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Pragmatic View of Research of Organisations

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Abstract:

Research question (RQ): Is pragmatic research the answer to researching complex, uncertain, and irrational organisational landscapes?

Purpose and originality: This article explains a mechanism-based pragmatic approach to organizational science. A comprehensive examination of core approaches to organizational research reveals that traditional organizational theories and classical models prove inadequate in providing a holistic understanding of the escalating complexity and multimodality of organizational phenomena. This underscores the novelty and potential of the pragmatic approach in tackling these complexities.

Method: The research used organizational source criticism as a historical methodology to analyse the shift in organizational science beyond classical objectivist conceptualizations. Mechanism-based research explored and understood the contingency of knowledge and action using a pragmatic approach to organisation research.

Results: This study's findings underscore the practical implications of pragmatic research in organizational science. It is not a static method but a dynamic and evolving one that effectively addresses organizations' changing needs, societal trends, and technological advancements. This emphasis on adaptability and relevance keeps pragmatic research at the forefront of organizational science, making our findings all the more significant and interesting.

Limitations/Further research: It's important to note that this research is based on conceptual views of organizational pragmatic research. While it involved a systematic analysis of the application of pragmatic research methods in the empirical field, it's crucial to acknowledge that further analysis is not just a suggestion but a necessity to fully understand the method's role in explaining complex organizational phenomena. This acknowledgement of the need for more research encourages the reader to delve deeper into the topic, fostering a sense of curiosity and engagement.

Keywords: paradigm, pragmatism, concept, model, complexity, reality, social mechanism, organisation.

1 Introduction

Major events in human society often lead to permanent changes in how people live and work, affecting every aspect of human life. The term 'modernity' describes these changes, characterised by technological, economic, and institutional features. Traditional and

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organisational science are rooted in modernist assumptions, as Gergen and Thatchenkery (1996) stated. It is empirical, inductive, observational, and experimental science, beginning with Francis Bacon's book 'The Organon.' His work became a source of various scientific and technological advances. Since then, new methodologies have developed, such as idealism and romanticism, but a rationalist or positivist view of organization still prevails today.

Itzkowitch (1996, p. 31) argues that traditional micro theories see individuals and their rational actions as pivotal for the social world. Society or social structures become possible only when actors' psychological meanings and rational intentions are revealed. In response, macro theorists deny individuals' prevailing role, arguing that micro theory is incapable of creating and developing structures. Additionally, Bueno and Salapa (2021) confirm that the classical theories of organization and administration, often the foundation of our studies, share the idea of a static and universally applicable organizational structure aimed at smooth functioning in achieving the outcome. However, as we delve deeper into these theories, they may not hold up to the realities of our dynamic and complex organizational environments. Taylor (1911). Scientific management, for instance, is based on “one best way” of applying Taylor’s scientific management empirical and experimental methods to solve everyday problems of organisations, which was not empirically validated. The rationality of scientific management treating workers as machine parts, emphasizing efficiency and productivity, and neglecting human factors, social context, and worker relationships do not explain the complex and dynamic functioning of the organisation (Casey, 2002, p. 71).

Fayol (1949) emphasized the hierarchical top-down management style and rigid formal structures and procedures. While these aspects may have been effective in the past, they fail to address the multifaceted challenges of a dynamic, permeable, and ever-changing organisational environment. Administrative theory, for instance, avoids the motivation factors of organisation members and gives no insight into engaging and inspiring workers. Fayol’s view of the organisation is simplistic and does not address the multifaceted challenges of a dynamic, permeable, and ever-changing organisational environment.

Weber (1947) developed the bureaucratic theory of organization, assuming that organizations are impersonal, structured by rules and procedures, and inefficient. Formalising processes and activities slow down the organization and make it unresponsive to change. Workers feel like the cogs in a big machine; their contribution, recognition, and individuality do not count. The bureaucratic organization theory does not explain the role of motives, responsiveness to change, and adaptability capacity of the organization in a rapidly changing and complex organizational environment.

However, classical organizational theories provide insight into foundational principles of organization. Only their exclusive emphasis on structure, control, and efficiency neglects the flexible, motivational, and adaptable capacity for change and the role of people in these processes (Itzkowitz,1996, p. 22).

The rationalist paradigm reinforced modern society's dependence on science and technology (Gergen & Thatchkenkery, 1996). In the 20th century, positivism faced new philosophical currents such as pragmatism, hermeneutics, phenomenology, and social constructivism. However, these opposing philosophies could not successfully engage with positivism due to their lack of clarity (Hjørland, 2016, p. 133).

The Enlightenment period significantly impacted organisational research and shifted the focus to employees and managers. We know that an organisation's knowledge is not objectively rational but rather a result of individual rationality (Gergen & Thatchkenkery, 1996). Hjørland (2016) argues that classical rationalism emphasises the importance of intuition and reason in science. As a part of European philosophy, this approach is a fundamental aspect of the rationalist paradigm. The subsequent paradigm of logical positivism, which emerged from a combination of empiricism and rationalism, remained significant until the rise of pragmatic naturalism in the 1960s under the leadership of Thomas Kuhn (1922-1996).

Kuhn coined the term "paradigm," which refers to a set of beliefs, values, techniques, and other factors shared by a particular community. According to Hjørland (2016), Kuhn believed that articulated and unarticulated factors influence paradigms in the research process, and new paradigms emerge, leading to new theories, approaches, and definitions. Taylorism, the first rational paradigm, held the firm belief that maximising the sensible behaviour of a rational actor could only be achieved through carefully planned, organised, coordinated, and controlled processes. From a rationalist perspective, management by Objectives and Total Quality Management is a method to increase employee performance. Many management researchers, such as Lawrence & Lorsch (1967), Vroom (1964), House (1971), Hersey and Blanchard (1980), and Fiedler (1967), took a similarly rational approach to studying the ideal manager.

In 1957, Herbert Simon introduced the concept of "bounded rationality," which raised the crucial question of the limitations of humans in processing available or hidden information. All theories and paradigms from this period emphasised the importance of human direction and control in organisations. March and Simon (1958) brought the discussion and study of organisations into the academic arena. They illustrated the nature of the "limits of rationality" at the limits of individuals constrained by the elements of the situation that are not included in the rational calculations supporting the strategic factors (Weick, 2019, p. 1531). Hedström and Swedberg (1998) see March and Simon's (1958) present rational constraints in decision-making as an example of theorising with social mechanisms. Bromiley et al. (2019) argue that the limits of rationality set by the situation lead to the perception and understanding of the selective and attentive effect of different mechanisms at different organisational levels involved in decision-making (Weick, 2019). Furthermore, strategic organisational performance is crucial and is the focus of organisational science research (Cooper & Burrell, 1988; Ambrož, 2021). However, successful management, even on the strategic level, relies heavily on the analytical capacities and competencies of the individual (Ambrož, 2021, p. 64).

Senge (1990) argues that the perception that someone up there is in control of an organisation is a pure illusion. This illusion rests on the belief that controlling an organisation's dynamic and detailed complexity is possible. To solve the problem of organisations' hidden complexity and dynamics, we first need to understand what organisational research has brought to light in the past. The history of organisations shows that we can trace many organisational changes back to important social events such as the Industrial Revolution, the globalisation of markets, and the development of information and communication technologies. Secondly, as organisations become increasingly complex, uncertain, and irrational, it is necessary to move away from an exclusively rational perspective and adopt new philosophical and methodological approaches to understand better and address the evolving concept of organisation. Organisational models and traditional research methods are insufficient to cope with the rapid and profound changes caused by modern society's complex and turbulent circumstances.

This article highlights the pragmatic shift in organisational science that presents itself in mechanism-based methodology approaches. (Figure 1). Empirical evidence on organisational research shows that current organisational theories and classical models are not the contemporary focus of organisational research and may not make sense of the phenomenon of organisation. The article explicates three core methodological principles: (1) mechanism-based theorizing, (2) multidisciplinary research, (3) problem-solving research resulting in actionable knowledge, and (4) mixed methodology with advanced analytical techniques rooted in inquiry and practical research process.

2 Theoretical framework

Natural science always tries to understand organisations and explain their behaviour (Van Aken & Romme, 2009). While positivist rational assumptions and deductive methods work well in the natural sciences, they require some refining in social sciences and studies. The positivist paradigm has four dimensions: objectivity, generality, empiricism, and linearity (Zhang et al., 2011). To gain a complete understanding of an organisation, Uduma and Sylva (2015) propose that a mixed approach is necessary, as relying solely on interpretative or positivist approaches can be limiting. Although positivist research studies can offer insight into one aspect of the problem, they do not suggest solutions. Mckenna et al. (2001) advocate using non-rationalist and non-positivist paradigms to overcome this gap in future research.

From a human perspective, the concept of an organisation is complex and individualised, and there are no universally applicable laws. Personal and societal characteristics, such as cultural capital, influence the interpretation of organisational research findings. When studying social systems, researchers cannot remain objective observers, and their participation will inevitably impact the object of analysis. Postmodern, critical approaches to the organisation are the device for understanding the non-deterministic view of the organisation (Feys, 1965; Zhang et al., 2011).

Weik (2022) argues that organisations influence how employees think and feel about the world. The author criticises rationalist and cognitivist attitudes to organisational institutionalism, which do not include the notion of life as the source and the motion of all creativity, valuation and self-actualisation. Weik (2022) emphasises predominantly the immediate experience of feeling, perception and understanding, the process of creativity and novelty and presents the organismic, humanist and non-humanist model of life, which guards against the reduction of knowledge to solve the problem of social collaboration and non-focus on creativity and novelty.

The organisational research history can highlight the pathways to future organisational research (Maclean et al., 2016). Interpreting some segments of organisational history explains the core ideas, constructs and theories that underlie the pragmatic research approach as philosophy and methodology. Moreover, Coners and Matthies (2014) argue that the historical approach combined with content analysis explains and understands various organisational phenomena. Content analysis categorises primary data collections based on interviews or open-ended surveys and transforms qualitative data into quantitative outcomes. We can analyse historical archived data with new analytical techniques that did not exist before (Edelmann et al., 2020).

Moreover, using newly digitalised data, researchers can develop new macro-level theories of social networks and cultural change and micro-level theories to explain human decision-making on micro levels. Examples include new macro-level theories of social networks, cultural change, and micro-level theories of human decision-making. According to Scherning (2011, p. 4), multilevel research on technology adoption uses social network theory on different levels to research theory, measurement, and analysis.

Wadhwani and Sørensen (2023) introduce the role of serious play in historical and organisational research. Drawing on the pragmatic philosophy of Pierce (1877), the authors argue that playful methods are effective for abductive methods in seeking new knowledge and improving it by creating and categorising new sources, detecting connections, developing new insights, and entertaining new presentations. New hypotheses and interpretations arose from the profound experience of the external and internal worlds comprised of the symbolic worlds connected by rules, habits and representations (Wadhwani & Sørensen, 2023).

Pfeffer's (1993) research shows that studying organisations requires further development due to the variety of theoretical and methodological approaches, which necessitates more agreement. Karatas-Özkan and Murphy's (2010) study highlights the importance of understanding and examining alternative perspectives on organisational analysis. Burrell and Morgan's functionalist, interpretive, radical humanist, and structuralist, as well as Hardy and Clegg's normative, interpretative, critical, and postmodern paradigms, establish modern organisational analysis. Hardy and Clegg (1997) stress the importance of intuitively exploring diverse research methodologies. They assert that the level of reflexivity demonstrated by knowledge in a specific context is crucial in achieving research objectivity. The authors

highlight the significance of distinguishing between theory and practice to avoid solely relying on normative and prescriptive practice concepts. Research and practice are inherently distinct, and reference images shape the identity of theory. A broader approach to theorising that encompasses different domains is necessary since the approach cannot recognise itself. Finally, plural communities tend to be more reflective of conventional wisdom.

According to Weick (1993, p. 635), reality is an ongoing accomplishment aimed at creating order and making retrospective sense of what occurs. Organisations are indeed transforming using new technologies and new sources of data. Employees' experiences are changing accordingly, generating vast data about the organisations. Davis (2017) argues that emerging pervasive markets can make organisations obsolete in many areas of human endeavour. Different access to information and markets will reshape organisations. The author even argues for the new institutions to replace the old ones. Polzer (2023) states that newly developed data, combined with established methods and supported by new analytical techniques, are the latest challenge to studying human behaviour at work. Moreover, Bosco (2002) thinks that the greatest potential to further organisational scientific progress lies in

- the extraction and selection of large-scale data,
- using a formal protocol and,
- open access to databases.

Church & Burke (2017) point out that topics like strategy, organisational design, mission, human capital, reward systems, diversity and inclusion of employees will play significant roles in the future. However, the authors also emphasise three key drivers important in organisational change processes: changing nature of work, changing nature of data, and changing workforce dynamic. These changes are related to changes in the organisation's design. Moreover, drivers are the new venue for future organisation research. The future of work is becoming a relevant future research topic. Barbosa et al. (2002) are talking about the 4th Industrial Revolution. Robotics, AI, biotechnology, and nanotechnology will mark this revolution.

Wenzel et al. (2020) see the organisational future as an open-ended category in organisational life and propose "future-making practices" to delineate it. According to Church and Burke (2017), four future trends emerge from the key drivers explaining the nature of organisational change. The first is a shift to platforms over products, where platforms are new organisational designs due to the development of communication and information technologies. The second is a shift from mechanic to digital due to the need for agility and quick response of the organisation to the external and internal environment challenges. The third trend is a shift to insights into data that generate huge volumes of hidden information. Insights are more important than data-generating patterns and trends that support the future behaviour of organisations. The fourth trend is a shift to talent over employees due to changing demographic trends and the need to select the use of resources by high-potential people.

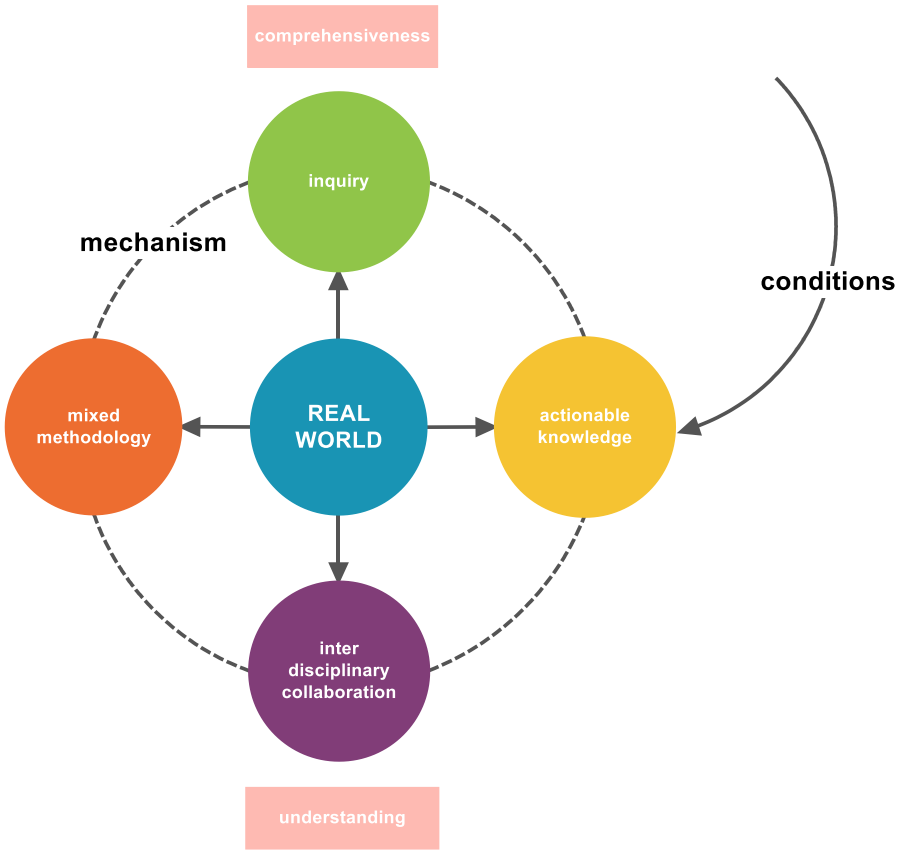

Figure 1. Pragmatic shift in organizational science

Research question: Has pragmatic research the explaining power in answering complex, uncertain, and irrational organisational landscapes?

2.1 Pragmatism as Organisational Philosophy

Back in (1998), Wicks and Freeman made a case that organisational studies required a significant shift. They believed pragmatism was a valuable philosophy that brought attention to ethical and moral concerns. More recently, Farjoun et al. (2015) discovered that many scholars of organisational theory view pragmatism as a philosophy that can help solve problems in organisational processes and relationships.

A pragmatic approach is primal to navigate changes and complexities within an organisation. This approach balances traditional rational and structural viewpoints in contemporary turbulent times marked by wars, migrations, industrial and technological revolutions, and environmental challenges (Lorino, 2018). Brecht (2011) and Simon (1957) suggest that humans make decisions based on limited knowledge and cognitive capacity, which Lorino (2018) further explains as complexity and uncertainty, requiring exploration, experimentation,

teamwork, community involvement, and significant resource commitment from the organisation (Pérez-Ortega & Vargas-Hernández, 2018). Pragmatism combines value, meaning, and practical consequences by linking truth with usability, as stated by Dewey (1986).

Tywoniak et al. (2021) provide an operational definition of pragmatism based on triadic thinking and mode of inquiry. This approach involves seeking a third way to discover useful solutions, unifying action and thought through a model to aid actors in understanding the situation, and interconnecting structure and processes in an ongoing process narrated as a story from the initial situation's description to the disruptive event, proposed actions, immediate action, and feedback loops to stabilise the system.

Tracy (2007) noted that context is essential in organisational research, involving observation, pattern-seeking, and theorising based on empirical evidence. Modern organisations combine classical concepts, social and behavioural sciences, and organisational theory, creating a link between the organisation and its environment (Davis, 2010).

2.2 Pragmatism and New Competencies

Current researchers tend to concentrate on their particular fields when studying organisations instead of affiliating themselves with a specific theoretical tradition. Davis (2010) clarifies that the sluggish development of new theories can be attributed to the absence of experimental control among researchers. We commonly see organisations as instruments rather than natural entities, and the patterns within them can shift over time because of the dynamic nature of modern organisations, making it challenging to maintain generalisations.

As per Walsh's (2006) research, knowledge is a critical production factor that assists workers alongside machines and capital. In today's knowledge-based work, problem-solving and strategic brokering are paramount. Therefore, workers require new competencies such as perception, attentiveness, and decision-making to excel in the new organisational setup. Wealth accumulation nowadays relies on investing in human capital through formal education. Balková et al. (2022) argue that this is insufficient and recommend that organisations' values significantly impact their performance and should be studied systematically. Organisations are constantly in need of creative behaviour. In 2016, Obeidat and his colleagues presented a proposition for additional exploration into the AMO theory. This theory posits that a functioning system has three separate elements that impact employee qualities and ultimately aid in the company's prosperity: an employee's capability, drive, and chance.

Ganster and colleagues (2018) highlight the importance of conducting psychological research in organisational sciences. They explore different approaches to stress and health, including arousal studies, neuroscience perspectives, emotions, individual differences, and sleep. To better comprehend the impact of work on our mental and physical well-being, the researchers

recommend creating an Allostatic load model, as proposed by Ganster and Rosen (2013), which can shed light on the factors that contribute to stress progression.

Waldmann et al. (2017) reviewed the advent of neuroscience in management and organisational research. The review identifies two general topics: how the brain may be important to management and organisational behaviour. Authors argue that the brain when resting, provides trait-like information that is important in understanding individuals' cognition, emotions and behaviour. Secondly, the brain offers state-like responses to stimuli. Waldmann et al. (2017) emphasise the need to research the theoretical basis of neural concepts and team-based neuroscience technologies, identifying and developing the organisational leaders to avoid narcissistic, Machiavellian and psychopathic individuals. Authors suggest using neuroscience to identify entrepreneurial talent and verbal and nonverbal communication in teams.

2.3 Mechanism-based Theorising

The past can highlight the pathways to future organizational research (Maclean et al., 2016). Interpreting some segments of organizational history explains the core ideas, constructs, and theories that underlie the pragmatic research approach as philosophy and methodology. Moreover, Coners and Matthies (2014) argue that the historical approach combined with content analysis explains and understands various organizational phenomena. Content analysis categorises primary data collections based on interviews or open-ended surveys and transforms qualitative data into quantitative outcomes.

The impact of technology, digital advancements, and the COVID-19 pandemic has caused significant changes in organisational structures and work processes (Polzer, 2022). Cascio and Montealegre (2016) highlight the transformative effects of cloud and mobile computing, big data and machine learning, sensors and intelligent manufacturing, robotics, and clean-energy technologies. These advancements have greatly influenced work efficiency and performance in organisations. However, there needs to be more research on the influence of modern technologies on leadership and organisational roles, as the authors argue.

Thanks to the information and communication technology revolution, scholars worldwide now have access to organisational data, leading to a transformation in organisational design (Davis et al., 2016). Problem-driven work has taken centre stage, and the focus is no longer solely on the organisation. This work utilises mechanism-based theorising and research to understand better the social mechanisms explaining relationships and how and why certain outcomes occur (Davis & Marquis, 2005; Anderson et al., 2006). Mechanism-based research aims to understand the processes that lead to causal relationships by examining the mechanisms and theories involved (Ylikoski, 2019). Reviewing these mechanisms, we can move beyond surface-level descriptions of phenomena (Davis & Marquis, 2006). Many researchers and scholars agree that having more data does not necessarily equate to more precise or higher-quality theories. Becker (2014) expands on this concept by linking social

mechanisms to case studies that deeply examine specific situations, organisations, and events.

In (2007), Tracy implemented a problem-based methodology that was contextual. This approach, created by Huberman and Miles (1994), involves an iterative process of analysing data while drawing upon previous research. The analytical process focuses on layers and cycles, and Tracy believes it is essential to produce intriguing, practical, and theoretically significant outcomes by paying close attention to detail. She dismisses the interpretive analysis steps that rely on predetermined rules, preferring to immerse herself in a context, iteratively analysing data, revealing power relations that hide subordinated knowledge, and developing results that can engage and be evaluated by different audiences. Zang (2023) concurs that observable studies can only be fully understood when linked to unobservable internal mechanisms supported by the ontologically defined existence of underlying structures.

2.4 Pragmatic View of Mechanism-based Research

As Weber (1947) noted, the social and organisational world is not a means that determines ends. Important factors are motives that have various relations to means. The same action and structure can lead to different social outcomes. Ekström (1992) believes that social actions are influenced by mental dispositions, intentions, social contexts, meanings, and structures, making it a complex interplay. Zhang (2023) argues that we must note that observable events actualise unobservable ones. We can understand the social world by understanding the structures that generate events.

According to Elster (1998), mechanisms provide insight into the inner workings of human behaviour, particularly the relationship between beliefs and desires. Similarly, Ekström (1992) advocates for a causal explanatory approach to research, which focuses on identifying the causal properties of processes instead of just establishing correlations between variables.

However, research using mechanisms rests on some rules: stopping rule, boundary rule, rule of levels, self-awareness rule, temporal dimension, and links to practice. These rules are bound, set limits, assess capabilities, set time limits, and develop the usability of the process using mechanisms in research (Anderson et al., 2006). Hedström and Ylikoski (2019) develop a different set of characteristics. They emphasize that mechanisms are far more than unobservable. They can involve irreducible links between the mechanism and its effect, forming causality, which is local with spatiotemporal dimension, enabling the forming of mechanism hierarchy and its variable structure.

Mechanisms aim to understand how individual parts form a collective result (Ambrož, 2022). Social mechanisms can be classified into three types by Hedstrom and Swedberg (1998): situational, action-formation, and transformational. Situational mechanisms show how macro-level factors affect the micro-level. Action-formation mechanisms, on the other hand, operate

on the micro-level, connecting cognition to behaviour. Transformational mechanisms, the third type, transform micro-level effects into macro-level outcomes. The ultimate aim of mechanisms is to connect these three levels and uncover the underlying mechanisms at the macro level. Situational mechanisms shape organisations, networks, and structures related to objectives, opportunities, beliefs, and expectations. Action formation and transformational mechanisms bring about both intended and unintended macro outcomes for actors through multi-level and multi-factor processes (Hedstrom & Swedberg, 1988; Hedström & Wennberg, 2016). As Weber (1936) argued, the motives of the social actors define the use of means to achieve ends. Social actors may have different motives, actions and structures to achieve the same end or use different motives, actions and structures to achieve various ends. We can hypothesise that different social mechanisms underlie social action (Ambrož, 2021). Coleman (1990) suggests that individual properties, actions, and relations to one another explain social facts and relational structures based on individuals' rational choices in social life phases.

In Aparna et al.'s (2019) individual-level MMO (massively multiplier games) framework, mechanisms are applied to three independent interacting domains: performing capability, desire to perform, and chances to perform. Barnett and Coulson (2010) define the strong social importance of the MMO as a form of online communication tool. Players in the MMO interact, form relationships and friendships, create working groups, and work together to accomplish goals. The MMO framework requires many resources to conduct in-depth analyses of individual performance.

In their research, Baum and Amburgey (2017) use organisational ecology to illustrate how social, economic, and political factors impact the variety of organisations, their evolution or extinction, and how different levels and dimensions of organisation can be combined. Hedström and Wennberg (2016) suggest that organisational ecology connects macro and micro levels and is a promising avenue for future research on organisations.

2.5 Multidisciplinary Research

In the past two decades, a new stream of research in organisation science emerged addressing organisational relationships, alliances, and partnerships. Engaging organisations with external agencies, local communities and non-profit organisations increases and develops the urge for collaborative action and transformation. The nature and meaning of the network in change processes are in introducing the role of dyadic relations based on the dialogue principle as a central mechanism for change learning new sustainability capabilities (Ryan et al., 2012).

Multidisciplinary research on organisation networking could develop knowledge of system-level change mechanisms, relationship dynamics, and mechanisms of dyadic learning on intra- and inter-organizational levels (Ryan et al., 2012; Ambrož, 2021). Organisations can create an equilibrium of stability and change in the internal and external environment by recognising the mechanisms constraining actors' ability to utilise agency (Capra & Luisi, 2014; Flockhart, 2016). Johnson and Onwuegbuzie (2004) emphasise the pragmatic

philosophical framework's nature in a multidisciplinary approach. They view knowledge as constructed (organisation as structure) and functional (organisation-environment transactions).

Breslin (2011a, 2014, 2015) argues for the research of evolutionary processes in organisations, introducing two approaches to evolution processes in organisation entities and a practice-based approach. The entity's approach advocates that ideas, knowledge and capabilities are the features of individuals, groups and organisations. The practice-based approach concentrates on how ideas, knowledge and capabilities perpetually enact and change through actions. Moreover, Peschl (2023) argues for a paradigm shift in understanding organisation as an innovation process based on organisational learning and a source of innovations.

Polzer (2023) introduces new trends in organisational research. He confirms that organisations employ organisational scientists to complement their informational science teams' research on concrete organisational problems. Organisational scientists have profound disciplinary knowledge and methodological and analytical expertise for conducting rigorous human resource research. Polzer (2023) emphasises that we face a new organisational landscape with research challenges such as data-driven decision-making processes developing from algorithmic aversion to appreciation, from algorithmic complements to substitutes, embedding algorithms in the flow of work, analysing social networks, and adapting collective intelligence in generating scientific knowledge through teams. Polzer et al. (2022) see meetings as a research source studying team interactions and conversations using conversation metrics. However, Polzer (2023) directs attention to new phenomena based on the development of computational linguistics to measure culture. Many other areas of work and management will become subject to algorithmic influence and raise questions about control, monitoring, transparency, privacy and fairness (Gagné et al., 2022).

Combining machine learning and artificial intelligence allows practitioners to use the information from abundant data and learn from data scientists. Using the design thinking method as an iterative process for redefining processes and creating innovative solutions (Razzouk & Shute, 2012; Church & Burke, 2017) as a parallel to the scientific method fosters better collaboration in the internal organisational research processes. This changing landscape of the organisational research ecosystem helps to bridge the research and practice and gives way to a pragmatic approach to scientific research (Polzer, 2023; Sarwar & Fraser, 2019).

2.6 Problem-driven Research

As we investigate future research venues for organisations, we have realised that the traditional definition of an organisation is no longer sustainable. Davis & Marquis (2005) and Davis (2006) highlight a significant shift in organisation theory research. Previously, organisation research was driven by paradigms; now, it is driven by problems. The effects of paradigmatic approaches to study organisations are no longer effective (Davis, 2006). Instead,

less obvious mechanisms of aggregation allow social scientists to analyse and interpret data at different levels of granularity, uncover patterns and relationships within complex social systems, and generate insights that inform theory, policy, and practice. That creates order within the organisation science and is key to understanding organisational behaviour (Coraiola et al., 2023).

In a study conducted by Davis et al. (2005), over 120 articles on organisational theory were analysed, and they found that only a handful rest on classical organisation theory (institutional theory 25.4%, network theory 16.8%, population ecology theory 6.7%). Surprisingly for the author, contingency theory was only used by 2.5% of the authors. On the other hand, 56% of the authors used organisation theory in their research. The authors' chosen descriptors were quite diverse, covering many themes, and Davis (2017) reinstates the problem of the phenomenon called organisation, defining it with relationships and actions.

2.7 Technology Mechanism of Organisation Research

The impact of technology, digital advancements, and the COVID-19 pandemic has caused significant changes in organisational structures and work processes (Polzer, 2022). Cascio and Montealegre (2016) highlight the transformative effects of cloud and mobile computing, big data and machine learning, sensors and intelligent manufacturing, robotics, and clean-energy technologies. These advancements have greatly influenced work efficiency and performance in organisations. However, there needs to be more research on the influence of modern technologies on leadership and organisational roles, especially in the field of psychological theory, on how to cope with technological developments, as the authors argue.

As we all know, our world is becoming increasingly global and technology-driven, reshaping how we create value, work, communicate, and interact in organisations. According to Cascio and Montealegre (2016), it is the job of organisational researchers to interpret these ongoing changes and their direct impact on organisational research. Asante (2013) presents two schools of thought on technology's influence. The first is technological determinism, which holds that technology plays a crucial role in determining an organisation's success. Research studies in organisation and technology explore how technology interacts with organisational aspects such as product and process quality and customer relations. Second, an opposing school of thought suggests that technology can shape human action. This viewpoint considers technology as a reflection of human behaviour. Assante (2013) notes that social interactions and political decisions play a crucial role in determining the development and application of technology.

Organisations invest heavily in technology with the clear expectation of enhancing their overall performance and productivity. The findings from studies conducted by Lakhwani et al. (2020), Borowiecki et al. (2021), and Gomes et al. (2018) indisputably demonstrate that IT technology has a positive impact on an organisation's productivity. Orlikowski and Barley (2001) and Malayeri et al. (2011) make it crystal clear that there is an essential contrast

between the beginnings of organisational studies and information technology. This difference lays the groundwork for an invaluable collaboration between institutional analysis and information research, highlighting technology's material properties as a crucial factor for organisational research. Through this approach, we can thoroughly analyse and explore the field.

Lazer et al. (2009) argue for a new computational social science based on the short-term teams of social and computer scientists. Computational science differs from classical social science in using new data sources and multi-discipline teams as a new intellectual community. It is usually digital and large-scale from all spheres of human life (Foster, 2023). Overall, Foster's characterisation underscores the transformative impact of computational approaches on social science research. It highlights the shift towards digital, interdisciplinary, and data-driven methodologies that enable researchers to explore and understand human behaviour and societal phenomena in novel ways.

New science calls for a new cross-disciplinary approach (Lazer et al., 2020). New data sources are hybrid: historical archived data and data on organisational behaviour aimed at understanding employee behaviour, performance, and well-being. In this domain, research scientists will continue to play an important role in explaining psychological, sociological, and organisational phenomena (Coraiola et al., 2023). Lyra et al. (2023) introduced NERMAP, a semiautomated program for discovering future events through the timeline, expressing the need for a small group of researchers. This program works with machine learning and can gather 83% of future events in documents compared to humans, significantly sparing time and lowering costs.

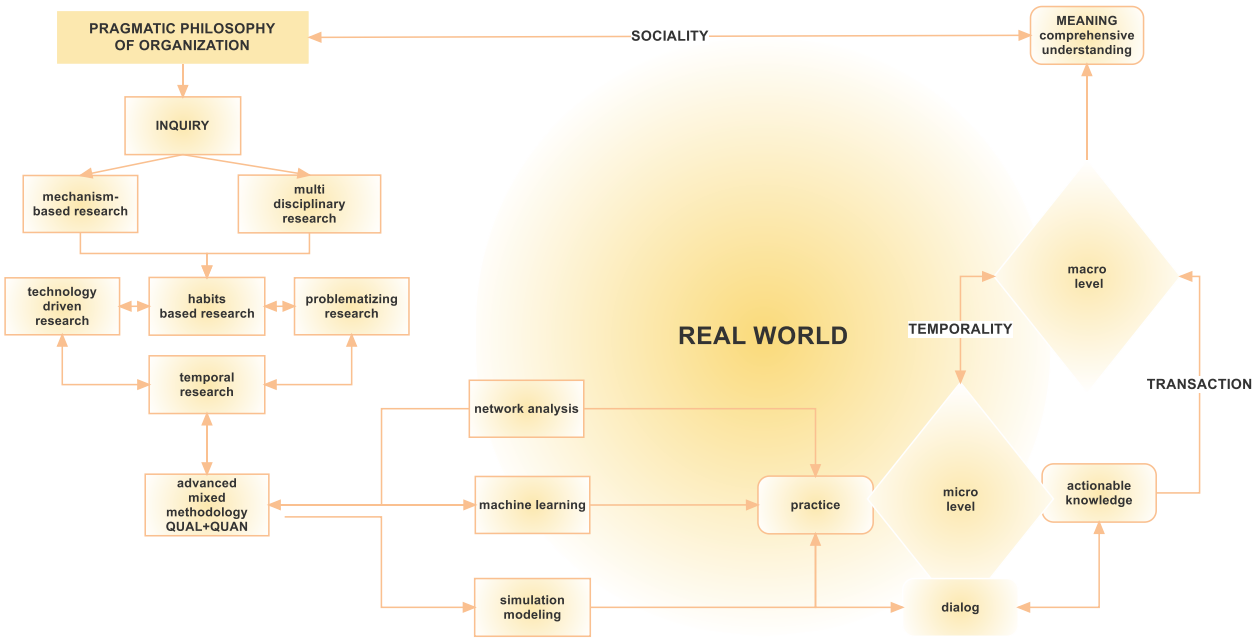

Figure 2. Conceptual model of pragmatic research of organisations

3 Method

Using organisational source criticism as a historical methodology, I researched sources in the history of organisational theories and concepts (patterns extending over time, contingencies, and contexts) to establish the veracity and meaning of the pragmatic concepts of the organisation (Burgelman, 2011; Heller, 2023; Lorino, 2018, p. 68) Through selective interpretation of pragmatic research concepts, I present the mechanism-based concept of pragmatic organizational research in a case study of the organisational culture of three industrial organisations. A case study is a method of inquiry that allows for a comprehensive understanding of a particular case within its real-life context (Schultz & Hatch, 1996). Case study as a research method provides a comprehensive, in-depth understanding of organisational phenomena (Harrison et al., 2017). Moreover, Ylikoski (2019) argues that case studies are a permanent issue in social science methodology and are suitable for the pragmatic method of inquiry to mechanism-based theorizing as they generate actionable knowledge of organisational phenomena (Yin, 2003). The pragmatic approach corresponded to the research goals of consulting in three industrial organisations as an initial method of qualitative analysis with the method of inquiry (King et al., 2003). During the consulting project preceding the doctoral project, I examined the processes underlying organisational culture as complex phenomena (Gutterman, 2023).

3.1 Organisational Culture Performance Project

The research design for the project linking organisational culture to performance is based on Hedström and Swedberg's (1998, 2005, p. 18; Gutterman, 2023) taxonomy, converting to actual (situation), constructive (action-formation) and ideal (transformation) culture. These organisational culture mechanisms were used by seeking the answer to the following questions:

1. How can organisation members build an effective organisational culture of an organisation going through cultural change imposed by external situations?
2. Which beliefs and opportunities for better performance generate individual action?
3. How do changes in collective behavior lead to better organisational performance?

The research was significant in its aim to delve into the inner organizational mechanisms that foster a performative organizational culture. This enables organizational members to gather self-relevant feedback from others and recognize habits they were previously unaware of. Biesta (2010, p. 112) emphasizes the importance of different approaches yielding different outcomes, and the knowledge gained should be assessed pragmatically. My project's goal was to gain insight using a pragmatic approach and make claims solely based on the processes and procedures through which knowledge about organizational culture has been generated (Biesta, 2010, p. 113). Pragmatically, the aim was to uncover causal factors that could bridge the gap between the ideal and factual culture, synthesize differentiation, transformation, and

aggregation mechanisms to achieve collective action and link them to the organization's performance (Gutterman, 2023).

These objectives were successfully achieved through a rigorous research process. First, a comprehensive literature review was conducted through databases like Google Scholar, Science Direct, and DOAJ to identify research gaps in organizational performance that supported the research questions. Second, an actionable knowledge approach was used to gather data, ensuring the information collected was practical and relevant. Finally, the link between organizational culture and performance was thoroughly explained, leaving no room for ambiguity. This meticulous approach to the research process instils confidence in the validity and reliability of the study's findings. Further, the research process developed into mixed-method research, including quantitative analysis (Biesta, 2010, p. 95).

In detail, the project's objectives were achieved through an active inquiry process, which included trans-actional dialogues, texts, acts, tools, and habits (Lorino, 1918, p. 143). This process involved intensive observations of the processes and the researcher's direct involvement in the organizational processes through trans-actional dialogues analyzing texts, speeches, acts, tools, and habits (Polzer, 2023). As Bakhtin (1981) argues, the storyteller and the listener jointly create the stories dialogically. This active role of the researcher was crucial in gaining a comprehensive understanding of the organizational culture and its impact on performance (*Figure 2*).

I initially anticipated that subcultures in all three organizations would differ from the organizational culture on the organizational level. Therefore, I employed purposive theory-based sampling based on an ethnographic approach. This approach allows for a close examination of the participants' understanding of organisational culture (Nymbili & Nymbili, 2024). I chose purposive sampling with rational sample selection to build a multilayer sample. In this way, I obtained actionable knowledge of the cultural habits of participants and made the practical relevance of the impact of organisational culture on the performance of organizations under enquiry (Lorino, 2018, p.102) evident.

3.2 Data collection

I conducted interviews with three-level management, administration, production and support processes, and focus groups with simulations of, e.g., teamwork on various levels of the organisation. Diverse research methods allowed for mapping the processes, triangulation of research problems, and even unseen and undetected ones (Hedström & Swedberg,1996). The pragmatic method revealed different interpretations of reality experienced by all participants in the enquiry and important practical habits with the potential to improve the performance of organisations.

I initially conducted a quantitative analysis using inferential statistical models to research organisational culture based on values, beliefs, norms, expectations and habits in all three

textile, machine, and food industry organisations. In the second phase, I gathered data using a narrative hermeneutic approach, interpreting texts, communications, habits, and interactions. The narrative approach was especially useful as Charniawska (2011) argues: "…narratives — that is, texts that present events developing in time according to (impersonal) causes or (human) intentions — are the main carriers of knowledge in modern societies toward the end of the 20th Century. « In the third phase, I asked respondents to thoroughly describe their practices to detect those that had been missed or not documented using quantitative and narrative-hermeneutic methods. Triangulating data from three phases of research allowed us to verify and validate the information about changes in organisational culture (Manning, 2018). The pragmatist approach based on abduction unified narrative and logical thought shifted perspectives and gave voice to all participants engaging in daily activities (Lorino, 2018, p. 218). Moreover, the pragmatist approach enabled reflection on efficient working methods. Follow-up surveys in all major organisational processes enabled the implementation of performance problems and solutions (Schultz & Hatch, 1996).

4 Results and Discussion

The research on the organizational cultures of three organizations emphasizes actionable knowledge to inform organizational practice. The researcher collaborated closely with practitioners to identify research questions, co-create solutions, and facilitate the implementation of research findings in real-culture settings. The pragmatic approach allowed the use of several different techniques to extract organisational performance factors and draw conclusions about the unique organisational changes imposed by other organizations.

Core pragmatist principles and constant feedback drove the dissemination of practical knowledge in organising the organisations' core processes. Knowledge not obtained by quantitative analysis was extracted from particular organisational practices relevant to a particular organisational culture. Practical knowledge on the level of practice allowed the researcher to extract useful knowledge and link micro and macro levels through organisational processes. A pragmatic approach enabled the interconnectedness between experience, actionable knowledge, and temporal transactions, as Lorino (2018, p. 80) states:
" Habit is a kind of crystallization of social experience, and, as such, it conveys some image of the past into the action-in-progress".

The situation where respondents' habits were mutually communicated in an inter-habit conversation kept them motivated and allowed them to further make field notes to communicate practical findings relevant to organisational performance. Constantly adding new writings of ongoing practices, supported by interviews and timely feedback loops, resulted in a dynamic and complex view of organisational performance. Charmaz (2009, p. 151) argues:" Straightforward categories about ordinary experiences have profound meaning in producing an analytic lens that sharpens and focuses views of these experiences." This

flexible and constantly recurring data collection is called abduction, the process of logical operations introducing new ideas (Pierce, 1931).

Using a pragmatic paradigm in organisational research produced several practical findings and solutions. Mechanism-based research inducing causal relationships allows digging under organisational phenomena' surface (Davis & Marquis, 2006). Becker (2014) links pragmatic research to social mechanisms and case studies to profoundly examine specific situations. In our case, we were in situations to be dealt with in the face of organisational change due to novel organisational practices (Ambrož, 2004).

The paradigmatic method was the right tool to detect organisational processes, examine performance measurements and evaluation, and detect a dynamic and multi-faceted view of cultural practice (Kelly & Cordeiro, 2020). Moreover, this method deepened the quality and diversity of practices that structure organisational culture performance factors. Additionally, the pragmatic approach allowed the researcher to combine micro and macro levels through transactional processes. The research design allowed stakeholders to engage actively in a larger organisational context and linked deductive, inductive, and abductive reasoning, placing evidence-based findings into theory.

Advanced analytical techniques, such as machine learning, network analysis, and simulation modelling, were used to analyse complex organizational data and extract actionable insights. Diverse research methods and techniques enable uncovering patterns, relationships, and causal mechanisms that may otherwise not be accessible. Assessing the effectiveness of interventions and the role of technology and innovation revealed drivers of organisational change and performance. Moreover, it revealed broader implications for organisational performance through the changes in organisational cultures.

Research dissemination and transferability were not neglected. The researcher aimed to link the research findings with the real world and form access to wider organisational audiences in scientific articles, books and conferences.

Overall, pragmatic research in organisational science continues to evolve in response to changing organisational needs, societal trends, and technological advancements. By embracing interdisciplinary collaboration, methodological innovation, and a strong focus on practical relevance, pragmatic researchers contribute to developing evidence-based practices that support organisational success and resilience in an increasingly complex and dynamic world (Ambrož, 2004).

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Povzetek:
Pragmatični pogled na raziskovanje organizacij

Raziskovalno vprašanje (RV): Ali je pragmatizem prava metoda za raziskovanje kompleksnega, nepredvidljivega in neracionalnega organizacijskega polja? Raziskovanje na področju organizacijske vede se odmika od uporabe klasičnih teorij, ki pogosto niso učinkovite pri razlagi fenomena organizacije, zato smo predstavili pragmatični raziskovalni model, ki omogoča celovit, kompleksen in raznovrsten pogled na delovanje organizacije.
Namen: Namen raziskovanja, na osnovi sistematičnega pregleda raziskovalnih konceptov, oblikovati pragmatični raziskovalni model, ki naj bi zapolnil vrzel, ki nastaja z uporabo tradicionalnih organizacijskih teorij v raziskovanju. Pragmatični pristop k raziskovanju predstavlja celovit, kompleksen in multi-modalni pristop k raziskovanju.
Metoda: Pregled raziskovalnih konceptov na področju organizacije smo izvedli z zgodovinsko in kritično organizacijsko metodo in verodostojni in pomenski pogled na pragmatični raziskovalni pristop. S selektivno razlago različnih pragmatičnih konceptov smo razvili na socialnih mehanizmih temelječ raziskovalni model.
Rezultati: Rezultat selektivnega pregleda in integracije paradigmatičnih raziskovalnih pristopov, je paradigmatični raziskovalni model, ki temelji na socialno - mehanicističnem pristopu, ki obravnava organizacijske spremembe in potrebe, organizacijske trende in tehnološki razvoj.
Omejitve/nadaljnje raziskovanje: Paradigmatični model je nastal na osnovi raziskovanja na konceptualni ravni. Kljub temu, da temelji na selektivnem pristopu k razvoju paradigmatičnega

pristopa k raziskovanju, je treba paradigmatični model operacionalizirati in ga preizkusiti v empirični raziskavi.

Ključne besede: paradigma, pragmatizem, koncept, model, kompleksnost, realnost, družbeni mehanizem, organizacija

Using organisational source criticism as a historical methodology, I researched sources in the history of organisational theories and concepts (patterns extending over time, contingencies, and contexts) to establish the veracity and meaning of the pragmatic concepts of the organisation (Burgelman, 2011; Heller, 2023; Lorino, 2018, p. 68) Through selective interpretation of pragmatic research concepts, I present the mechanism-based concept of pragmatic organizational research.

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Challenges of Integrating Artificial Intelligence Into Testing Laboratories

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Abstract:

Research Question (RQ): How do testing laboratories use artificial intelligence (AI) and what challenges arise from the use of AI tools?
Purpose: To investigate the use of AI in Slovenian and Croatian testing laboratories, to analyse the impact of the complexity of measurement methods and equipment and to predict trends in this area.
Method: A questionnaire was developed for the study. Representatives of 125 randomly selected testing laboratories in Slovenia and Croatia performing accreditation activities according to SIST EN ISO/IEC 17025:2017 were invited to participate. In addition to descriptive statistics, the Kruskal-Wallis and Mann-Whitney U tests were used to analyse the data.
Results: 44 laboratories responded. The survey shows that most testing laboratories expect increased use of AI tools in the future and that laboratory staff recognise the benefits in terms of efficiency, accuracy and error reduction. However, according to the participants, the use of AI in Slovenian and Croatian laboratories is still limited due to the lack of qualified personnel, technical limitations and high initial costs. Laboratories that have more sophisticated measuring equipment perceive AI tools differently than laboratories that do not operate such equipment. The challenge for the future is to use AI to improve the quality of laboratory services, increase efficiency, improve progress and limit costs.
Organisation: The use of AI enables the development of new business models based on the automation and digitalisation of laboratory processes. Research enables organisations to better understand and exploit the potential of AI.
Society: For society, research can bring many benefits that improve the quality of life, promote economic and technological development and contribute to sustainable development and progress.
Originality: The research topic is unexplored in Slovenia and Croatia, and even in the international environment such concrete research is still quite limited.
Limitations / further research: Only a limited number of Slovenian and Croatian testing laboratories were included in the study, which could limit the generalization of the conclusions at the global level. It would make sense to carry out further research in a wider geographical area. As well as focus further research on determining the economic impact of using AI in laboratories, on determining the effectiveness and reliability of measurements, on studies to identify long-term research opportunities, the development of analytical methods using AI, a more in-depth analysis of differences between laboratories taking into account AI approaches and the analysis of cultural, economic and regulatory factors.

Keywords: artificial intelligence, AI, testing laboratories, monitoring, challenges, opportunities.

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1 Introduction

Advanced technologies are being used in production, research and other processes, among which artificial intelligence (AI) stands out as one of the most important innovations. AI is transforming many areas. Monitoring, testing products, controlling industrial processes, research activities, medicine and the development of new materials for production and logistics - it is also playing an increasingly important role in testing laboratories. Laboratories, which are essential for quality products and services, industrial innovation and development, are faced with increasing demands on the accuracy, efficiency and reliability of measurements. AI for testing laboratories brings many benefits in various scientific and technical fields. However, it also brings new challenges that the laboratory must recognise and overcome. It is unresearched how analytical chemistry staff adopt new technology, for what purpose and to what extent they even use available AI tools. It is also unknown how laboratories are willing to face the new opportunities and risks that the development of AI brings. We assumed that the decision on the scope and use of AI is related to the complexity of the measuring equipment that the laboratory manages. The purpose of the research is to find answers to these questions for testing laboratories in Slovenia and Croatia.

We have analysed the main challenges faced by laboratory personnel when implementing AI in monitoring procedures and proposed possible solutions to address the identified risks. We believe that a systematic approach to addressing the identified challenges can ensure that the use of AI maximises the benefits without compromising the quality and reliability of the reported results.

We wanted to know how testing laboratories in Slovenia and Croatia recognise the benefits of AI and to what extent they are already use AI tools. We were also interested in whether the complexity of the analytical methods and measuring equipment influences the extent of AI use in the laboratories, both currently and in the future. To this purpose, we analysed a limited number of testing laboratories, all of which perform at least some monitoring as an accredited activity that complies with SIST EN ISO/IEC 17025:2017. The field of using AI for the needs of various monitoring in Slovenia and Croatia was unexplored; even for the international area, these studies were still quite limited. For the reasons mentioned above, the research conducted is important for organisations and society.

2 Theoretical Framework

2.1 Function of testing laboratories and risk management

The most important function of testing laboratories is to provide accurate, reliable and repeatable measurements that are critical for the validation of research results, the quality of production processes, the development of new materials, products and technologies, and regulatory compliance. The international standard SIST EN ISO 9001:2015 specifies the requirements for a quality management system (QMS) and supports testing laboratories in establishing and maintaining a high quality of their work activities. This contributes to greater

confidence in their results, greater customer satisfaction and increased competitiveness in the market. In a demanding and multidimensional competitive environment, more than one million certificates have been issued to organisations in 189 countries since 1987, demonstrating compliance with the quality management requirements of SIST EN ISO 9001:2015 (International Organization for Standardization, 2024).

SIST EN ISO 9001:2015 is the most widely used standard for quality management worldwide. The ISO 9001 standard is derived from the quality management principles of successful organisations. It integrates good business practises and helps organisations to achieve their highest goals. The next international standard, SIST EN ISO/IEC 17025:2017, has been developed to provide confidence in the operation of laboratories. Testing and calibration laboratories operating to SIST EN ISO/IEC 17025:2017 generally operate in accordance with the principles of ISO 9001 (ISO 17025:2017, 2018, p. 9). The currently valid revisions of the international standards SIST EN ISO 9001:2015 (Quality management systems) and SIST EN ISO/IEC 17025:2017 (General requirements for the competence of testing and calibration laboratories) bring new requirements for dealing with risks and opportunities that must be comprehensively managed. (Fonseca, 2015, p. 174; ISO 17025:2017, 2018, p. 38) The effective identification of risks, the limitation of consequences and the management of crisis situations are decisive factors in the activities of laboratories.

Tziakou, Fragkaki and Platis (2023, pp. 167–177) consider that worker safety, accuracy and reliability of laboratory results, as well as financial sustainability and environmental protection issues, play an important role in decision-making in both industry and the service sector. For a laboratory to be considered reliable, safe and therefore competitive, it is advisable to fulfil the requirements of international standards and other legal regulations and to use risk management tools and procedures. The main sources of risk in a laboratory are the personnel themselves, the samples to be analysed, the chemical reagents and waste, the equipment, the test methods, the measurements, the non-updated quality control procedures, the reporting of results, impartiality and confidentiality, digitalisation and, last but not least, the financial aspects. The continuous management of risks is necessary in order to set new priorities and continuously implement the necessary safety and prevention measures. Risk management is essential to ensure a safe internal and external laboratory environment and to ensure the provision of reliable and competent services. In addition, implementing a risk-based mindset can positively influence the outcome of regular assessments to explore opportunities to increase the effectiveness of the management system and avoid negative impacts.

The US Department of Energy (DOE) has published a standard for improving human performance, which emphasises that 80% of incidents in the industry are caused by human error. The other 20% are caused by equipment failure (note that this study was conducted in 2009 and that the percentage of incidents attributed to equipment failure has since declined due to improved preventive and corrective maintenance practises and other reliability controls). (Burns & Hubbard, 2021, p. 22)

Da Silva, Grochau, and Veit (2021) created a process diagram (Figure 1) for risk management, which also applies to the laboratory testing activity based on a literature review, an identification of risk management levels, and necessary tool. The proposed system, in the form of a flowchart and in accordance with the current version of SIST EN ISO/IEC 17025:2017, provides for the stages of analysis, evaluation, classification and validating risks, their cause(s), identifying existing measures, the need for additional actions and the treatment and monitoring of risks. The model contains some effective tools for risk management.

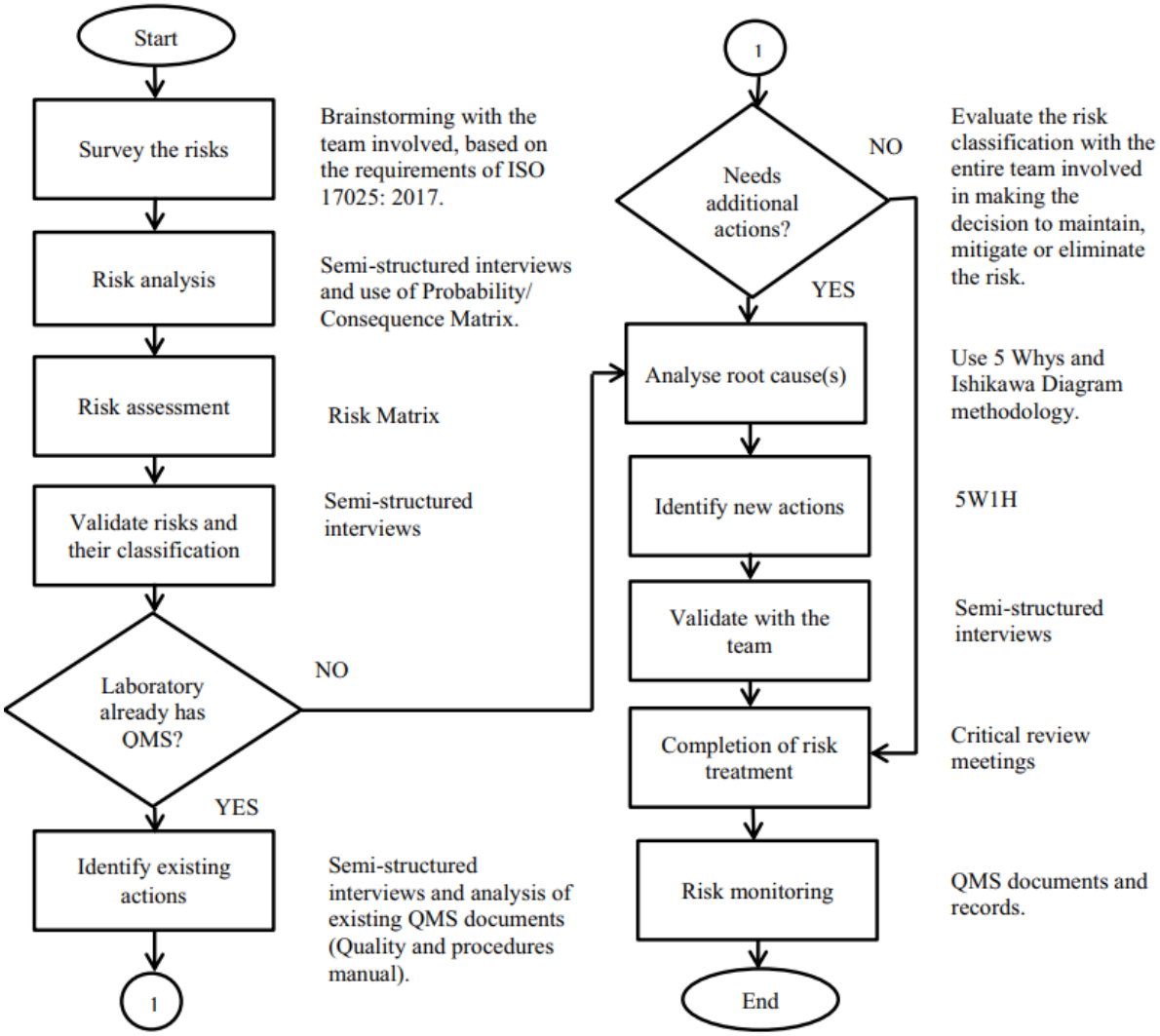

Figure 1. An example of a risk management process in laboratories. Summarised from *System proposal for the implementation of risk management in the context of ISO/IEC 17025*, Da Silva; Grochau, & Veit, 2021, Accreditation and Quality Assurance, 26, p. 274.

The quality of laboratory services contributes to the advancement of science, technology and industry; testing laboratories therefore play an important role in improving the quality of life and promoting economic development. One of the challenges and risks identified is the use of AI in the measurement and reporting processes of testing laboratories.

2.2 The status and challenges of AI in the laboratories

AI is an imitation of human cognitive processes with the help of machines. In particular, the unique implementation of AI, including specialised computer systems, artificial language processing, speech recognition and AI performed by AI machines. This is in contrast to the natural intelligence of humans or animals. Key AI textbooks emphasise that AI will present us with new challenges which will translate into new practises and ways of thinking. (Chatterjee, 2020, p. 13). Barczak (2023, p. 6) adds that the development of the practical application of AI has been very slow until recently, but in recent years AI technology has advanced at a dizzying pace. The turning point for AI has been the achievements associated primarily with deep learning, a technology for autonomous learning from large data sets.

In the next twenty to thirty years, AI will completely fill every activities and action of every person and entire societies. Each of us will face unique practical, intellectual and mental challenges. The changes that will accompany us will be revolutionary. In order to master the challenges of the age of AI, we must be perfectly and comprehensively prepared and, above all, show understanding and resilience to its temporary negative effects. Of course, companies' knowledge of the nature of the immense opportunities and the use of AI solutions will be decisive to success. (Barczak, 2023, p. 21)

We have analysed how AI is being used in the chemical industry, particularly in analytical testing laboratories.

Most examples of the use of AI tools in testing laboratories are described in the field of medical research and diagnostics. Research conducted by Paranjape et al. (2021) shows that specific knowledge about AI in medical laboratories is still poor and that education about artificial intelligence is very necessary. One strategy could be to implement new AI tools alongside existing tools. In 2020, 15.6% of medical laboratories of Roche’s Strategic Advisory Network were using AI tools, while 66.4% believed they could use it in the future. Most had an unsure attitude on what they would need to adopt AI in the diagnostics space. High investment costs, lack of proven clinical benefits, number of decision makers, and privacy concerns were identified as barriers to adoption. Education in the value of AI, streamlined implementation and integration into existing workflows, and research to prove clinical utility were identified as solutions needed to mainstream AI in laboratory medicine. (p. 823) Herman, Rhoads, Schulz, & Durant (2021, p. 1466) add that AI technologies in laboratory medicine are being rapidly developed and described, but their implementation thus far has been modest. To spur the implementation of reliable and sophisticated machine learning-based technologies, we need to establish best practices further and improve our information system and communication infrastructure. The participation of the clinical laboratory community is essential to ensure that laboratory data are sufficiently available and incorporated conscientiously into robust, safe, and clinically effective machine learning supported clinical diagnostics.

Scientists at the University of Glasgow tried to answer the question of whether robots can be trained to be chemists. Over the past few years, the team has been designing a desktop-sized robot chemist tasked with the time-consuming and repetitive job of creating chemicals. The robot carries out tasks using simple instructions from an in-house program called SynthReader. Eventually, the team hopes SynthReader will become a staple in laboratories around the world. It's this type of collaborative research that will continue to accelerate scientific discoveries and advance modern science. AI has empowered researchers with the tools to design smarter and more cost-efficient solutions for a variety of applications. AI has some incredible benefits, but it comes at a cost. In the UK, the Science and Technology Facilities Council (STFC) has teamed up with global computing giant IBM to launch the Hartree National Centre for Digital Innovation (HNCDI). Designed to offer British businesses and public sector groups access to AI and quantum computing technologies, the HNCDI program aims to boost innovation, support growth and stimulate the local economy. (International Labmate Limited, 2021)

Thurow (2023) summarizes that analytical measurement methods are used in different areas of production and quality control, diagnostics, environmental monitoring, or in research applications. He states that AI will increasingly find use in automation. The main area of application here is initially data analysis. AI can analyse large amounts of data and recognize patterns and trends. This can be particularly useful for evaluating large amounts of data, e.g., in medical research. (Bio)analytical methods often also require the automation of image recognition. AI methods are increasingly being used here. However, methods of AI can also be used to optimize process control based on measurement data and can thus take over the development and optimization of automated methods, among other things. AI methods can be used to monitor quality control processes in the laboratory. For example, AI systems can be used to detect deviations from standard values in measurement processes and to take corrective measures in good time. (p. 5063)

Kumar (2023, pp. 16–17) summarises that the era of AI is characterised by rapid and profound changes in market trends, consumer preferences and the business environment. These changes have a significant impact on the internal functioning of the organisation and its employees, especially on the demand for complex cognitive and information processing skills. These skills are critical to understanding, adapting and innovating in the AI-driven world. Some examples of these skills are:

- data analysis and visualisation,
- systems thinking and design thinking,
- data-driven decision making,
- continuous learning, and
- agility.

Olu-Lawal et al. (2024) investigated the multifaceted role of precision measurement in improving production quality. Their aim was to provide a detailed overview of advanced

metrology techniques, their use in various industries, the associated challenges and their prospects. By synthesising existing knowledge and research findings, they demonstrated the importance of precision metrology and its impact on modern manufacturing practise. Precision metrology is a cornerstone of modern manufacturing, ensuring the quality, reliability and performance of products in various industries. As highlighted in this review, precision monitoring plays a critical role in improving manufacturing quality through accurate measurement, quality assurance and standards compliance. The future of precision laboratory activities offers exciting prospects for innovation and progress fuelled by emerging technologies such as AI, machine learning and IoT (Internet of Things). Predictive maintenance and autonomous quality control systems will revolutionise metrology by enabling proactive maintenance, real-time quality monitoring and closed-loop control of manufacturing processes. Continuous research and innovation in metrology promise to address new challenges and open up new opportunities that will shape the future of modern industry. To summarise, precision work in the laboratory remains essential to ensure production quality and competitiveness in today's global marketplace. By embracing new technologies, advancing metrology techniques and fostering collaboration and innovation, manufacturers can harness the full potential of precision metrology to continuously improve and innovate their products and processes. (p. 736)

The use of AI in chemistry (in general) has increased enormously in recent years. Baum et al. (2021) studied the growth and distribution of AI-related chemistry publications over the last two decades. The volume of both journal and patent publications has increased dramatically, especially since 2015. When examining the distribution of publications across the various research areas of chemistry, they found that analytical chemistry and biochemistry incorporate AI the most and with the highest growth rates. They also analysed trends in interdisciplinary research and identified frequently occurring combinations of research areas in publications. In addition, topic analyses were conducted for journal and patent publications to illustrate emerging associations of AI with specific chemical research topics. The significant increase in the use of AI in chemistry since 2015 can probably be explained by several factors. The greater availability of software and hardware tools to implement AI has lowered the barriers to the use of AI in chemical research, while research area-specific datasets suitable for AI methods have proliferated. In addition, many researchers have learnt techniques for generating and handling data for AI methods. The frequency of AI and research area-specific concepts in publications between 2000 and 2020 shows how AI has been integrated into various research areas. Many AI methods have been adapted for chemical research and are being introduced into new areas of chemical study. As such, due to the increasingly interdisciplinary research landscape, many AI methods have been successfully adapted to chemical research. In some areas, the use of AI has even become routine. However, there are still areas of chemistry, such as organic synthesis chemistry, where AI is not yet being used. Perhaps it is only a matter of time before improvements in AI itself, experience from successful applications of AI and interdisciplinary

research come together to lift these areas from the 'valley of disillusionment' to the 'plateau of productivity'. (p. 3207)

The application of AI in chemistry is not limited to chemical laboratories, but is also useful for pharmaceuticals, drugs, advanced analytical techniques, healthcare, biochemistry and other related fields. Molecular properties of new molecules can be detected, compared and predicted against already existing databases, reducing the time for analysis and comparison and using artificial intelligence to achieve efficient results. (Rai & Chatrath, 2021, p. 18)

Best practises for the use of AI for research purposes are also useful in technological process control, medicine, quality control and other activities. Liangru, Li, and Fan (2023) investigated the impact of AI transparency on trust considering challenges and threats, the extent of trust in AI, and how employees' knowledge of AI influences the perception of challenges and threats. According to their research, the practical implications are mainly in the following areas: firstly, employees who work with AI believe that AI poses more challenges than threats. In the future, companies will be able to rely on AI as a decision-making tool for part of their daily work. Coleman Parks Research (Smith, 2019) investigated the perception of AI among hourly and salaried workers in several countries and found that four out of five workers can see the potential benefits of AI for improving the working environment. Furthermore, the research found that transparency of AI has a positive impact on workers' trust in AI, which directly and indirectly increases workers' perception of the challenge and reduces their perception of the threat. Therefore, organisations should improve the transparency of AI systems, e.g. by informing employees about the AI decision-making process or developing more transparent AI systems. When employees work with AI, it is important that they understand the benefits of the work and feel less like they have no control over the work in order to increase their appreciation of the challenge and decrease their perception of the threat.

In the context of the increasingly widespread use of AI, the Electric Power Research Institute (EPRI, 2024) has addressed a new challenge that has not yet been assessed. In May 2024, it published a report highlighting the impact on electricity consumption in the US. As AI becomes increasingly important in our 24/7 digital economy, data centres processing AI could significantly increase energy demand. According to their study, data centres could consume more than double the electricity produced in the US by 2030. This could lead to regional supply problems, among other things. AI queries require around ten times more electricity than conventional internet searches, and the creation of original music, photos and videos requires even more. With 5.3 billion internet users, the rapid adoption of these new tools could significantly increase energy consumption. At the same time, computing power is becoming increasingly concentrated, with individual devices now consuming the equivalent of 80,000 to 800,000 households, exacerbating energy supply issues. Their comprehensive study also takes into account other forecasting variables, including extreme weather events, decentralised energy resources, electrification and emerging technologies.

2.3 Hypotheses testing

Depending on their function and purpose, test laboratories use more or less sophisticated measurement systems or analysis methods. This affects the accuracy, reliability, scope and cost of the tests. It also influences the experience of the laboratory staff, the level of expertise, working conditions, reporting and the integration of the requirements of standards and protocols. We tested the following hypothesis: “The use of AI tools is a function of the complexity of the measuring equipment and analysis methods. Testing laboratories that manage demanding measuring equipment and more demanding analytical methods in Slovenia and Croatia perceive the use of AI in laboratories differently than those working with less demanding analytical equipment.”

3 Method

In June 2024, we conducted an online survey in which 125 randomly selected testing laboratories in Slovenia and Croatia participated. All of them perform (at least to a limited extent) an accredited activity according to the requirements of SIST EN ISO/IEC 17025:2017. Their contact details can be found in the publicly accessible register of the Slovenian Accreditation Agency and the Croatian Accreditation Agency and on their websites. Depending on their function and purpose, laboratories use less or more demanding measuring equipment and consequently different measuring methods. In the survey, the participants defined the complexity of their measurement methods, the scope of the measurement systems and the number of laboratory staff. The participants were asked whether and which AI tools they already use in their laboratories and for which function. The term "the use of artificial intelligence" was introduced and meant as "technology that enables the execution of tasks with the help of a computer and can complement human intelligence, for example in data analysis, samples recognition, decision making, process automation, accuracy improvement, quality control and research optimization”.

The model of research is shown in Figure 2.

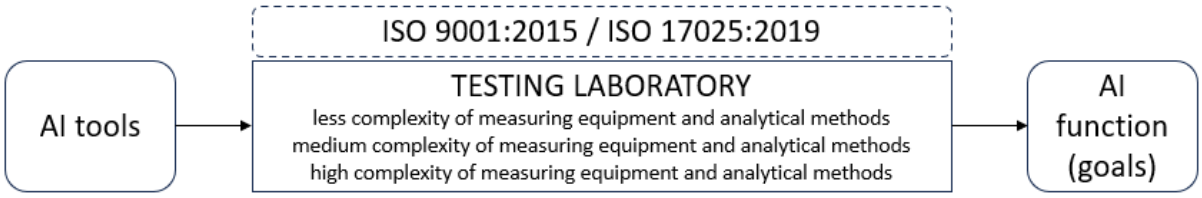

Figure 2. Model of research.

The testing laboratories involved in the research carry out accredited tests in the following areas:

- the environment,
- chemicals, chemical products, cosmetics, paints and varnishes,

- medicine,
- pharmaceuticals,
- energy production,
- agriculture, food,
- metallurgy,
- construction industry,
- quality and metrology,
- research activities.

We used an objective measurement tool that is a function of the variables we measured. A questionnaire with 11 closed-ended questions was developed for the purpose of the study. Participants indicated their agreement with the statements. In addition to the use or non-use of AI, the purpose and goals, they could also indicate what plans they have for the future and what purposes and challenges they expect in this context. If AI is not planned for the future, they were able to state the reasons for this.

The reliability of the questionnaire was tested using the Cronbach's alpha test. The value of a was 0.728, which means that the questionnaire has a moderately high reliability and is acceptable for our research purpose. The survey is replicable so that its consistency can be checked. To analyse the collected data, we used descriptive and frequency statistics, the Kruskal-Wallis and Mann-Whitney U tests to identify statistically significant differences, considering the complexity of the measurement systems used, the number of measurement systems and the use of AI tools.

4 Results

During the three-week period of data collection, representatives of 44 laboratories responded, 29 of them from Slovenia and 15 from Croatia, who completed the questionnaire in full. The number of participants by sector is shown in Figure 3.

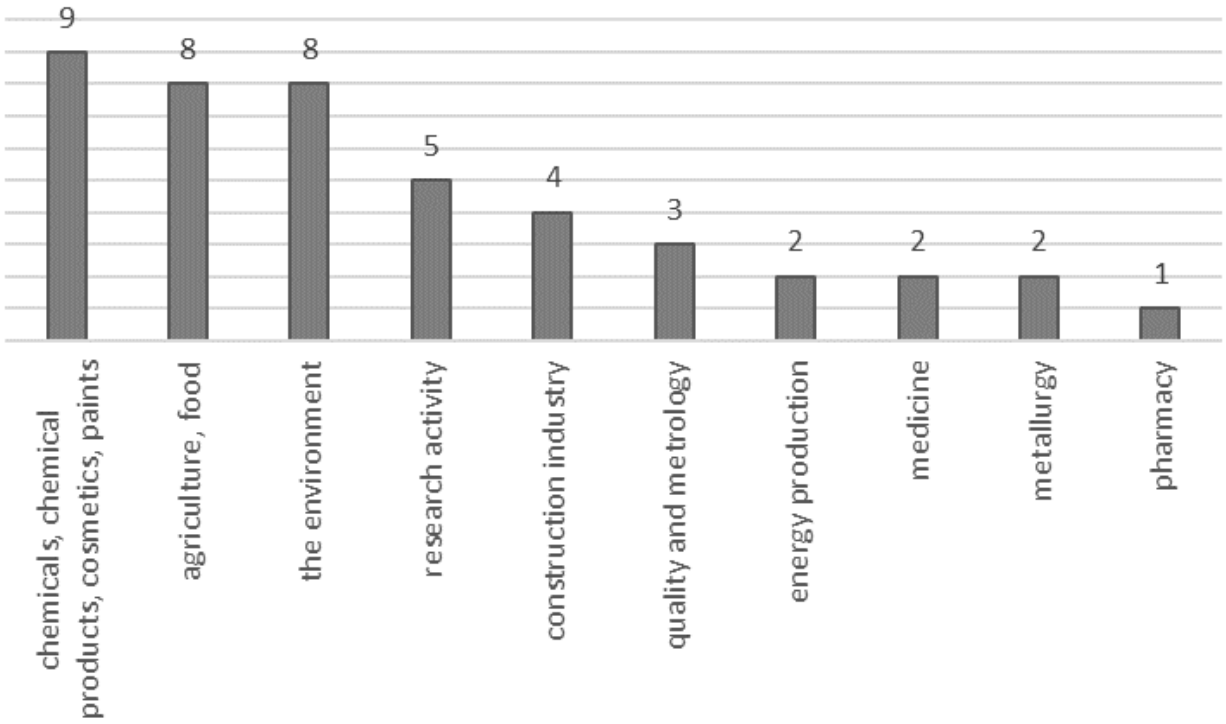

Figure 3. Number of participating laboratories by industry.

Table 1 shows the degree of agreement with 11 statements from the field of AI applications. The percentage of agreement and overall agreement with the individual statements is shown in Figure 4. The highest level of agreement was measured for the statements “The challenges of using AI in laboratories are considerable.”, "AI can improve the efficiency of laboratory processes.”, "Laboratories will increasingly use AI in the future” and “AI can reduce human error in measurements and reports”.

Table 1. Scale of agreement and total agreement with individual statements.

STATEMENT	total agreement	agreement	undecided	disagreement	total disagreement
			%		
AI can improve the efficiency of laboratory processes.	27.3	50.0	11.4	11.3	0.0
Using AI can lead to more accurate results.	25.0	36.4	15.9	22.7	0.0
AI can reduce laboratory operating costs.	34.1	34.1	13.6	18.2	0.0
AI can reduce human error in measurement and reporting.	36.4	36.4	9.1	15.9	2.3
Laboratories will increase their use of AI in the future.	43.2	34.1	15.9	6.8	0.0
The challenges of using AI in laboratories are considerable.	25.0	61.4	9.1	4.5	0.0
Lack of expertise is a major barrier to the use of AI in laboratories.	15.9	50.0	15.9	15.9	2.3
Lack of high-quality data is a major obstacle to the use of AI in laboratories.	6.8	31.8	22.8	38.6	0.0
High cost is a major barrier to the use of AI in laboratories.	2.3	40.9	25.0	29.5	2.3
Technical challenges are the main obstacle to the use of AI.	15.9	45.5	25.0	11.3	2.3
Legislative restrictions are the main obstacle to the use of AI.	4.5	18.2	22.7	40.9	13.7

Sixteen laboratories (36.4 % of the total) stated that they already use AI tools in their work to a greater or lesser extent, primarily for data analysis, but also for predicting results (calculating theoretical values based on input data), optimising processes, automating experiments and sample recognition. As “other”, participants mentioned the use of AI for report generation, diagnostics, spectral analysis, clinical research, research and coding and analysing digital records. All those already using AI tools plan to increase their use in the future. A further six laboratories (13.6 %) that do not yet use AI are planning to use it. 77.2 % of participants agree or strongly agree that laboratories will increase their use of AI in the future.

In Figure 5, we have summarised the AI tools that the participating testing laboratories already use in their work, their function and their purpose. Six laboratories stated that they use less demanding measurement methods in their work, 17 medium and 21 very demanding measurement methods. The proportion of those using very demanding measurement methods is 47.7%. 25 laboratories use up to 10 measurement systems, 11 laboratories use 11 to 20

measurement systems, 5 laboratories use between 21 and 30 measurement systems and 3 laboratories use more than 30 measurement systems.

The results of the Kruskal-Wallis test are summarised in Table 2. The test was carried out taking into account the number of measurement systems checked by a laboratory. A statistically significant difference was found in 6 out of 11 statements.

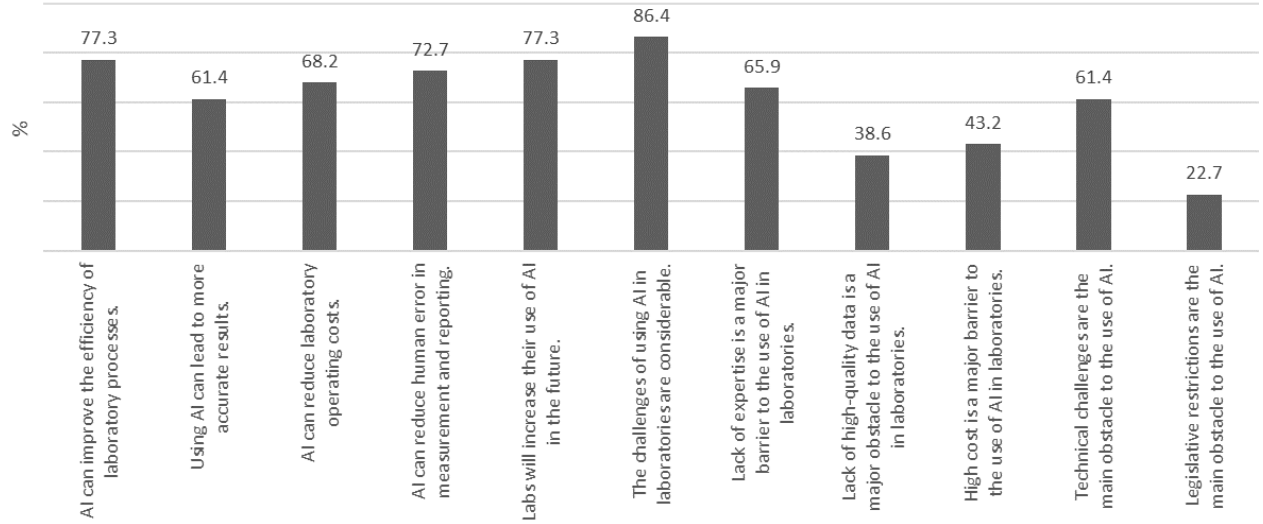

Figure 4. Scale of agreement and total agreement with individual statements.

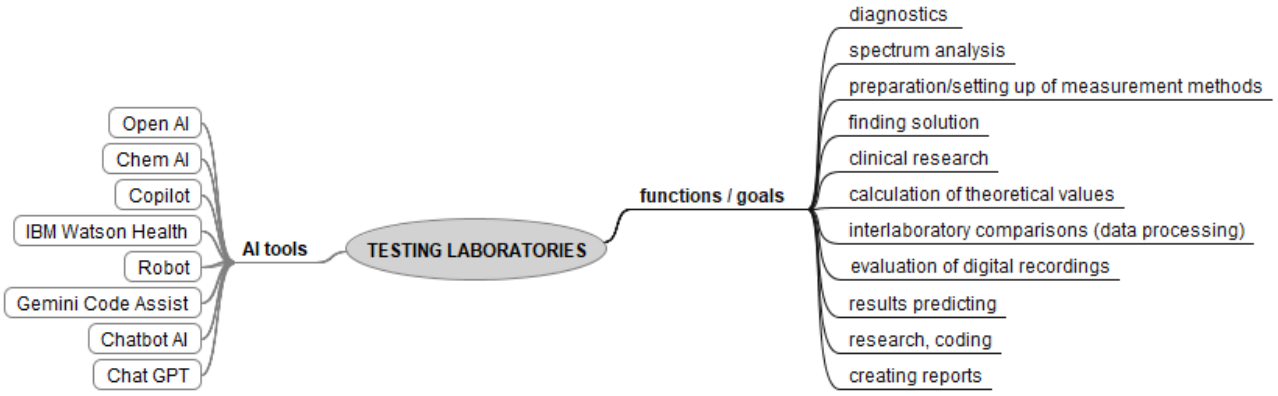

Figure 5. AI Tools and the scope of AI applications in laboratories currently and planned.

Table 2. Results of Kruskal-Wallis test.

STATEMENT (dependent variable)	***df***	***H***	***p***
AI can improve the efficiency of laboratory processes.	3	13.741	<0.05
Using AI can lead to more accurate results.	3	3.541	<0.05
AI can reduce laboratory operating costs.	3	6.217	0.102
AI can reduce human error in measurement and reporting.	3	9.961	<0.05
Laboratories will increase their use of AI in the future.	3	11.876	<0.05
The challenges of using AI in laboratories are considerable.	3	1.692	0.064
Lack of expertise is a major barrier to the use of AI in laboratories.	3	4.075	0.254
Lack of high-quality data is a major obstacle to the use of AI in laboratories.	3	6.068	0.108
High cost is a major barrier to the use of AI in laboratories.	3	9.493	<0.05
Technical challenges are the main obstacle to the use of AI.	3	8.478	<0.05
Legislative restrictions are the main obstacle to the use of AI.	3	3.569	0.312

Note. *df*: degree of freedom; *H*: K-W test statistic; *p*: statistical significance (p <0.05 means that there is a statistically significant difference).

Table 3 shows the data we used to test for statistically significant differences, taking into account the complexity of the measurement devices and the use or non-use of AI tools. We combined all those who reported using less or moderately complex methods in their work and compared them with those using high complex methods. When comparing laboratories that use very demanding measurement tools with others, there is a statistically significant difference in most responses (8 out of 11). The statistically significant difference between laboratories can also be supported by the fact that approximately 57 % of laboratories that use more sophisticated measuring equipment already use AI tools (unlike others, where this proportion is approximately 17 %). Approximately 76 % of these laboratories intend to expand the use of AI (in contrast to others, where this share is approximately 30 % only), see table 4.

Table 3. Results of Mann-Whitney *U* test.

STATEMENT (dependent variable)	CRITERION	*U*	*p*
AI can improve the efficiency of laboratory processes.	users of AI	363	<0.05
	complexity of methods	106	<0.05
Using AI can lead to more accurate results.	users of AI	359	<0.05
	complexity of methods	146	<0.05
AI can reduce laboratory operating costs.	users of AI	355.5	<0.05
	complexity of methods	121	<0.05
AI can reduce human error in measurement and reporting.	users of AI	342	<0.05
	complexity of methods	101	<0.05
Laboratories will increase their use of AI in the future.	users of AI	356	<0.05
	complexity of methods	109	<0.05
The challenges of using AI in laboratories are considerable.	users of AI	245	0.564
	complexity of methods	210	0.409
Lack of expertise is a major barrier to the use of AI in laboratories.	users of AI	202	0.172
	complexity of methods	290.5	<0.05
Lack of high-quality data is a major obstacle to the use of AI in laboratories.	users of AI	153	0.097
	complexity of methods	362	<0.05
High cost is a major barrier to the use of AI in laboratories.	users of AI	184.5	0.313
	complexity of methods	331	<0.05
Technical challenges are the main obstacle to the use of AI.	users of AI	146.5	<0.05
	complexity of methods	286	0.272
Legislative restrictions are the main obstacle to the use of AI.	users of AI	169	0.164
	complexity of methods	238.5	0.951

Note. *U*: Mann-Whitney test statistic; *p*: statistical significance ($p < 0.05$ means that there is a statistically significant difference).

Table 4. Complexity of measuring equipment, impact on the use of AI tools currently and planned.

COMPLEXITY OF EQUIPMENT	N	already use of AI tools	plan to use of AI tools in future	already use of AI tools	plan to use of AI tools in future
	number			%	
high	21	12	16	57.1	76.2
less&medium	23	4	7	17.4	30.4

Those using demanding measurement equipment are more likely to agree that AI can improve the efficiency of lab work, that AI can contribute to more accurate results, reduce costs and human error, and that the use of AI in lab work will be more pronounced in the future (Table 5). They are also more likely believe that technical challenges and finances are not a limitation to the use of AI.

Table 5. Complexity of measuring equipment, agreement and total agreement with some statements.

STATEMENT	less&medium complexity equipment	high complexity equipment	less&medium complexity equipment	high complexity equipment
	agreement or total agreement (N)		agreement or total agreement (%)	
AI can improve the efficiency of laboratory processes.	14	20	60.9	95.2
Using AI can lead to more accurate results.	12	15	52.2	71.4
AI can reduce human error in measurement and reporting.	12	20	52.2	95.2
Laboratories will increase their use of AI in the future.	14	20	60.9	95.2

5 Discussion

The use of AI in laboratories carrying out various tests is becoming an increasingly important topic and is also a trend at the international level. The research conducted among testing laboratories provide interesting insights into the current status and future possibilities of the use of AI. Most participants in the survey believe in the increased use of AI in the future. Despite the major challenges associated with this technology, they recognise the benefits it can bring to laboratory work. Participants agree that AI can significantly improve the efficiency of work in laboratories. The automation of routine tasks and advanced analyses will enable faster and more accurate results. As can be seen from the literature review, we also find that AI will reduce human error, which is particularly important when analysis and processing large amounts of complex data. In addition, process optimisation with the help of AI can lead to significant cost savings, which is crucial in today's competitive environment. Participants expressed the need for further research and improvement of AI algorithms to achieve even better results. The use of AI to predict outcomes and analyse data can produce breakthrough innovations in areas such as medical research, pharmaceuticals, biotechnology and many other scientific disciplines.

In approaches to AI parallels with the global level and Slovenian and Croatian testing laboratories can be found. Despite the potential of AI, laboratories face challenges, as shown by the low utilisation of AI in the testing laboratories in Slovenia and Croatia (similarly as the research conducted by Paranjape et al., 2021). The employees of several laboratories stated that they do not know how AI can be used in their work. The laboratories often do not have enough qualified employees who know how to use AI technologies. According to the respondents this leads to the need to invest in staff training and development, which is a long-term and financially demanding process.

In the review of the available literature, we did not find research where the impact of the complexity of the used measuring equipment in approaches to AI was studied. The obtained results therefore contribute significantly to the understanding of the differences and consequences to laboratory activities. Those using less sophisticated measurement devices

believe that technical limitations are an important factor influencing the reduced use of AI. Without suitable technical solutions, the potential of AI can only be utilised to a limited extent. According to some, cost is also a barrier to the use of AI tools; the introduction of AI technologies is said to require significant initial investment. However, the long-term savings potential through improved efficiency is a strong argument in favour of overcoming this challenge. Laboratories that have adopted AI report the effectiveness of its use, indicating the possibility of recouping the initial investment. The lack of quality solutions and regulatory restrictions are additional challenges. The use of AI requires constant adaptation and optimisation of algorithms to achieve reliable results. Furthermore, it is important to monitor legal changes and adapt to regulatory requirements, which requires additional effort.

A good third of the participating laboratories already use AI tools and consider their use to be effective. The most important areas of application include data analysis, results prediction and process optimisation. These laboratories serve as examples of best practise that can motivate others to adopt AI technologies. In addition, nearly one in two laboratories plan to expand the use of AI or introduce AI into their workflows. This data points to a promising future and the willingness of laboratories to overcome existing challenges and reap the benefits of AI.

The differences between laboratories that use more advanced measurement devices and those that do not are evident in many areas. Advanced instrumentation enables more accurate measurements and lower detection limits, which is critical for some applications. Advanced equipment reduces the probability of error and improves the reproducibility of results, which means greater reliability. This enables a wide range of analyses, including more complex and specialised tests. Laboratories with sophisticated instruments have a significantly higher initial investment and manage a more powerful computer configuration. They have higher costs due to maintenance, calibration and ensuring working conditions. The services of such laboratories are consequently more expensive. Laboratories with demanding measuring equipment require personnel with a higher level of training and specialisation for the management and maintenance of demanding measuring equipment. Continuous education and training are required to keep up with the latest technologies and methods. Laboratories with sophisticated measuring equipment often fulfil stricter quality and accreditation standards, which in turn means higher quality requirements, more documentation, assessment and elimination of risks.

The results showed a statistically significant difference in the approach to AI between laboratories using complex and those using simpler measurement methods. It is difficult to conclude that the number of measurement systems mastered by the laboratories correlates with the perception of AI. However, the complexity of the measurement systems or the measurement methods certainly does. Testing laboratories in Slovenia and Croatia, which use advanced measuring devices and more advanced analysis methods, in most cases already use AI tools, at least to a lesser extent, and intend to use them even more in the future. This is how they differ from others.

Because the evaluation of 8 out of 11 statements related to AI approaches confirmed a statistically significant difference, we confirmed the hypothesis. The statistically significant difference between laboratories considering complexity of equipment can also be supported by the fact that users of more sophisticated analytical methods and equipment are already using AI tools more often, and to a greater extent than others and planning to do in the future as well. This was expressed very convincingly.

The results contribute to the understanding of the current situation and predict the possibilities of using AI in laboratories in the future. The research highlights the potential of AI to improve efficiency, accuracy and automation of laboratory processes. They also reveal challenges such as lack of trained personnel, technical limitations, and high initial costs that need to be overcome for the wider implementation of AI. Laboratories can use the information obtained to automate routine tasks, which reduces errors and speeds up data processing. The use of AI makes it possible to carry out more complex and accurate analyses, which increases the reliability of results, helps in the optimization of measurement methods and processes, and leads to better use of resources and lower costs. Laboratories that implement AI are becoming more competitive in the market due to faster and higher quality services. For even better laboratory practices, safe and effective use of AI, laboratories should increase their investment in education and training of staff in the field of AI, thereby improving the understanding and use of modern technology. They should provide access to advanced technical equipment and information support. At the global level, it would be welcome to promote research and development of new AI solutions in analytical chemistry, collaboration between laboratories, academic institutions and industry to share knowledge and good practices. At the same time, the implementation of pilot projects to test different solutions and approaches in different laboratory environments and analyse their effects would be welcome.

AI can contribute to the automation of laboratory processes, reducing errors and improving efficiency. Most users of AI tools in Slovenia and Croatia are convinced of this which has also been confirmed by other researchers. The use of advanced technology is important for improving the quality of services and increasing competitiveness on the market. Commitment to introducing continuous improvements in laboratories is one of the purposes of SIST EN ISO/IEC 17025:2017.

We confirmed the hypothesis using statistical methods. These showed significant differences in the use, perception, and approaches to AI between laboratories with more advanced measurement equipment and those with simpler ones. The results confirmed that laboratories with more advanced equipment use AI tools more often, which was further supported by the survey responses, which showed a greater willingness and ability of these laboratories to implement new technologies.

The use of AI in testing laboratories bring risks that need to be addressed and mitigated. Risks assessment is a key action to ensure quality laboratory services. It is included in the

requirements of the SIST EN ISO/IEC 17025:2017 and SIST EN ISO 9001:2015. The mentioned international standards affect work processes in many laboratories. This is also evident from the reviewed literature. Considering the theoretical starting points and research findings, here are some possible examples of risks and vulnerabilities:

- Over-reliance on AI technology may lead to a decrease in critical thinking and verification of results. This could lead to reduced oversight and misreported monitoring results.
- The more advanced use of AI involves handling larger amounts of data that may be confidential. Improper management of this data can lead to privacy and security breaches. The need for large amounts of data can lead to challenges in data management and storage.
- The implementation of more sophisticated AI tools requires specialised knowledge, training, and resources. Misinterpretation of AI results can lead to errors and higher costs.
- The use of AI in laboratories may come into conflict with existing legal and regulatory frameworks (e.g. in the fields of medicine, pharmacy, biomedicine, and food production).
- The introduction of AI can lead to changes in work processes, which can have an impact on employees. Some jobs may become redundant, while the need for new skills and knowledge will increase.
- AI systems may become the target of cyber-attacks, especially if they process sensitive data. A robust cyber security infrastructure is required to protect data and information systems.
- Integrating new AI systems into existing laboratory systems and protocols can be challenging, especially if the existing systems are outdated or incompatible with new technologies.

6 Conclusion

According to an analysis of megatrends in the global environment, the increased use of AI is predicted for practically all industries, so laboratory processes will be no exception. We conducted a study on the use of AI in testing laboratories in Slovenia and Croatia. We were interested in both the current situation and the predictions for the future. Most participants believe in the increased use of AI in the future and recognise many benefits such as the automation of routine tasks, faster and more accurate results and the reduction of human error. Nevertheless, testing laboratories in Slovenia and Croatia do not yet use AI tools very often. Practical examples were given for diagnostics, spectrum analyses, setting up and optimising measurement methods, finding solutions, clinical research, calculating theoretical results, evaluating digital records, coding, research, data processing of interlaboratory comparisons and creating reports. We have confirmed the expectation that testing laboratories that have more advanced measurement equipment are more inclined to use AI. As a result, these laboratories have a higher level of expertise and process more complex data. The scale and complexity of

measurement methods are influential factors in the adoption and implementation of AI technologies to improve measurements and optimise laboratory processes.

The main challenges in deploying AI are the lack of skilled personnel, high costs and technical limitations. This coincides with theoretical starting points that emphasize the need for continuous education, training and adaptation to new technologies to ensure a high level of quality and reliability in laboratory environments. The findings on the use of AI to improve laboratory processes and increase the accuracy and reliability of results confirm the importance of continuous development and introduction of new technologies, which is essential for progress in science, technology and industry. The study emphasises the potential for long-term savings and improved efficiency, which is important for the economic sustainability of laboratories. We believe that there will be more and more implementations of AI tools in test labs in the future. This will accelerate scientific research and development and improve the quality of laboratory activities.

The present research contributes to new approaches in analytical chemistry. This will enable more advanced tests and more accurate results in the future and contribute to a better quality of service. For organisations, the use of AI will bring many benefits, including the automation of routine tasks, faster data processing and cost control. Experience shows that AI enables better prediction of results and optimisation of processes, which is crucial in a competitive business environment. For the wider society, the study sheds light on the current state of AI use in laboratories in Slovenia and Croatia and identifies obstacles and opportunities for wider use of this technology. It emphasises the need for education and training of staff and the importance of technical solutions. Through the use of AI, laboratories will contribute to higher quality products, healthier food, better services, faster medical diagnoses, more effective treatments and general progress in various fields, which will have a direct positive impact on society. Increased efficiency, accuracy of work and automation of routine tasks with the help of AI will speed up processes and reduce the need for physical labour in the future.

The future of the use of AI in test labs is promising. As the technology evolves and integrates into laboratory processes, AI will play a key role in increasing efficiency, accuracy and innovation in scientific research and industry. However, ethical issues, data security, training, provision of technical equipment and regulatory requirements need to be considered to ensure responsible and safe use of this technology.

The survey included a limited group of testing laboratories in Slovenia and Croatia that perform partially or fully accredited activities according to SIST EN ISO/IEC 17025:2017 and could limit the generalization of the conclusions at the global level. The response rate of the laboratories was approximately 35%, which may limit the representativity of the sample. The participating laboratories have different equipment and use different methods of analysis. In the research, we did not verify the participants' experience and knowledge of AI; opinions and judgements about the use and impact of AI may be subjective.

To obtain more representative results, it would be good to extend the survey to a larger geographical area and include laboratories from different countries, regions and even more industries, compare approaches to AI and analyse the effects of cultural, economic and regulatory factors on the use of AI. For further research, it is useful to focus on determining the economic impact of using AI, on determining the effectiveness and reliability of measurements, and on studies that identify long-term research opportunities and the development of analytical methods using AI. As a suggestion for further research is a more in-depth analysis of the differences between laboratories with an investigation of which types of AI the respondents use.

We would like to thank all the laboratories from Slovenia and Croatia that participated in our research. Their contribution was crucial for the successful realisation of this study. Through their collaboration, they have contributed to a better understanding of the use of AI in laboratory environments, which will benefit both academia and industry.

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Povzetek:
Izzivi integracije umetne inteligence v preskuševalne laboratorije

Raziskovalno vprašanje (RV): Na kakšen način preskuševalni laboratoriji uporabljajo umetno inteligenco (UI) in s kakšnimi izzivi se pri tem srečujejo?
Namen: Raziskati uporabo UI v slovenskih in hrvaških preskuševalnih laboratorijih, preveriti vpliv kompleksnosti merilnih metod in merilne opreme ter predvideti trende na tem področju.
Metoda: Za raziskavo je bil razvit anketni vprašalnik. V raziskavo so bili povabljeni predstavniki 125 naključno izbranih preskuševalnih laboratorijev iz Slovenije in Hrvaške, ki izvajajo akreditacijsko dejavnost po SIST EN ISO/IEC 17025:2017. Poleg deskriptivne in frekvenčne

statistike sta bila za ovrednotenje podatkov uporabljena Kruskal-Wallis test in Mann-Whitney U test.
Rezultati: Odzvalo se je 44 laboratorijev. Raziskava je potrdila, da večina preskuševalnih laboratorijev pričakuje povečano uporabo orodij UI v prihodnosti, laboratorijsko osebje prepoznava prednosti v učinkovitosti, natančnosti in zmanjšanju napak. Vendar pa je uporaba UI v slovenskih in hrvaških laboratorijih še omejena, po mnenju sodelujočih zaradi pomanjkanja usposobljenega osebja, tehničnih omejitev in visokih začetnih stroškov. Laboratoriji z zahtevnejšo merilno opremo orodja UI dojemajo drugače kot tisti, ki s takšno opremo ne upravljajo. Izziv za bodoče je uporaba UI z namenom povečanja kakovosti storitev laboratorijev, za večjo učinkovitost, napredek in omejevanje stroškov.
Organizacija: Uporaba UI omogoča razvoj novih poslovnih modelov, ki temeljijo na avtomatizaciji in digitalizaciji laboratorijskih procesov. Raziskava omogoča organizacijam, da bolje razumejo in izkoristijo potencial UI.
Družba: Za družbo lahko raziskava prinese številne koristi, ki izboljšujejo kakovost življenja, spodbujajo gospodarski in tehnološki razvoj ter prispevajo k trajnostnemu razvoju in napredku družbe kot celote.
Originalnost: Obravnavano področje raziskav je v Sloveniji in na Hrvaškem neraziskano, tudi za mednarodno okolje so takšne konkretne raziskave še precej omejene.
Omejitve/nadaljnje raziskovanje: V raziskavo je bilo vključeno omejeno število slovenskih in hrvaških preskuševalnih laboratorijev, kar bi lahko omejilo posploševanje zaključkov na globalni ravni. Nadaljnje raziskave bi bilo zato smiselno izvesti na širšem geografskem področju. Tudi v ugotavljanje ekonomskih vplivov uporabe UI v laboratorijih, v ugotavljanje učinkovitosti in zanesljivosti meritev, v študije, kjer bi ugotavljali dolgoročne raziskovalne možnosti in razvoj analitičnih metod z uporabo UI, bolj poglobljeno analizo razlik med laboratoriji upoštevajoč pristope UI ter analizo kulturnih, gospodarskih in regulativnih dejavnikov na uporabo UI.

Ključne besede: umetna inteligenca, UI, preskuševalni laboratoriji, monitoring, izzivi, priložnosti.

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Temporary Protection and Continuation of Remote Work for the Country of Origin

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Abstract:

Research Question (RQ): Can under EU law (Directive 2001/55/EC) displaced persons continue working for public authorities of their country of origin or should their international protection be revoked by narrowly interpreting per analogy the 1951 UN Refugee Convention or should that UN treaty be interpreted according to the UNHCR's not formally binding guidelines?

Purpose: This research focuses on an analysis of differences between the 1951 UN Refugee Convention and Directive 2001/55/EC regarding definitions of persons who can benefit from these norms. Incidental contacts with a country of origin may not justify revoking a refugee status. It is unclear if the same reasoning applies to longer contacts. Continuation of employment for the country of origin is that form of the contact, so diplomats were denied a refugee status. A situation of persons who remotely work for public authorities of a country of origin differs from a situation of diplomats. Directive does not refer to a need to terminate contacts with that country. This article answers a question if under international non-binding laws persons working remotely for public administration of their country of origin have to be denied temporary protection.

Method: Typically for legal science, this paper is dominated by a use of a dogmatic-legal and analogy methods. Critical comparative analysis of the UN (1951 UN Refugee Convention) and EU (Directive 2001/55/EC) law was made. Historical method helped to deduce intentions of the drafters of the 1951 treaty from *Travaux préparatoires* to show differences between these laws.

Results: The 1951 Refugee Convention applies to persons who are unwilling or unable to be protected by their country of origin. However, Directive 2001/55/EC does not refer explicitly to a need to terminate all contacts with that country. Thus, beneficiaries of temporary protection should be able to continue their remote work for public authorities of a country of origin. Still, an asylum caseworker should be able to verify if these activities do not violate refugee law. If they do, temporary protection should be revoked in an individual procedure.

Organization: The answer to the research question would help to determine whether providing work for authorities of a country of origin is always an obstacle to benefiting from temporary protection. This can increase coherency of decisions of case workers and judges on providing and revoking temporary protection. Consequently, it may increase predictability of an interpretation of law, and affect a legal situation of beneficiaries of temporary protection.

Originality: 28% of displaced persons in Poland work remotely in Ukraine. This factor has been unnoted in other military conflicts, but this may change with a popularization of remote work also in public administration, so among persons who do not terminate their contacts with a country of origin. The 1951 Refugee Convention and Directive 2001/55/EC do not refer to such situations. Still, the Convention explicitly requires to terminate some contacts. Directive 2001/55/EC does not have such an explicit requirement. Previous research focused on a situation when a country of origin is a source of persecution or a when person continues employment in diplomacy. An impact of differences between a direct execution of sovereign powers of a country of origin in that country and in a country of residence on decisions on revoking protection have not been researched yet from a perspective of a soft law.

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Limitations / further research: This theoretical research focuses on international law. National legislation of the EU Member States and their practice have not been verified. Thus, it should be furthered researched if states have respected a pro humane interpretation of international law.

Keywords: EU asylum law, mass arrivals of displaced persons, temporary protection, refugees, work for public authorities.

1 Introduction

The 1951 UN Refugee Convention (United Nations, 1950) amended by the 1967 Protocol (United Nations, 1967), which are hereinafter jointly called as the 1951 RC, form fundaments of the world's system of protecting persons who leave their country of origin (hereinafter: a COO) owing to a well-founded fear of persecution. That treaty defines a term "persecution" which justifies granting a refugee status. Additional forms of protection have been adopted by states and international organizations to address needs of persons who cannot be returned to COO, because the return would expose to a risk returnee's right to life or freedom from torture (a principle of *non-refoulement*). These forms of protection include the EU's temporary protection. It can be granted under Council Directive 2001/55/EC on minimum standards for giving temporary protection in the event of a mass influx of displaced persons and on measures promoting a balance of efforts between Member States in receiving such persons and bearing the consequences thereof (European Union, 2001; hereinafter: Directive 2001/55/EC). Similarly to other regional norms, also this Directive has to conform to the UN norms. Therefore, the EU's Common European Asylum System (hereinafter: the CEAS) must respect the 1951 RC, which should be interpreted in a dynamic way, so taking into account current social and economic realities.

After the Russian attack on Ukraine on 22 February 2022 the Council has adopted Implementing Decision (EU) 2022/382 establishing the existence of a mass influx of displaced persons from Ukraine within the meaning of Article 5 of Directive 2001/55/EC, and having the effect of introducing temporary protection (European Union, 2022; hereinafter: Decision). It has activated protection to displaced persons from Ukraine who have left Ukraine because of the war. That law, *i.a.*, establishes the EU's minimum effective, coherent and solidary standards for giving temporary protection in a mass influx situation. Thus, in this article beneficiaries of Directive are referred to as "beneficiaries of temporary protection" (hereinafter: BTP) to clearly show differences between a refugee status and a temporary protection. This also indicates that an increasingly popular phrase "Ukrainian refugees" which is applied to beneficiaries of Directive 2001/55/EC (c.f. European Union Agency for Asylum, 2022) is incorrect from legal science perspective, because most of these persons do not meet the 1951 RC's prerequisites to obtain a refugee status.

In March 2024 there were 4.3 million BTPs (Eurostat, 2024a). They have not applied for a refugee status. These data can be compared with 1 million applications for a refugee status which were submitted in the EU Member States (hereinafter: the EUMSs) in 2023 - a 20%

increase to a number from 2022 (Eurostat 2024b). Not all applicants receive a refugee status, so the number of beneficiaries is lower than the number of applicants. This shows that the first activation of Directive is of practical importance.

Up until now research have focused on a COO which is a source of persecution (e.g. Boccardi, 2002) or persons who receive orders to reside and execute state powers outside their COO (e.g. diplomats; UNHCR 1979). Some scientists have underlined that refugee status is more stable than temporary protection (e.g. owing to a lack of deadlines specifying for how long a refugee status is granted) and, consequently, they have advocated for facilitating procedures of granting a refugee status in mass influx situations (Küçük, 2023). A situation of persons who leave a COO owing to an ongoing military conflict but who intend to continue working remotely for that country has only recently been analysed (Sadowski, 2024). The low interest in this theme is unsurprising. Buffer (2023) states, a cross-border remote work is a relatively recent phenomenon, unpopular in less developed states and in public administration. Thus, it is uncommon in countries with underdeveloped public administration, so from COOs of most international protection seekers. This can be contrasted with the profile of displaced persons from Ukraine, because 28% of them work remotely in Ukraine when they stay in Poland. Ukraine has not asked its officials to work remotely. However, an increasing popularity of a remote work (Bal & Bulgur, 2023; Gersdorf, 2019) accompanied by a development of electronic platforms of communication makes it worth answering the research question: can under EU law (Directive 2001/55/EC) displaced persons continue working for public authorities of their COO or should international protection be revoked in their cases by applying per analogy the 1951 RC under which a refugee status can be denied to a person who has not ended ties with authorities of a COO?

Previously conducted research have focused on the analysis of legally binding treaties. They have assumed that these treaties should respect aims for which they have been adopted. Still, researchers have limited themselves to a declaration that treaties should be interpreted in a good will. However, these articles have not analysed what are the UNHCR's views on extend of that good will and what were the intentions of the founders of the 1951 RC.

Contrary to previous analysis this article focuses on a difference between a temporary protection and a refugee status granted in a simplified procedure (relying on a *prima facie* recognition – hereinafter: PFR, so by protecting persons who belong to a persecuted group e.g. coming from the same country) by interpreting non-formally binding instruments (soft law). Hence, this article can contribute to building new theoretical knowledge on temporary protection by: filling in the research gap in previously conducted research findings and applying per analogy former research findings focusing on a right to deny refugee.

Conclusions from this article may be useful for further theoretical studies. They may focus on legal possibilities available to a receiving state (hereinafter: a RS) to obtain information about performing remote work for public administration of a COO by BTPs. Conclusions from this

article may also be used by case workers and judges. They may benefit from the expanded interpretation of the aims for which the 1951 RC and temporary protection are granted. Hence, results of this analysis can have an impact on cases on revoking protection owing to performing remote work for the COO.

2 Theoretical framework

The 1951 Refugee Convention forms fundaments of a refugee law. This is the UN-level treaty, so regional organizations whose members share closely e.g. common values and economic situation may complement that treaty in regional laws. These laws must be in line with the letter and aims of the 1951 RC, what can be deduced from Vienna Convention on the Law of the Treaties (United Nations, 1969).

The importance of the 1951 RC to the EU is explicitly declared in the EU's CEAS, including in Article 78(1) of the Treaty on the European Union, which has been amended by European Union (2007). Recently, the CJEU has underlined that "Directive 2011/95 [(European Union, 2011)] must, for that reason, be interpreted not only in a light of its general scheme and purpose, but also in a manner consistent with the Geneva Convention and the other relevant treaties referred to in Article 78(1) TFEU" (CJEU, 2024). The EU has harmonized its asylum policy to increase coherency of the EUMS's case workers' decisions on:

- determining the EUMS responsible for examining an application for international protection (currently: European Union, 2013),
- granting and revoking international protection (so that the EUMSs will more coherently interpret *i.a.*, prerequisites for granting protection), which includes the EU's:
    - a subsidiary status granted under Directive 2011/95/EU (applied in individualized recognition procedures when a person is denied a refugee status), and
    - a temporary protection granted *in abstracto* under Directive 2001/55/EC – the only internationally binding treaty regulating protection in mass influx situations (Leboeuf, 2022; Koo, 2018; on the EU's approach to mass influx from the former Yugoslavia see Hurwitz, 2009),
- social conditions (e.g. access to accommodation and food) available to refugee applicants and persons who receive a decision granting protection.

The CEAS was more precise than the 1951 RC. Still, the EU's norms left some issues under regulated. The EUMSs could also apply more favourable norms on e.g. an amount of social support to refugee applicants. The CEAS has been amended to further increase coherency of EU laws. Directive 2001/55/EC is the only law which has not been revised. Therefore, Łysienia (2023, p. 185) indicates that "Its wording often lacks precision and thoroughness".

Prerequisites for obtaining a refugee status and a temporary protection differ. Article 1(2) of the 1951 RC explicitly states that a refugee must be "unable or /…/ unwilling to avail himself

of the protection of that country". An expression "that country" means a COO. A definition of "displaced persons" from Article 2(c) of Directive 2001/55/EC does not resemble Article 1(2) of the 1951 RC.

However, a "Temporary protection shall not prejudge recognition of a refugee status under the [1951] Geneva Convention." (Article 3(1) and motive 10 of Directive 2001/55/EC). This is because every state (including the EUMS) can provide international protection to persons who do not meet prerequisites to qualify as refugees, as long as primacy of a refugee status is maintained (Küçük, 2023; Koo, 2018). In other words: a state has to first decide on granting a refugee status and when this status is denied it can verify if other forms of international protection could be granted. Therefore, regional laws which provide an access to a territory and, consequently, registration without making an individualized assessment of a situation of every person (so *in abstracto*) conform to the letter and aims of UN norms (Sadowski, 2022). The reference to aims of the 1951 RC is important, because an interpretation of law which ensures that states meet also these aims has been advocated by the UNCHR. The signatories to the 1951 RC are obliged to cooperate with the UNHCR (Article 35 of the 1951 RC), and they should respect its interpretation of refugee law. Nevertheless, that clarification does not have a binding character, so courts and tribunals cannot claim that states which do not follow the UNHCR's interpretation of the 1951 RC are infringing that treaty.

Under Article 4 of Directive 2001/55/EC a temporary protection is given for a year. It can be extended two times (each time for maximum 6 months). Contrary to this, a refugee status is granted for an undefined period. Therefore, it is a more stable form of protection than a temporary protection. Küçük (2023) relied on this stabilization to advocate for granting a refugee status also during mass influx. She claimed that decisions could be quick if states would rely on a PFR of a refugee status, but she does not focus on a lack of a legally binding nature of a PFR. Contrary to this, the EUMSs have to grant temporary protection, if the Council decides so (Sadowski, 2023), but he analysed mainly legally binding treaties assuming that their interpretation respects aims for which they have been adopted.

None of the above-mentioned papers have verified if under soft law and *Travaux préparatoires* not all forms of continuation of long-term contacts with the COO justify revoking protection. Therefore, this article in an innovative way fills the research gap by developing previously conducted analysis. It asks a question if persons who continue cooperation with a COO should under soft law be denied a temporary protection and if such a decision can be made when this persons is admitted to the EUMSs' territory (what may put into question an abstract nature of a decision on an admission to the territory) or when a procedure on revocation of a temporary protection is initiated.

3 Method

The purpose of this paper was to verify if the EUMSs may rely on Directive 2001/55/EC to revoke a temporary protection to displaced persons who continue working for public

authorities of the COO. This theoretical research was a preliminary study. It explained an impact of differences between a direct execution of sovereign powers of:

- a COO in the COO and
- a COO and a country of residence

on decisions on denying international protection under the 1951 RC and Directive 2001/55/EC. Findings from this analysis were presented on 30 November 2023 during an academic conference "Challenges of the Modern World" organized by Faculty of Organisation Studies in Novo mesto (Slovenia) with universities from Argentina, Belgium, Netherlands, Poland, Slovenia, and Spain. Subsequent research relied on an obligation to respect the UN norms and their aims (Sadowski, 2024) without analysing these aims and soft law. Other authors have analysed e.g. a term "mass influx" and a need to facilitate an access to state's territory (c.f. Carrera & Ineli-Ciger, 2023; Ineli-Ciger, 2016b, 2016a; Karska & Dabrowski 2024; Küçük, 2023; Łysienia, 2023).

Typically for legal science this paper is dominated by a use of a dogmatic-legal and analogy methods. Critical comparative analysis of the UN law (1951 RC) and EU law (Directive 2001/55/EC) was made. Historical method helped to deduce intentions of the drafters of the 1951 treaty from *Travaux préparatoires*.

Ukraine has not asked persons performing work for public authorities to leave Ukraine. Thus, that country's employees have not received instructions to perform their work in other state. Even if BTPs continue employment for Ukrainian public authorities, they deliver services to persons in Ukraine not in the RS. This lack of an order to leave Ukraine differentiates a remote work from employment in e.g. diplomacy. Therefore, it was impossible to conduct comparative research. However, popularity of a remote work among persons from Ukraine is an incentive to verify if law is ready for a situation when BTPs will be asked by their COO to perform remote work.

Legal scientists increasingly frequently conduct qualitative research (cf. Strzępek 2020, pp. 278–279). Official electronic databases with Polish (Centralna Baza Orzeczeń Sądów Administracyjnych) and Czech (Vyhledávač NSS) courts' decisions were searched in Polish and Czech language versions of a phrase "revoking temporary protection". There were 3 results from Poland, but not about BTPs. There were also 3 results from Czech Republic, but all of them considered revoking protection because of the fact that BTPs have obtained protection in other EUMSs, so these cases focused on a different theme than this research. Therefore, it was impossible to conduct qualitative research looking at the cases which have already been decided by courts in states hosting the biggest number of BTPs per capita. Nevertheless, reasons indicating why such a situation has occurred were explained in this analysis by focusing on *non-refoulement*.

This article was primarily based on the analysis of law and study of previous research findings. The dogmatic and a historical-legal methods made it possible to identify whether

states have intended to deny protection to all persons working for public authorities of a COO or whether this limitation applies only in some situations. This served as the basis for the analysis to what extend an interpretation of Directive 2001/55/EC (which does not refer to that issue) should take into account the 1951 RC, and whether verification of a possibility to verify an employment relationship should be done when a person is admitted to the territory or only by revoking temporary protection.

The analysis of reliable case-law databases has three limitations. Firstly, not all persons who receive administrative decisions decide to start a court procedure. Secondly, international protection cases are lengthy, so some of the procedures which have already been initiated may not be ended. Thirdly, terms which has been searched were translations of the term used in Directive 2001/55/EC, but courts might have used a reference to an article in law rather than a name of the form of protection (although that name is very likely to appear in the case). Therefore, the findings from official court databases may not reflect the full picture of denying and revoking temporary protection in Poland and in Czech Republic.

These research results can contribute to the systematization of terms used in refugee law. Considering the lack of dogmatic studies on the possibility of verifying whether the beneficiary of a temporary protection is employed by the authorities of a COO and whether such employment affects his/her right to a temporary protection - they also confirm the innovativeness of this article.

4 Results

Other forms of protection can complement the 1951 RC, but they cannot render this UN law obsolete. Moreover, it follows from the very foundations of human rights that states cannot confine themselves to providing illusory protection. On the contrary, countries (especially members of the Council of Europe) must ensure that those rights are effectively executed (ECtHR, 1979).

EXCOMM (1981) supports facilitated admission and registration procedures. A Conference of Plenipotentiaries (hereinafter: the CP) which was held to complete the drafting of, and to sign, the 1951 RC explicitly declared in letter “E” of the text attached to the 1951 RC that it “expresses the hope that the Convention /…/ will have value as an example exceeding its contractual scope and that convention and protocol all nations will be guided by it in granting so far as possible to persons in their territory as refugees and who would not be covered by the terms of the Convention, the treatment for which it provides.” Also Hurwitz (2009, p. 145) underlines that this interpretation can be deduced from the 1951 RC.

Directive 2001/55/EC can be activated when a large number of persons arrives at the EUMSs’ borders. These persons have to come from one country or a specified geographic region. The EU’s temporary protection is activated only when such a situation is confirmed by the EU. This is done through the adoption of an implementing decision by the Council. An analysis of

a history of works on Directive 2001/55/EC prove that a "temporary protection ought not to depend on the lack of functioning of the asylum system" (Kerber, 2002, p. 195). Therefore, an existence of such a deficiency is not required to activate temporary protection.

The EUMSs and the UK (were after Brexit Directive 2001/55/EC still applies; Kosiel-Pająk & Sadowski, 2023) do not issue individual decisions on granting protection to BTPs. Granting protection *in abstracto* facilitates admission of beneficiaries to a safe territory. Similar goal can be achieved by granting a refugee status in a PFR. This procedure has been used in Africa and Latin America (Costello, Foster, McAdam, 2021, p. 641), but states are not legally bounded to interpret the 1951 RC in this way.

A decision to deny protection can be made at the border. This is, however, limited to the clearest cases e.g. war criminals (Sadowski, 2023; Przybysławska, 2009). A more in-detail check can be initiated to revoke a temporary protection status when the EUMS has information about reasons justifying revoking protection to the individual. Kőhalmi and Nagy-Nádasdi (2020, p. 288) cited the CJUE decision in which judges "ruled that a residence permit, once granted to a refugee may be revoked either [when] there are compelling reasons of national security or public order within the meaning of that provision, or there are reasons to apply the derogation from the principle of *non-refoulement*. Supporting a terrorist organization included on the list may constitute one of the 'compelling reasons of national security or public order'.". Other reasons include e.g. convicting a foreigner by a final judgment of a particularly serious crime (Kerber, 2002, pp. 197–198). Prerequisites justifying revocation of a refugee status are enumerated in the 1951 RC. This is a closed list. No other reason can be used by a state in revocation procedure.

The list is repeated in Article 14(4) of Directive 2011/95/EU. Similar grounds are listed in Article 28 of Directive 2001/55/EC. However, they relate to an exclusion from protection.

Table 1. A summary of differences and similarities between the 1951 RC, Directive 2001/55/EC, the UNHCR's Handbook (1979), and an interest in these themes in literature.

		The 1951 RC	The UNHCR's Handbook	Directive 2001/55/EC	Availability of academic research
Applicant unwilling or unable to be protected by a COO		An explicit reference	An explicit reference	Not referred to in Directive's text	Commented extensively on this prerequisite
Contacts with a COO	**Short-term**	Not mentioned explicitly, but may contradict with a prerequisite that applicants are unwilling or unable to be protected by their COO	Possible if contacts are incidental	Not referred to in Directive's text	Short mentions in literature
	Long-term		Not explicitly referred to	Not referred to in Directive's text	Authors assumed that such contacts contradict with the prerequisite for which protection is granted or that a COO is a source of persecution, so cooperation with that state deprives persons protection
Revocation of protection		A closed catalogue of reasons to revoke protection	States cannot add any new prerequisites to the 1951 RC to revoke a refugee status	The same as in the 1951 RC	Commented extensively on this prerequisite
Availability of protection to individuals		Always available to individuals if a state ratified the Convention	Always available to individuals if a state ratified the 1951 RC	Requires adoption of the Council implementing decision	Some authors suggest that *non-refoulement* is a customary law, so it does not require ratification
Granting protection after submission of individual application		A rule	An explicit reference	Not available	Commented on this prerequisite – extensively on the 1951 RC and without an in-depth analysis – in case of Directive 2001/55/EC
Granting protection without an in-depth examination of individual case		No legal obligation	Clear support to PFR	A rule	Comments are available

5 Discussion

Directive does not contain a reference to a need to terminate contacts with a COO. This may be interpreted as a possibility to continue employment for that state. This view conforms to the 1951 RC aims, analysis of *Travaux préparatoires*, and the UNHCR's views. Therefore, although such contacts can be prohibited if the text of the 1951 UN Refugee Convention would be applied per analogy, that interpretation should be rejected.

States cannot refer to their obligations stemming from participation in regional organization like the EU to justify disobeying the UN standard (Sadowski, 2021). Hence, Widerski (2024, p. 61) correctly underlines that Polish "special act dedicated to the citizens of Ukraine [, which in Poland implements Decision,] in no way excludes displaced persons from this country from using other forms of protection in the territory of Poland (e.g. granting a refugee status, subsidiary protection /…/), due to the situation in their country.". This has been confirmed by Polish practice, which (unlike the UK's and Czech Republic's practices) does not suspend ongoing refugee procedures when the applicant has already been a BTP (Kosiel-Pająk & Sadowski, 2023). This confirms, that Küçük (2023) correctly declared that the main goal of a temporary protection was to provide humanitarian assistance.

Under the 1951 RC definition of "a refugee", protection is granted to persons who are "unable or /…/ unwilling to avail himself of the protection" of a COO. Such a reference is missing in Directive's definition of a temporary protection. This should be welcomed, because the EXCOMM Conclusions, which explicitly regulated a relationship between a refugee status and a temporary protection, also do not contain such a reference. This has been achieved by declaring that "The asylum seekers forming part of these large-scale influxes include persons who are refugees within the meaning of the 1951 /…/ Convention /…/ or who, owing to external aggression, occupation, foreign domination or events seriously disturbing public order in either part of, or the whole of their country of origin or nationality are compelled to seek refuge outside that country." (EXCOMM, 1981, para. 1.1).

Historic analysis confirmed that promoting the admission and registration of BTPs is clearly in line with aims of the 1951 RC. This is because the CP (1951, letter "E") explicitly declared that "the Convention /…/ will have value as an example exceeding its contractual scope and that convention and protocol /…/ [and states] will be guided by it in granting [protection] so far as possible to persons /…/ who would not be covered by the terms of the Convention". A use of terms "as an example" and "guided by it in granting so far as possible" are of a particular importance. They manifestly underline a minimal character of the 1951 treaty, so a possibility to complement it in regional and national laws. This was explicitly declared by the EXCOMM (1981). It can also be derived from works on Directive 2001/55/EC (Kerber, 2002, p. 195), and literature (Hurwitz, 2009, p. 145).

Küçük (2023, p. 3) correctly perceives an "immediate access to certain right without the long asylum process" as an exemplification of a solidarity with persons in need of protection. She

claims that this could be achieved also in a *prima facie* subsidiary protection procedure. Her views are in line with the 1951 RC and para. 44 of the UNHCR Handbook (1979). Still, a reliance on the PFR is not obligatory to the EUMSs. It has not been also explicitly mentioned in the EXCOMM Conclusions, even those on mass influx situations (1981). Hence, an initiation of a PFR depends solely on a good will of states. Even states with overburdened asylum systems are not legally bounded to rely on these procedures. This is problematic, because the 1951 RC lacks a clear definition of a *non-refoulement* principle, and some states indicate that this means that their responsibilities are limited to supporting persons staying in their territory. This view contradicts with aims for which the 1951 RC has been adopted and with the Plenipotentiaries' views. The CP's view should be seen as a confirmation of a humanitarian nature of a refugee law. Hence, it is a part of international humanitarian law (hereinafter: the IHL), so principles from that law should be applied also to refugee law. The principle of humanitarianism underlines a need to protect all non-combatants (persons who cannot be targets to military actions) and limit casualties among combatants. Moreover, the IHL confirms that states are responsible for persons who are under their effective jurisdiction during a military conflict. This is perfectly exemplified by the fact that during occupation (which was mentioned by the CP) it is the occupant who is responsible for persons on the occupied territory. Annexation of that territory by the occupant is a war crime. Thus, the occupant executes its jurisdiction also on a territory which is not a territory of that state.

Also, the European Court of Human Rights (since 1989) has indicated that states are responsible for consequences of their decisions even if these consequences (e.g., risk to life and freedom from torture) would materialize in other state. Therefore, it can be said that the views from the CP pre-dated that interpretation. Hence, they should be seen as an expression of solidarity with all persons in need of protection. However, this also exemplifies solidarity with states which host displaced persons (Koo, 2018; Küçük, 2023) by promoting fair burden sharing between RSs. Moreover, this Plenipotentiaries' view should be taken into consideration in interpreting Directive 2001/55/EC, because increasing solidarity was one of the reasons for which this Directive has been adopted.

Contrary to the non-binding nature of a PFR, Decision has explicitly established an obligation to grant protection *in abstracto*. This confirms that Directive 2001/55/EC follows the CP's recommendation (1951) to "Governments and inter-governmental bodies to facilitate, encourage and sustain the efforts of properly qualified organizations" in their actions to efficiently address the needs of protection seekers.

In mass influx situations Directive 2001/55/EC is a *Lex specialis* to the 1951 RC, so the 2001 norms get priority. Hence, the EUMSs can protect persons who have been displaced from a country specified in the Council implementing decision. This form of protection should be available also when a person is not "unable or /…/ [is not] unwilling to avail himself of the protection" of a COO. This is a case of persons who work remotely for the administration of their COO.

However, Article 1.C.1 of the 1951 RC specifies that a cessation clause applies when a person acts in order to reobtain protection from a COO and when that country provides this protection (UNHCR, 1979, para. 119). An examination of meeting the first of these preconditions is complicated. The UNHCR Handbook (1979, para. 121) specifies that asking for a passport can be considered as asking for protection, contrary to incidental acts like asking for a birth certificate. This suggests that a caseworker should focus on a strength of ties between a refugee and a COO. A type of an employment contract (e.g. employment law vs. civil law contract) is irrelevant.

However, the UNHCR's Handbook (1979) explicitly states that sometimes *i.a.*, during a war a COO may be unable to provide effective protection. Thus, when a person employed by public administration of a COO cannot be efficiently protected in that state, than this person can receive temporary protection. Moreover, granting protection to persons who cannot be protected under the 1951 RC is in line with that treaty aims. This is because that treaty explicitly allows to establish more favourable norms. This view is supported by the fact that Directive 2001/55/EC provides a list of exclusions from temporary protection which is the same as in that UN treaty (Kerber, 2002, pp. 197–198).

What is more, an impossibility to be effectively protected by a COO is explicitly declared in Decision. That law enumerates preconditions which have to be met to obtain a temporary protection (Sadowski, 2022). Among others, it explicitly refers to general risks in the COO.

As a rule, the applicant should be considered by a state as a person in need of protection. However, the 1951 RC provides a list of preconditions which could exceptionally be used to revoke protection. This nature of the list suggests that the enumeration has to be interpreted narrowly, so states-signatories to the 1951 RC cannot establish additional reasons for non-granting or depriving protection. EU norms enumerating reasons to revoke protection do not go beyond the list which can be found in the UN treaty. Thus, they are in line with the UN standard. This, again, underlines the fundamental importance of the 1951 RC to the CEAS.

Public authorities of a RS should be able to verify a relationship between the BTP and a COO. It is insufficient to limit verification to an identification of the existence of such a link. This is because not all situations when a state power is executed by a person employed by a COO contradict with the aims of the UN values (Sadowski, 2024). As it has been discussed in the above, other reasons do not justify denying and depriving a person of temporary protection, because Directive 2001/55/EC does not provide other motives than the 1951 RC.

Finally, authorities denying and revoking a temporary protection should verify if a return decision, which is a consequence of their decision on denying or revoking protection, does not contradict with a *non-refoulement* principle. Hence, all these decisions should be accompanied with information about a right to appeal (Article 29 of Directive 2001/55/EC).

6 Conclusion

This research confirmed that Directive does not require to end all contacts with the COO. This can be interpreted as allowing to continue employment for that state. This view conforms to the 1951 RC objectives, the analysis of the *Travaux paratoires* and the views of the UNHCR.

The EU's CEAS is based on the foundations of the 1951 RC, but it has developed an interpretation of that UN treaty. Among others, the EU has established the only legally binding law which can be activated in mass influx situations. Displaced persons may benefit from a temporary protection when the Council defines "mass influx" in a specific case. This protection cannot limit an access to a refugee status. Still, it can ensure protection to persons who would not qualify for a refugee status. This interpretation is in line with aims of the 1951 RC, because that UN treaty promotes providing humanitarian assistance.

However, under EU law the EUMSs may deny and revoke a temporary protection to persons performing work to authorities of their COO. These decisions cannot be arbitrary. They should focus on a relationship between a person performing work and the authorities of the COO. Consequently, a country providing protection should verify if that performance is connected with an execution of state powers. If it is, then a nature of this execution of power has to be analysed. This would ensure that state security and public order of the RS are respected, as well as the UN goals are ensured. This individualized verification would also guarantee that protection is denied only in exceptional cases.

This research was limited to the theoretical analysis of the impact of soft law on an interpretation of international refugee law. An existence of relationships between them are uncontested, but it is the Authors subjective (although deeply based in law and results of dogmatic studies) opinion that states should strongly support an interpretation of international law takes into account also soft law and aims for which treaties has been adopted. Views presented in this research have reflected European perspective, because Directive has been activated only once to support persons displaced from European state to other European states. Subsequent research could verify if findings from this article could be used also in other regions of origin and destination.

The conclusion from this article are well grounded in the UNHCR's views, the humanitarian nature of a refugee status, views of the CP, and indications from scientists. Support for these suggestions is based on the need to interpret treaties in a good will in order to ensure real efficiency of these laws. However, owing to a lack of an institution which can impose legally binding interpretation of the 1951 RC and sanction states which do not obey these interpretations views opting for a pro humane perception of the 1951 RC cannot be promoted at the UN level in a binding way. This should not hinder efforts of the Court of Justice of the European Union (which interprets EU law) and the European Court of Human Rights to continue their efforts in ensuring efficient executions of international refugee law, taking into account current social and economic realities. This could help to increase European coherency

of an interpretation of a refugee law. Still, loopholes which have been identified in this article should be clarified in the amendments to Directive 2001/55/EC, because that law is the only part of the CEAS which has not been amended.

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Povzetek:
Začasna zaščita in nadaljevanje dela na daljavo za državo izvora

Raziskovalno vprašanje (RV): Ali lahko razseljene osebe v skladu z zakonodajo EU (Direktiva 2001/55/ES) še naprej delajo za javne organe svoje izvorne države ali bi bilo treba njihovo mednarodno zaščito preklicati z ozko razlago po analogiji Konvencije ZN o beguncih iz leta 1951 ali bi bilo treba to pogodbo ZN razlagati v skladu z formalno zavezujoče smernice UNHCR?
Namen: Ta raziskava se osredotoča na analizo razlik med Konvencijo ZN o beguncih iz leta 1951 in Direktivo 2001/55/ES glede opredelitev oseb, ki lahko koristijo te norme. Naključni stiki z državo izvora morda ne upravičujejo preklica statusa begunca. Ni jasno, ali enako razmišljanje velja za daljše stike. Nadaljevanje zaposlitve za državo izvora je taka oblika stika, zato so diplomati zavrnili status begunca. Položaj oseb, ki delajo na daljavo za javne organe države izvora, se razlikuje od položaja diplomatov. Direktiva se ne nanaša na potrebo po prekinitvi stikov s to državo. Ta članek odgovarja na vprašanje, ali je treba v skladu z mednarodnimi nezavezujočimi zakoni osebam, ki delajo na daljavo za javno upravo svoje matične države, zavrniti začasno zaščito.
Metoda: Značilno za pravno znanost v tem prispevku prevladuje uporaba dogmatsko-pravne in analogne metode. Opravljena je bila kritična primerjalna analiza prava ZN (Konvencija ZN o beguncih iz leta 1951) in prava EU (Direktiva 2001/55/ES). Zgodovinska metoda je pomagala razbrati namere pripravljavcev pogodbe iz leta 1951 iz Travaux préparatoires, da pokažejo razlike med temi zakoni.
Rezultati: Konvencija o beguncih iz leta 1951 se uporablja za osebe, ki nočejo ali ne morejo biti zaščitene v svoji državi izvora. Vendar Direktiva 2001/55/ES ne navaja izrecno potrebe po prekinitvi vseh stikov z državo izvora. Tako bi morali imeti upravičenci do začasne zaščite možnost nadaljevati delo na daljavo za javne organe države izvora. Kljub temu bi moral biti azilni delavec sposoben preveriti, ali te dejavnosti ne kršijo begunskega prava. V nasprotnem primeru naj se začasno varstvo odvzame v posameznem postopku.
Organizacija: Odgovor na raziskovalno vprašanje bi pomagal ugotoviti, ali je zagotavljanje dela za organe izvorne države vedno ovira za pridobitev začasne zaščite. S tem se lahko poveča usklajenost odločitev sodnih delavcev in sodnikov o dodelitvi in odvzemu začasnega varstva.

Posledično lahko poveča predvidljivost razlage prava in vpliva na pravni položaj upravičencev do začasne zaščite.
Originalnost: 28 % razseljenih oseb na Poljskem dela v Ukrajini na daljavo. Ta dejavnik v drugih vojaških spopadih ni bil opažen, vendar se lahko to spremeni s popularizacijo dela na daljavo tudi v javni upravi, torej med osebami, ki ne prekinejo svojih stikov z državo izvora. Konvencija o beguncih iz leta 1951 in Direktiva 2001/55/ES ne omenjata takih situacij. Kljub temu konvencija izrecno zahteva prekinitev nekaterih stikov. Direktiva 2001/55/ES nima tako izrecne zahteve. Prejšnje raziskave so se osredotočale na situacijo, ko je država izvora vir preganjanja ali ko oseba nadaljuje z delom v diplomaciji. Vpliv razlik med neposrednim izvajanjem suverenih pooblastil izvorne države v tej državi in v državi bivanja na odločitve o odvzemu zaščite torej še ni raziskan z vidika mehkega prava.
Omejitve/nadaljnje raziskovanje: Ta teoretična raziskava se osredotoča na mednarodno pravo. Nacionalna zakonodaja držav članic EU in njihova praksa nista bili preverjeni. Zato bi bilo treba nadalje raziskati, ali so države spoštovale prohumano razlago mednarodnega prava.

Ključne besede: azilno pravo EU, množični prihodi razseljenih oseb, začasna zaščita, begunci, delo za javne organe.

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Employee Loyalty in the Platform Economy: Does it Exist?

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Abstract:

Research Question (RQ): In this paper, we answer the research question of whether platform workers harbour a sense of loyalty towards the platform they work for, despite the transient nature of this work form, the absence of traditional employment benefits and the often-impersonal relationship between the platform and its workers.
Purpose: The purpose of this paper is to expand the discussion on employee loyalty to the context of platform work, due to the crucial role employee loyalty plays for both organisations and their workers – employee loyalty helps organisations retain their workforce and avoid the harms of employee turnover, while also fostering a sense of belonging and fulfilment among employees.
Method: 20 in-depth semi-structured interviews were performed with food delivery couriers (working for Wolt and Glovo) from Slovenia.
Results: Our findings show that while this group of workers does display some behaviours which indicate their loyalty to their platform, such as the fact they mostly speak of the platform positively, they actively recommend it to their peers and they display relatively high levels of trust towards it, they do not feel loyal to the extent where they would intend to stay working for the platform indefinitely.
Organization: These findings are important for the sustainability of the platform economy model, as they can help reduce employee turnover and consequently improve the consistency and profitability of digital labour platforms.
Society: Findings on employee loyalty within the platform economy have the potential to decrease employee turnover, which is currently one of the biggest limitations to collective action in this sector.
Originality: This is one of the first papers to discuss the phenomenon of employee loyalty in the context of platform work, as the concept is typically explored in traditional employment relationships. It contributes to our understanding of whether individuals, platform, or non-platform economy participants, can develop a sense of loyalty even towards employers who offer suboptimal working conditions.
Limitations / further research: The current body of knowledge would greatly benefit from a longitudinal study which could explain how platform workers' sentiments towards their platform change over time.

Keywords: employee loyalty, platform work, gig economy, job quality, delivery, precarity.

1 Introduction

Well before the COVID-19 pandemic, EU-CEE countries were faced with significant labour shortages across various sectors (Astrov et al., 2021). On a company-level, labour shortages

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mean organisations need to pay additional attention to not only how they attract and train, but also how they retain their workers (Lahkar Das et al., 2013). This is especially important due to how severe the consequences of a large worker turnover can be (Alvesson, 2000; Phuong et al., 2020) - it is monetarily and psychologically costly for both the employer as well as the employee (Ing Chung Huang et al., 2006). Its increasing costs have been the focus of academic debates for decades (Koch et al., 1978), as high employee turnover harms all industries, even those where hiring new staff is seemingly easier due to a low required skill level. A study conducted on factory workers in mobile devices production, for example, showed that high worker turnover leads to lower product reliability as it increases the share of field failures – the associated costs are estimated to amount to hundreds of millions of US dollars (Moon et al., 2022).

Existing literature indicates that one of the ways in which companies can achieve employee retention is by fostering loyalty among their workers – in fact, some studies indicate that employee attachment is a more effective predictor of worker turnover than job satisfaction (Koch et al., 1978). Employees are less likely to quit their organisation if it is »successful in putting its imprint on the identity of its employees« (Alvesson, 2000, p. 1119). This imprint, one of the most successful paths to employee retention, is typically referred to as employee loyalty (Cuong, 2023). The concept can be defined as the employee's feeling of attachment to their organisation (Yee et al., 2010), or as »a deliberate commitment to further the best interests of one’s employer, even when doing so may demand sacrificing some aspects of one’s self-interest beyond what would be required by one’s legal and other moral duties« (Elegido, 2013, p. 496). Essentially, loyal employees are more likely to stand by their employer in good and bad times, which is highly valuable for organisations (Dutta et al., 2021).

The current body of knowledge from the field is largely focused on the importance and effects of employee loyalty in the context of a traditional workplace (Andriani, 2023; Alvesson, 2000; Yee et al., 2010; Auer Antončič et al., 2011), which greatly differs from the workplace created within the platform economy, the focus of this paper. Moreover, authors focus predominantly on what employee loyalty or lack thereof means for employee productivity and consequently on the profitability and growth of the organisation they work for (Yee et al., 2010; Auer Antončič et al., 2011). Additionally, a large strand of literature is focused on customer loyalty towards an organisation (Lin et al., 2015; Sidharta et al., 2021; Amoako et al., 2021) or even towards individual service workers (Bove et al., 2006; 2002), while studies focusing on employee loyalty in the context of platform work are practically non-existent.

This paper fills precisely these gaps in the current body of knowledge by answering the central research question of whether platform workers feel loyalty towards the platform they work for. The answers to this research question offer an insight into whether individuals can develop a sense of loyalty towards employers that provide suboptimal working conditions, even beyond the platform context. In the context of platform work, these conditions include the often

isolating (Seetharaman et al., 2021) and precarious (Hauben et al., 2020) nature of work, which means platform workers are most often independent contractors who are paid on a piece-rate basis (Hui Huang, 2022). Understanding these questions is not only important for worker wellbeing and platform profitability, but also holds relevance for other segments of the labour market, especially the many sectors where employment relationships are growing increasingly contractual and where short-term contracts are often the norm, not the exception.

This paper is structured as follows: Section 2 provides the theoretical framework on the determinants and effects of employee loyalty, as well as on the phenomenon of employee loyalty within the platform economy. Section 3 explains the methodology, and Section 4 presents the results of the study. Section 5 contains the discussion, and a conclusion with limitations and possibilities for future research can be found in Section 6.

2 Theoretical framework

2.1 The Determinants and Effects of Employee Loyalty

There is no consensus over which determinants contribute most to employee loyalty. In Cuong (2023), survey data from 225 employees in Vietnam showed that the following five elements contribute most to employee loyalty: compensation (the most important factor), work environment, relationships with co-workers, training and development, and job satisfaction. Job satisfaction as a way to achieve organisational loyalty was also emphasized in a survey with 228 Vietnamese doctors, which showed that income, relationship with colleagues, quality of treatment, hospital resources, autonomy at work and training, as well as promotion opportunities were key in achieving high job satisfaction and contributed to high employee loyalty (Vuong et al., 2021). A survey from Indonesia with 45 respondents showed not only that compensation has a positive effect on employee loyalty, but also that it contributes to it the most (Andriani, 2023). Data collected from 10880 employees from Armenia, Azerbaijan, Kazakhstan, Kyrgyzstan, Russia, and Serbia was used to explore whether there is a link between employee loyalty and workplace reward policies. Results showed that workers are more loyal when they expect to be rewarded for their hard work – whether the reward includes money, opportunities for further skill development or the opportunity to gain more autonomy (Linz et al., 2015). A survey conducted on 532 employees working in Swedish hotels aimed to develop and apply a model of employee loyalty (Martensen et al., 2006). From the results of this study, we can observe that leadership had the biggest effect on employee loyalty, followed by human relations and values, personal development and competencies, job contents, creativity and innovation and customer orientation. The authors point out that, interestingly, almost 50 % of the effect on employee loyalty can be attributed to the characteristics of individual employees or their jobs (such as personal and competence development or job contents and creativity). In conclusion, if companies want to retain their workers, they must provide them with good leaders who are capable of motivating their employees, but also provide them with the opportunities to work on challenging tasks, develop their career plans, and express their creativity.

Studies show that employee loyalty has an effect on firm growth and profitability – having loyal workers is thus beneficial for employers (Linz et al., 2015). A survey including 210 service shops in Hong Kong showed that employee loyalty improves the service quality, which leads to an increase in customer satisfaction and thus customer loyalty, which, consequently, positively affects the company's profitability (Yee et al., 2010). Therefore, "employee loyalty is a predecessor of customer loyalty" (Dutta et al., 2021, p. 13). A similar connection can be observed through a survey with 134 representatives from Slovenian service and manufacturing companies which confirmed that employee loyalty has an effect on firm growth, especially for manufacturing companies (Auer Antončič et al., 2011). Studies also show that workers who do not feel loyal to their employer are more likely to quit their job, which has a negative effect on company performance. This can be observed in a study which examined 48 months of turnover data from a major retail chain in the USA and showed that "employee turnover is associated with decreased performance, as measured by profit margin and customer service" (Ton et al., 2008, p. 56).

Besides positive effects on employers, loyalty towards their employer is also beneficial for the workers, although these benefits are seldom the research focus. In a study by Elegido (2013), the author finds that employee loyalty can contribute to human flourishing, as it can improve the workers' lives and helps them form authentic relationships. Other studies show that platform workers often feel low levels of relatedness to their jobs and co-workers, as they usually have no shared spaces or regular meetings (Davidson et al., 2023), which makes it harder for them to feel loyal to their platform.

2.2 Employee Loyalty in Platform Work

The emergence of the platform economy (also commonly referred to as the gig economy) has, in some ways, redefined work. If traditional employers hire their workers, platform companies rely on short-term independent contractors to offer their services in exchange for payment (Behl et al., 2021). Therefore, platform workers, such as Uber drivers or micro taskers on Amazon Mechanical Turk, have less in-person interactions with their "employers", enjoy more autonomy to work when and how they want (Gleim et al., 2019), work predominantly alone and are largely managed by sophisticated algorithms which are responsible for task allocation, performance oversight and the implementation of a customer rating system. Due to the unique working conditions digital labour platforms offer, it is important to understand how workers perceive their employment (Davidson et al., 2023) and whether they feel loyal to their digital employer.

Similarly to traditional organisations, large worker turnover is also an issue faced by platform companies (Johnston et al., 2018) - while some individuals work for them for a long time, many quit after they realize their income is lower than anticipated or that the working conditions are not as advertised by the platform. At first glance, this turnover in a platform economy context, especially in delivery and ride-hailing, seems to be less problematic, as it appears new workers are abundant and easy to train. However, studies show that unsatisfied and disloyal platform

workers can present a threat to the platforms' profitability. Through survey data from 330 ride-hail drivers, Maffie (2023) shows that independence is an alternative to exit in the case of many platform workers. This means that instead of deactivating their platform account, many drivers create their own illegal taxi services and use the platform as a means to source clients to their private business – this does not seem to be a challenge, since one of the drivers claimed 10-12 regular client suffices to be independent from the platform. This study shows that the evidently large worker turnover on digital labour platforms is not harmless, and that while it may seem like the workers are quitting, they are actually creating competitive businesses and thus taking a portion of the platform's profits (Maffie, 2023). The difference in nature of platform jobs as opposed to traditional jobs means achieving loyalty among workers can be challenging. A qualitative study with 327 platform workers in France showed that their commitment towards the platform is positively affected by work meaningfulness, which the workers developed through individual and collaborative job crafting behaviour (Mousa et al., 2023). A survey with 376 white-collar gig workers from several Asian countries showed that another way to improve employee loyalty and increase gig workers' retention is through gamification of the labour process (Behl et al., 2021), which can be defined as the use of rankings, reputation scores and awards which aim to improve work performance (Krzywdzinski et al., 2021). In a literature review by Zhang & Liu (2020), the authors explore the main factors of enterprise management on employee loyalty in the platform economy. They find that employee loyalty is achieved through enterprise incentive mechanisms (such as rewards for positive performance assessments and career management which includes promotion opportunities), respectful and trust-based enterprise management communication and a focus on staff cohesion and a corporate culture.

3 Method

In order to fully encapsulate the workers' experiences and sentiments of employee loyalty, a qualitative case study (Yin, 2014) with 20 semi structured interviews was conducted with Slovenian food delivery couriers.

Prior to conducting the interviews, we reviewed existing literature from the field of employee loyalty in a non-platform employment context, as well as in the context of platform work, using search engines such as Google Scholar and ScienceDirect.

In the second step, we conducted 20 semi-structured interviews. When forming the pool of interview participants, a maximum variation purposive sampling was used to capture a diversity of experiences, as we understand that employee loyalty can vary based on worker age, employment status and education levels (Patton, 2014). Participants were recruited through the author's personal network, via street intercepts and then mostly via snowball method where couriers recruited future participants from their acquaintances. The final sample consisted of 20 food delivery couriers. The interviews were conducted through telephone or video conferencing tools such as Zoom and lasted 45 minutes on average.

The final interview sample consisted of workers for two delivery platforms which we refer to as “Platform 1” and “Platform 2”. The final sample consisted of 7 women and 13 men from the ages of 19 to 39. Among the 20 participants, 10 worked for the platform as students, while 10 worked as independent contractors. The sample consisted of relatively well-educated individuals, with 12 participants holding a high school diploma and 8 participants holding a bachelor’s degree.

All 20 interviews were transcribed and open coded in NVivo (Version 14) according to the principles of deductive thematic analysis as per Braun & Clarke (2006). Firstly, interview transcriptions were reviewed closely to get an initial understanding of our data and to note down preliminary thoughts and potential patterns. In the second step, interviews were coded according to the three key themes, which were the three elements of employee loyalty as defined by Dutta & Dhir (2021). Their model measures employee loyalty through a sense of ownership (whether worker speak positively of their organisation, whether they look forward to their work, whether they believe the organisation has given them a lot, etc.), trust (whether they believe management will help them if needed, whether they can rely on their colleagues, etc.) and willingness to stay (whether workers think about leaving the organisation, if they would chose this organisation again, if given the chance, etc.). During the coding process, themes were refined, as the original themes included employee loyalty elements not applicable to the context of the platform economy. In the following section, participant quotes are used to illustrate to support the themes.

To ensure the validity and reliability of our qualitative study, data was triangulated with the researcher’s fieldwork diary, and the results section presents different perspectives of the participants perspectives, regardless of incidence – the presentation of contradictory statements enhances the study’s validity (Creswell, 2009). In order to improve qualitative reliability, all transcripts were re-read several times to eliminate mistakes that can occur during transcription (Gibbs, 2007).

Before the onset of the interviews, ethical approval from the author’s institution was obtained for the purpose of this study and all participants provided informed consent for their participation.

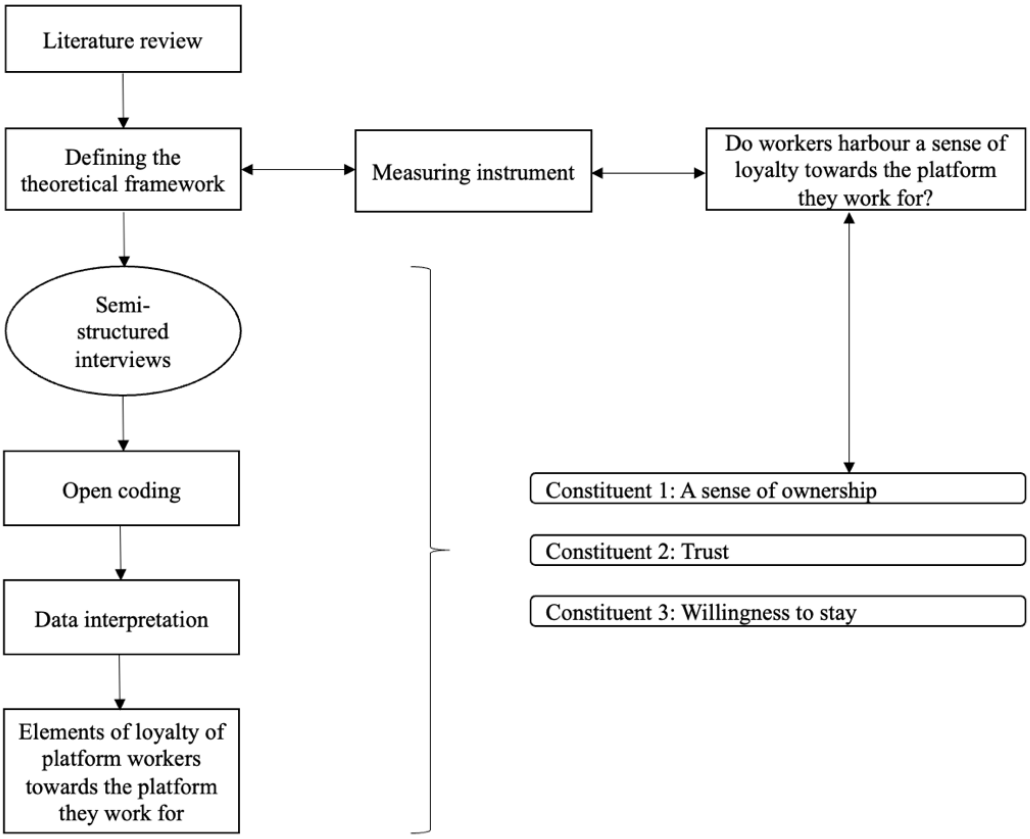

Figure 1. Research design

4 Results

4.1 Overview

Through literature review and a qualitative study using semi-structured interviews with 20 food delivery couriers, our goal was to answer the research question of whether this group of workers harbours a sense of loyalty towards the platform they work for, despite the transient nature of this work form, the absence of traditional employment benefits anf the often-impersonal relationship between the platform and its workers.

Results are presented in three subheadings according to the three consitutents of the employee loyalty model by Dutta & Dhir (2021) presented above.

4.2 A Sense of Ownership

When it comes to a sense of ownership, the first determinant of employee loyalty, which we observe when employees feel that the organisation they work for belongs to them and vice versa, we explore whether the couriers speak positively of the platform they work for, whether they look forward to their job, and whether they feel as if the platform has given them a lot.

When it comes to the latter, all interview participants agree that the platform has given them the opportunity to maintain a better work-life balance, as it allows them to work whenever and wherever they want. In the words of one of the couriers:

> "Before, I had two jobs and had a really hard time coordinating both of them with time for friends and family. Now, the platform allows me to work whenever I want, and I really enjoy that." (P4)

There is significant cross-platform variation when it comes to how couriers speak about the platform they work for. Workers from platform 1 speak highly of their chosen platform, mostly emphasizing their appreciation of the respectful and friendly courier support centre, while workers on platform 2 speak poorly of it. Two of the workers stated this:

> Platform 1: "Our platform's staff is very kind, they communicate well, they help us if we make mistakes and I even have some inside jokes with one of the help centre operators." (P1)

> Platform 2: "My relationship with the platform began well, but they became inconsiderate after a few months, and I had to wait for payment for a long time." (P13)

Evidence of loyalty towards one of the platforms is further suggested by the fact that its workers often express a belief in the superiority of their platform, despite having no first-hand experience with its competitor. One of the workers told us the following:

> "While out platform treats us well, I've heard that the other delivery platform does not work like that. I heard that they punish you for the mistakes you make and that they are much stricter." (P1)

In addition to expressing positive sentiments about their platform, we noticed that couriers frequently recommend it to their friends and family, which further exemplifies their favourable perception of the platform. While the participants were not directly asked about whether they would recommend this job to others, we observe that 8 out of 20 were recruited by their friends themselves, which is considered a sign of loyalty, as it indicates a sense of pride and trust in the organisation (Martensen et al., 2006).

In addition to how they speak about the delivery platform, some couriers explicitly state feeling a sense of belonging and a responsibility to protect the platform's image and reputation, which encourages them to be kinder and act more responsibly in traffic. One of them described it like this:

> "When you have a lot of work, you are really trying to be as fast as possible, which means you drive faster than you should, and break traffic rules. The platform is trying hard to remind us to drive safely, and I really do try to be careful. At the end of the day, when I'm delivering for this platform, I'm also representing it, so I do my best to represent it well." (P14)

Furthermore, one of the couriers distinctly expressed a sense of ownership towards the platform and was actively contemplating ways in which the platform could improve its operations, which indicates a deep level of commitment. In the words of one of the couriers:

> »I think the platform could promote our services better, I have a lot of ideas on how it could be more successful. For example, I think we could teach older people how to use the mobile app, because they do have smartphones, and the app is easy enough for them to use it, but they need some help – they often stop me and ask about how they could order food too. « (P3)

4.3 Trust

Two factors contribute to the determinant of trust – whether workers feel like they can rely on their colleagues and subordinates to perform their tasks and support them if needed, and whether they can rely on the management to resolve their complaints and other problems that arise at the workplace (Dutta et al., 2021).

Platform work, however, is autonomous and isolating in nature (Wood et al., 2019), which means workers do not need to rely on their peers to fulfil their tasks. This does not mean, however, that they do not have contact with their fellow couriers – our observations merely show that the nature of this contact is predominantly social, not professional. One of the couriers, for example, described their contact with their peers like this:

> "We're a very connected group, and a lot of us meet daily on a parking lot close to the city centre where we wait for deliveries. We even had a group chat where we talked about work and other things." (P9)

We mostly observe themes of trust arise when discussing the couriers' relationship with the platform they work for. For some workers, their trust was based on concrete issues, such as the quality of the platform's mobile application, its general work organisation or payment reliability. This is what they told us about their trust towards their platform.

> "I really trust this platform because it has a better app than its competitor, and I also prefer how the work is organised with this platform. It's more flexible. "(P3)

> "I trust this platform more than the other one because it has a more sophisticated app and a fairer algorithm." (P9)

Interestingly, though, a lot of trust and loyalty is based on hearsay or a "feeling", which can be observed in the following worker statements:

> "I work for this platform because I trust it more, but I don't know why – it's just a feeling I have." (P5)

> "I have more trust for my platform, which is a foreign company, than for its competitor, which started as a start-up created by three Slovenian students." (P4)

The participants' trust towards the platform largely depends on how much they can trust the courier help centre to solve their problems quickly, efficiently, and respectfully, but it is generally very high. Two couriers expressed it in the following way:

> "I have really good experiences with the platform's support, they're excellent. They're fast, responsive and kind, and they make me feel comfortable when I have issues or requests. Even when you do something wrong, they warn you very kindly." (P9)

> "Even though you don't meet the support in person, you can see them and chat with them when you pick up or replace your equipment at their headquarters. They're always available, you can even call them, so you're not just left to your own devices." (P14)

4.4 Willingness to Stay

When it comes to the workers' willingness to stay at their selected platform, the focus was directed to two major questions – firstly, if the delivery couriers are considering quitting this job, and secondly, if they would choose this platform if they could choose again.

When asked about the former, the majority of participants expressed no intent to remain working for the platform indefinitely. This includes both long-term workers, who have been delivering food for several years, as well as short-term workers, who intend on working for a few weeks or a few months only. Two of them stated:

> "The only reason I'm working for a delivery platform is because I didn't have enough time to find a better job." (P18)

> "I don't really care about whether we have common areas for the couriers, because this job is just a transition for me". (P12)

Only one worker stated that he genuinely likes the job and the selected platform and sees themselves working for it indefinitely:

> "I work for this platform because I want to and because I genuinely enjoy it, not because I have to or because I have no alternatives. I would continue to work for it even if I were CEO of my own company." (P14)

While we cannot comment on concrete turnover rates in the Slovenian food delivery platform sector, as this data is not available, our interviews show that platform work is still not considered a long-term career option for the majority of participants. This is unsurprising due to the uncertainty of platform work.

5 Discussion

Our findings show that platform delivery workers exhibit a certain degree of loyalty towards the platform they work. When it comes to their sense of ownership, many of them feel as if the platform has given them a lot, as it allows them to better coordinate their job with their personal

life. This appreciation of the freedom and autonomy offered by digital labour platforms are the most valued aspects of this work form in other research as well (such as Goods et al., 2019; Švagan, 2023; Xu & Liu, 2021). Moreover, platform workers in our study exhibit relatively high levels of trust, which is surprising, since existing literature often shows low trust levels between platform workers and the platform. For example, an empirical study with 35 Uber drivers in Paris showed the presence of mistrust between Uber and its workers, which potentially stems from the replacement of human supervisors with algorithmic control mechanisms (Wentrup et al., 2019). This finding shows that there is a significant amount of cross-platform variation in terms of working conditions and workers' perception of their platform job. Lastly, our findings show that despite the fact the workers show some degree of loyalty towards their platform, they mostly do not intend to stay working for it indefinitely.

In addressing the central research question of our paper, whether employee loyalty exists within the context of platform work, our findings reveal a complex reality. Despite the precarious nature of their jobs, platform food delivery workers do exhibit a certain degree of loyalty towards the platform they work for. This is manifested through various behaviours, but mostly through the fact that workers predominantly speak positively of their chosen platform, that they actively recommend it to their peers and express a relatively high level of trust in its operations. On the other hand, food delivery couriers do not seem to have a strong intention to stay working for their platform, which could be attributed to the physically demanding and often dangerous nature of the job (Christie et al., 2019) and to financial and social insecurity, which are common across different types of platform work (Berg, 2016; Xu et al., 2021).

Existing literature highlights the importance of employee loyalty, emphasizing its benefits for both workers and organisations. Studies show that loyalty not only helps businesses by reducing turnover and boosting productivity but also enhances employee satisfaction and morale – these findings apply to platform work as well. Companies who wish to retain their workers should not only analyse their retention and turnover rates, as these give no insight into the workers' intention to stay – it is employee loyalty that ensures the workforce stays at an organisation (Dutta et al., 2021).

More importantly, we argue that employee loyalty has benefits for the working conditions of platform workers. This is due to the fact that loyalty has the potential to, as can be observed in empirical studies presented above, decrease turnover rates in platform work, which is currently one of the main inhibiting factors to collective organisation of platform workers (Johnston et al., 2018), especially combined with the workers' lack of financial resources (Porta et al., 2022). This social fragmentation affects all types of platform work in terms of skill level and work location (online or location-based) (Porta et al., 2022), and can be observed in our interviews as well.

Despite the benefits of employee loyalty presented in this paper, however, we must also emphasize its potential negative repercussions for workers, which are, although rarely,

documented in some studies (Meschke, 2021). These show that loyal employees are, in some situations, more likely to be taken advantage of due to their willingness and inclination to make personal sacrifices for their employer (Stanley et al., 2023). Stanley et al. (2023, p. 1) also show that workers who consent to the exploitation are more likely to obtain a reputation for loyalty, and how "these links between loyalty and exploitation have the potential to create a vicious circle of suffering".

6 Conclusion

Our qualitative study shows that despite the precarious, transient, and short-term nature of the job, platform food delivery workers express some degree of employee loyalty towards the platform they work for. This is mostly observed in how positively they speak of the platform, and how much they trust it. However, their loyalty does not extend to long-term commitment to working for the platform.

The findings are significant as they contribute to the academic discourse on the platform economy and labour dynamics by showing how employee loyalty can develop under conditions typically characterised as poor. This challenges prevailing theories that associate employee loyalty with long-term employment stability and comprehensive worker benefits and provides a foundation for digital labour platforms to explore workforce retention strategies.

However, limitations to this study must be considered. They mostly relate to the fact that the sample is relatively small and includes exclusively food delivery couriers operating in Slovenia. This limits the generalisability of the findings, as platform work conditions, which heavily influence employee loyalty, vary according to national legislation.

As this is one of the first studies to explore the phenomenon of employee loyalty in the context of platform work, the opportunities for future research are abundant. Future studies could analyse how the structural features of platform work impact employee loyalty, such as payment schemes, work flexibility, and job security. Researchers could also investigate the role of interpersonal relationships and community building among platform workers and how these factors influence loyalty. Additionally, comparative studies between traditional employment and platform-based work could provide insights into the unique loyalty dynamics in each setting. Finally, exploring the effects of regulatory changes on worker loyalty could yield important findings, particularly in regions undergoing rapid policy evolution related to gig work.

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Povzetek:
Zvestoba zaposlenih v platformni ekonomiji: Ali obstaja?

Raziskovalno vprašanje (RV): V tem članku odgovarjamo na raziskovalno vprašanje, ali delavci na spletnih platformah gojijo občutek zvestobe do platforme, za katero delajo, kljub prehodni naravi te oblike dela, odsotnosti tradicionalnih zaposlitvenih ugodnosti in pogosto neosebnem odnosu med delavci in platformo.
Namen: Namen tega članka je razširiti razpravo o zvestobi zaposlenih na kontekst platformnega dela, predvsem zaradi ključne vloge, ki jo ta koncept igra tako za organizacije kot za njihove delavce. Zvestoba zaposlenih pomaga organizacijam zadržati svojo delovno silo in se izogniti škodljivim posledicam, ki jih prinesejo obsežne menjave zaposlenih, hhkrati pa spodbuja občutek pripadnosti in izpolnjenosti med zaposlenimi.
Metoda: Izvedli smo 20 poglobljenih polstrukturiranih intervjujev z dostavljavci hrane, ki delajo prek dveh platform za dostavo hrane, ki delujeta v Sloveniji (Wolt in Glovo).
Rezultati: Naše ugotovitve kažejo, da platformni delavci izkazujejo nekatere znake pripadnosti svoji platformi (na primer, da o platformi govorijo pozitivno, jo aktivno priporočajo svojim znancem in kažejo razmeroma visoko raven zaupanja do nje), hkrati pa niso dovolj zvesti, da bi želeli z delom za platformno nadaljevati dolgoročno.
Organizacija: Te ugotovitve so pomembne za trajnost platformega poslovnega modela, saj lahko pomagajo zmanjšati fluktuacije zaposlenih in posledično izboljšati doslednost in dobičkonosnost digitalnih platform za delo.
Družba: Ugotovitve o zvestobi zaposlenih znotraj platformne ekonomije imajo potencial zmanjšati menjave zaposlenih, ki trenutno predstavljajo eno izmed največjih omejitev za sindikalno organiziranje v tem sektorju.
Originalnost: To je eden prvih člankov, ki obravnava pojav zvestobe zaposlenih v kontekstu platformnega dela, saj avtorji ta koncept običajno raziskujejo v tradicionalnih zaposlitvenih odnosih. Članek prispeva k našemu razumevanju tega, ali lahko udeleženci na trgu dela razvijejo občutek zvestobe tudi do delodajalcev, ki svojim zaposlenim ponujajo suboptimalne delovne pogoje.
Nadaljnje raziskovanje: V prihodnosti bi bila zelo koristna longitdinalna študija, ki bi lahko pojasnila kako se mnenja delavcev na spletnih platformah spreminjajo s časom.

Ključne besede: zvestoba zaposlenih, platformno delo, platformna ekonomija, kakovost dela, dostava, prekarnost.