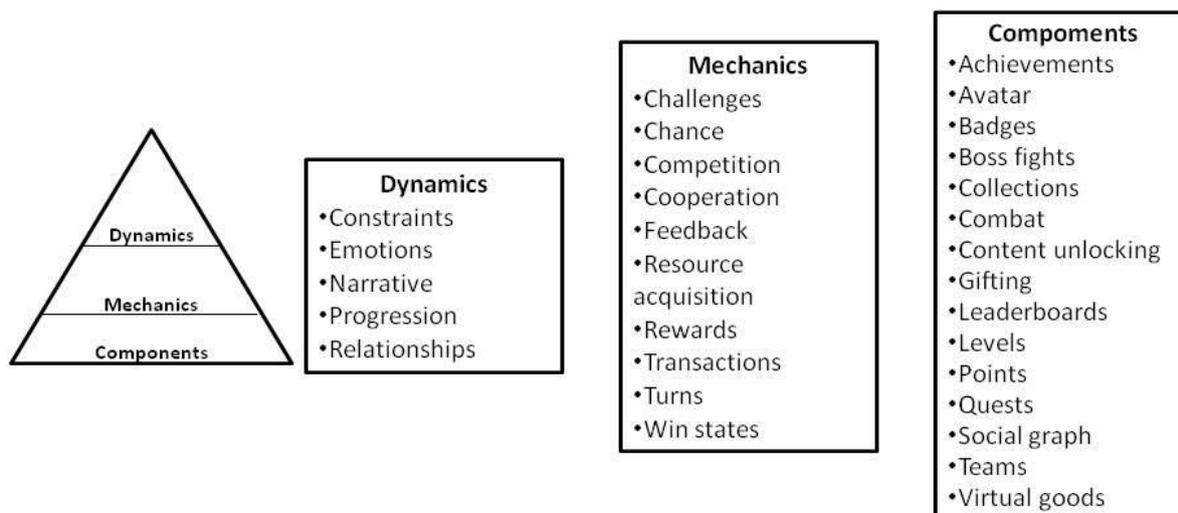


Figure 1. Pyramid of game elements [26; p.78].

Data used in this study are collected from Grouper’s customer and sales database. The data is collected in a period of 15 days when the game was applied starting from January 15 to 30, 2014.

Descriptive analysis and T-test are used to analyze the effects of the application of gamification by testing the following research hypotheses:

H1: The application of gamification can significantly increase the number of users.

H2: The application of gamification can significantly increase sales.

H3: The application of gamification is an effective tool for promoting an event and creating engagement.

GAME DESIGN AND RESULTS OF THE APPLICATION OF GAMIFICATION IN GROUPER

"Birthday Slot Machine" is a web application created on the occasion of the fourth birthday of the company, that traditionally celebrates its years of existence, bringing it closer to users and the offline world. The application of the gamification is toward achieving three goals: promoting an event – celebrating the fourth birthday, increasing the number of users and increasing sales (Grouper, 2014). For the needs of this research, the focus is put on the external perspectives and the presentation of the application of the slot machine as a gamified solution aiming to achieve the business goals set by the company.

The celebration event took place on February 1, 2014, and the duration of the game, which is subject to analysis, is in a period of 15 days from January 15 to January 30, 2014. The game was advertised through social media, email campaigns and banner ads on Grouper.mk. The game concept is a game of chance and is based on the luck of the participants who can randomly receive a prize. The game does not include competition between participants, statuses and points based on the skills and knowledge of the participants, so it awakens a sense of “having lucky”. The algorithm of the game is created in such a way that every day an equal number of prizes are awarded during the duration of the game to the lucky winners.

The game is part of an integrated marketing campaign that starts online with the web application "Birthday Slot Machine" and ends with the physical presence of the winners and other participants at the birthday celebration of the company. The lucky winners in the game do not know what prize they have won, and in order to collect it, they need to come to the event where they will draw and pick-up their prize. The winners see only a list of prizes they

could win, but do not know the exact one until they come to collect it. In order to investigate the application of gamification through the game "Birthday Slot Machine", the game is explained by applying the D6 framework for game design consisting of 6 steps.

(1) Defining business goals: Grouper has set three goals to achieve with this game and they are ranked according to the following schedule: promoting an event – the fourth birthday of the company; increasing the number of users; and increasing sales. It is important that the goals are aligned with the mission of the company, so in that sense the main goal of the application is the promotion of the birthday event that the company traditionally organizes each year, which is open for all users while rewarding many of them. Furthermore, increasing the number of users is an obvious goal, as users are potential buyers/customers of the deals it offers. Finally, the third goal is to increase sales.

(2) Delineate target behaviors: Users are required to join the game by connecting with their current Grouper account via Facebook or by creating a new account via Facebook, all in order to collect more demographic data for each user via their Facebook profile and additionally, because of the possibility the participant to share the game with his friends on Facebook. Each user, during the first login in the game, gets 3 spins on the slot machine. Behavior is measured through the active participation of users and through the number of winning spins that are published in the ranking list. To stimulate sharing the game with friends, each user can get a free spin by inviting a friend to join the game. Additionally, each user can get a spin by entering the coupon code from a purchased Grouper coupon from any deal, which stimulates additional sales and rewards buyers. After the spin, the user receives a notification to share the game on their Facebook profile, if desired.

(3) Description of the players: Participants in the game are all existing and potential Grouper users. According to demographics, the main target is online users aged 24 to 35. According to the desire for playfulness, the target of the game are online users who like interactions and games (socializers) and who want to explore (explorers).

(4) Device activity loops are defined in two phases: the engagement loops and progression loops. Engagement loops include motivation, action and feedback. The rewards given in the game, depending on the winning combination, are used as motivation for engagement. Table 1 shows the prizes for every winning option and the quantity of each prize. If the user wins, he gets a voucher code that he has to bring to the Grouper birthday event in order to collect the gift. If one user wins twice, he can give the winning voucher to a friend. All game players must connect their profiles via Facebook in order to play the game, thus once a day, the app posts a call to action with text to his timeline (if he gave permissions to the app when connecting). There are 2 ways for the player to get extra spins. The first is to request a free spin from a friend. In order to give a free spin the friend has to enter the app, give permissions and accept the invitation. The second is to get free spin with a coupon purchased during the previous month or s/he can buy a coupon at the moment and get a free spin by entering the coupon code. The first option creates word-of-mouth and buzz for the game and the second option is connecting the game directly with the sales.

Table 1. Prizes for the winners of the game [27].

Winning combination	Prize	Quantity of Prizes
3 x Grouper mascote	Surprise Gift (Gifts from Partners of Grouper, among which travel prizes for weekend getaways, massages, spa packages etc.)	228

3 x Gs	Grouper branded gifts (cups, pillows, t-shirts)	90
3 x wallets	Grouper gift cards with various value amounts for future purchases	45

(5) The fun element is the base of every game. A slot machine is a popular well-known game concept, and applying it in a non-gaming industry is intriguing for users. Additionally, through the design of the slots on the Slot Machine and the various winning combinations, a moment of fun and surprise for the users is created.

(6) Deployment of appropriate tools: Dynamics, mechanics and components are used in the deployment of game tools in order to create the whole solution.

(6.1) The selected dynamics in our game represent the concept of the Slot Machine as an already known type of game of chance.

- Limitations in this analyzed game are: the number of spins per user, which initially is 3 spins for each logged user; chance to win – each user to win a prize, i.e. if s/he wins a prize for the second time s/he can give it to a friend. An additional restriction is that the user must log in with his Facebook account to participate, which is a limitation for those who do not have a Facebook account.
- Emotions: The emotion created by this game is a sense of hope for a win before the spin, uncertainty during the spin, a surprise win and a desire to spin again.
- Narratives: The narrative is expressed through the text descriptions in the game and the design of the elements that are associated with the birthday of Grouper, and thus create a whole in the structure of the game.
- Progression: Because there are no levels in the application through which users can progress, the progression is expressed with a winning combination, i.e. if a user turns a winning combination he becomes the winner of a reward.
- Relationships: Users can invite their friends to get an extra spin on the slot machine, share the game on their Facebook profile and, in case of winning, share the win with their friends.

(6.2) Game mechanics are the more specific elements in the sense that they are aimed at more specific actions. The mechanics used in the game through the user scenario accompanied by a pictorial presentation of selected parts of the game are illustrated.

Each user gets 3 free spins on the slot machine. Each spin can be win or lose. (Chance). There are 3 possible winning combinations in the game; all three winning options are if the user gets 3 same slots (3xGrouper mascot; 3xWallets; and/or 3xGs).

The user scenario accompanied by screenshots from each game screen explains the game mechanics. The existing or potential user comes to the start screen (Fig. 2), as a result of a previously clicked link of the game banner ads, social media posts, links from friends or other ads where the game is promoted. The start screen provides basic information for the game, and at the same time invites the user to the birthday party (text in the bottom part).



Figure 2. Screenshot: Start Screen [27].

The click of the button “Start” opens a pop up login form where the user has to connect his existing account via Facebook or create a new account via “Facebook Connect” button. Then the user is logged in and can start spinning. (Fig. 3)



Figure 3. Screenshot: Logged in user ready to spin [27].

The outcomes of the spin can be a no-win combination and a win combination (three same slots). The winning combination can be either three mascots, three wallets or three Gs, and the user gets a pop-up notification for his win and a voucher code for collection of the prize. Fig. 4 shows the screen the user sees if he gets a winning spins for the second time. If the user is left with no spins he gets the call to action screen reminding him that he can purchase a coupon and get an additional spin.

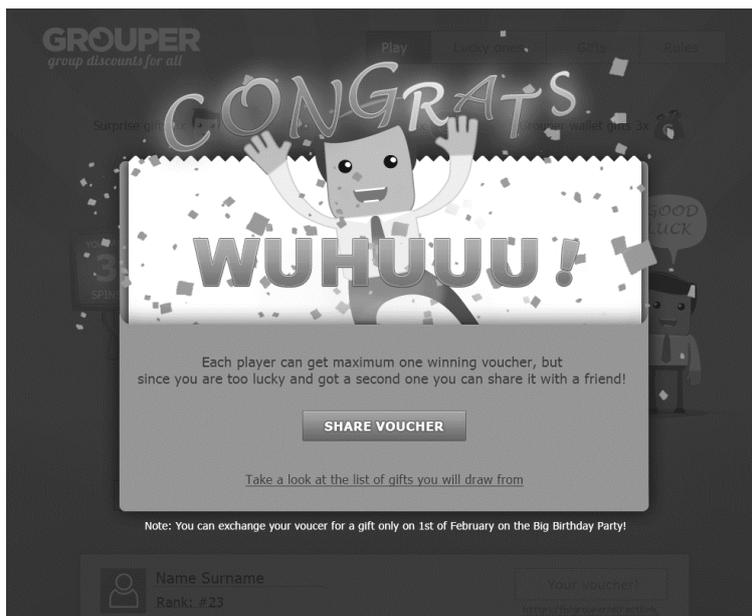


Figure 4. Screenshot: Second Win, Congrats Screen [27].

(6.3) Specific components or elements used in the interface of the game "Birthday Slot Machine" are the following:

- Achievement is receiving a reward that is random, i.e. based on the luck of the player.
- Avatar: After logging in, the image of the user appears in the web application. (Fig. 2)
- Gift: Players can give a spin to a friend.
- Claims: After a winning spin, the player receives a notification that s/he has won along with information on how to collect the prize, i.e. an invitation to come to the birthday event to collect his prize. The winner of a prize is asked to present the winning code which is sent to him after the winning spin.

Having in mind the set of goals that Grouper wants to achieve with the web application "Birthday Slot Machine", the results for the set hypotheses are elaborated and presented below.

H1: The application of gamification can significantly increase the number of users.

The increase of new users in the past 12 months before the game was implemented was 1,200 new registered users on average per month [27]. The number of new registered users in January, when the game was launched, was 5,018, out of which 3,687 users were registered directly through the game. The total number of players in the game was 6,844, out of which 1,826 connected their existing Grouper profiles with Facebook, allowing data collection in their profiles. Fig. 5 shows the growth of new users on a daily basis during January 2014.

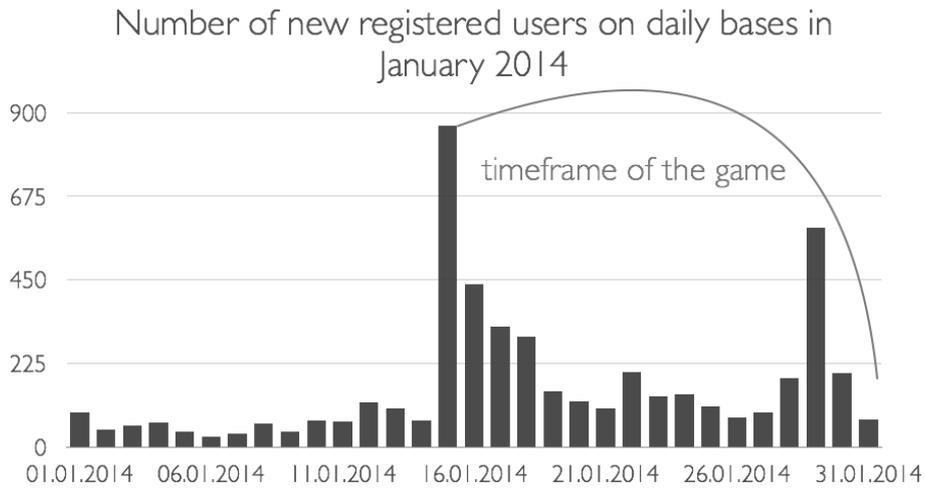


Figure 5. Report on the number of new users on daily basis in the period from 01.01.2014 to 31.01.2014 [27].

When setting the hypotheses, it is assumed that the application has no impact on the growth of the number of users and the number of daily sales. A t-test of two independent samples is used to test the hypothesis. To see the impact of the application, the number of new users during the game (15 days) is compared with the number of new users in the previous 15 days. The analysis of the t-test ($p < 0,05$) showed rejection of the null hypothesis, i.e. there is a statistically significant difference in the number of new users in the two analyzed periods. It can be concluded that the application of gamification can significantly increase the number of new users.

H2: The application of gamification can significantly increase sales.

The average number of coupons sold, on a monthly basis, in the previous 12 months before the game was 5,612 coupons. The number of coupons sold in January 2014 was 8,188, which resulted in an increase of over 45 % compared to the monthly average [27]. More than 900 coupons sold in January were used to get additional Slot Machine spins from users, and 350 of them were purchased just before used for spins. This indicates a direct boost in sales from consumers who bought a coupon in order to get an extra spin, which means that 4,2 % of coupons sold in January were due to applied gamification. The analysis assumes that there were no significant changes in the offer of deals on the site, i.e. that the offered deals were with the same pattern as the previous months since the average values of coupons and sales were calculated.

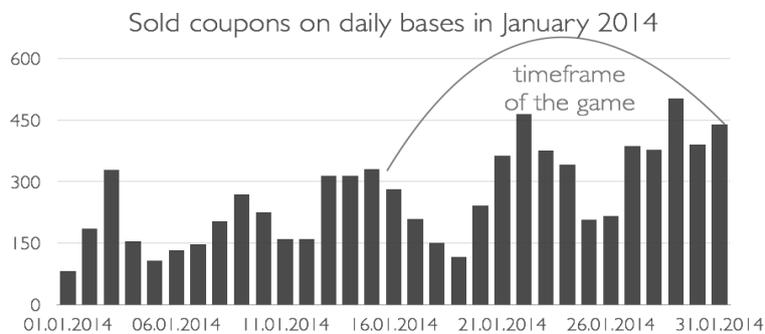


Figure 6. Report on the number of coupons sold on a daily basis in the period from 01.01.2014 to 31.01.2014 [27].

The same procedure for testing the hypothesis (H2) is applied as in the case of testing the first hypothesis (H1). The analysis of the t-test ($p < 0,05$) showed the rejection of the null hypothesis, so

it can be concluded that the application of gamification can significantly increase the number of sales.

H3: The application of gamification is an effective tool for promoting an event and creating engagement.

Since it is impossible to quantify this hypothesis, the effects of the application are considered through promotion of the event and awareness, word-of-mouth and buzz and the number of guests at the event. The application invited all users at the company's birthday party, regardless if they participated in the game or not. The winners of the game, 363 users, were also invited to the celebration event to collect their prizes. Grouper has sent reminder messages to all winners, reminding them on the date and location, as well as to bring their winning code to collect their prize. The event took place at a popular venue in the city center, with more than 1200 guests, including media representatives, business partners and customers. A total of 250 winners of the prizes from the conducted game were among the guests who collected their prizes, and the rest of the prizes that were not collected were distributed to other guests who shared content from the celebration on social media (Facebook, Instagram and Twitter) which contributed to increased word-of-mouth about the brand. The game itself proved to be viral and quickly spread among users as a result of content sharing by game participants. Players gave away and received free spins from friends, resulting in over 1000 spins received from friends. The company considers this event very successful, taking into account its attendance and the virality of social media [27].

CONCLUSION

The goal of this research was to investigate the effects of using gamification to reach company's predetermined goals. The process of the design of the game "Birthday slot machine" using Werbach and Hunter [26] 6 D framework methodology is presented and the results of the game are analyzed to prove the success of the game according the predetermined goals, or to examine the effects of applied gamification measured in the number of acquired new customers, volume of sales and engagement created for a company event. The effects of the application are shown through the increased number of new customers in the period of the game by 318 %, increase of the monthly sales by 45 % and awareness created for the company and event that was promoted. A t-test of two independent samples is used to test the hypothesis. To see the impact of the application, the number of new users during the game (15 days) is compared with the number of new users in the previous 15 days. The analysis of the t-test ($p < 0,05$) showed rejection of the null hypothesis and H1 is proven, i.e. there is a statistically significant difference in the number of new users in the two analyzed periods. The analysis of the t-test ($p < 0,05$) of H2 showed the rejection of the null hypothesis meaning that the application of gamification can significantly increase the number of sales. In the effort to quantify the results achieved through the game "Birthday Slot Machine", with the main visible purpose for the users being promotion of an event, it can be seen that a clear connection between the virtual gaming space and the offline presence is achieved.

The results of this study can be used by academics and practitioners. It will contribute to the scarce literature on this topic important for marketing and business management. Companies can apply gaming techniques to marketing campaigns, product development efforts, sales activities, or any other business or nonbusiness process. The goals of the game elements being applied must be connected in some well-defined and meaningful way to the business activity so that desired effects and outcomes can be achieved.

The findings of this research are product of case study research made in a small service company acting in the group buying industry (deal marketplace platform). Many

opportunities for future research on gamification are available. The effectiveness of gamified marketing campaigns and their underlying mechanisms will improve understanding of the specific mechanisms and their impact.

REFERENCES

- [1] Reedy, J.; Schullo, S. and Zimmerman, K.: *Electronic Marketing: Integrating Electronic Resources into the Marketing Process*. Dryden Press, Fort Worth, 2000,
- [2] Kotler, P. and Keller, K.L.: *Marketing Management*. Prentice Hall, New Jersey, 2009,
- [3] Hamari, J.; Koivisto, J. and Sarsa, H.: *Does Gamification Work? – A Literature Review of Empirical Studies on Gamification*. In proceedings of the 47th Hawaii International Conference on System Sciences, Hawaii, January 6-9, 2014,
- [4] Yang, Y.; Asaad, Y. and Dwivedi, Y.: *Examining the impact of gamification on intention of engagement and brand attitude in the marketing context*. Computers in Human Behavior **73**, 459-469, 2017, <http://dx.doi.org/10.1016/j.chb.2017.03.066>,
- [5] Zichermaim, G. and Cunningham, C.: *Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps*. O'Reilly Media, Newton, 2011,
- [6] Zichermaim, G. and Linder, J.: *The Gamification Revolution: How Leaders Leverage Game Mechanics to Crush the Competition*. McGraw-Hill Education, New York, 2013,
- [7] Folmar, D.: *Game it up: Using gamification to incentivize your library*. Rowman & Littlefield, Maryland, 2015,
- [8] Francisco-Aparicio, A.; Gutiérrez-Vela, F.L.; Isla-Montes, J.L. and González Sanchez, J.L.: *Gamification: Analysis and application*. In: Penichet, V.M.R., Peñalver, A. and Gallud, J.A., eds.: *New trends in Interaction, Virtual Reality and Modeling*. Human Computer Interaction Series. Springer-Verlag, London, pp.113-126, 2013,
- [9] McGonigal, J.: *Reality is broken: Why games make us better and how they can change the world*. Penguin books, London, 2011,
- [10] Schell, J.: *The Art of Game Design: A Book of Lenses*. CRC Press, Boca Raton, 2015,
- [11] Reeves, B. and Read, J.L.: *Total Engagement: Using Games and Virtual Worlds to Change the Way People Work and Businesses Compete*. Harvard Business Press, Harvard, 2009,
- [12] Radoff, J.: *History of Social Games*. <http://radoff.com/blog/2010/05/24/history-social-games>,
- [13] Drucker, P.F.: *Management: Tasks, Responsibilities, Practices*. Harper & Row, New York, 1973,
- [14] Deterding, S.; Dixon, D.; Khaled, R. and Nacke, L.: *From game design elements to gamefulness: Defining gamification*. In Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments, Tampere, 28-30 September 2011,
- [15] Huotari, K. and Hamari, J.: *A definition for gamification: Anchoring gamification in the service marketing literature*. Electronic Markets **27**(1), 21-31, 2016, <http://dx.doi.org/10.1007/s12525-015-0212-z>,

- [16] Bakker, A.B. and Demerouti, E.: *The Job Demand-Resource Model: State of the Art*.
Journal of Managerial Psychology 22(3), 309-328, 2007,
<http://dx.doi.org/10.1108/02683940710733115>,
- [17] Rappaport, S.D.: *Lessons from Online Practice: New Advertising Models*.
Journal of Advertising Research 47, 135-141, 2007,
<http://dx.doi.org/10.2501/S0021849907070158>,
- [18] Dick, A.S. and Basu, K.: *Customer Loyalty: Toward an Integrated Conceptual Framework*.
Journal of the Academy of Marketing Science 22, 99-113, 1994,
<http://dx.doi.org/10.1177/0092070394222001>,
- [19] Hoyer, W.D. and Brown, S.P.: *Effects of Brand Awareness on Choice for a Common, Repeat-Purchase Product*.
Journal of Consumer Research 17(2), 141-148, 1990,
<http://dx.doi.org/10.1086/208544>,
- [20] Bunchball Inc.: *Gamification 101: An Introduction to the Use of Game Dynamics to Influence Behavior*.
<http://www.bunchball.com/gamification/gamification101.pdf>,
- [21] Hamari, J. and Järvinen, A.: *Building Customer Relationship through Game Mechanics in Social Games*.
2011,
- [22] Witt, M.; Scheiner, C. and Robra-Bissantz, S.: *Gamification of Online Idea Competitions: Insights from an Explorative Case*.
INFORMATIK, Berlin, 2011,
- [23] Grouper: *Internal Marketing Reports and Statistics*.
2013,
- [24] National Bank of Republic of Macedonia: *Report on the Use of Payment Cards and devices on which they are used in the country*.
2013,
- [25] Sajtnagodinata: *National election of best website of the year*.
Media Solutions and Keep and eye, Skopje, 2013,
<http://sajtnagodinata.mk/pages/archive/view.php?y=2011>, accessed 30th June 2015,
- [26] Werbach, K. and Hunter, K.: *For The Win*.
Wharton Digital Press, Philadelphia, 2012,
- [27] Grouper: *Internal Marketing Reports and Statistics*.
2015.

DYNAMICS OF AN INVINCIBLE TROOP FORMATION IN ANCIENT OPEN BATTLEFIELDS

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ABSTRACT

One of the most enthralling ancient magical battle formation tactics is the Chakravyuh -- a multilayer dynamic defensive structure, which was used in the 18-days long Kurukshetra war as described in the great Indian epic Mahabharata and in many subsequent scriptures. Unfortunately, none of the existing literature address its inner details or the skills involved and, as such, its working still shrouds in mystery. What makes it nearly invincible even for an exceptionally skilled warrior? How a huge troop was controlled, organized, and restructured from the core of the Chakra? What are the governing rules for maintaining the structure even in the time of extreme hardship in the battlefield? In quest of the answers to such technical questions, while we made attempts to explore and decipher the inner details of Chakravyuh, we find some descriptions that differ geometrically from each other. Despite such variants of the structure, here we would like to bring into focus the common inner mechanism of such a multilayer organizational strategy that, in turn, confirms its inherent geometry. It reveals how, because of synchronize maneuvers, the direction of rotation of the Chakra about its axis is closely interwoven with the direction of movement of the infantrymen. The fact that relative spinning motion has adverse psychological impact in diminishing mental power, seems to be the foremost principle behind the design of its dynamics that slowly push on an invading warrior towards one of the dead-ends that are created by restructuring the Chakra out of nearly infinite possible ways.

KEY WORDS

Chakravyuh, relative spinning motion, logarithmic spiral, equilateral triangle

CLASSIFICATION

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Pacs: 02.40.Pc, 87.23.Kg, 89.90.+n, 89.20.Dd

INTRODUCTION

Myths, histories, and mysteries of the ancient great wars, on the one hand, mesmerize the human mind in discriminating good and evil, justice and injustice, ethics and immorality, power and incapability, loyalty and treachery and, on the other hand, ignite a passion for understanding the ancient tactics and strategies of warfare that bear witness to a towering vision of transcendence. Whatever the cause for the outbreak of an open battle, it is the tactics and strategies of warfare that finally determine the victory and defeat. Different styles of warfare in ancient India are described in the Vedic literature (1500-1000 BCE), the two Sanskrit epics Ramayana and Mahabharata (1000-600 BCE), Kautilya's Arthashastra (c. 4th century BCE), Banabhatta's Harshacharita (c. 7th century BCE) and in many other scriptures [1-4]. One of the ancient great battles, described in the epic Mahabharata and in many subsequent scriptures, is the war of Kurukshetra that lasted 18-days long [5]. Among the various tactical battle arrays that were used by the warriors in the Kurukshetra war as a defensive as well as an offensive tool, one of the deadliest troop formation tactics was the Chakravyuh – a system of magical defense, the working method of which shrouded in mystery. Dronacharyya – the renegade Brahman, the master of martial arts and the commander-in-chief of the Kaurava army, formed the Chakravyuh on the 13th day of the war to trap and kill Abhimanyu – the son of Arjuna and an invincible legendary youngest warrior of that time. Being one of the deadliest war strategies, the structure and its formation mystified humans from ancient times. How ingeniously it was designed and what is the level of complexity of such a structure? Why does it remain invincible even for a highly skilled warrior and what geometry is involved in its construction? Vedic literature and the Sanskrit epics Ramayana and Mahabharata composed in ancient India refer to battle formations as diverse as Chakravyuh (wheel formation), Krauncha vyuh (heron formation), Mandal vyuh (galaxy formation), Suchivvyuh (needle formation), Chandrakalavyuh (Crescent moon formation), Makaravyuh (scorpion formation), and many others. The Yuddhakanda of the Mahabharata (composed around 400 BCE) refers to these tactical configurations as the characteristic Indian way of war fighting with few abstract details. Other subsequent scriptures such as Kautilya Arthashastra, Manusamhita, Kamandaka Nitisara, described the strategies and tactics of such ancient Indian warfares without offering inner details. According to these scriptures, the formation of Chakravyuh resembles with that of a hurricane or a tornado. It sucks in and eats up everything on its path and before the enemy realises it's effects, the human vortex shifts in opposite directions and brings in a newer battling force, thereby tiring the opponent to an utter psychological, physical and resourceless defeat.

Since none of the existing ancient scriptures addressed the inner details or the skills involved [6, 7], the subsequent attempts in understanding the working principle of Chakravyuh differ significantly, both structurally and functionally. Although several recent works on ancient India's military history have come up [8-12], there has been hardly any attempts in revealing the underlying strategies of such an ancient marvel. The carvings on the Halebidu temple of Mysore that was supposed to have constructed during the 12th and 13th centuries A.D. contain a structure of Chakravyuh which can be sketched as shown in Fig. 1. Although this structure has long been treated as a template in describing Chakravyuh, there are some other descriptions where entirely different labyrinth structures are used. Here we would like to bring into focus all such possible structures and their geometry. We shall emphasize the structure engraved in the Halebidu temple which is, from a geometrical point of view, a relatively simple seven-layered structure. It reveals that the direction of rotation of the Chakra about its axis is closely interwoven with the direction of movement of the infantrymen. We shall also discuss some other structures and show how all such geometry leads to nearly infinite possible ways of restructuring the Chakra to create final dead-ends.

The fact that relative spinning motion has an adverse psychological impact in diminishing mental power seems to be the foremost principle behind the design of its dynamics that finally push on an invader towards a victim of indiscriminate slaughter due to continuous multi-directional attack of strategically distributed strength of soldiers in the layers of the Chakravyuh. We also show the underlying tricks of its construction using some elementary geometry, with a hope that it may help unravel the magic, stimulate ideas, and spark curiosity among the readers.

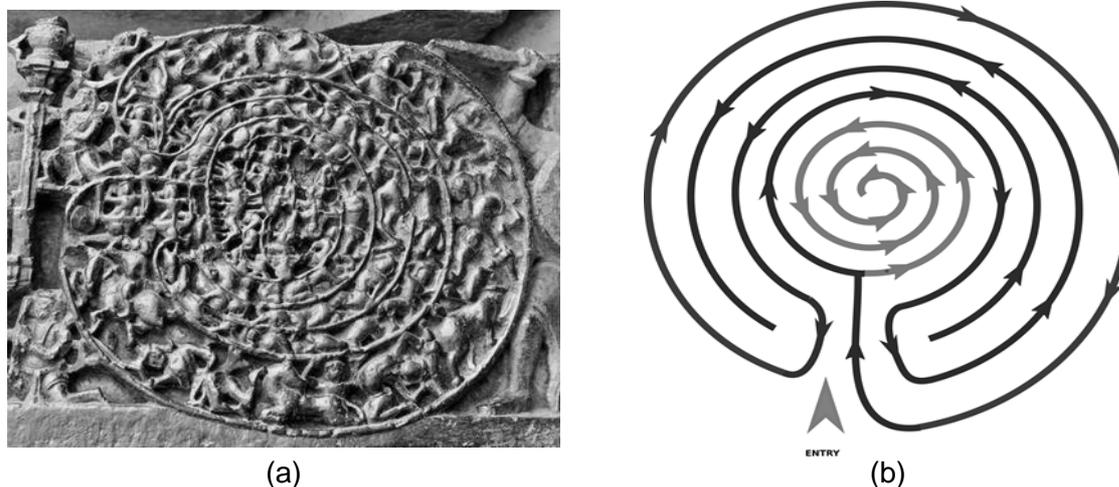


Figure 1. (a) The carving of Chakravyuh in the temple of Halebidu, Mysore (India) [13] (b) A sketch showing the top view of the trajectories of a Chakravyuh that form its multilayer structure. In this structure, there are seven layers and arrows indicate the direction of the soldier's movement in each layer.

ORGANIZATION OF THE ARRAY

Most of our description here is based on the structure engraved in the temple of Halebidu. Moreover, we shall also briefly describe some other possible seven-layered structures where the same principle as describes here is applicable regarding the organization of the troop.

DEFENSIVE MANOUVRE

Being a multilayer defensive structure, Chakravyuh remains one of the deadliest formations ever known [14]. As schematically depicted in Figure 1, a Chakravyuh comprises of seven layers of soldiers where weak and strong warriors are strategically placed in each of the layers, either to impose maximum damage on the opposing warriors or to defend the attacks from highly skilled enemy warriors. Soldiers of the inner level are technically and physically stronger than the soldiers on the outer level. The Infantry form the outer layers while the inner layers are formed by armored chariots and elephant cavalry (fought on the back of elephant). The innermost level consists of the strongest soldiers with a relatively higher density than that of the outer layers. The highly skilled warriors including the commander himself take positions near the core of the Chakra so that any devastating projectile attack on the vyuh can be easily neutralized. Each layer has a concealed entrance that is closely protected by one of the highly skilled warriors and his personal troops. The role of soldiers in the outer layers is to only conceal the entry of enemy warrior into the layer. If a layer breaks down, the outer layer soldiers conceal further entries and not attack the warriors who already breached the layer. The whole arrangement that looks like a disc when viewed from above, has a mechanism of synchronous rotation about its axis. As we describe below, the rotation of the Chakra and the oppositely directing movements of the soldiers in two successive layers

are closely interwoven, making it a puzzled arrangement of soldiers who keep moving in a spinning wheel. In addition to rotation about the axis, the Chakravyuh also revolves in its orbit and, on such rotating and revolving tracks, the whole arrangement of soldiers moves continuously across the battlefield like a typhoon and destroys everything whoever comes in its path. The entrance acts like a mouth that slowly and steadily engulfs an enemy warrior, an enemy troop, and the entire enemy army. However, the Chakravyuh does not move around the battlefield for the sake of destruction. Being a dedicated mission of making captive and bringing the target into custody, it only focuses on and dedicates to accomplishing goals, no matter whatever barrier comes in its way.

TRIGGERING SYNCHRONIZE MOVEMENTS

The very essence of any defensive maneuver is the synchronized movement. In order to visualize how the soldiers synchronize their movement on the layers, let us begin with the nascent formation (Fig. 1) with neither any roadblocks nor any dead ends. Such roadblocks and dead ends that are created according to the commander's order only after the enemy is trapped in the maze, are the results of some rearrangement on this bare structure. In order to capture the targeted warrior, the bare formation moves across the battlefield. The outer levels, shown black in Fig. 1, are formed by tightly packed infantry equipped with close combat weapons such as spear, sword, and shield so as not to allow the incoming chariot to breach the layer easily. The direction of the soldier's movement in these outer layers (black spirals) is triggered by the position of the black dot shown in Fig. 2(a). The soldier who takes this position is responsible to initiate anticlockwise motion by taking a step forward. This triggers a chain reaction as each soldier in the same ring needs to move a step forward to take up the empty position, as shown in Fig. 2(b). This sliding motion propagates throughout the entire black rings, resulting in both clockwise and anticlockwise motion.

In the inner rings shown in red, the direction of movement is initiated concurrently from the position of the red dot. The soldier who takes this position makes a forward step and triggers the chain reaction following which every soldier on the same (red) ring makes a sliding motion to fill up the empty space. In this way, soldiers maintain their movement in all the seven circular trajectories in an alternate clockwise and anticlockwise rotation, and, as a result, the whole Chakra spins in an anticlockwise direction about its axis, as shown in Fig. 2. This direction would be easily reversed (clockwise) if the soldiers start moving in a direction opposite to that of Fig. 2.

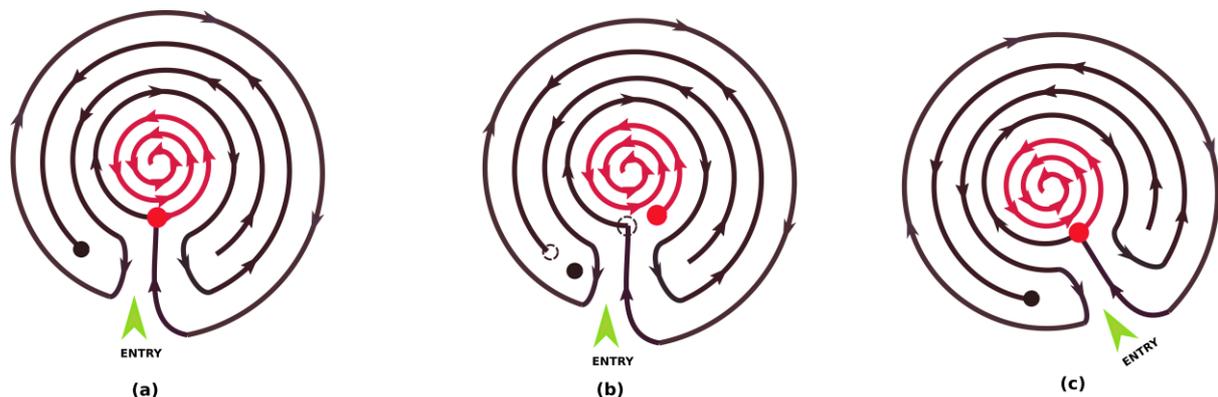


Figure 2. Synchronize movements of infantrymen and the resulting spinning motion of the Chakra. (a) The directions of movement are triggered by the positions of the black and red dots in black and red rings, respectively. (b) Soldier's forward sliding motion create gaps at the position of red and black dots (c) In order to fill up the gaps, the soldiers move continuously on the tracks that initiate rotation of the whole arrangement about its axis.

In order to make a Chakravyuh nearly invincible, maintaining a perfect synchronized movement among the entire array is very much necessary. As we have seen, it is this synchronized motion that makes the entire wheel spin on its axis. That the rotation of the Chakra is closely interwoven with the direction of movement of the soldiers is the key to the perplexing puzzle. Being a massive structure, the fast movement of soldiers in the outer layers creates a web of deceit looking at which the enemy would be completely lost into thinking that the formation is in few numbers as the insurmountable strength of the inner rings cannot be estimated from outside the formation.

The synchronized motion of the soldiers on the layers holds a vital clue that may help in deciphering the potentially viable structures of a Chakravyuh. The structure that we have shown above (Figs. 1 and 2) can be constructed from a spiral, a step-by-step procedure of which is described in Section 5. One can think of its construction from concentric circles but in that case, synchronization would not be possible on the resulting structure. Some existing literature mentioned another seven-layered structure as a Chakravyuh which is made of concentric circles, as shown in Fig. 3(a). However, one can easily figure out that the above mentioned perfect synchronized motion would be impossible here and, as such, it is just a labyrinth structure and not a Chakravyuh unless we make it from spirals, as shown in Fig. 3(b). Although the structure shown in Fig. 3(b) differs from that of Fig. 1, it would perform the same type of spinning motion as described in Fig. 2.

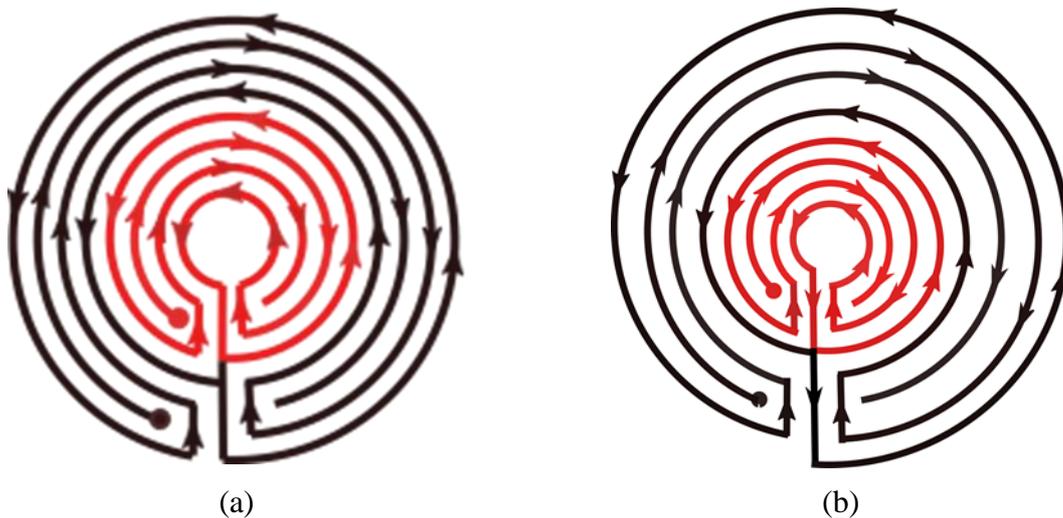


Figure 3. Another two seven-layered structures which are constructed from (a) concentric circles and (b) a spiral. The synchronized motion is possible only on the structure shown in (b).

ENSURING A TIGHT COORDINATION AMONG THE TROOP

On the battlefield, war drums, conch shells, and other musical instruments are effectively used in order to maintain perfect harmony in the movement of infantrymen. Depending on the needs, the commander controls the direction as well as the speed of movement with the help of some special drumbeats or blowing a conch in a particular note. Maintaining order during the movement is very much necessary as any gap in the chain of infantryman could be fatal, if exploited. If any soldier in the formation gets killed, his position is immediately covered up by the sliding motion of the soldiers following him, thereby ensuring the existence of the whole maze even in the time of extreme hardship. Skilled archers in armored chariots, cavalry, and elephants on the inner level can easily fire arrows on the heads of infantrymen on the outer layer to kill the infantrymen of enemy warriors. This formation ensures the safety of the infantry from enemy warriors who are trying to breach the Chakravyuh.

sheer size of the entire formation. For him, it appears as a traditional battle where a wave of soldiers is coming and another wave of soldiers are going way and, amidst all such upheaval, he would find a free lane and enters the right way, thereby being trapped.

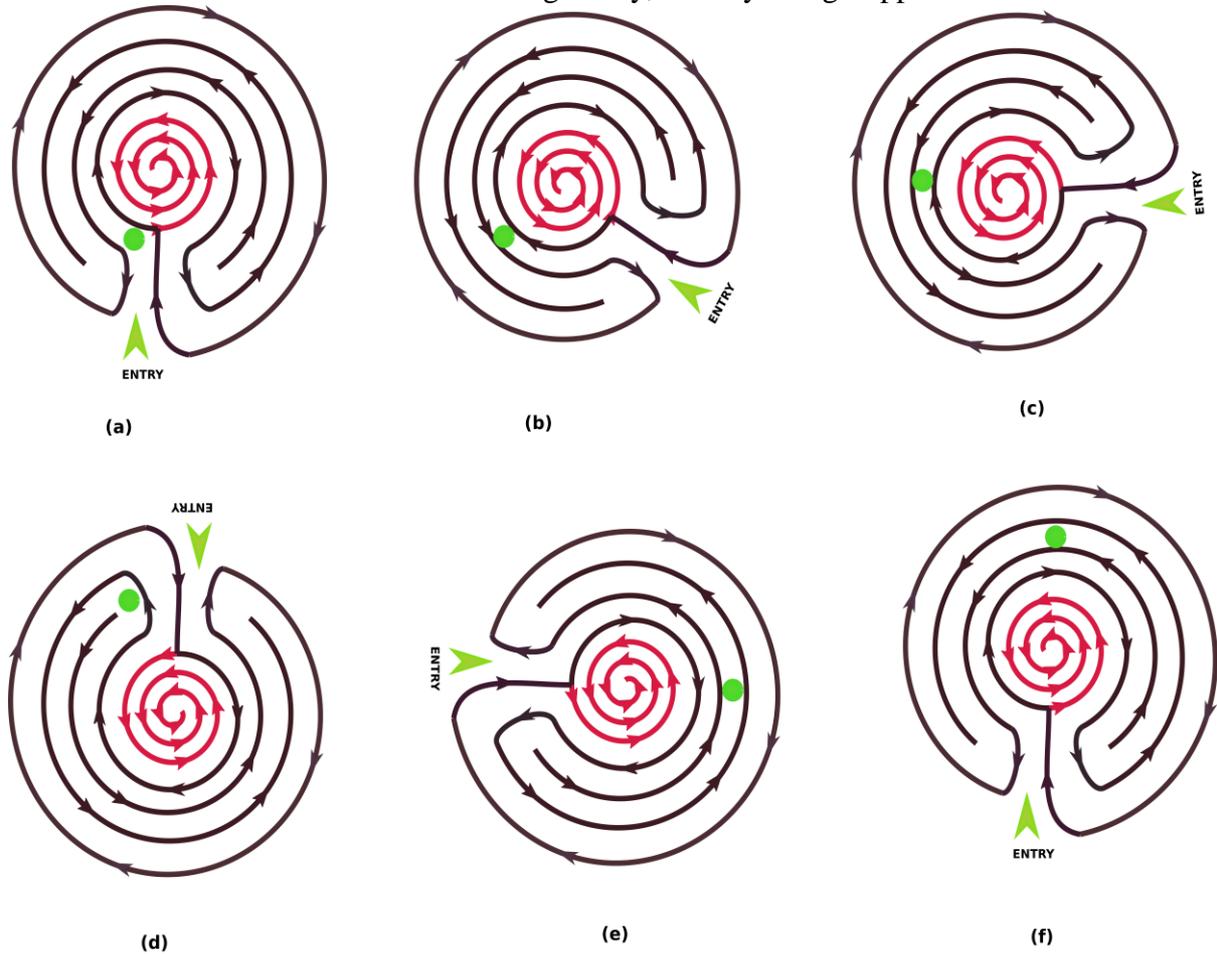


Figure 5. Anticlockwise rotation of the Chakra. The green dots represent the successive positions of an incoming enemy warrior. The relative speed of the warrior depends on the speed of rotation of the Chakra and the speed of the warrior.

The entrance is heavily fortified by a strong and skilled warrior and his troop to ensure that no other enemy warriors can enter the maze to help the already trapped warrior. Being trapped in the maze, the targeted warrior may remain standstill or keeps running in a circular motion along the allowed path as depicted in Fig. 4. In either case, he must face the attack of new and fresh soldiers. This is because, although he decides to stand still, the whole formation can be kept rotating continuously about its centre. Thus, there appears a relative motion between the incoming warrior and the whole mess, as depicted in Fig. 5. While the incoming warrior is in stand still position, the chakra is revolving continuously in anticlockwise direction about its centre. As a result, the position of the warrior keeps changing with the rotation of the chakra. By observing his movement, the commander of the troop passes the signal to his soldiers on how to change their movement and speed. Depending upon the strategy of attack on the targeted warrior, the commander can either speed up or stop the rotation of the Chakra. In any case, the targeted warrior must move across the perimeter of each layer. If somehow he is successful in traversing one layer, he would end up fighting the stronger soldiers in the innermost layer. If the warrior is successful in killing many soldiers of a particular layer, then he is forced to go inside another layer to get attacked by more ferocious and seasoned warriors. As a result, as he enters deep and deep

inside the Chakra, he keeps getting tired both physically and mentally and eventually, becomes the victim of indiscriminate slaughter.

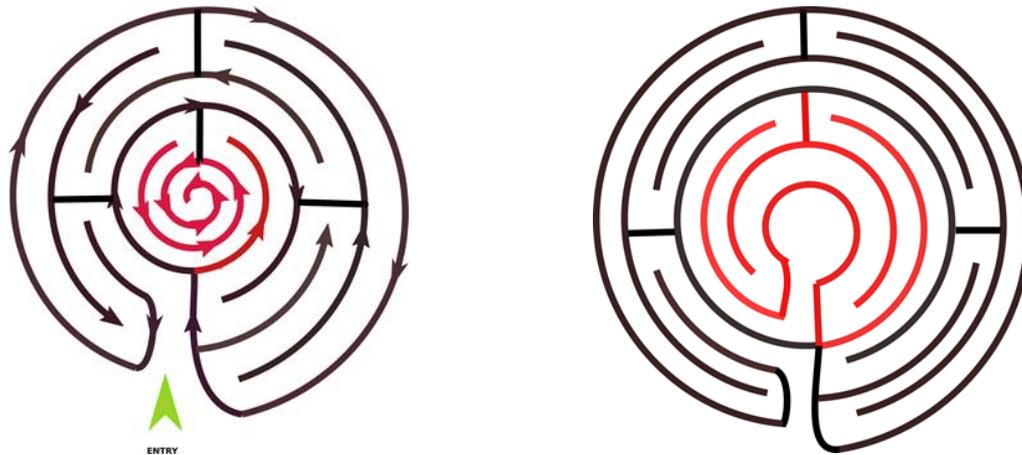


Figure 6. Rearrangement of the Chakra by creating more roadblocks. The two different configurations correspond to two different nascent structures.

But that is not the whole scenario. At any moment, by assessing the strength of invasion, the commander can change the design of the formation to a necessary extent. Being a dynamic multilayer structure, the Chakra can be rearranged meticulously in several ways. The commander can restructure the entire maze by creating roadblocks as many as he can manipulate out of nearly infinite possible ways; one such configuration is shown in Fig. 6. By creating more roadblocks, the enemy can be pushed to a more restricted area and finally towards the dead-end. The dead-ends are the outcome of creating more and more roadblocks and turnings on the nascent structure, turning back from which is nearly impossible even for a seasoned warrior unless he destroys the formation. However, as the maze gets more and more complicated, creating chaos within the maze would not be difficult for a well-trained warrior. To destroy such a ferocious warrior with minimum effort and least damage from own side, the exact creation of such roadblocks and final dead-ends requires a high level of computation. This might be the reason as to why only a very few exceptional warriors during the time of Mahabharata possessed the knowledge of the execution of Chakravyuh.

AS A DEFENSIVE SYSTEM

It is interesting to see how a Chakravyuh remains as an almost impenetrable defensive system. In order to defend someone in an open battle or if the chief target of the enemy is known beforehand, Chakravyuh is the ultimate solution where the enemy's target can be well-protected by keeping him at the core of the Chakra. As already described above, the soldiers near the entrance are always stronger and more skilled compared to the remaining regions. As such, the enemy warriors are most likely to get killed if enter through the opening. If the enemy forces somehow manage to enter through the entrance, they cannot directly rush to the heart of the formation without breaching the layers. If the enemy forces want to reach the center without applying any thrust to break the layers, they need to move across the perimeters of each layer. Due to the massive size of the Chakravyuh, such a long journey alone would be enough for the enemy to catch their breath.

An alternative but a preferable tactic to reach the target is to enter straight towards the center by killing as many soldiers as possible so as to increase the gap between them which later can be easily breached by the warriors following him. This is possible only for seasoned warriors; ordinary warriors will no longer be successful in breaching the layer by killing soldiers in front of them, as the gap will be instantly covered by the sliding soldiers. Being a self-healing

machine, the Chakravyuh takes the lives of inexperienced warriors who challenge and attempt to breach the layers. As soon as the enemy troop starts breaching layers, the commander manipulates the structure and creates roadblocks out of varieties of permutations and combinations to surround and then to crush the enemy. Only a highly skilled warrior with piercing intelligence can breach all the seven layers and able to approach the target.

THE ROUTE TO ENTER AND ESCAPE

Entering and exiting from such a well-planned defensive fortification is an almost impossible task unless a warrior possesses the highest degree of training, extremely fast analytical power, and mental strength. This is because, in both the offensive and defensive maneuvers, the Chakravyuh can simultaneously impose a three-fold attack --- physical, psychological, and strategic. The warrior must come up from the illusions of relative spinning motion, continue his fight, and at the same time, he needs to retrace the possible pathways before the commander reorganizes the maze and creates more roadblocks and dead ends. The sheer size of the Chakra offers the commander nearly infinite ways of creating roadblocks and final dead-ends, as depicted in Fig. 7. He can swiftly rearrange the entire Chakra out of many possibilities and can create free-lanes or narrow gaps for the warrior. As such, there seems to be no predefined rule of escaping the vyuh; it can only be realized within the Chakravyuh while it is in action. Since the escape route can only be devised and fine-tuned on the go, a warrior requires incredibly fast analytical skills. Only a few warriors in the past possessed this attribute and, as such, there were only a few legendary warriors who could destroy a Chakravyuh.



Figure 7. Rearrangement of the whole Chakra to crush the enemy.

A successful trick of reaching the core of the Chakra lies in how familiar the invading warrior is with the skills and strength of interior warriors. This helps him accurately figuring out some vulnerable area and potential point of conflict where he can launch a pre-emptive attack and quickly move away to another place. This movement is necessary in order to avoid getting trapped. As soon as the invading warrior starts creating havoc, there is a high chance of getting trapped because in the meantime the commander would redesign the maze and create roadblocks. The invading warrior needs to perform his action in a meticulous way such that his little effort can cause long-lasting effects and diverts the commander's attention in maintaining the formation. Meanwhile, the warrior can change his angle of attack so that the commander is unable to get enough scope for making dead-ends. This way warrior can devise a smarter strategy to reach the core of the Chakravyuh. There are some other clever tricks of approaching the core. One of the tricks is to keep the archers of the inner layer engaged so that they remain busy in defending themselves instead of attacking the enemy. In extreme

danger, one can also play the trick, although unethical, to kill the drummer that would break the formation into chaos as stopping the drumbeats would break the rhythms of soldiers.

If a warrior somehow manages to destroy the core of the Chakra, he needs to exit from the giant formation. Exiting the Chakravayuh is a much more difficult task than entering. During the entering phase, the Chakravayuh works in a slow-kill approach. Once the core is destroyed, the exiting phase takes an instant-kill approach and all the troops jump upon the warrior. As such, there seems to be no route to escape from the Chakravayuh after destroying its core except using some art of deceit like a Trojan-horse.

So far, our above descriptions on Chakravayuh focuses on its inherent dynamics from which one would arrive at the conclusion that the clockwise-anticlockwise movement of soldiers in the layers is necessary in order to ensure the existence of the whole maze and, at the same time, in creating an illusion. That the synchronized movement of the infantrymen is closely interwoven with the spinning motion of the Chakra about its axis, is the key to the perplexing puzzle that slackens the mental strength of an enemy warrior. The warrior gradually loses all his physical strength due to strategically distributed strength of the troop and finally, the creation of roadblocks and dead ends out of nearly infinite possible ways doomed to lose his life. Curiosity however remains as to how such a structure is devised or what is its underlying geometry. Below, we use some elementary geometry to elucidate the construction of such an invincible magical defense.

THE GEOMETRY OF CHAKRAVAYUH

To begin with, let us try to draw a nascent Chakravayuh geometrically. The simplest way of drawing a seven-layered Chakravayuh requires a spiral comprising seven equidistant loops, as shown in Fig. 8(a). Although we have shown here a clockwise moving spiral, an anticlockwise spiral will also produce the same result, the only difference will be the position of the entrance. After drawing the spiral, the loops are labeled in reverse order starting from the center. Now a vertical line pointing towards the center is used to connect the endpoint of the spiral to the loop 5. Another two lines are drawn equidistant from the previous line that connects loops 2 and 4.

In the second step, as shown in Fig. 8(b), the portion in between the two smaller lines is erased. In Fig. 8(b) onwards, we have shown a zoom-in view of the outer loops for better visibility. In the third step, the loop 3 is disjoined from the rest of the figure, as shown in Fig. 8(c). Finally, this results in a perfect seven-layers Chakravayuh, as shown in Fig. 8(d).

The above method of drawing is a rudimentary one and does not involve any template for generating the pattern. As we see in mathematics, most of the natural and man-made complicated structures involve a seed or a template. Thus it is natural that there might be some basic template embedded in a Chakravayuh. To create such a seed, let us carefully observe the geometry of the Chakravayuh. As displayed in Fig. 9, if we join the center of the Chakra with the terminating points located at loop 3 on the right and loop 2 on the left by straight lines, they form a triangle. If we perfectly choose the locations of the endpoints of loop 2 and 3, the inscribed triangle will be an equilateral triangle if we draw a logarithmic spiral, given by $r = ae^{-\theta}$ with $a = 1$. In that case, all three sides will be intersected by the loops and create four equal segments on each side. This equilateral triangle whose vertex is located at the center of the Chakra and the baseline is the one which connects the disjoint arcs (spirals 3 on the right and 2 on the left), can be treated as a seed for the whole pattern. In Fig. 10, we extract out the triangle for better visibility. The labeling of the segments begins from the center segment of

the baseline and it goes from 1 to 7 in the anticlockwise direction, the vertex of the triangle being labeled as 7. On the other side of the triangle, the labeling of the segments is done in reverse order where the vertex is labeled as 6 so that the two consecutive segments of the baseline acquire the same labeling as 1, 1. This will be clear after a short while as to why the labeling is done in such a particular fashion.

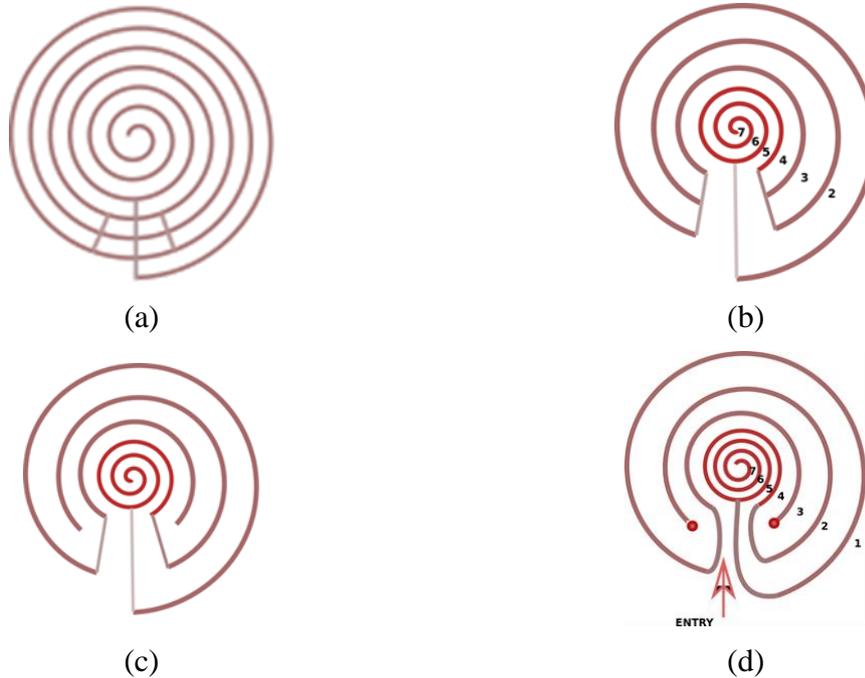


Figure 8. The steps involved in constructing a nascent Chakravayuh from a spiral. It involves a few steps: (a) drawing a logarithmic spiral ($r=e^{-\theta}$) with 7 loops and leveling them in reverse order starting from the center, connecting the endpoint with loop 5 by a vertical line pointing towards the center, and connecting the spirals 2 and 4 by another two lines (b) erasing a portion between the spirals 4 and 2 (c) disconnecting the spiral 3 from the lines and (d) making a narrow path for the entrance.

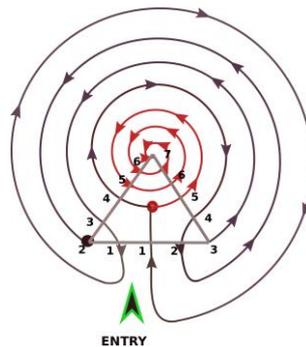


Figure 9. Construction of a basic seed pattern.

To construct the whole pattern, let us begin with the point 7 located on the top of the triangle and proceed towards the point 6 on the left arm by drawing a clockwise-rotating spiral, as depicted in Fig. 10. As we continue the spiral with gradually increasing radii that goes from 6 to 6, 5-5, 4-4, 3-3, 2-2, and 1-1, it forms a complete seven-layered Chakravayuh and the labeling of the layers exactly matches with that of Fig. 8. In order to do so, the trick lies in labeling the points on the sides of the triangle. If we want to start with an anticlockwise-rotating spiral (not shown here), the labeling of the segments on the seed pattern needs to be

reversed. In that case, the entrance will appear on the other side. In either case, the seed pattern will remain the same and acts as the heart of the Chakravayuh.

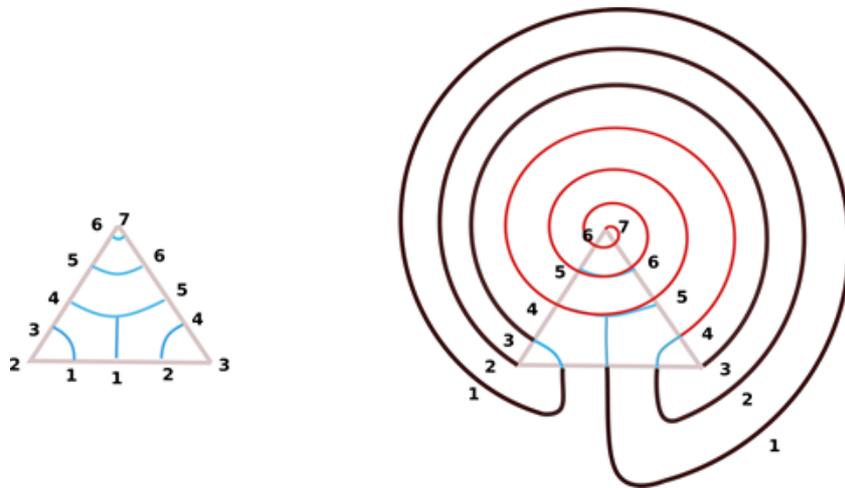


Figure 10. The triangle is a basic seed pattern for Chakravayuh construction. (a) Labeling the segments on each side of the triangle (b) connecting equal numbers by segments of a spiral completes the Chakravayuh.

The seed that we show is basically an equilateral triangle whose perpendicular bisectors meet at the centroid. This structure, as shown in Fig. 11, is rotationally invariant about the perpendicular bisectors. This symmetry belongs to dihedral 3 or, simply D_3 group by an angle of 120° , indicating that we can choose any of the sides as the base without distracting the structure. That is the reason that the whole troop that forms the Chakravayuh in a battlefield can rotate continuously about its axis, keeping intact its structure.

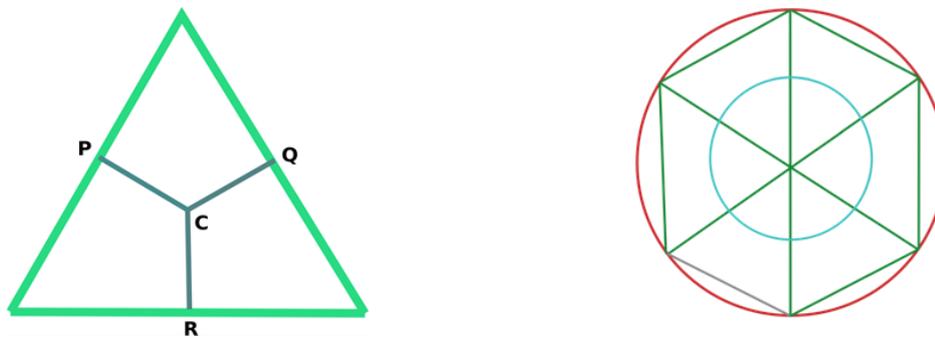


Figure 11. An equilateral triangle where three perpendicular bisectors PC, QC, and RC meet at the centroid (b) the rotation of the triangle about a vertex circumscribes a circle while the centroids lie in another (inner) circle.

How a Chakravayuh looks like when it rotates about its center? This can be easily visualized by looking at the rotation of the seed pattern. Rotation of an equilateral triangle about any one of its vertices circumscribes a circle while the centroids lie in another (inner) circle. This is shown in Fig. 11(b) only for six discrete rotations. The inner circle is basically the trajectory of centroids (point C) of each triangle. If we make a comparison of Fig. 10 with Fig. 11, it will be immediately obvious that the centroid of the equilateral triangle is the point where the vertical line touches layer 5 of the Chakravayuh. This is also the junction of two different wings of soldiers, one from the outer layer (shown black in color) and the other from the inner layer (shown red in color). Eventually, the soldiers at the position of centroid need to be extremely cautious. They must avoid crossing each other and at the same time, they need to

revolve in a circular path. As such, this is the weakest point of Chakravayuh formation and vulnerable to a skilled enemy warrior.

EPILOGUE

With a little textual and archaeological evidence about the details of Chakravayuh, here we have offered with our own speculation a detailed analysis that might decipher its underlying complexity as to why such a battle formation has remained nearly invincible even for highly skilled warriors of antiquity. What lies at the heart of its complexity is the nearly infinite possible ways of its rearrangement that can simultaneously impose physical, psychological, and strategic attack on the enemy forces.

With rapid advances in computer hardware and visualization systems, scientists and engineers are nowadays able to perform exact geometric computation on any complex shapes with the help of incredibly efficient algorithms [15]. The crowning intellectual achievements in computational geometry provide a great opportunity for representation, manipulation, and analysis of any complex shape. As we have described above, at the heart of the complex geometry of Chakravayuh lies some deep mathematical issues concerned with its representation, computation, and manipulation. Now it is the turn of modern mathematicians, engineers, and computer scientists to open such treasure-trove of ancient marvels, decipher the puzzle, unravel the inherent mystery and enchant the world with the pearls of ancient wisdom.

REFERENCES

- [1] Singha, K.: *Mahabharata*. Basumati Sahitya Mandir, Kolkata. 2005,
- [2] Chakravarti, P.C.: *The art of war in ancient India*. Kalpaz publications, New Delhi, 2019,
- [3] Tripathi, R.S.: *History of ancient India*. Motilal Banarasidass, Delhi, 2006,
- [4] Hooper, C.: *The Mahabharata*. Psychological Perspectives **61**(1), 76-91, 2018, <http://dx.doi.org/10.1080/00332925.2018.1422931>,
- [5] Rao, S.R.: *From Dvaraka to Kurukshetra*. Journal of Marine Archeology **5-6**, 61-71, 1995,
- [6] Gombach, B.; Larsen, G.J. and Hudson, E.T.: *The Mahabharata: What is Not Here is Nowhere Else*. Munshiram Manoharlal Publishers, New Delhi, 2005,
- [7] Gombach, B.: *Ancillary stories in the Sanskrit Mahabharata*. Ph.D. Thesis. Columbia University, New York, 2000,
- [8] Rosen, S.P.: *Societies and Military Power: India and its Armies*. Cornell University Press, New York, 1996,
- [9] Greenhut, J.: *Armies of India from the Aryans to the Marathas*. Journal of the United Service Institution of India **106**(442), 30-41, 1976,
- [10] Barua, P.P.: *The State at War in South Asia*. The American Historical Review **111**(1),139, 2006, <http://dx.doi.org/10.1086/ahr.111.1.139-a>,
- [11] Prasad, S.N.: *Historical Perspectives of Warfare in India: Some Morale and Material Determinants*. Centre for Studies in Civilizations in association with Motilal Banarasidass, New Delhi, 2002,
- [12] Thapliyal, U.P.: *Warfare in Ancient India: Organizational and Operational Principles*. Manohar, New Delhi, 2010,

- [13] Wikimedia: <https://commons.wikimedia.org/wiki/File:Halebid2.JPG>,
- [14] Bhakari, S.K.: *Indian warfare: an appraisal of strategy and tactics of war in early medieval period*.
Munshiram Manoharlal Publishers, New Delhi, 1981,
- [15] Zomorodian, A.J.: *Topology for Computing*.
Cambridge University Press, Cambridge, 2005.

CURRENT STATUS OF THE USE OF DRONES IN EDUCATION IN CROATIA

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ABSTRACT

Use of drones considerably rises which includes the education, both by the drones and about drones. We analyse the current use of drones in education in Croatia and provide predictions for its future development. We collected corresponding data using available internet sources. The analysis of the collected data indicates a systematic approach to the inclusion of drones in education. There are two directions of growth in the use of drones, the first leads to an increase in the number of drones in a particular institution and the second leads to an increase in the number of institutions that use drones in education. This article presents an insight into the current use of drones as part of education in Croatia.

KEY WORDS

unmanned aerial vehicles, drones, education, teaching, Croatia

CLASSIFICATION

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INTRODUCTION

The practice has shown that the use of Unmanned Aerial Vehicles (UAVs) is broad. UAVs are used to collect meteorological data, transfer medical equipment, prevent natural disasters from leaking harmful substances into the environment, deliver commercial packages, perform agricultural work, survey in geodesy, search for casualties in accidents and elsewhere. Given the projected increase in the number of jobs that can be performed using UAVs, it is clear that the introduction of UAVs in education ensures the acquisition of competencies that increase competitiveness in the labour market. According to Future of Jobs Report [1] skills that involving UAVs are among the most wanted. In the list of categories of work skills and technologies likely to be adopted by 2025, by share of companies surveyed, rated the category of robots, non-humanoid (e.g. industrial automation, UAVs) with an average percentage of 10 %. This percentage indicates that drones are slowly becoming the mainstay of work across industries. Increasing the scope of use indicates the need for a systematic effect on the development of quality education in the areas covered by the use of drones. This can be achieved by using drones at all levels of education, from primary school to the college.

Use of drones in education provides new learning experiences to students by increasing their engagement and motivation in the learning process, particularly for student's centric learning. Drones enable students to visualize a problem from different perspectives and become a better problem analyser which helps them to think critically and encourages them to be creative and provide innovative solutions [2]. Research shows that the use of drones has significantly improved students' learning of spatial visualization and sequencing skills [3]. In this article is presented an insight into the current use of drones as part of education in Croatia.

DRONES IN EDUCATION

Drones in education make possible the acquisition of new knowledge using advanced technology, opening new trends and adding new dimensions to teaching and learning practices. Applying the acquired knowledge, students can assemble and make drones and write programs for flight control in various programming languages. On this way they develop skills and interest in robotics and informatics. Even with simple flight planning, the weight of the drone, the altitude at which drone flies, the speed, the length of the flight and the range of the drone must be considering. In such calculations, knowledge of mathematics and physics is applied. Likewise, drones can be used in the practical teaching of geography, in biology in the study of the environment, plant and animal species, in geodesy in mapping terrain, in medicine in the delivery of medical material. From this follows the conclusion that the use of drones in education can be divided into two concepts, the concept A – education about drones and the concept B – education by drones.

Concept A encompasses the use of drones in education where students use drones regardless of whether they construct or operate them. Concept B includes the application of drones in education where professors use drones to facilitate students' acquisition of knowledge in field of physics, meteorology, geography, geodesy, photography, etc. The role of students in concept B is the processing and analysis of collected data. Concept B is more applicable at lower levels of education. At higher levels of education, both concepts are applicable because students have enough knowledge to be able to actively participate in class.

The European legislative framework prohibits that persons under 16 years, operate with more than 5 kg weighing drones [4]. Drones are most often used in the education of secondary vocational schools, in training for specific occupations, and in higher educational institutions as a special study subject, related to the construction and flight dynamics.

EDUCATIONAL APPLICATION OF DRONES IN CROATIA

In Croatia, the benefits of the use of drones in education are recognized and aligned with the National Curriculum of the Republic of Croatia for preschool, primary and secondary education [5]. Accordingly all legal frameworks that ensure the implementation of advanced technologies in curricular and extra-curricular activities are met. According to the applicable regulations on the rules and procedures for the operation of drones in European Union [4], obligatory in Croatia from 1 January 2021 [6], teacher must know the legal acts and acquaint the students with the laws related to the management of unmanned aerial vehicles, taking into account the age of the person to whom they teach. The classes can be held indoors and outdoors. In the case of indoor classes, the pilot of the drone does not have to report the flight because it does not enter the airspace and in that case only regulations related to education are applied. In the case of outdoor operations all legal acts are applicable. In primary schools, students' level of psycho-physical and cognitive development brings about additional aspects to be taken into account and all that points to the fact that toy-drones can be used [7].

According to user reports [8] and internet sources, the use of droned in education has been conducted for a definite period of time. That points to the fact that it is necessary to implement the systematic introduction of drones in the implementation and planning of classes. This article will present some of examples from practice:

- the Geodetic Technical School in Zagreb [9] use drones to map terrain photogrammetric procedures for digital terrain model, without direct contact with the subject, provide reliable data that could be later analysed. In the teaching of geodesy, drones are also used as a teaching tool at the Technical School in Pula [10],
- the first technical school Tesla [11] for the needs of teaching the subjects Robotics, Information and Communication and has acquired sets for students and teachers that contain modularly controlled robotic arms, drones, vehicles, sensors and other equipment,
- students from School of Electrical Engineering in Varaždin used drone to film the attractions of Trakošćan castle [12]. Even if they cannot provide funds for the purchase of drones, schools often, in collaboration with the wider community and science popularisers, seek to provide presentations of working with drones and introduce students to modern technologies [13],
- in project “Technologies, Innovation and Modernization for Education” (TIME), Agricultural and Forestry School in Vinkovci, includes teachers and students of 2nd, 3rd and 4th grade of educational programs agricultural phytopharmaceutical technician, agrotechnician, forestry technician and agricultural entrepreneur in three different professional practice programs - training for application of drones in agriculture, forestry and horticulture. Goal of the project is to introduce innovative teaching methods and modern techniques and technologies into the daily work of the institution and modernize the curriculum and harmonize content with the labor market. Students will acquire skills that they will desperately need in order to be as competent as possible in the labor market, but also in working on their family farms [14],
- the Technical School Sisak is participating in the Drone Team project. They are collaborating on the project with schools from Spain, Poland and Slovenia and the AIJU, Institute of Technology in Spain. The aim of the project is to construct a manoeuvrable unmanned aerial vehicle and program its flight through given waypoints. The project envisages the construction of a drone and writing a dictionary with terms from this specific field. Constructed drone will use additional equipment such as GPS, cameras and First Person View (FPV). All materials will be published under an open license as Open Educational Resources (OER) [15],

- Vladimir Prelog School of Science in Zagreb, in cooperation with the Andrija Mohorovičić gymnasium in Rijeka, the Faculty of Science in Zagreb and the pharmaceutical company Pliva, implemented the Science Plus project. As a result of this project is curricula created for 15 new optional subjects that have already been introduced in teaching [16]. One of the modern, innovative subjects is Bionics. The course connects biology and technical sciences. Biological forms and abilities of living organisms are a model for making and assembling a bionic spacecraft,
- aeronautical technical school Rudolf Perešin, Croatian Post Inc., Greek and Cyprus Post and partner companies Dronint, AKME and BK Consult, signed a grant agreement with the Agency for Mobility and EU Programmes for the implementation of the project entitled "Fly VET Up!" [17]. Through this project, it is planned to develop a Curriculum for drone pilot.,
- "LOKO LAG – Sustainable Rural Development" project includes 14 primary schools and during the project each involved school will receive one drone [18]. It is planned that 140 students will be educated and trained to work with drones. In addition to students, their teachers would also underwent this training so that they could later pass on knowledge to the next generations, because upon completion of the project, all equipment remains with the school for further use, all for the purpose of educating future generations.

In these examples of the use of drones in secondary schools, the concept B is prevalent. Further in this text, a detailed description of a well-structured example of concept A follows.

CASE STUDY OF EDUCATIONAL DRONE USE IN FACULTY OF MECHANICAL ENGINEERING AND NAVAL ARCHITECTURE, UNIVERSITY OF ZAGREB

In Faculty of mechanical engineering and naval architecture, University of Zagreb, drones were used in higher education. Classes included several elective courses – *Unmanned Aerial Vehicles Equipment, Navigation Systems* and *Unmanned Aerial Vehicles Systems*, in which students acquire basic understanding and develop competencies of drone usage. About 50 students underwent training through these courses.

The classes consisted of students being introduced to the regulations on the rules and procedures for the operation of drones [4], construction of drones, their technical characteristics, associated equipment and flying. Accordingly, the lessons were divided into the following sections:

- theory – regulations, meteorology, etc.,
- simulation training,
- written instructions,
- demonstration of work with drones (preflight and post-flight inspection),
- practical work with drones (preflight and post-flight inspection) and
- post-flight reports.

The structure of one hour of practical classes is elaborated further in the text.

The training of students was conducted indoors, in the classroom, where the training ground was set up. Figure 1 shows a schematic representation of the training ground where the blue rectangles mark the edges of the tables, the gray grid represents the safety net, the red circles the students and the green circle the flight supervisor. It is to be emphasized that the training area was set in the regular classroom.

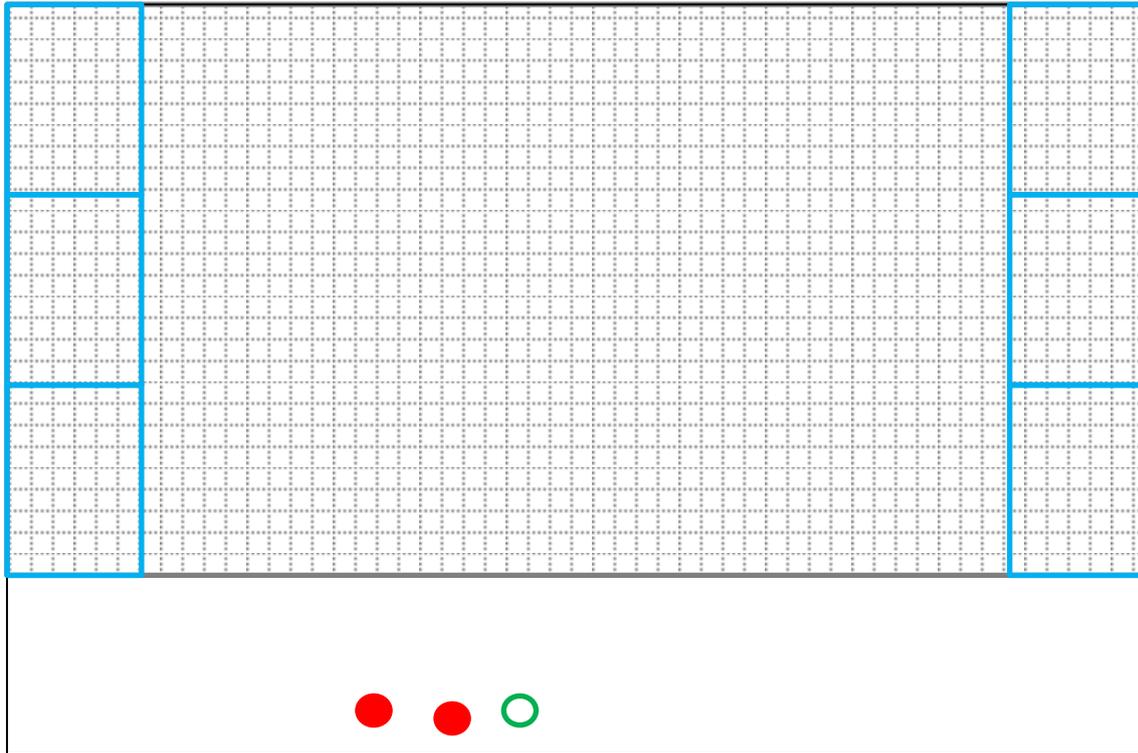


Figure 1. Schematic representation of the training ground. Rectangles on the left and right sides are tables used during other classes, smaller-scale net is safety net, filled circles are positions for students while empty circle is position where flight supervisor stood.

The training ground was secured by a safety net that restricted the movement of students, and at the same time protected the drone from damage. Figure 2 shows real situation during practical class where drone is marked by larger ellipse. A series of circles mark some of the nodes of the net spanned through most of the classroom.

To access practical class, students had to adhere to the following guidelines:

- it is required to participate in the classes only during the pre-registered time interval,
- it is required to come to the class with printed, red and understood procedures planned for the particular training,
- it is required to strictly and immediately follow the flight supervisor instructions during the class.

Access to the training ground in a practical class's period was allowed to the following persons:

- flight supervisor,
- two students who were scheduled for class,
- other persons only after permission of flight supervisor.

On the outside of the door was a clear sign that in the classroom is a practical class with drones.

Upon arrival at training ground and before each class, students had to check the safety net for damage and inform everyone present at the training ground about its condition. After checking the safety net, the students performed a pre-flight inspection of the drone. The pre-flight inspection includes checking the drone and remote control for damaged, battery status, are propellers attached to the engines and can they rotate freely. Each battery, which was used,



Figure 2. Training ground, drone in red mark and safety net nodes in yellow circles.

is given an enumeration that enables the flight supervisor to fill-in the table of charging and discharging for each battery.

After determined pre-flight inspection students performed assigned exercises prescribed by training plan. In case that flight supervisor issues an additional instruction, the student (drone pilot) immediately conducts necessary corresponding actions. In case of a need, the flight supervisor takes over the drone control.

Through classes, the students successfully conducted 16 exercises related to the use of drones in a wide range of situations, Table 1. As shown in Table 1, the exercises covered various segments of drone flight such as vertical flight to restricted high, different types of horizontal flights, flights in tri-dimensional trajectories, flight with sudden trajectory changes and flight data processing.

After the completion of the flight, drone pilot conducts post-flight check of the drone. Drone pilot reports any observations to the flight supervisor along with handing in the drone.

After each training flight supervisor filled Flight report, Table 2.

CONCLUSION

The application of drones is broad and includes various professions. This number of professions is expanding every day and there is a need for people who are properly and professionally educated to be able to use all the potentials that drones provide. Education for their use should be started at the lowest possible level of education.

The data collected about the drone use in education in Croatia point to the current spread of the use of drones in diverse aspects of education. Owing to the relative modernity of these uses, drones can currently be considered as a novel technology, thus the statistical analysis of their use cannot be conducted in details. However, qualitatively, pattern of drone introduction into education follows the average introduction of advanced technologies into education.

Table 1. Exercises plan.

	Exercise	Description
1.	Introduction with drone construction	Assembling and disassembling the drone and checking settings.
2.	Vertical flight	Flying up and down between the given intervals of height.
3.	Horizontal flight in longitudinal axis	Flying drone back and forth between default points.
4.	Horizontal flight in transverse axis	Flying drone left and right between default points.
5.	Turning with drone	Rotating drone about the vertical axis for a given angle.
6.	Horizontal rotation	Circle flight in horizontal plane.
7.	Default trajectory – rectangle	Flying in a “rectangle” pattern.
8.	Default trajectory – number 8	Flying in “number 8” pattern.
9.	Vertical rotation	Flying in “circle” pattern in vertical plane.
10.	Default trajectory – rectangle	Flying in a “rectangle” pattern in vertical plane.
11.	Default trajectory – number 8	Flying in “number 8” pattern in vertical plane.
12.	Default trajectory – 3D	Flying in 3D pattern.
13.	Describing default trajectory – <i>flip</i>	Circle rotation from hovering.
14.		Circle rotation during flight.
15.	Using Flight Data Recorder	Dubbing and processing flight data.
16.	Specific operations	Flight with sudden trajectory changes.

Table 2. Flight report.

FLIGHT REPORT		
Place:	Date:	
Flight supervisor:		
Drone pilot:	Flight start:	Flight end:
Drone pilot:	Flight start:	Flight end:
Notes:		
Flight supervisor:	Responsible person:	

REFERENCES

- [1] –: *The Future of Jobs Report 2020*. World Economic Forum, 2020, <https://www.weforum.org/reports/the-future-of-jobs-report-2020>, accessed 3rd December 2020,
- [2] Sattar, F.: *Droning the Pedagogy: Future Prospect of Teaching and Learning*. International Journal of Educational and Pedagogical Sciences **11**, 1622-1627, 2017,
- [3] Chou, P.N.: *Smart Technology for Sustainable Curriculum: Using Drone to Support Young Students’ Learning*. Nature Sustainability **1**, 2018, <http://dx.doi.org/10.1038/s41893-017-0019-3>,

- [4] –: *Commission implementing regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft*. European Commission, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R0947&from=HR>, accessed 3rd December 2020,
- [5] –: *National Curriculum*. Croatian Ministry of Science and education, <https://mzo.gov.hr/UserDocsImages//dokumenti/Obrazovanje/NacionalniKurikulum/NacionalniKurikulumi//Okvir%20nacionalnoga%20kurikuluma.pdf>, accessed 3rd December 2020,
- [6] –: *UAS operator registration and taking exams for remote pilots*. Croatian Civil Aviation Agency, <http://www.ccaa.hr/letenje-dronom-98073>, accessed 3rd December 2020,
- [7] –: *DIRECTIVE 2009/48/EC*. European Commission, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0048&from=HR>, accessed 3rd December 2020,
- [8] Topljak, A. and Oreški, P.: *Equipping Schools with Information and Communication Technology for the Needs of Introducing the Subject of Informatics as a Compulsory Subject as Part of the School for Life Project*. In Croatian. Hrvatski sjever: književnost, kultura, znanost **15**(54), 95-114, 2020,
- [9] Zavada, A.: *The first drones arrived in Croatian schools*. In Croatian. <http://hr.n1info.com/Znanost/a88146/Prvi-dronovi-stigli-u-hrvatske-skole.html>, accessed 3rd December 2020,
- [10] Bagar, L.: *Drone as a teaching aid in geodetic education*. In Croatian. http://ss-tehnicka-pu.skole.hr/?news_id=308, accessed 3rd December 2020,
- [11] –: *Robotic arms and drones in education*. In Croatian. <http://www.ss-prva-tehnicka-tesla-zg.skole.hr/vijesti/robotske-ruke-i-dronovi-u-nastavi>, accessed 3rd December 2020,
- [12] –: *Students of the School of Electrical Engineering made a short film about Trakošćan*. In Croatian. <https://varazdinski.net.hr/vijesti/drustvo/3168249/video-ucenici-elektrostrojarske-skole-snimili-kratki-film-o-trakoscanu>, accessed 3rd December 2020,
- [13] –: *A presentation of drones was held at the Đurđevac Vocational School*. In Croatian. <https://www.leramis.hr/2020/02/odrzana-prezenacija-dronova-u-strukovnoj-skoli-durdevac>, accessed 3rd December 2020,
- [14] –: *Erasmus+ TIME*. <http://ss-poljoprivredno-sumarska-vk.skole.hr/erasmus/time>, accessed 3rd December 2020,
- [15] Klarić, S.: *Another successful EU project of the Technical School Sisak*. In Croatian. <https://www.radio-banovina.hr/jos-jedan-uspjesan-eu-projekt-tehnicke-skole-sisak>, accessed 3rd December 2020,
- [16] –: *List of Elective Courses*. <https://www.psvprelog.hr/fakultativni>, accessed 3rd December 2020,
- [17] Croatian Post Inc.: *Innovative Training Curricula for Drone Controllers*. In Croatian. <https://www.posta.hr/default.aspx?id=8567>, accessed 3rd December 2020,
- [18] –: *LOKO LAG - Sustainable Rural Development*. In Croatian. <https://lag-bosutskiniz.hr/loko-lag-odrzivi-razvoj-ruralnog-podrucja-uvodna-konferencija>, accessed 3rd December 2020.

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