Kristiania University College

Master of Information Systems: Digital Business Systems

The New Road to Serfdom: The Impact of Technology-Mediated Control on Worker Autonomy

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Abstract

The gig economy, controlled by machines and governed by algorithms, has engulfed blue-collar gig workers. Gig economy platforms such as Uber, Deliveroo and Foodora are pioneers of algorithmic management techniques. In parallel, the rapid development of automation has become particularly relevant in the context of white-collar work, where automation technologies have become increasingly capable of taking over a major portion of traditionally human tasks.

This multiple-case study investigates how technology-mediated control (TMC) impacts blue-collar- and white-collar workers' experience of work life autonomy. The study looks at Robotic Process Automation (RPA) in white-collar work and mobile apps in blue-collar work. The findings are studied by utilising the CIMO-logic in order to understand control mechanisms and the METUX model to investigate the spheres of experienced autonomy.

TMC is found to simultaneously enhance autonomy and control for both blue- and white-collar workers. While the workers experience that the technologies augment perceived autonomy, TMC is found to challenge the balance between autonomy and control. Findings in blue-collar work reveal that autonomy in scheduling work is not entirely transferred to the worker, but is rather a disciplinary incentive and a way of controlling and guiding the workforce through the apps. Findings in white-collar work demonstrate that the benefits of being relieved by RPA are coupled with role modifications, no new tasks and little comprehensive understanding of the process. Further, the research identifies tensions in four spheres of experienced autonomy in each case, where the technologies are found to both enhance and constrain autonomy.

The findings contribute to the field of TMC by identifying tensions which provide greater insight for practice and research. The findings will hopefully inspire further development in organisational IT strategy and management systems and future research within the field of TMC. The study also recognises the need for more research on TMC in white-collar work environments.

Keywords: *Technology-mediated control; TMC; Robotic Process Automation; RPA; Control; Autonomy; Workplace Autonomy; Algorithms; Automation; White-collar work; Knowledge work; Blue-collar work; Gig work.*

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1.0 Introduction

The Austrian economist Friedrichs Hayek's book "The road to serfdom" (1944) reflects on how individual liberty was undermined because of centralised planning and government intrusion. Even though the book was written 78 years ago, and at the time was a product of a particular time in politics, it might have renewed relevance. In his book, Hayek argued how centrally planned economies and interventionism establish the groundwork for totalitarianism by creating systems that will be controlled by the most powerful. He criticised socialism and claimed that abandoning individualism and classical liberalism ultimately results in a loss of freedom, and the formation of an oppressive society and dictatorship.

The world has seen some considerable changes since the book was released in 1944. Innovations and developments in technology have established new forms of social connection, increased productivity in the workplace and enabled people to get from A to B with one click through algorithmically managed platforms. Although developments within computing have provided humankind with advantages, there is a darker, more oppressive side of computing (Ekbia & Nardia, 2017).

Ekbia and Nardi (2017) establish the term heteromation, a novel logic of capital accumulation, which they explain as "*the extraction of economic value from low-cost or free labor in computer-mediated networks"* (2017, p. 2). According to Ekbia and Nardia (2017), phases of automation, augmentation, and heteromation have emerged in human-machine relations, and the advent of computing into work contexts has had a variety of effects on labour.

The so-called gig economy, which is controlled by machines and governed by algorithms, has engulfed blue-collar (BC) gig workers (Hara et al., 2018), where gig economy platforms such as Uber, Deliveroo and Foodora are pioneers of algorithmic management techniques. A central feature of these platforms is a layer of automated middle management in the form of a coordinating algorithm that interacts with workers executing tasks through the platform (Enriquez & Vertesy, 2021).

Alongside the technological development within BC work, the rapid development of automation has become particularly relevant in the context of white-collar (WC) work (Ekbia & Nardia, 2017; Kellogg et al., 2020). IT-based systems appear to be increasingly capable of

taking over a major portion of traditional human cognitive tasks (Frey & Osborne 2017), and competent WC workers are becoming increasingly vulnerable to automation, where Robotic Process Automation (RPA) is one of the most adopted forms of automation (Asatiani et al., 2020).

Research within the field of control has generally ignored the influence of technology in control processes, focusing almost solely on the direct interaction between human controls and control individuals (Cram & Wiener, 2020; Wiener et al., 2020). Today, we find ourselves in a position where technology can be used to automate control operations by acting as a substitute for human control (Cram & Wiener, 2020). Thus, the ideas of Hayek (1944) somehow seem to remain relevant as what we see today is possibly how neoliberalism may be resulting in the amassment of centralised control into tech, such as AI-related automation, influencing cognitive and non-routine tasks and automated middle management in the form of coordinating algorithms.

Cram and Wiener (2020) introduce the notion of technology-mediated control (TMC), which they define as "*managers' use of ubiquitous technologies to influence workers to act in a way that conforms to organisational expectations*" (p. 74). With the emergence of ubiquitous technology, they argue that the use of an enabling control style will likely diminish (Cram & Wiener, 2020). Through technologically mediated forms of control, humans perform labour, and loss of autonomy occurs fairly frequently in heteromated labour (Ekbia & Nardia, 2017). Previous research cautions us about the importance of autonomy and freedom of choice (e.g., Hayek, 1944; Deci & Ryan, 1987; Hodson, 1991). Thus, the escalating complexity of business environments invokes the need to balance the evidently opposing tensions of autonomy and control (Gupta et al., 2006).

Even though WC- and BC workers are executing different types of work, there are several common denominators that raise both excitement and consternation regarding the use of technology in the workplace. In both working groups, work is assisted or automated by technology, which implies that regardless of the collar group, you seemingly get influenced by technology to behave in a way that conforms to organisational expectations (Cram & Wiener, 2020). The promise seems to be the same; the technology will lead to more autonomy and flexibility (Ivanova et al., 2018). However, recent research states that workers are under-equipped with the knowledge and competence needed to understand the technology they are interacting with (Ivanova et al., 2018; Asatiani et al., 2020).

Research Aim and Objectives

Most of the current literature that contemplates automation in WC work has focused on benefits and potential opportunities such as quality, efficiency and reduced human errors (e.g., Lacity & Willcocks 2016a; Aguirre & Rodriguez, 2017; Hallikainen et al., 2018; Ranerup & Henriksen, 2019; Radke et al., 2020; Asatiani et al., 2019; Asatiani et al., 2020). Research within BC work identifies functions regarding how technology could support managerial control (e.g., Lee et al., 2015; Rosenblat & Stark, 2016; Möhlmann & Zalmanson, 2017; Ivanova et al., 2018; van Doorn, 2017; Cram & Wiener, 2020) and how perceived benefits are coupled with decreased payment, isolation, unpredictability in working hours, increased workload, sleep deprivation and tiredness (e.g., Fleming, 2017; Wood et al., 2018).

To the authors' knowledge, a limited amount of empirical research has investigated the impact of technology and control, more specifically TMC, related to workers' experience of work life autonomy, except for some emerging studies on gig-work (e.g., Ivanova et al., 2018). There seems to be a dearth of comparative studies on how TMC impacts different forms of work as well as a gap in our understanding of how TMC impacts workers' experience of workplace autonomy. Current literature calls for several research directions which will be important within TMC, such as the impacts TMC has on individual workers (Cram & Wiener, 2020).

Inspired by Cram and Wiener's (2020) TMC theory, this study seeks to continue the discussion about the growing influence that digital technologies have on control and autonomy and contribute to the limited research. This study aims to establish a foundation of the parallels between WC- and BC workers' experience of technology in the workplace by studying workers' experience of TMC. The goal is to understand how different dimensions of TMC impact workers' experience of autonomy. The dearth of comparative studies and the authors' fascination for the topic has led to the following research question:

(i) *How does Technology-mediated control impact blue- and white-collar workers' experience of workplace autonomy?*

This dissertation will answer the research question by conducting a multiple-case study on four different cases within BC- and WC work. The study aims to further investigate the concept of TMC, empirically test the CIMO-logic (Denyer et al. 2008) and METUX model (Peters et al.

2018) and contribute to the field of research and practice of TMC by investigating how BC- and WC workers' experience workplace autonomy.

The study will have the following structure: First, there will be a presentation of relevant literature surrounding autonomy and control, TMC, TMC in WC work and TMC in BC work. Secondly, the research method and data collection will be presented, explaining how the study was executed. The third section contains the findings from the research. The fifth section involves a discussion of empirical findings against previous research. Lastly, implications and limitations will be presented, followed by suggestions for future research and conclusion.

2.0 Theoretical background

This chapter presents the key topics and concepts which are relevant to this study. The first part covers control and autonomy, followed by an overview of TMC. Lastly, the focus will be on TMC in WC work and TMC in BC work.

Method of Theoretical foundation

As suggested by Webster and Watson (2002), the search for literature started in leading journals such as MIS Quarterly, Information Systems Research and Journal of Information Technology. Following, this study collected literature through different databases such as ACM, IEEE, Wiley and Web of Science. As the field of TMC is still in its infancy, it was necessary to broaden the scope and explore the field further, using Google Scholar and Oria. The literature search was carried out between August 2021 and March 2022, and was specified according to the following keywords, both stand-alone and in combinations: *Technology-mediated control, TMC, Robotic Process Automation, RPA, Control, Autonomy, Workplace Autonomy, Algorithms, Algorithmic management, White-collar work, Knowledge work, Blue-collar work.*

To ensure that the collected literature could be perceived as legitimate, well-reviewed journals and peer-reviewed articles were favoured. Tables of contents in relevant journals were also scanned to pinpoint relevant articles not caught by the mentioned keywords (Webster & Watson, 2002). In addition to the database searches, the snowballing approach in the references of the discovered articles was utilised to identify additional relevant articles (Webster & Watson, 2002; Jalali & Wohlin, 2012; Wohlin, 2014). Some articles were also provided by the supervisor. Following Webster and Watson (2002), the theoretical background distinguishes each of the concepts and is structured in a way that divides each concept into its own section in a logical and reader-friendly way.

2.1 Control and autonomy

It is said that organisations must exercise control to regulate or adjust employee behaviour to ensure the full utilisation of capabilities (Kirsch, 1997; Cram & Wiener, 2020). Previous studies of control highlight how control was a work process; managers had to practise control over workers to optimise the value given of their efforts to achieve the organisation's desired goals (e.g., Braverman, 1974; Burawoy, 1985; Thompson & Smith, 2009; Kirsch, 1997; Kellog et al., 2020). Control is variously defined within research traditions. According to Kirsch (1997),

control is mechanisms exercised by controllers to assure the behaviour of the controllee, which when correctly performed, results in the controllee adjusting their behaviour accordingly. Control is often viewed as dyadic in the sense that it involves a controller and a controllee (or group of controllees) in the organisational and IS literature (Cram & Wiener, 2020).

According to Wiener et al. (2019), research should differentiate between controller intentions (control purpose) and controller behaviours (control modes and style used). Furthermore, control purposes (why) are divided into value-appropriation and value-creation (Wiener et al., 2019). Control modes (what) are divided into formal control modes (input, outcome and behaviour control) and informal control modes (clan and self-control) (Kirsch, 1997; Wiener et al., 2019). Formal power or organisational authority is needed for behavioural and outcome controls. Clan control, on the other hand, is highly relevant when the outcomes are vague, and the behaviour is difficult to define. Clan control preaches common values, beliefs, and norms (Kirsch, 1996; Kirsch, 2004, as cited in Chua et al., 2012). A value-creating perspective on management practice is reflected in a positive work environment (Wiener et al., 2019). Paradoxically, it is argued that management practices could harm a company's performance by limiting work autonomy and creating stress in the workplace (Pfeffer, 2018; Wiener et al., 2019).

Autonomy is defined in different ways. Hackman and Oldman (1976, p. 258) define autonomy in the working place as "*The degree to which the job provides substantial freedom, independence, and discretion to the individual in scheduling the work and in determining the procedures to be used in carrying it out*". Deci and Ryan (1987, p. 1025) give an alternative explanation of being autonomous which is not specific to working life: "*When autonomous, people experience themselves as initiators of their own behaviour; they select desired outcomes and choose how to achieve them. Regulation through choice is characterised by flexibility and the absence of pressure*".

Gilbert and Sutherland (2013) investigate key factors that impact combinations of control and autonomy. Workers in their research experienced that trait of control, when combined with autonomy, is valuable in driving employee and organisational performance. Workers in Hodson (1991) evaluated the quality of their occupations based on how much flexibility they had. Jobs that provided workers with the flexibility for exercising creativity, offered prerequisites for the emergence of pride, passion, and additional effort (Hodson, 1991). However, as noted by

Gilbert and Sutherland (2013), an atmosphere with complete autonomy and no control will disempower managers and eventually damage the organisation. Contradictory, an environment with total control and no autonomy may be equally harmful as it would be too constraining (Gilbert & Sutherland, 2013).

Cram and Wiener (2020) state that research within the field of control has generally ignored the influence of technology in control processes, focusing almost solely on the direct interaction between human controls and control individuals. In previous research, control was seen as a dialectical process in which employers constantly innovate to increase the value achieved by workers, while workers resist to maintain their autonomy, dignity, and identity (e.g., Edwards, 1979; Jaros, 2010; Thompson & Van den Broek, 2010, as cited in Kellogg et al., 2020, p. 369).

In general, autonomy refers to the ability to exert control or independence over components of labour, such as its content and bounds, as well as its location, timing, and performance requirements (Mazmanian et al., 2013). While some research has found that low workplace autonomy contributes to workers feeling frustrated (Barley & Kunda 2004), others state that increased levels of autonomy because of digital technology-mediated work environments have both benefits and drawbacks (Mazmanian et al., 2013). Mazmanian et al. (2013) identified the "autonomy paradox", which states that digital technologies give workers more autonomy while also erasing restrictions and increasing stress, because workers self-limit their autonomy owing to internalising norms. According to Deci and Ryan (1987), the question of whether people interpret settings as supporting their autonomy or regulating their behaviour is a central concern of the autonomy and control debate in human behaviour. Freedom of choice, as stated by Hayek (1944), is an essential requirement of individual freedom.

The paradox of autonomy and control is well established in previous research (e.g., Miller & Friesen, 1982; Kanter, 1983, as cited in Feldman, 1989). *"Autonomy and control are inseparable aspects of managerial actions, not independent empirical phenomena."* (Feldman, 1989, p.83). According to Gilbert and Sutherland (2013), autonomy and control must coexist to develop a successful management tool.

2.1.1 CIMO-logic

Denyer et al. (2008) proposed the CIMO-logic for developing solutions to a specific class of field problems. As an approach, this logic can be used to understand in what class of Contexts (C) particular interventions (I) invoke generative mechanism(s) (M), to achieve Outcome(s) (O) (Denyer et al., 2008, p. 395-396). This study adopts this logic to the context of a TMC environment in the BC- and WC work, and to distinguish aspects of TMC approaches in the given areas. Approximating Cram and Wiener (2020), the aim is to separate relevant contextual factors from technological and managerial interventions, as well as generative mechanisms from business-oriented outcomes, in TMC activities (Denyer et al., 2008; Cram & Wiener, 2020), see table 1.

Table 1: CIMO-logic (based on Denyer et al., 2008; Cram & Wiener, 2020)

Dimension	*Description*
Context (C)	Context factors that can influence behavioural change (e.g., organisational setting, control purpose and controller-controllee relationship).
Interventions (I)	Interventions (managerial or technological) that controllers could utilise to affect the behaviour of controllees' (e.g., performance management, control systems and processes, control modes and style).
Mechanisms (M)	The interventions activate the generative mechanisms in a specific context and stimulate behaviour change on an individual level (e.g., competition, awareness and feedback)
Outcomes (O)	At the organisational level, an intervention generates business-oriented outcomes (e.g., reduced cost, improved performance and lower error rate).

2.1.2 METUX model

To understand how TMC impacts worker autonomy, this research will borrow the METUX model from human-computer interaction (HCI) and psychological research, which identifies six distinct spheres of technology experience (Peters et al., 2018). The different spheres of analysis include adoption, interface, tasks, behaviour, life, and society, see figure A.

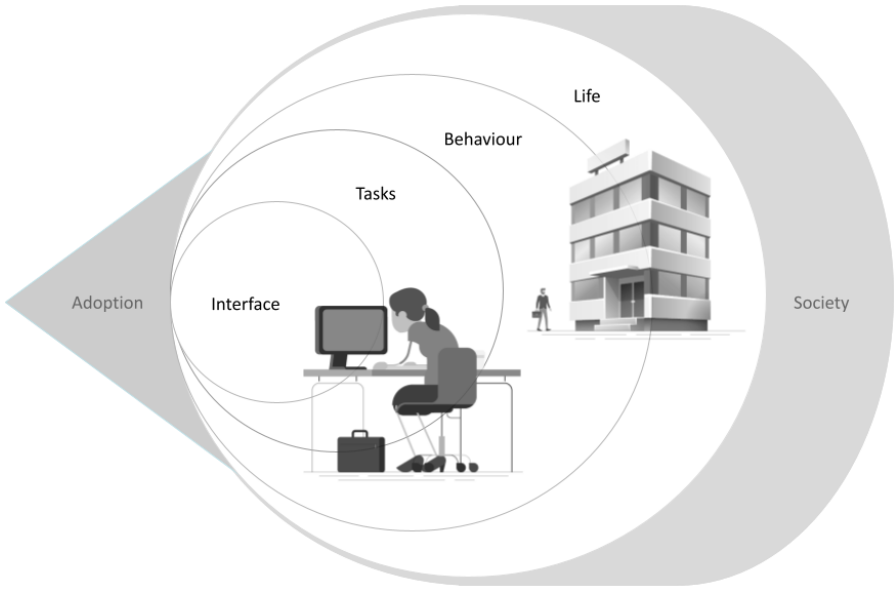

Figure A: Spheres of technology experience, the METUX model. (Calvo et al.2020; Peters et al., 2018)

The METUX model ("*Motivation, Engagement & Thriving in User Experience*") was first introduced by Peters et al. (2018). Peters et al. (2018) illuminate research from psychological research and human-computer interaction research to show how the impact of design should be considered across six different spheres of technology experience, where each sphere raises questions that target different aspects of well-being. Burr et al. (2020, p. 2325) refer to the METUX model as "*the most comprehensive framework for evaluating digital well-being to date*".

Peters et al. (2018) state that within HCI research, basic psychological needs are rarely considered in design strategies. METUX is introduced as a model to understand these needs in the context of HCI. Even though the METUX model concentrates on technology designs and how designs support or undermine basic psychological needs, the model is a tool for understanding basic psychological needs in relation to technology. Calvo et al. (2020) case study applied the METUX model to better comprehend human autonomy in an AI-enhanced video recommender system and illustrated different autonomy-related tensions arising from AI.

The METUX model was first introduced by Peters et al. (2018), hence it must be further validated. To the author's knowledge, there is little empirical support for its effectiveness at this point. However, the key elements in METUX are based on the Self-determination theory (SDT) (Ryan & Deci, 2002), which is a scientifically validated method for analysing elements that promote long-term wellbeing and motivation. SDT proposes that all humans have basic

psychological needs such as a need for competence, relatedness, and most relevant to this study, autonomy (Ryan & Deci, 2002; Peters et al., 2018).

Autonomy is defined as the ability to act in accordance with one's personality and values. Competence refers to one's perception of one's ability, competence, and effectiveness when performing a task. A sense of belonging is referred to as relatedness (Peters et al., 2018). By concentrating on key psychological demands as described by the SDT, Peters et al. (2018) note that the impact of technology on an individual's psychological experience can be better understood, analysed and planned for.

2.2 Technology-mediated control

Traditional control relationships are progressively being replaced by technology-mediated control (TMC) (Pregenzer et al., 2020; Cram & Wiener, 2020). Employers' ability to create unique control systems is greatly aided by technological progress (Hall, 2010, as cited in Kellogg et al., 2020). Employers have been able to transform the exercise of rational control in recent decades due to the advent of algorithmic technologies (Kellogg et al., 2020).

In 2017, New York Times predicted that "*using big data and algorithms to manage workers will not simply be a niche phenomenon. It may become one of the most common ways of managing the American labour force"* (Scheiber, 2017; Cram & Wiener 2020).

Cram and Wiener (2020, p.74) define TMC as "*managers using digital technologies as a means to influence workers to behave in a way that concurs with organisational expectations"*. From a TMC standpoint, the possible behavioural, emotional, and physiological data gathered by technology could provide highly useful information. Motions, interactions (Michael & Miller, 2013), and responses to external stimuli, such as eye movements, are expected to be beneficial to organisations in the coming years (Cram & Wiener, 2020; Pregenzer et al., 2020).

TMC theory distinguishes between supporting and automating managerial control processes (Cram & Wiener, 2020), see figure B. In both cases, there is still an organisation and some level of management behind the system (Wiener et al., 2020; Feshchenko, 2021). When technology is used as a monitoring tool, support management control is carried out. When technology is used completely without human controllers, management control processes are automated.

Uber, a transportation company, is an example of a business that employs automated management control processes (Cram & Wiener, 2020; Pregenzer et al., 2020).

Technology can be utilised as a management tool to provide important insights into employee behaviour, as a replacement for human controls (Cram & Wiener, 2017), or to automate control operations (Liu et al., 2022). By providing managers with valuable insight into subordinate behaviour, the technology could be utilised to support management and control processes (Cram & Wiener, 2020).

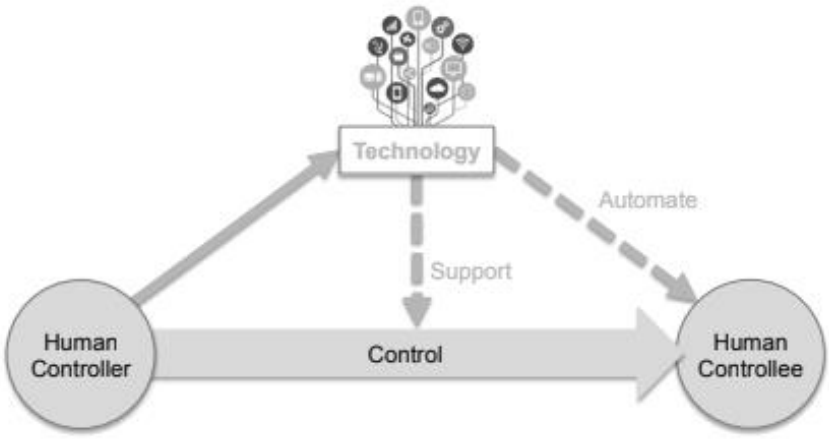

Figure B: Basic TMC model (support vs. automate) (Cram & Wiener, 2020)

Liu et al. (2022) present how different technology (e.g., Internet of Things) plays a supporting role in knowledge management on decision-making and reducing uncertainties. Furthermore, the technology impacts business process performance by claiming accuracy and efficiency. Exemplifying, in the insurance industry, the IoT system's functionalities even improve drivers' behaviour and increase satisfaction. The study reveals how IoT-based technologies could enable knowledge creation by supporting organisations in knowledge management and automating the knowledge management systems (Liu et al., 2022).

This study will use TMC in terms of the way we control through technology. Drawing on the perspectives of Cram and Wiener's (2020) definition of TMC and earlier perspectives of control and autonomy, this study broadens the view to control and ubiquitous technology that has gradually begun to replace or change traditional control relationships between human controllers and controllees. The next section of the thesis will look at RPA technology in WC environments which is a technology that can be viewed as an indirect enactment of control in

terms of changing roles and routines and automating non-routine tasks. In the BC section the study will concentrate on mobile apps in gig-work; work that is enabled through algorithmic-managed platforms.

2.3 TMC in white-collar work

White-collar (WC) work, also referred to as knowledge work, is broadly explained by Yarlagadda (2018) as intellectual and creative work resulting from the utilisation and creation of knowledge. According to Drucker (1999), six factors define WC workers and their productivity. Their tasks can be defined, they have autonomy, they are responsible for their own productivity, their work requires continuously innovating and learning, they are not primarily measured on quantity but rather quality, and they are to be treated as an "asset" and not a "cost". Following Drucker (1999), these requirements are opposite to what is needed to increase manual worker productivity.

Robotic process automation (RPA) is a software technology which typically automates structured and repetitive business processes and are being applied for a wide range of tasks, such as coping, pasting, extracting, tipping, merging and moving data from one system to another *(*Aguirre & Rodriques, 2017; Cooper et al., 2019; Benbya et al., 2021; Eulerich et al., 2021). RPA is a rule-based approach that mimics human tasks in knowledge work processes and automates repetitive administrative tasks (Lacity & Willcocks 2016a; Penttinen et al. 2018; Asatiani et al., 2019). There is a growing number of examples of automation affecting what traditionally has been described as WC work, such as in social services (e.g., Ranerup & Henriksen, 2019) and accounting and finance operations (e.g., Sutton et al., 2018; Cooper et al. 2019; Asatiani et al., 2019; Asatiani et al., 2020; Eulerich et al., 2021).

As RPA is an emerging technology, research on RPA seems to be somewhat in its early stages. Earlier research has focused on benefits and potential opportunities, where studies show high satisfaction and benefits related to RPA (e.g., Lacity & Willcocks, 2016a; Aguirre & Rodriguez, 2017; Hallikainen et al., 2018; Ranerup & Henriksen, 2019; Radke et al., 2020; Asatiani et al., 2019; Asatiani et al., 2020). For example, the mentioned studies report that RPA increases efficiency and productivity, reduces errors and costs, and that RPA frees workers from monotonous and non-value-adding tasks. According to Lacity and Willcocks (2016b) and Willcocks et al. (2015), the released time contributes to workers spending their resources on

tasks that involve more intellectual judgement and creative thinking, while Asatiani et al. (2019) report problematic consequences such as deskilling of workers due to automation. Scholars also assume that automation will not result in layoffs (e.g., Lacity & Willcocks, 2015; Aguirre & Rodriguez, 2017).

Ranerup and Henriksen (2019) describe professionalism and efficiency as the most mentioned value positions of RPA-related digitisation and automation in social services in Sweden. With the use of RPA, applications were processed more quickly due to the automation of process parts and the well-designed IT tools were associated with legality and accountability (Ranerup & Henriksen, 2019). Similarly, Cooper et al. (2019) and Eulerich et al. (2021), report that RPA contributes to increased efficiency, improved service quality, as well as effectiveness improvements for accounting firms.

Asatiani et al. (2020) document that the potential reduction in human errors motivated the implementation of RPA in an accounting firm, even though the workers' job descriptions had to be changed to accommodate the introduction of RPA. Pachidi et al. (2020) state that when working with a RPA, employees could have difficulties in letting go of cognitive tasks in which they have invested knowledge and skills. Asatiani et al. (2020) discovered negative perceptions of job security and fears about RPA replacing workers and losing control over work when tasks were automated. Tasks may be fragmented, preventing accountants from gaining a comprehensive understanding of the process, which could lead to deskilling of the employees (Asatiani et al., 2020).

The concerns raised in Ranerup and Henriksen (2019) were also related to the caseworkers' somewhat altered role. One issue was that human judgement and face-to-face interaction, which are perceived to be of high importance in social work, would have a different focus in automated decision making. Beerbaum (2021) highlights the risk of operational failure through loss of human control: Humans should decide how and when to delegate choices to AI systems to achieve human-defined goals and ensure that machine profiles are accurately interpreted. According to Asatiani et al. (2019), the use of automation can be classified into three types: epistemic analyses, pragmatic decision-making, and pragmatic prevention of human error. Their study demonstrates the advantages of breaking down tasks into mindfulness and mindlessness components, and delegating the mindlessness work to automation.

Technology dominance is defined by Arnold and Sutton (1998, as cited in Sutton et al., 2018) as the concern about the dominant influence technology can have on the user. The user will be in a more subordinate position, which favours technology in the decision-making process. Deficiency could arise because of technology dependence and appears as a secondary concern. The decompetence effect can occur as a result of wear and tear on existing skills or in the absence of skill development which is a normal part of competence development (Arnold & Sutton, 1998, as cited in Sutton et al., 2018). Emphasising, in the case study of Asatiani et al. (2019), the implementation of RPA in fixed asset management had resulted in the absence of human control for several years. When the use was abruptly interrupted, the accountants were unable to manage fixed assets. Their abilities had deteriorated over time due to automation (Asatiani et al., 2019).

It is not easy to integrate humans and systems to accomplish beneficial automation (Madakam et al., 2019). Automation is assumed to free its users from repetitive tasks but could also lead to people offloading complex reasoning to algorithms. This results in humans giving up what has historically been considered a fundamental competitive advantage of the human species (Asatiani et al., 2020). Arnold and Sutton (1998, as cited in Asatiani et al., 2020) show attentive completion of detailed tasks as critical in the accumulation of skills and the formation of hard-earned competence. Taking this into account, the use of automation of repetitive tasks could prevent the acquisition of skills and hinder their maintenance (Asatiani et al., 2020).

An organisations' collective intellectual capital is a critical asset for many organisations today. According to Asatiani et al. (2019), deskilling of employees poses a threat to the long-term viability of this collective knowledge. Deskilling also threatens to deprive the individual worker of their most valuable commodity in the employment market.

In the study of Ranerup and Henriksen (2019) on RPA in social services, removing all aspects of control is considered undesirable, because the value position of professionalism necessitates confirming citizens' self-reported data in the decision-making process. According to Asatiani et al. (2019), mindfulness tasks and control, as well as mindlessness tasks and execution, appear to be natural partners. Mindfulness and mindlessness are complementary, but control and execution have a subservient relationship. In order to accomplish a task or work, one must have some amount of control over it (Asatiani et al., 2019).

Asatiani et al. (2019) propose that automation should be used to carry out pragmatic tasks, while making sure that human employees retain the control of the tasks to maintain their level of skills. Humans who rely on automation for task control may lose their conceptual grasp on operations, become overly comfortable, and thus lose attentive control of tasks (Asatiani et al., 2019). Sutton et al. (2018) compared finance professionals who use algorithms and AI with pilots who let the plane fly with little control or input. While humans with many years of experience in the sector may have unique information to race against the system, Sutton et al. (2018) claim that new workers working with AI may find it difficult to learn this knowledge. Control of automated tasks could eventually diminish when the creation and maintenance of one's knowledge are delegated exclusively to automation and its supplier (Asatiani et al., 2019).

2.4 TMC in blue-collar work

Blue-collar (BC) workers can be defined as hourly workers who perform manual labour (Shirai, 1983; Prandy et al., 1982, as cited in Hopp et al., 2009). An increasing part of the hourly workers are independent contractors, paid for completing a specific task provided by a sharing economy. This type of work is known as "gig" work. Unlike more “traditional" types of temporary employment, gig work is supported by, and managed through internet platforms and algorithms (Wiener et al., 2020).

Literature within the gig economy identifies functions regarding how technology could support managerial control, such as surveillance of the labour force, collection of data for performance evaluation, automatic decision making and automated messaging systems (e.g., Lee et al., 2015; Möhlmann & Zalmanson, 2017; van Doorn, 2017; Ivanova et al., 2018). Some previous research has focused on the efficiency made possible by the utilisation of TMC, such as in crowdsourcing where geographically dispersed people can work together (e.g., Brabham, 2013; Kittur et al., 2013) and how it enables inclusivity by offering opportunities to people as for various reasons precludes them from working regular hours (Valenduc & Vendramin, 2016).

Although digital platforms may provide workers with flexibility and autonomy, research illuminates that the benefits are often coupled with decreased payment, isolation, unpredictability in working hours, increased workload, sleep deprivation, and tiredness (e.g., Fleming, 2017; Wood et al., 2018). Research shows how TMC may result in harming workers' motivation and well-being, as well as creating an ethical and privacy quandary (Tarafdar et al.,

2015; Marabelli et al., 2017; Wood et al., 2018; Cram & Wiener, 2020). Research further shows how gig workers are portrayed as weak and vulnerable due to isolation and technological control (Gerber & Krzywdzinski, 2019). In general, there is a lack of knowledge about TMC's long-term effectiveness and effects (Cram & Wiener, 2020; Markus, 2017; Pregenzer et al., 2020).

The business model of food-delivery organisations such as Deliveroo, Foodora and Uber eats, and ridesharing organisations such as Uber and Lyft, have sparked interest in researchers as it has created new marketplaces for customers to get food and transport from A to B (e.g., **S**tanford, 2017; Rosenblat & Stark, 2016; Ivanova et al., 2018; Cram & Wiener, 2020).

The platforms control the interactions between the provider and the customer. This is accomplished using data and algorithms, as well as payment and assessment systems (Alsos et al., 2017). Alsos et al. (2017) state that these systems are meant to increase the customers' faith in the service, but at the same time the systems provide control over the process. Galière (2020) emphasises that algorithmic rational control is enhanced by techniques of subjectivation. A case study of Deliveroo shows that several dispositions on the platform, e.g., payment per delivery and shift picking systems, generates an active mobilisation of workers (Galière, 2020).

Uber, Foodora and Deliveroo guide their workers' behaviour through a smartphone-based application (Rosenblat & Stark, 2016; Ivanova et al., 2018; Cram & Wiener, 2020). Deliveroo uses a model of workforce management which is similar to Uber, which relies on self-employed contractors. Foodora is similar but stands out as many of its workers are actual employees (Ivanova et al., 2018). Common for these platforms is an irregular manager-subordinate relationship, as workers have the autonomy to choose when and how long to work (Cram & Wiener, 2020; Ivanova et al., 2018). Ivanova et al. (2018) demonstrate how Deliveroo and Foodora have features in their apps, which correlate to four different ways of controlling autonomy in this type of management regime: automated notifications, monetary incentives, internal competition for shifts and informational asymmetry.

Workers who comply with algorithmic assignments are rewarded with additional work, higher pay, and greater flexibility (Rosenblat & Stark, 2016; Ivanova et al., 2018). Particularly, platforms have frequently used algorithmic rewarding to magnify one of the gig-economy's

redeeming characteristics, which is flexibility in working hours and self-determination in scheduling work (Ivanova et al., 2018).

However, there is a disciplinary function that acts through the shift-booking system, which is partially based on data collected on performance and behaviour. Ivanova et al.´s (2018) study on Foodora shows that riders are categorised into a sorting system based on their individual statistics. This affects the shifts that are available to pick from and is a significant automated reward/sanction mechanism in the app (Ivanova et al., 2018). Uber uses a mobile app to monitor, guide, evaluate, and reward or punish drivers' behaviour without any significant human involvement (Cram & Wiener, 2020).

Uber has gained attention in previous research (Rosenblat & Stark, 2016; Cram & Wiener 2020; Wiener et al., 2020; Oppegaard, 2020). The smartphone application for ridesharing has managed to displace conventional taxi work with the use of an effective digital dispatch system. Clients hail and prepays for a ride through a smartphone app, which includes features that make the passenger able to track the location of their car (Stanford, 2017). Similar to Ivanova et al.'s (2018) findings on control features in the apps of Foodora and Deliveroo, a case study on Uber drivers by Rosenblat and Stark (2016) reports that the lines of communication between Uber and its drivers are based on a powerful informational asymmetry. Uber drivers are affected by the company's use of a range of design decisions and information asymmetries through the app to exert "soft control" on their routines (Boltanski & Chiapello, 1999/2007; Deleuze, 1990, as cited in Rosenblat & Stark, 2016). Information asymmetry disables the worker to make informed decisions (Rosenblat & Stark, 2016; Ivanova et al., 2018).

Gerber and Krzywdzinski (2019) present a case study on crowdwork; a form of on-demand gig work. While Uber, Deliveroo and Foodora are geographically limited, crowdwork is mostly done online and is not limited to a specific location. The labour process, on the other hand, is organised and structured through online platforms and digital interfaces like Uber and Deliveroo. Direct control, reputation systems, and community building are used to govern performance on crowd platforms (Gerber & Krzywdzinski, 2019).

3.0 Methodology

This study aims to provide insight and understanding on how TMC impacts WC- and BC workers' experience of workplace autonomy. The next section will first introduce the approach to grasp the phenomenon. Following, the choice of research design, data collection process, case collection and data analysis will be elaborated.

3.1 Phenomenon-driven research

There is a dearth of comparative studies that can sufficiently explain how TMC impacts different forms of work. Rather than establishing gaps in existing theories, the starting point for this study is a broad interest in the TMC phenomenon. Instead of serving as building blocks for new theory, current theory serves to position the study and contribution to the area (Schwarz & Stensaker, 2014).

As an alternative to Theory-driven research (TDR), Schwarz and Stensaker (2014) advocate phenomenon-driven research (PDR) on organisational change phenomena. Unlike TDR, which uses existing theories to develop new theories, PDR employs existing theories to position findings distinct from what is currently known (Schwarz & Stensaker, 2014). This study adopts the PDR approach, which has the potential to generate a variety of novel views, to better understand the TMC phenomenon introduced by Cram and Wiener (2020). This approach permits various theoretical lenses to emerge gradually, without the constraints of a particular theoretical approach limiting interpretation (Schwarz & Stensaker, 2014).

Whether you work in an office with RPA technology, or in the ride sharing business with platform technology, you seemingly get influenced by technology. However, there are difficulties in finding answers to how TMC impacts workers' experiences of work life autonomy through existing literature as it is a novel phenomenon. The next section will elaborate on the research methodology used to answer the research question.

3.2 Research design

Quantitative, qualitative, and mixed methods are three common approaches when conducting research. Based on the assessment of whether numerical, textural or both are needed, the researcher selects one of the mentioned approaches to conduct research (Williams, 2007). The

research question of this study requires an understanding of how TMC impacts WC- and BC workers' experience of workplace autonomy. After carefully considering different research methods, it was decided that the research question requires a deeper and more qualitative understanding of how workers experience their autonomy. There is also an assumption that some aspects cannot be reduced to numbers. Therefore, the qualitative approach has been selected in this dissertation.

As mentioned, there is still a dearth of comparative studies of how TMC impacts different forms of work. According to Leedy and Ormrod (2001), a qualitative approach is suitable when there is little literature about the topic, as the research design will give the researcher flexibility to explore a phenomenon and identify important aspects affecting it. The next section will explain the chosen research design for this study.

3.2.1 Multiple-case study

This study aims to provide insight and understanding on how TMC impacts WC- and BC workers' experience of workplace autonomy. A case study may be useful when the researcher wants to learn more about a situation that is little known or poorly understood. A case study is an in-depth investigation of a specific individual, program, or event and is studied for a set period (Leedy & Ormrod, 2015). The method examines the phenomena in its natural setting and generates data that is related to people's experiences. Thus, the study contains an interpretivist paradigm approach (Klein & Myers, 1999; Oates, 2006).

Researchers may conduct a single-case design, which investigates a phenomenon and test theories on individuals in a specific context (Tellis, 1997; Leedy & Ormrod, 2015). A researcher can also examine two or more cases, such as cases that are similar or different in crucial ways. This is known as a multiple or collective case study and is conducted by concluding a group of cases in order to draw comparisons, develop theory or propose generalisations (Tellis, 1997; Leedy & Ormrod, 2015). According to Tellis (1997), a multiple-case design is suitable when a phenomenon takes place in several situations, and the researcher seeks to obtain generalised conclusions rather than case-specific ones.

The purpose of this study is to achieve new insights on TMC, and an exploratory research design is therefore seen as appropriate. Exploratory research is used when there is little

literature available about a topic (Oates, 2006). As there are few studies on TMC, and a dearth of comparative studies on TMC amongst WC- and BC workers, the exploratory research design can help us to better procure depth and insights into the topic. This research design can also help us generate new and interesting contributions about the topic. Due to the limited amount of literature concerning TMC and the aim of researching workers' experience of autonomy related to TMC, an exploratory multiple-case study is chosen as the research design for this study. The characteristics of the chosen method are summarised in table 2.

Table 2: Summary of chosen method

Design	*Purpose*	*Focus*	*Research instrument*
Multiple-Case study	To understand how TMC impact WC- and BC workers experience of workplace autonomy in greater depth.	Two cases within WC work and two cases within BC work	Interviews

Case studies have been criticised for providing findings that are only relevant for the case under study. However, although certain aspects of the case may be unique, other aspects are likely to be found in other situations as well. It is therefore possible to generate conclusions that are relevant beyond the case under study (Oates, 2006). Analytical concepts and theoretical perspectives will be used as a basis, in addition to the informants' descriptions of reality. The researchers will be critical of their own role, the use of methods, meeting with informants and interpretation of findings. This may enhance the actuality of the research in similar practice or research contexts. Additionally, the research field concerning TMC is still in its infancy and a multiple-case study could contribute with implications and rich insight into the field, beyond the case under study.

3.2.2 Semi-structured interviews

This study will collect data using interviews. Interviews can be divided into structured, semi-structured and unstructured interviews and are summarised in table 3.

Table 3: Types of interviews (Oates, 2006)

Structured interviews	Each interviewee is presented with pre-determined, standardised questions in a set order and there is little interaction beyond the predetermined questions.
Semi-structured interviews	This strategy allows for a discussion between the interviewee and the researcher rather than a strict, formalised question and answer format. The researcher can change the order of questions depending on the conversation.
Unstructured interviews	The researcher introduces the topic and questions arise in a free-flowing conversation. The researcher has less control and there is a non-directive interviewing.

Due to the aim to encourage the interviewees to freely discuss their own experiences on how TMC impacts autonomy, semi-structured interviews are chosen as the method to collect data. The open-ended questions allow adjustments in questions depending on the attributes of the specific worker and the given type of experience that the worker possesses.

To ensure validity, the respondents were informed about the purpose and methods of the dissertation, both orally and in writing prior to participating. The research was conducted in accordance with NSD ("Norsk senter for forskningsdata"). NSD approved the study and the use of data before the data collection. A written consent according to the ethical regulations for research was signed by the participants before the interview, see appendix 1. In order to obtain focus on the interview situation and the respondents, the interviews were conducted via Microsoft Teams and the conversations were recorded (Oates, 2006). For further transparency and validity assurance, the interview recordings were shared with each participant via a secured, shared platform. The recordings were transcribed after each interview to process the collected data and reflect upon if the respondent provided relevant data.

Since the study applies the CIMO-logic (Denyer et al., 2008) and METUX model (Peters et al., 2018), these theories were used as a point of departure when constructing the interview questions for this study. The interview guide has the following structure: (1) Introduction to the research project, (2) Background, (3) Autonomy, (4) Competence (5) Relatedness. The interview guide is found in appendix 2.

3.3 Data collection

In this research, both primary and secondary data are collected. In order to obtain better insight of the situation concerning TMC and autonomy, and to support the theoretical and methodological part of the thesis, secondary data has been collected from books and scientific articles. The planning and execution of the data gathering started with reviewing relevant literature to get a deeper understanding of the phenomenon under study and previous research within the field. The data collection process is illustrated in figure C.

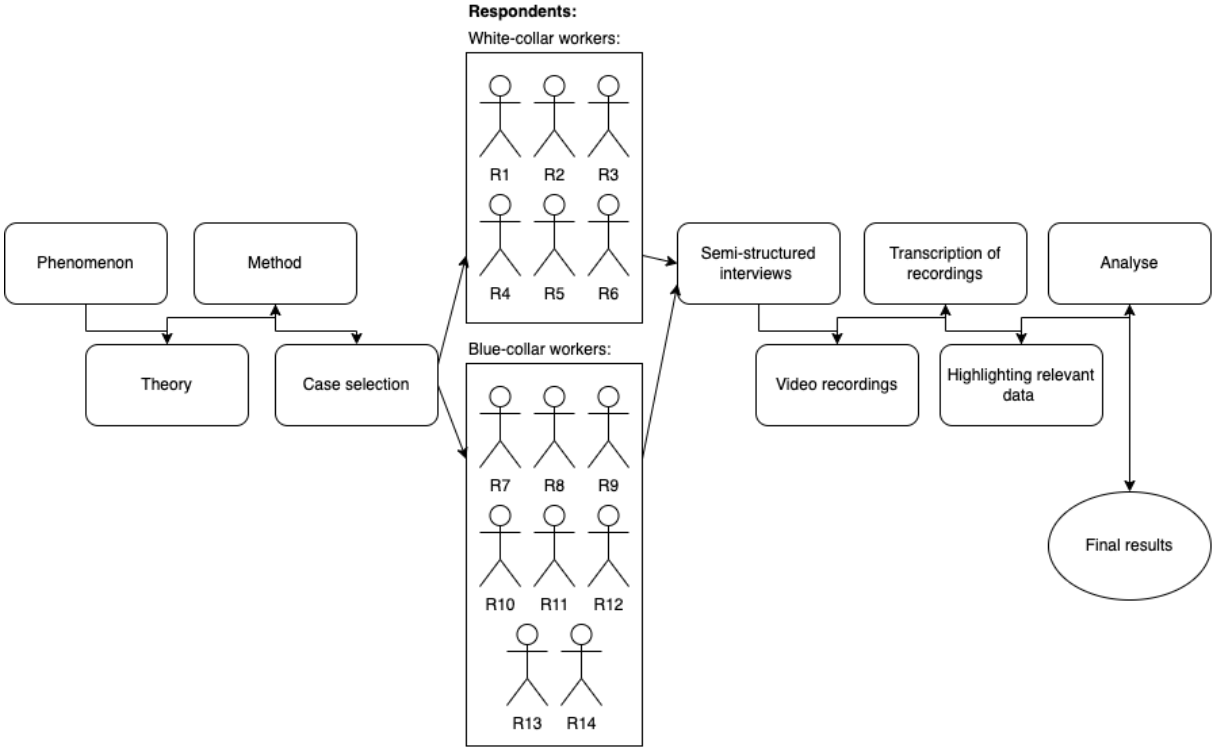

Figure C: Data collection process

As mentioned in the previous section, the primary data source in this dissertation is qualitative open-ended interviews with WC- and BC workers. The data collection was performed over two months, and 14 individuals were interviewed in total. The number of interviews in each working group are listed in Table 4 below.

Table 4: Sample size

Role	*Number of interviews*
WC worker	n=6
BC worker	n=8

3.4 Case selection

Coyne (1997) emphasises that sample selection in qualitative research has a profound effect on the ultimate quality of the research. There has been a strategic selection when recruiting respondents. It was first decided which target groups would be most beneficial in order to gather necessary data, and then relevant workers who were to participate in the data collection were contacted. The starting point is therefore appropriateness and not representativeness (Coyne, 1997). The sample in this study is selected according to what is most suitable for the topic TMC, the research question, and the data collection method. The respondents are chosen as they have direct experiences and knowledge related to the research question.

The researcher's personal and professional networks have been utilised to get in touch with relevant respondents. The respondents have been selected from various organisations, two organisations in the WC environment and two organisations in the BC environment, with the goal to cover a larger part of the phenomenon. This is not an organisation-specific study, and the sample selection is done with the goal of uncovering a general set of experiences related to the topic.

3.4.1 Case selection overview

This study ended up with 14 respondents from four different organisations, where 8 participants represent BC workers and 6 represent WC workers. This is assumed as an adequate sampling size which will contribute to knowledge and insights related to the topic being studied. The sample of respondents is also decided as feasible based on the time scope and framework of the study.

An information letter that promised anonymity both for the organisation and the informants were sent out prior to the interview to every participant. The names of the organisations and respondents will be replaced with pseudonyms. The industry the organisations operate in will not be anonymised in order to maintain transparency in this research project. An overview of the participants and their organisations are summarised in table 5.

Table 5: Overview of the participants and organisations

	Organisation	*Respondent*	*Organisation description*	*Role*
White-collar	Debt Collection (DC)	R1	Works with collection of debts and receivables that have not been paid by the due date to the original creditor. Worked with RPA since the end of 2017. Has 30 automated robotic processes that work side-by-side with caseworkers.	Case-worker
		R2		Case-worker
	Education Services (ES)	R3	Assist the units with administrative operations and provide services to students and applicants. Worked with RPA for almost three years. Has several robotic processes that work side-by-side with consultants.	Consultant
		R4		Consultant
		R5		Consultant
		R6		Consultant
Blue-collar	Food-delivery 1 (FD1)	R7	An online food-delivery service where the workforce works via an app. The organisation has both employees and independent contractors.	Courier
		R8		Courier
		R9		Courier
		R10		Courier
		R11		Courier
		R12		Courier
	Food-delivery 2 (FD2)	R13	An online food-delivery service where the workforce works via an app. The workers are independent contractors.	Courier
		R14		Courier

3.4.2 White-collar workers

In the beginning of the data selection there was completed a search for relevant organisations using RPA in their operations. The most important criteria were to find workers who worked with the robots and not workers that were entirely replaced by robots. The first step of this process was through googling. Relevant organisations were found via news articles and organisations' own websites. The organisations were contacted directly via email and telephone. The researchers also used personal and professional networks to get in touch with the relevant

organisations. The study ended up with two different organisations, one in the debt collection industry and one in the higher education sector.

Case description: Debt collection organisation (DC)

The core operations of the debt collection organisation (DC) are to help customers pay unpaid invoices. Other business areas are invoicing and ledger work. The respondents in this case work in the invoicing unit and the debt collection unit. The organisation has worked with RPA processes since the end of 2017 and has over 30 automated processes that work side-by-side with caseworkers. They have in-house developers and work with UIPath RPA. The processes and tasks that are automated today are typical repetitive, rule-driven tasks that were considered desirable to get rid of.

The starting point for the implementation was to be able to handle a larger volume of tasks without having to hire more people. The robots, according to the organisation, make it easier to onboard more customers without having to hire more employees. The organisation also highlights that planning and staffing for typical volume processes that come in periods is difficult, and that the robots have contributed to an improved scalability in relation to the volume of the tasks.

Examples of processes that have been automated are robots that return payments if customers have paid too much. There are also several clearing jobs that have been automated, such as ledger work. For example, if a customer pays with the wrong KID on an old invoice, the systems are set up in such a way that the payment will be added as an additional payment on the old invoice, and then the robot moves it to the correct invoice.

Case description: Education Services (ES)

The Education Services (ES) has responsibility for the operation and standardisation of administrative support functions within education of the specific university. The workers assist the units with administrative operations and provide services to students. The ES has used BluePrism, an RPA software, in their operations for almost three years. Within the department there are several units, where it varies between teams and units how long the robots have been used in their processes.

The respondents from ES work in the study administration and in the archive section, and work with tasks related to semester fee, semester registration, dispensation cases and different

archiving tasks. An example of automated processes in the study administration is robots receiving applications for dispensation from the deadline for paying semester fees, creating new invoices in the system, and sending emails to students that the invoice is ready. This process was automated in august 2021.

3.4.3 Blue-collar workers

Through online news articles and different studies related to the gig-work in Norway, there were found several relevant organisations in the BC environment. Since several of the gig-organisations work via a platform or an app, there is little or no contact between management and workers. It was therefore difficult to reach workers via the organisations. Facebook was used as a point of departure, where the organisation name was put in the search field. Workers were contacted directly via Facebook messenger. Prior to making contact, a template with information about the project and the purpose of the participation was written. This study ended up with two different organisations, both in the food-delivery industry.

Case description: Food delivery 1 (FD1)

FD1 is a food delivery business that operates online. In Norway, this case offers meals from a diverse range of vendors. Customers may choose between nearby places, order food, and track their order as it is delivered by a bicycle courier or car through an app.

The couriers are either permanent employees or working freelance for the organisation. All couriers are guided and managed by an app, and interact with both the customers and the management system through the app.

The app works as a management function as it holds control and administrative roles such as check in for shift, statistical measurements, swipe to accept/cancel order, tracking and mapping function, start/end destination, communication function and push notifications.

Case description: Food delivery 2 (FD2)

FD2 is a food delivery organisation comparable to the case of FD1 when it comes to fundamental purpose and task. Customers could order from the platform's vendors/partners through FD2´s app or website and pick it up or have it delivered by the platform's courier partners.

Nonetheless, under FD2, the couriers are all independent contractors and are classified as sole proprietorship contractors. The couriers are guided and managed via an app, which allows them to connect with both clients and the corporate system.

The app works as a management function as it holds control and administrative functions such as check in/check out, swipe to accept/cancel order, tracking and mapping function, start/end destination, communication function and push notifications.

3.5 Data analysis

To analyse the data, a complete background for analysis is established through collected theory to understand how organisations within the WC- and BC environment utilise RPA (WC) and mobile apps (BC) in their operations. Following, the findings from the interviews were integrated and analysed according to the CIMO-logic (Denyer et al. 2008) and the METUX model (Peters et al. 2018).

3.5.1 Transcription analysis

In line with Oates (2006), the interview recordings were transcribed as accurately as possible. To analyse the interviews, the transcription first underwent 'open coding' (Burnard, 1991). Following, main lines, headings and subheadings are established through two phases, resulting in a list of categories. The list of categories is surveyed and grouped under higher order headings and finally colour coded. In the next stage, quotations were matched under headings (CIMO and METUX). Subsequently, findings were implemented, supported by quotations (Burnard, 1991). A hybrid coding approach (mix of inductive and deductive) was conducted, in which priori codes (deductive) emerged from interview questions, and new codes (inductive) were established while the data was being reviewed (Oates, 2006).

3.5.2 CIMO-logic

To present the TMC perspective in a structured manner, the findings will be integrated into Denyer et al.'s (2008) "CIMO-logic", which comprises four core dimensions: context, interventions, mechanisms, and outcomes (see Table 1 for details). This study will use the CIMO-logic to analyse TMC in four different cases, two WC and two BC.

As an approach, this logic can be used to understand in what class of *contexts (C)* particular *interventions (I)* invokes generative *mechanism(s) (M)*, to achieve *outcome(s) (O)* (Denyer et al., 2008, p. 395-396). This study adopts this logic to the context of a TMC environment in WC- and BC work and to distinguish aspects of TMC phenomenon in the given areas.

The C, I, M and O in this study can be described as how contextual factors in TMC activities (e.g., controller-controllee relationship) use technological and managerial interventions (e.g., control style) to invoke generative mechanisms (e.g., competition) to deliver certain outcomes (e.g., increased/decreased performance). The CIMO-logic will contribute to a broad overview and description of the control aspect in the case studies.

3.5.3 METUX model

While the METUX model initially proposes six spheres which may impact user experience, this study will only elaborate on four of the six spheres. The study will exclude the adoption sphere as the adoption sphere emerges before the implementation of the technology, and thus not considered relevant to how the technology impacts workers autonomy in this study. The society sphere will also be excluded given that the case selection will not provide sufficient answers to experience to all members of society, beyond the technology. In addition, life will be modified to work life, as this is a specific part of the issue under study. Following, it is posited that it is helpful to think about how technology impacts workplace autonomy within the following four spheres of experience: Interface, tasks, behaviour and work life. Based on Calvo et al. (2020) and Peters et al. (2018), this study will explore the following spheres of experience, see table 6:

Table 6: Spheres of experience in the METUX model (based on Calvo et al., 2020; Peters et al., 2018)

Spheres of experience	*Description*
Interface	How the direct interaction with technology impact autonomy.
Task	How technology specific tasks impact experienced autonomy.
Behaviour	How technology affects autonomy in relation to the behaviour it supports.
Work life	How the technology impact autonomy in overall work life

The model will help in understanding workplace autonomy in a TMC context by applying it to real-word case studies of workers working with mobile apps and RPA. This modified model will provide analysis from four different spheres of experience in order to appropriately capture the TMC effects on autonomy.

Adapting the METUX model to this context will assumingly provide this study with a nuanced understanding of experienced workplace autonomy. Looking at previous literature, concerns over basic psychological needs related to TMC are somehow reflected, such as fears related to how the technology will lead to deskilling (threatening competence), regulate unpredictability in working hours (threatening autonomy) or replacing human-to-human connection (threatening relatedness) (Peters et al., 2018).

4.0 Findings

This section presents the empirical findings from the interviews with WC- and BC workers. A total of fourteen semi-structured interviews were conducted. The section will be divided in each case, where the respondents and their organisations are briefly elucidated followed by a summary of the main themes from WC- and BC workers. The findings from each case are structured through the CIMO-logic and METUX model to sort out experienced autonomy and TMC. Following, the findings are supported by relevant citations and insights emerging from the specific case.

4.1 TMC in white-collar work

The WC organisations utilise technology to relieve workers as well as for efficiency and quality purposes. RPA is primarily used to supplement organisational control processes and not to automate managerial control processes. The RPA provides workers with more time to maintain existing responsibilities. The gained time is marginally exploited for new, less routine tasks. Tasks that were previously performed manually by workers (controllee) are now partially controlled by a third party (RPA team) which possess knowledge related to function and maintenance, such as solutions to errors or problems.

4.1.1 Workers in Debt collection

The core operations of the DC organisation are to help customers pay unpaid invoices. Other business areas are invoicing and ledger work. The respondents in this case work in the invoicing unit and the debt collection unit. The organisation has worked with RPA processes since the end of 2017 and has over 30 automated processes that work parallel with caseworkers. The organisation has in-house developers and work with UIPath RPA. The findings for this case are summarised in table 7.

Table 7: Summary of findings in Debt Collection

CASE Debt collection workers	
Context	- RPA (UIPath) - Internal IT team - Manager (Controller) - Employees (Controllee) - Value creation (Productivity, efficiency and quality Improvement)

Interventions	- Self-control (e.g., choosing how to perform a task) - Clan control (e.g., shared norms aligning behaviours and project goals) - Enabling control style (controllee empowerment)
Mechanisms	- Perceived increased degree of work autonomy - Perceived increased time to do other tasks - Perceived decreased stress levels
Outcomes	- Improved productivity - Improved efficiency - Improved service quality - Reduced human errors - Improved flexibility and scalability - Modification in employee roles
Sphere of experience	
Interface	- Internal RPA-team handling errors on command - No access to or interaction with the robot interfaces - Do not see the automated tasks/processes
Tasks	- RPA free time for workers to do new and other tasks - RPA free workers from repetitive, tedious, and demotivating tasks - RPA provides workers more time to solve tasks that need expertise and customised solutions. - Tasks that were liked among workers have been automated - No technical competence when errors occur - Minimal insight into automated tasks - Automated tasks sometimes require manual treatment - Increased risk in not knowing how to solve a task
Behaviour	- Feeling of more self-control - Feeling of being more productive - Feeling of delivering better services to customers - Modification in employee roles
Work Life	- Increased interaction among team members - Decreased pressure and reduced stress levels - Dependent on RPA-team when error occurs

4.1.2 Workers in Education services

The ES department has responsibility for the operation, management, and standardisation of administrative support functions within education of the specific university. The department assists the units with administrative operations and provides services directly to students and applicants. The department has used BluePrism in its operations for almost three years, where it varies between teams and units how long the robots have been used in their processes. The respondents in this case work in the study administration (6 months with RPA) and in the archive section (3 years with RPA). The findings for this case are summarised in table 8.

Table 8: Summary of findings in Education Services

CASE Education services workers	
Context	- RPA (BluePrism) - Internal IT team - Manager (Controller)

	- Employees (Controllee) - Value creation (Productivity, efficiency and quality Improvement)
Interventions	- Self-control (e.g., setting of individual goals) - Clan control (e.g., shared norms aligning behaviours and project goals) - Enabling control style (controllee empowerment)
Mechanisms	- Perceived increased degree work autonomy - Perceived increased time to do other things - Perceived decreased stress levels
Outcomes	- Improved productivity - Improved efficiency - Improved service quality - Reduced human errors - Improved security - Modifications in roles - Increased cooperation
Sphere of experience	
Interface	- No access to or interaction with the robot interfaces - Internal RPA-team handling errors on command - Do not see the automated tasks/processes
Tasks	- RPA free time for workers to do new and other tasks - RPA free workers from repetitive, tedious, and demotivating tasks - RPA provides workers more time to solve tasks that need expertise and customised solutions. - Robots performs high quality - Standardisation of processes - No technical competence when errors occur - Adjusted work tasks and modifications in role - Automated processes sometimes require manual treatment
Behaviour	- More productive - Delivering better services to students - Lack of understanding of how the robot works
Work Life	- Increased interaction among team members - Decreased pressure and reduced stress levels - Dependent on RPA-team when error occurs

4.1.3 Findings within white-collar workers

In total, six interviews were conducted among the WC workers (n=6). In the following section, the main themes in WC work are provided, see table 9. A main theme is sub structured on repetitious or similar headings (Burnard, 1991), which is further supported by at least five out of six respondents.

Table 9: Main themes in WC work

Sphere of experience	*Support for autonomy*	*Compromise to autonomy*
Interface	Delegating error concerns	No access
Tasks	Relieves tasks	Manual treatment
Behaviour	Increased quality and efficiency	Role modifications
Work life	Decreased pressure	Dependent on RPA team

Interface

The findings shows that there is no direct interaction with the robotic interface in WC work (n=6). All participants are free from tasks concerning the interface of the software. Thus, WC workers are dependent on a support-team when errors occur.

> R3: *"We do not work directly with the robot and do not use an interface through the robot."*
>
> R4: *"I get what's in the end. The robot is set up in collaboration with us for [tasks]. And so yes, these computer people have arranged and fixed and set up the robots so that they will do these things correctly. So, if it is wrong, we have to have a new meeting with [support team] and then they have to adjust the robot so that it works properly."*

The findings indicate that four out of six workers are unfamiliar with the setup. Two respondents were involved in the process of setting up the robots, whereas it still seems to be foreign to the remaining four. This was illuminated by participant R6 which reflected the importance and a desire to understand the process that the RPA software performs.

> R6: *"I was a little curious about how they [the robots] were set up. We were not told. And what parameters do the robots use to shuffle correctly. You can say that in one way it is unnecessary knowledge, but for me it is very important to understand how things are set up to find out when and why the error message occurs because the setup is wrong."*

Tasks

All the participants (n=6) express that the RPA relieves work and provides time to do new tasks. Regarding RPA impact on tasks, several factors were mentioned. Common themes expressed among all the participants were how RPA had removed demotivating tasks and provided more time for other tasks. When asked about how the RPA impact the experience of autonomy, the general answers are summed up in the reflections of participant R2 and R1:

> R1: *"We have more time for the tasks that actually solve issues"*
>
> R2: "*I don't not have to sit with the long lists and reports that were very demotivating and now I have more time to do other tasks*."

Despite workers stressing how the RPA provided time for other tasks, it emerges from the interviews that the workers did not necessarily do new tasks or tasks that required expertise and

customised solutions. Participant R2 highlighted how the organisation expressed that RPA were to give more time to focus on more difficult tasks.

> R2: "*They [the organisation] said that it [RPA] would give us more time to focus on more difficult tasks. Sometimes you have... but there are not so many of the difficult tasks."*

In relation to the question of what the time liberated by RPA was used for, none of the participants had a clear answer to what "other" or "new" tasks were. More time to do what one already did was a recurring theme among all the participants (n=6), as well as more time to take care of tasks they had limited time for earlier. This was addressed by participant R3:

> R3: *"We have more time to do the same things we did before. It [the tasks] is the same as we have done before, the same type of things... So… not actually new tasks".*

Additionally, participant R1 explained how their team had become smaller due to a natural decline and that no new workers had been employed. The decrease in team members led to more cases and more to do of the same type of tasks.

> R1: *"(...) We have got a few fewer on the team over time, but there has been a natural decline then – but it has not been replaced by anyone. So then we have more cases, so that we have more to do, but of the same type of work. But we have more time to do it then because some of the other tasks have disappeared."*

A somewhat contrasting finding is related to how tasks are being replaced by robots, providing workers with more time, and workers pointing to how they manually have to check if the robots' outcomes are correct. Participants point to how they must oversee automated results in the case of errors, treat automated processes manually and ensure quality in the automated processes. Participants R1, R4, R6 reflect:

> R1: *"We still have to go in to check the results"*
>
> R4: *"(...) we have to pay attention to the results. Because they [the robots] change, if criteria or fields or something like that change in [the system], and when the robot continuously runs, then it will be wrong. So it is something you have to oversee somehow."*
>
> R6: *"Sometimes it has given me more work than registering manually. It was presented as if we were to save time and that things would be easier. My first experience was that*

> *it only gives us more work, because the time you have saved you have to use to ensure quality much more."*

The WC workers mostly reflects a relatively positive attitude regarding the RPA concerning the task sphere. All workers stressed that the benefits outweigh the drawbacks, where more time and relieved tasks were common denominators. The RPA can therefore be categorised as a support for task autonomy. However, the findings reveal that more time was not necessarily spent on new tasks. Rather, it occurs that increased worker capacity and time was spent on the same tasks, as well as quality checking automated results. There is little support for technology enhancing task competence.

Behaviour

A significant finding is that all the participants (n=6) are enthusiastic about RPA. All the participants expressed how they could see the value in their own work, as well as for the organisation. A common theme among the participants was how the RPA has increased their efficiency, improved the service quality and reduced the number of human errors.

> R1: *"The robots enable me to be more productive in my tasks and I feel that we deliver a much better product to our clients. I experience the robots as a great help. (…) we actually save a... a person's work for a whole day when we get help to [tasks] and such*."

> R2: *"Now we deliver a much better product for our customer... There were some promises we had given before that we have felt we have not kept. Like we promise that we will have full control over the [task] but we have not really had that because we have not had the capacity for all those [task]…all those clearings. Yes, so the feeling that we are now delivering a much better product to our clients."*

The service quality is expressed to be improved by RPA as it increases accuracy in the operations. Particularly, participants expressed that RPA contributes to reducing the risk of errors, such as inaccurate data input. This is illuminated by participant R1 which highlights how the robot does the repetitive tasks more precisely than humans.

> R1: *"(...)it [RPA] frees up a lot of time. (…) The robot also does it more precisely than what we do. It is very easy that we type some number wrong, and then the result comes out wrong from us and that is very boring. It is very repetitive tasks that make you feel like you are sitting and punching through and maybe you also make more mistakes and are not as alert and do not become aware when to enter (…)"*

Participants also express how RPA is improving quality due to the necessity for the organisations and the workers to better understand processes before they can be automated. Through standardisation of processes prior to automation, workers expressed that they had to familiarise themselves carefully with the process. The standardisation of processes was said to uncover weaknesses that they were able to adjust. This was discussed by participant R3 and R5:

> R3: *"To set up a robot…you actually have to get into your work process and then you have to… You kind of have to pick it apart and then you have to put it back together, and then everyone gets a lot more insight or better insight into what one actually does then at the level of detail. So that's been a nice thing and actually improved effectiveness."*
>
> R5*: "RPA forces … some people probably disagree on whether it is good or bad.. but it forces you to get the work processes standardised, and that may result in more equal treatment [of cases]."*

It appears that all the respondents have lost some of the previous work tasks. Some participants point out that even when seeing benefits of RPA removing tasks, it has replaced tasks that were liked among workers, removing a part of the actual job description and tasks where workers have invested knowledge and skills. Participant R2 reflected:

> R2: *"The [task] process is actually a task that I liked which I think is a bit sad that you now only get a part of. (…) Yes, I liked the program and to work in it. And now you only do less than half of the work you have done before. Well, just that was a bit divided for me... well… great that we save a lot of time. But since it is one of the tasks that people actually liked to do."*

Modifications in roles also appear through the impact RPA has on the decreased necessity for manual competence. Participants express how tasks which were earlier executed by workers have disappeared, and that if processes are to fail or stop, there is a need to get into the matter and learn how things are done. It occurs that the participants do not think about what the robots do.

> R3: *"When we get a message from the robot that things are going wrong… I have got it sometimes, but what is difficult about having a robot, if things go wrong… I do not think about what the robot does, so then I have to get into the matter and learn how things are done, because we are so used to the robot doing things automatically."*

Additionally, participants noted how some processes would be necessary to have training on if the automated processes were to stop in the future and that new workers would be under-equipped in knowing how to do it. Participant R1 explained:

> R1: "(...) *I see in the future, if all this should go over to RPA, then there are some processes that one must have training on again to be able to do* (...) *There are some tasks and processes today that they [new workers] will not be able to do if the process stops.*"

All in all, the WC workers mostly reflect a relatively positive attitude regarding the RPA concerning the behaviour sphere. RPA provides the workers with the tool to produce higher-quality work while still emancipating time for workers to complete the remaining duties. Although the workers express that the RPA mostly has replaced boring work, the findings reveal that the robots have the ability to overtake even desired tasks. Tasks that were previously performed manually are now controlled by technology, and the worker is no longer participating in the process. However, the technology seems to enhance the feeling of effectiveness in doing a task.

Work Life

The robots are expressed by the participants (n=6) to relieve them from time-consuming and repetitive tasks, which according to workers has increased the absence of pressure. The participants illuminate how the RPA contributed to reduced anxiety in terms of time sensitive tasks, reduced stress levels and overall provides them with the capacity to deliver better services.

> R2*: "(...) There were some promises we had given before that we have felt we have not kept. Like we promise that we will have full control over the [task], but we have not really had that because we have not had the capacity for all those payments…all those clearings. It has been stressful. Yes, so the feeling that we are now delivering a much better product to our clients."*

> R3: *"(...) The robots work with time sensitive things, so that is very relieving. Because we have – when it comes to registration of external payments, everything must be completed by the payment deadline (...). So, it [RPA] reduces a lot of anxiety to finish on time."*

Some participants also reported that they were dependent on an internal RPA team when errors occurred. The workers have no direct interaction with the robot's interface and only get the

output of the different processes, such as in a list or report format. However, as expressed by workers, they get notifications from the robots when errors occur, and they do not have necessary technical competence to understand those errors.

> R2: *"The robot makes reports on what it has done… and then we get, for example, on [task] then we get the message successful or not successful and an explanation. On [task], the explanation [from the robot] is not very easy for everyone to understand. I still have contact with the RPA team about this. Like, okey, what happens, what was this error, and why it happens. So, if that mistake is repeated then they make a bug and correct it then."*

> R4: *"I was contacted by the technical department, and he said: it looks like something is wrong, I get error messages here. But it's technical, so I do not know what those error messages mean, but he sees there is something wrong, and then I must go through the process in collaboration with him, such as what the robot is supposed to do, and then he goes in and sees where the errors are. So, he had everything up on his computer, and showed me… it works, but I'm not technical like that, so I cannot answer anything"*

4.2 TMC in blue-collar work

In the BC cases, the mobile app emerges as a managerial tool that guide controllees without human intervention. The mobile app in FD1 leverages information asymmetries, performance-based compensation and bonuses, internal rivalry for shifts, and both FD1 and FD2 utilise automated messaging systems. FD1 utilises mechanisms to control workers' behaviour by using data-driven performance analytics to feed the automated pay system and sorting used for the shift-booking system. In addition, the data-driven systems establish a hierarchy between the couriers based on various parameters, such as hours worked in a week and performance. This results in an additional incentive for workers with good statistics, which accumulates in the form of flexibility in scheduling. The next subsections will present summaries of the findings regarding each BC case, followed by an elaboration of the main findings.

4.2.1 Workers in Food-delivery 1

The organisation is a food delivery business that operates online. In Norway, this organisation offers meals from a diverse range of vendors. Customers may choose between nearby places, order food, and track their order as it is delivered by a bicycle courier or car through an app. The couriers are either permanent employees or working as independent contractors, and are guided and managed via an app. The findings for this case are summarised in table 10.

Table 10: Summary of findings in Food-Delivery 1

CASE Food-delivery 1 (FD1)	
Context	- Mobile (courier service) app - Manager (Controller) - Freelance couriers and employees (Controllee) - Value creation (demand and supply matching)
Interventions	- Rider app enables automation of specifications, monitoring, evaluation and reward/sanction - Input control (e.g., ranking riders) - Behaviour control (e.g., directions, automated notifications) - Outcome control (e.g., monetary incentives) - Forced control style (e.g., compliant behaviour)
Mechanisms	- Work gamification - Perceived lack of control transparency - Informational asymmetry
Outcomes	- Reduced working morale and high turnover rates - Effective demand and supply matching - Increased courier productivity - Flexible work - Internal competition - Inclusivity (opportunity for atypical working schedule)
Sphere of experience	
Interface	- User friendly - Displays individual statistics - Lose internet connection - Provides wrong information (e.g., location) - No button for declining an order - Constant changes in the system - Regular bugs in the system (e.g., functions do not work)
Tasks	- Undemanding tasks; “pick up and deliver” - Select work rates - Check-in zone when starting shift - Shift length 3-6 hours - Personal score - Go through tedious menu of issues before reaching support - Responsible for own means of transport (petrol, wear and tear on cars or bicycles, tolls etc.) - Just one option of delay time (5 min)
Behaviour	- Freedom to choose when to work - Insights in individual statistics 24/7 (e.g., income, working hours, distance) - Can choose means of transport - Measured on individual statistics (e.g., volume, accept/declined, speed, breaks, punctuality) - Can only plan work two weeks ahead - Automated notifications (also when off duty)
Work Life	- Digital support team - Employees get fixed salary - Commission salary (both employees and independent contractors) - No physical office - GPS tracking - Delay in support response - Isolation and little or no interaction with co-workers and management - Irregular and unpredictable working hours - Reward/sanction mechanism impacting shifts one can choose from - Uncertain of what parameters that are measured - Information asymmetry (e.g., uncertainty when new functions appear in the app) - Low willingness and no obligations to help colleagues with roster - Nudging and automated messages outside working hours - Annoying notification sound

4.2.2 Workers in Food-delivery 2

FD2 is a food delivery organisation comparable to FD1 when it comes to fundamental purpose and task. Customers could order from the platform's vendors through FD2´s app or website and pick it up or have it delivered by the platform's courier partners. Nonetheless, under FD2, the couriers are all independent contractors for the organisation and are classified as independent contractors. The couriers are guided and managed via an app. The findings for this case are summarised in table 11.

Table 11: Summary of findings in Food-Delivery 2

CASE Food-delivery 2 (FD2)	
Context	- Mobile (courier service) app - Manager (Controller) - Freelance riders (Controllee) - Value creation (demand and supply matching)
Interventions	- Rider app enables automation of specifications and monitoring - Input control (e.g., rider activation and deactivation) - Behaviour control (e.g., directions, automated notifications) - Outcome control (e.g., monetary incentives) - Forced control style (e.g., compliant behaviour)
Mechanisms	- Work gamification - Perceived lack of control transparency
Outcomes	- Flexible work - Reduced working morale and high turnover rates - Effective demand and supply matching - Increased rider productivity - Inclusivity (opportunity for atypical working schedule)
Sphere of experience	
Interface	- User friendly - Displays individual statistics
Tasks	- Can log on and off whenever wanted - Can choose means of transport - Can be logged on for several hours, but no guarantee in getting tasks - Only get paid per delivery - Responsible for own means of transport (petrol, wear and tear on cars or bicycles, tolls etc.)
Behaviour	- Freedom to choose when to work - Insights in personal statistics 24/7 (e.g., income, working hours, distance) - Beneficial working hours depends on day-to-day order volume - Commission salary
Work Life	- App perceived as a tool that allows for autonomy - Digital support team - Nudging and automated messages outside working hours - Independent contractors - Irregular and unpredictable working hours - Annoying notification sound - No physical office - GPS tracking - Isolation and little or no interaction with co-workers and management

4.2.3 Findings within blue-collar workers

In total, eight interviews were conducted among the BC workers (n=8). In the following section, the main themes in BC work are provided, see table 12. A main theme is sub structured on repetitious or similar headings (Burnard, 1991), which is further supported by at least six out of eight respondents.

Table 12: Main themes in BC work

Sphere of experience	*Support for autonomy*	*Compromise to autonomy*
Interface	User-friendly	Unknown app features
Tasks	Selectability	No guaranteed work
Behaviour	Self-government	Individual statistics
Work life	Flexible schedule	Nudging

Interface

Looking at the interface sphere, all the participants (n=8) experience navigation, display and the overall functionalities during use as satisfying. The participants highlight how it is almost impossible to make mistakes.

> R7: *"It is planned to be fool proof and that you will not make a mistake."*
>
> R8*: "I think the app is very user friendly."*

However, the perception of the app as user-friendly deviated somewhat when the respondents were asked about the different functionalities in the app. Informational asymmetry emerges in the interface through new functions being added in the app without any further information. Participants, particularly in FD1, point to uncertainty concerning new app features where functionalities are unknown. Particularly, participants highlight buttons being changed and removed from time to time, buttons where they do not know the functions and overall little or no communication from the organisations about different changes in the app.

> R9: *"(...) Before, if food was late, then you could say it is 5 minutes late, 10 minutes late or 15 minutes late. Now if the food is late, you get a menu where you have to say how long it will take and you can only choose 5 minutes."*
>
> R10: "*If there are changes in the app and things like that, they do not send an email and inform. (...) They have a button [in the app] where you are supposed to press when you*

> *get to the restaurant and customer. I was very curious about how fancy it really was, (…) I have asked a customer; hey, did you get any kind of alert before I called you now? And all the customers have said; No, I have not received any kind of notice, it just says that it is less than five minutes until you arrive. This means that the function is completely unnecessary to have."*

The findings reveal that the mobile app interface supports psychological needs by promoting competence (via ease-of-use). However, due to uncertainty about app features and functionalities, it is difficult to find support for autonomy at the interface level.

Task

It is a mobile app created expressly for workforce management that unites the business models of the two BC organisations, but also the working experiences of the FD1 and FD2 workers. When the participants got the opportunity to reflect on how they experience the technology-enabled tasks, common themes were flexibility and how they could select their own work rates.

> R14: "*I would say that the job has a high degree of flexibility. I can make decisions about when in the day I want to work, how much I want to work and what I should wear. And no one is checking on me or doing anything."*

However, despite the perceived benefits of selecting their own work rates, participants expressed that there is no guaranteed work and that they could only obtain reasonable levels of work at times when there was much to do, which were said to be in the evening or weekends. Although FD1 operates with both employees and independent contractors and FD2 only with independent contractors, the workers expressed the same concerns regarding the guarantee of work.

> R11: "*It is also the limitation that in practice you are often… even though you on paper can choose when you want to work… in practice you have to work on those times where it is possible to earn something."*
>
> R13: *"In [FD2] you can risk coming to work and working eight hours without earning anything special."*

Additionally, Participant R13 elaborated on how they are restricted in regard to how the workers choose to perform their tasks.

> R13: "*Your work tasks are quite controlled - you have the app that gives you an order. When an order ticks in you have to accept it and then you are told to go to the restaurant and then to the customer. And you have quite a limited opportunity to override the system yourself and say that this order I will not take. Or if you have two orders that you can choose the sequence of how you will deliver them. And if you are waiting for an order, which you know is delayed, you cannot put it on pause and then take something else - so it is quite controlled through the app then*."

Behaviour

All the participants (n=8) express that the flexibility provided by the app in terms of scheduling your own work is positive in terms of the behaviour it initially is meant to support. Common themes occur among the participants, where self-government through freedom to choose when to work are regularly mentioned benefits.

> R8: *"I determine when I can work."*
>
> R13: *"In [FD2], it is a freedom to be able to work exactly when you want and for how long you want."*

Despite the perceived feeling of self-government, participants in FD1 report that they must work a particular number of hours each week to maintain precedence access for booking shifts in the app. Workers are rewarded or punished based on individual statistics. The statistics appear to impact a ranking system, which affects the shifts you can choose from and in turn how much you will earn. The ranking system has a score between nine and one, where nine is the worst. Participants express a negative attitude towards the system and its disciplinary functions.

> R10: *"The score can make up the salary, what you get per delivery (…) It can make up how many shifts you actually get available when they post shifts each week...In theory, the more active you are and the better job you do, the better you get out of it and the better you will also be able to earn. Are you ranked as one… I've never been on that score before. (...) I'm at eight now… and then I do not have many shifts available"*
>
> R12: *"Yes, in the [FD1] app. This [ranking system] is something I don't like. It takes away a bit of the element of freedom which I sought out in the beginning. There was a time when there was a misunderstanding with a shift that I did not show up for that made me rank as number five instead of two or one or so. Then I did not get to pick the shifts and work the hours I wanted."*

Participants in both apps also explain that they have insight into their own statistics.

> R9: *"Yes, you can see how much you have earned, and you can see the distance you have cycled."*

Besides the number of hours worked, the shift booking system is dependent on other individual statistics. There are deviations among the answers to what parameters they are measured on and how it impacts their ranking. Some participants point to measurements only regarding how many shifts you take, whereas others sum up a list of different parameters that impact their ranking. Highlights from participant R7, R8, R10 and R11:

> R7: *"All parameters are measured. Arrival, departure, speed and everything."*
>
> R8: *"(...) They [FD1] measure our performance based on how many orders you are able to pick, and how many orders you reject. So we have an acceptance rate."*
>
> R10: *"(...) you are measured based on how many shifts you take."*
>
> R11: *"(...) Everything from how quickly you respond in the app when you receive an order and how long it takes before you accept it. They [FD1] want you to respond right away - so that's the response time. How fast you cycle to a certain extent, how long time you use you are with the customer. Because they register when you get close to the delivery address and take the time before you press drop off in the app. There are also several other parameters as well, I think"*

There seems to be significantly more control features in the FD1 case with parameters categorising riders into a sorting system based on data collected on performance and behaviour. In FD2, participants express little or no disciplinary functions related to rewards or punishments. This seems to be related to the fact that they are independent contractors, payed per delivery.

> R11*: "In [FD2] you have access to the number of deliveries per hour and such, but you are not measured, I think. This is because they [FD2] do not need it, because you only get paid per delivery, so in a way it does not matter to them how long you spend per delivery. Their costs are not changed by it."*

An unexpected finding was how none of the participants, except from one, viewed monitoring, particularly GPS tracking, as a restriction. Other participants viewed tracking as a necessity for being able to perform the work and did not express any negative attitude related to monitoring. Participant R8, however, noted how the GPS restricts the freedom of movement:

R8: *"(...) The GPS… it's easy for somebody to know where you are located, and then to know where you're going and all of a sudden, it restricts your freedom of movement."*

Work Life

Flexibility stands out as a desired outcome among all BC workers (n=9) when they reflect on everyday work. The opportunity to choose working hours seems to appeal to a feeling of freedom (FD1 and FD2) and predictability (FD1).

R11: *"You have shifts, which one can choose in different ways. Either one can choose a few weeks in advance – that this week I will work those days and show up for work then. It can give yourself – it gives predictability and freedom as you know somehow what you will earn. Because you know that in the times you are set up, you have a guaranteed minimum wage for example."*

Nevertheless, the flexibility in scheduling work is found to have some limitations as you only get to choose for a limited period of time in the future.

R9: *"... you cannot plan more than two weeks ahead."*

It emerges that FD1 and FD2 leverage gamification strategies as a key mechanism to nudge its riders. Findings reveal that participants stressed the feeling of being "overloaded" by automated notifications, and pointed to notifications, both when working and in their free time. Participants explain the notifications as annoying, random and intrusive.

R7: *"Yes, it's something real rubbish - everyone hates it. (...) If, for example, I'm not at work, and the weather changes, or there is suddenly a lack of couriers, they send out Hey, hey, we have a lot of orders at the moment, if you want to work, we want you. You can get that in your spare time."*

R10: *"It's so annoying, because you can get into situations where a lot of things happen at once – maybe you struggle to find a customer, maybe there are other people talking to you about the situation you end up in (...). And when the app constantly nudges you and sends push alerts – yes you get tired of it quickly then."*

R11: *"I get really annoyed about getting all these messages and alerts constantly. You are sort of drawn into a kind of work situation even if it is in your free time. Even if it's just like looking at the phone and seeing a warning, it's like some kind of mental thing for sure that you will then be shaken out of peace and quiet. So, I think there are quite a few who experience it as quite intrusive, and I myself have experienced it this way sometimes."*

The notification sound was also expressed as "very annoying" among all the respondents in FD1. The disturbing sound is described in strong words, which indicates negative emotions related to the sound or messages. It appears that the strongest irritation is related to notifications in FD1.

> R10: *"It's damn annoying. It's insanely annoying."*
>
> R11: "*It can be quite invasive with such a high alarm, which goes off if you do not turn it off."*
>
> R12: *"It is set to the most annoying beeping sound on your cell phone."*

According to the participants, FD2 seems to be more conscious of appearing gracious and pleasant in the notifications, in relation to FD1.

> R11: "*They [FD1] often have short messages full of typos such as: Come to work, we need people."*
>
> R13: *"Here I have a typical notification where it says Lots of orders in [town] - and smiley with heart eyes, Customers are loving [FD2] this evening, Swipe online and doing some deliveries are both recommended and appreciated with smiley, Support is off course available if you need any help with blue heart.*

The participants highlight that the work is isolated in terms of communication with co-workers and management, where there is little human-to-human interaction. However, isolation and little interaction with co-workers were reported to have various influence among the couriers:

> R9: *"I kind of avoid getting to a physical place then and in a way talking to people sort of haha. It's very simple like that then, so freedom becomes in a way simplicity."*
>
> R14: *"That is the biggest of the disadvantages then, you do so much work and you do it alone. (...) So no, I'm not talking to anyone almost".*

Little interaction among co-workers also seems to impact life in terms of relatedness, where respondents point to the feeling of no obligations towards each other.

> R9: *"Being so at the mercy that I got the right shifts at the right time. And it happens a lot where I get shifts when I cannot really work, and I have to try to get them changed and a lot of stress like that. (...) It is rare that people feel an obligation to help you or take care of you somehow. So, it is actually a deprivation of liberty, to in a way get a shift when you cannot work and then it is hell to get rid of the shift."*

5.0 Discussion

The findings identify several themes on the relationship between TMC and experienced work life autonomy in each case. The following section will discuss the findings in light of literature from theoretical background against the METUX spheres of autonomy.

5.1 White-collar workers

In the WC cases, there is still a management behind the system, and there is little insight into subordinate behaviour in relation to the technology in use. Drawing on the perspectives of Cram and Wiener's (2020) definition of TMC, there is not a change or replacement in the traditional control relationship between the human controllers and controllees' in the WC group. The WC organisations assumingly use technology mainly to relieve workers and for efficiency purposes. Thus, RPA is primarily used to support organisational control processes and not to automate managerial control processes (Liu et al., 2022).

Although the technology is not a replacement for human controls, one could view the technology as an enactment of control through implementing RPA that changes roles and routines (Asatiani et al., 2020). Arguably, the RPA has a dominant influence on the user, which puts the workers in a subordinate position through displacing them to somewhat new roles when working side-by-side with a robot (Arnold & Sutton, 1998, as cited in Sutton et al., 2018). They must relate to their new co-worker, which might change their frame. Thus, the utilisation of RPA among WC workers corresponds to Cram and Wiener's (2020) definition of TMC as "using digital technologies as a means to influence workers", but with different control modes.

The *interface* sphere (Peters et al., 2018) in WC emerges as a tension between *Delegating error concerns* vs. *No access to the interface.* Neither workers in ES nor DC perform tasks directly in the interface of the robotic software. Consistent with previous research, the RPA solutions execute rule-based automated repetitive administrative tasks (Lacity & Willcocks 2016a; Penttinen et al. 2018; Asatiani et al., 2019). Furthermore, in both cases WC workers have been involved in setup prior to implementation of the robot. In both WC cases, the RPA setup could be argued to be *pragmatic prevention of human error* (Asatiani et al., 2019) solutions. Nevertheless, system errors occur in both cases. The fact that the workers do not have access to the interface and little technical knowledge makes them dependent on the IT/support team

when system error occurs. The autonomy of the workers might well be supported as they delegate error concerns, freeing themselves from tasks in the interface. On the other hand, the liberation could result in a competence gap and dependency, which could support Asatiani et al.'s (2020) claim that automation of repetitive tasks could prevent the acquisition and maintenance of skills. The fact that the very purpose of implementing RPA is to perform independent processes and liberate workers stands out as an argument supporting that this task should not be assigned to workers.

However, it is revealed that workers want to comprehend and gain insight into the processes performed by RPA. The absence of access to the interface might release the indirect control mechanism of *loss of attentive control of tasks*. Hence, curtailment of autonomy would emerge through the reliance on automation for task control, as the workers lose conceptual grasp on operations, become overly comfortable, and thus lose attentive control of tasks (Asatiani et al., 2019).

When it comes to *tasks*, it is a matter of *Relieviation of tasks* vs. *Manual treatment.* RPA has replaced tasks that were liked among workers, removing a part of the actual job description and tasks where workers have invested knowledge and skills (Pachidi et al., 2020). Although this did not seem to impact the overall attitude towards the RPA, one could draw on Madakam et al.'s (2019) argument and argue how this is not beneficial automation. The findings also reveal that more time was not necessarily spent on new tasks. Rather, it occurs that increased worker capacity and time was spent on the same tasks, as well as manual treatment and quality control of automated results. Although this can be due to the RPA still being in its early stages, the reasoning behind the management decision of implementing robots and the organisations inability to utilise the free resources are questionable. Thus, the WC organisations fail in treating the WC worker as an asset (Drucker, 1999). Consequently, one could imply that they are not doing the benefits of putting them into work and securing that the workers retain the control of the tasks to maintain their level of skills (Asatiani et al., 2019).

Common themes expressed among all the participants were how RPA had relieved them from demotivating tasks in addition to providing more time for other tasks. Based on conversations with the participants, the tasks that are automated seems to be typical mindlessness tasks (Asatiani et al., 2020), such as pasting, extracting, merging and moving data (Aguirre & Rodriques, 2017; Cooper et al. 2019; Benbya et al. 2021; Eulerich et al., 2021). WC participants

expressed positive outcomes related to more efficient work processes with fewer routine tasks and pointed to more time for new and more important tasks. An interesting finding in these cases is the discrepancy between the robot's function of removing menial, demotivating tasks with the intention of providing workers with more time for other tasks, to the workers basically not doing any new tasks.

Emphasising, the tension related to the *behaviour* sphere (Peters et al., 2018) in WC, *Increased quality and efficiency* vs. *Role modifications*, illuminate related concerns in terms of relieved tasks. Increased quality and efficiency were reported as highly beneficial outcome of the RPA. In line with Ranerup and Henriksen (2019), WC workers expressed how tasks in general were processed more quickly due to the automation of processes. While findings support the positive expectations of RPA in previous literature such as professionalism and efficiency, the potential reduction in the number of human errors, liberation of monotonous tasks, improved service quality and low operational costs and scalability (e.g., Lacity & Willcocks, 2016a; Aguirre & Rodriguez, 2017; Hallikainen et al., 2018; Ranerup & Henriksen, 2019; Radke et al., 2020; Asatiani et al., 2019; Asatiani et al., 2020; Beerbaum, 2021), there seems to be little research available to sustenance the assumption that WC workers will be freed from tedious tasks to work on more engaging ones.

According to Peters et al. (2018), most technologies are intended to enable or augment some overarching behaviour, thus helping workers to succeed at something else. As mentioned in relation to the *task* sphere, the findings reveal that RPA provides WC workers with more time to execute the same tasks, rather than new ones. Hence, it is questionable why the DC organisation did not hire new workers, when there were layoffs in the team. Although the RPA is expressed as relieving workers and automate repetitive, administrative tasks (Lacity & Willcocks 2016a; Penttinen et al. 2018; Asatiani et al., 2019), one could assume that the organisations instead of providing them with more interesting tasks, may need less WC workers and will either lay them off or not rehire new ones.

According to Asatiani et al. (2019), neither organisations nor employees might be completely aware of the potential risks associated with automation. As for now, the WC workers seems happy to be relieved by the robots, despite the modifications in roles. However, while the organisation assumingly deploys automation in support of the workers, there is a long-term aspect where practitioners potentially could take workers entirely out of the loop. Automation,

as expressed by Asatiani et al. (2019), may result in a loss of control. Control of the automated task could eventually diminish when the creation and maintenance of one's knowledge is delegated exclusively to automation and its supplier (Asatiani et al., 2019). This in turn could remove important factors defining a knowledge worker as explained by Drucker (1999), such as the responsibility for their own productivity and the continuously innovating and learning aspect. If automation is to remove these requirements, the nature of the WC work suddenly does not differentiate much from manual worker productivity, as stated by Drucker (1999). This could also remove parts of what is earlier said to be autonomy in the workplace, as stated by Hackman and Oldman (1976), such as independence and determining the procedures to be used in carrying it out.

Although the RPA is assumingly supposed to support the workers, a long-term aspect is that the technology could risk compromising WC workers' experience of autonomy with regards to the behaviour it initially was meant to support. In addition, if automation leads to workers deskilling over time, the WC organisations can risk losing collective intellectual capital, which is stated by Asatiani et al. (2019) as a critical asset for many organisations.

Similar to Sutton et al.'s (2018) claim regarding how new workers working with AI may find it difficult to race against the system, a WC respondent notes how new workers in the DC organisation will be under-equipped related to knowledge in certain processes and tasks. Suddenly, you risk that the creation and maintenance of WC workers' knowledge is delegated exclusively to automation (Asatiani et al., 2019) and new workers are under-equipped with knowing how to work with certain processes. This in turn could lead to losing the substantial freedom in determining the procedures used in carrying it out, which Hackman and Oldman (1976) define as autonomy in the workplace.

The *work life* sphere (Peters et al., 2018) unfolds through *Decreased pressure vs. Dependent on RPA team.* Looking back at Hackman and Oldman (1976), the RPA provides some type of freedom in the way it has removed monotonous tasks. The experience of relieved work in the task sphere and the increased quality and efficiency in the behaviour sphere, seem to have positive impact regarding autonomy in the work life sphere, where the RPA contributes to absence of pressure (Deci & Ryan, 1987). Nonetheless, as mentioned in connection with the lack of access to the interface, the liberation could result in a competence gap (Asatiani et al., 2020) as the WC workers become dependent on an RPA team. Following, this dependency

could lead to e.g., stress or related unwanted feelings, which again could threaten autonomy and competence (Peters et al., 2018). The RPA team's position in terms of error competence and system maintenance demonstrates how control of certain processes is dependent on a third party.

5.2 Blue-collar workers

In the BC cases, a mobile app is utilised to collect data on and guide couriers' behaviour. This approach is consistent with Cram and Wiener's (2020) definition of TMC, in which FD1 and FD2 manage the workforce exercised by mobile apps. FD2 uses a model of workforce management, similar to Uber, which relies on self-employed contractors (Ivanova et al., 2018). Managers act as controllers and couriers as controllees in both cases, with the exception that FD1 riders are both employees (hierarchical relationship) and independent contractors, whereas FD2 riders are exclusively independent contractors. Common for the BC cases is an irregular manager-subordinate relationship as workers have the autonomy to choose when and how long to work (Cram & Wiener, 2020; Ivanova et al., 2018). Few, if any, interactions occur between managers and couriers.

When it comes to the *interface* sphere (Peters et al., 2018) in BC, it is a matter of *User-friendly* vs. *unknown features.* Findings indicate that the BC workers in general are satisfied with the interface of the app. The workers declare the app to enhance efficiency as it displays all information needed for a delivery (i.a. pick up point, time, route, address), which emphasise the efficiency possibilities TMC provides in gig work (Brabham, 2013; Kittur et al., 2013). The app is user-friendly and fool proof, according to the respondents. At the same time, the workers explain how the support feature is inefficient as you must choose and scroll through numerous options in order to report a problem. Moreover, this might illustrate a main issue when control functions such as management are replaced by a feature in the app, as automated messaging systems (Lee et al., 2015; Möhlmann & Zalmanson, 2017; Ivanova et al., 2018) to a small extent have the ability to utilise judgement. Furthermore, the respondents notify how new features are added in the app without any further information, which indicates informational asymmetry in the app (FD1). This hinders the courier in making informed choices when utilising the app (Rosenblat & Stark, 2016; Ivanova et al., 2018). On the other hand, BC workers seem to keep track of statistics such as income and length, as it is displayed in the app. Thus, they become empowered and informed in contrast to Uber riders in the study of Rosenblat and Stark (2016).

However, findings show that workers are unaware of which parameters are being measured, implying that the app may not provide a complete picture overall.

The app provides i.a. automated notifications in correlation with Ivanova et al (2018) four different ways of controlling autonomy. The findings paint a picture of these notifications to be disturbing and, to a lesser extent, simple to remove from the display. Both FD1 and FD2 utilise automated messaging systems to affect the choices that are, in theory, delegated to autonomous couriers (Cram & Wiener, 2020). The messaging system that functions as an automated mechanism seemingly attempts to influence couriers' behaviour through nudging and reminders.

The *task* sphere (Peters et al., 2018) emerges as a tension between *Selectability vs. No guaranteed work.* Freedom to select your work rates was expressed as a benefit among the BC workers, which comply with earlier definition of work life autonomy, such as how the workplace allows the feeling of substantial freedom and flexibility in scheduling the work (Hackman & Oldman, 1976). However, there is a system controlling the process (Alsos et al., 2017), and the BC workers express how they can only obtain reasonable levels of work in the evening or weekends, which casts a shadow over the actuality of control and autonomy. Thus, this implies that autonomy can only be achieved if the workers' demands match those of the customers. This in turn indicates that the market and the consumers can be viewed as an additional part of the control-relationship (Rosenblat & Stark, 2016).

In addition, the FD2 workers and some of the FD1 workers are independent contractors, so to have an income they are dependent on orders. The flexibility aspect somehow disappears when one considers that there is no guarantee in getting the shifts you want, and thus, no guarantee in income.

Self-government vs. *Individual statistics* becomes the tension of the *behaviour* sphere (Peters et al., 2018) in BC. In line with prior research, BC workers who comply with algorithmic assignments are rewarded with i.a. greater flexibility (Rosenblat & Stark, 2016; Ivanova et al., 2018; Fleming, 2017; Wood et al., 2018). The BC workers could, in theory, choose when they want to work by choosing from shifts (FD1) or logging on and off (FD2) as desired in the app. As an outcome, the app put BC workers in control of their own working day rather than making them weak and vulnerable, as Gerber and Krzywdzinski (2019) claim. Nonetheless, the findings

show that there are certain times and days when demand is high and opportunities to make money are plentiful. As a result, the reality of flexibility to choose could be argued otherwise. Our findings support the notion that certain platform dispositions, such as payment per delivery and shift picking systems, lead to an active worker mobilisation (Galière, 2020). It is debatable whether it is the workers who are flexible or whether the organisation benefits most from an indirect flexible disposition. Additionally, a participant elaborated on how they are restricted in regard to how they choose to perform their tasks, such as saying no or choosing sequence of deliveries, which obscure the reality of being autonomous in terms of control in the procedures used in carrying tasks out (Hackman & Oldman, 1976).

In FD1, workers expressed limitations to autonomy related to the requirement to maintain individual statistics. Similar to riders in Ivanova et al.'s study (2018), respondents reported that they must work a particular number of hours each week to maintain precedence access for booking shifts in the app, which in turn rewards them with additional work and higher pay (Rosenblat & Stark, 2016; Ivanova et al., 2018). According to FD1 respondents, the ranking system is also impacted by other parameters. However, findings in this study related to FD1 operations correlates with Rosenblat and Stark's (2016) case study, and it appears that the lines of communication between the platform and its riders are based on an informational asymmetry. In FD1, participants report that they are measured on several parameters, but findings reveal that there is a lack of understanding on how the different measurements impacts their work in terms of the shift booking system.

In FD1 and FD2, technology is used as a management tool to provide insights into employee behaviour. As with Uber (Rosenblat & Stark, 2016; Cram & Wiener, 2020), FD1 and FD2 also use a mobile app to monitor, guide and evaluate behaviour without any significant human involvement. However, there seem to be significantly more control features in the FD1 case with parameters categorising riders into a sorting system based on data collected on performance and behaviour and with automated reward/sanction mechanism in the app (Ivanova et al., 2018). The data-driven systems establish a hierarchy between the couriers based on various parameters, such as hours worked in a week and performance. This results in an additional incentive for workers with good statistics, which accumulates in the form of flexibility in work-shifts and scheduling. Thus, autonomy in scheduling work is not entirely transferred to the worker, but rather is a disciplinary incentive and a way of controlling and guiding the workforce. With this in mind, the automated middle management in the form of

coordinating algorithms may eventually wind up leading the workers down "the road to serfdom," as Hayek (1944) put it.

The *work life* sphere (Peters et al., 2018) unfolds through *Flexible schedule* vs. *Nudging*. Valenduc and Vendramin (2016) argue that the mobile apps offer opportunities to people that do not want to or are precluded from working regular hours and thereby inclusivity. Several of the respondents report that they decided to work for FD1 and FD2 due to lack of opportunities elsewhere or lack of jobs caused by Covid-19. The characteristics of shift booking systems and payment per delivery is also something that is highlighted as appealing among the workers, which Galiére (2020) notes as dispositions generating an active mobilisation of workers in Deliveroo. Even though there are features in the apps that compromise the flexibility to choose when to work, such as which ranking you are in (FD1) or which shifts that are available to pick from (FD1, FD2), respondents note that the flexibility provided by the app in terms of scheduling your own work is positive related to overall life and the feeling of experiencing oneself autonomous.

Nevertheless, the schedule flexibility is discovered to have some limitations because you only get to choose for a limited period of time in the future. Hence, the aforementioned feeling of freedom might be neutralised or even absent. Another aspect is the leverage of gamification strategies, utilised by the organisations, that are found to interfere with spear time. The constant nudging could be seen as a mechanism that causes stress as several of the respondents report these notifications as invasive due to the message sound and frequency. Thus, the nudging could be perceived as an influencing factor to i.a. isolation, increased workload, sleep deprivation, and tiredness among gig workers, emphasising with the studies of Fleming (2017) and Wood et al. (2018). A scenario in which a worker has received little or no deliveries during the previous shifts at work can make a worker more susceptible to nudging and thus work more than a normal working week. More work will result in increased isolation and possibly a cancellation of original plans. It is also easy to imagine being on "watch" for nudging if you are in a period of low income, that could lead to e.g. little or poor sleep.

Some earlier research focuses on BC workers as subjects to isolation and technological control (e.g., Gerber & Krzywdzinski, 2019). Although BC workers in this study highlight that the work is in fact isolated in terms of communication with co-workers and management, many of the BC workers in FD1 and FD2 had a positive attitude regarding little human-to-human

interaction. At the same time, an unanticipated finding reveals that the BC workers to a minor extent feel committed to help colleagues with shifts. This lack of belonging has a negative impact on autonomy in terms of relatedness (Peters et al., 2018).

6.0 Implications and limitations

6.1 Implications for research

As the literature on TMC is still in its infancy, more research in the field of TMC is required. This dissertation provides new insight and perspectives to the emerging field of TMC, and the conducted case study contributes to the field by demonstrating how TMC are utilised in WC- and BC work. This novel perspective contributes to academic literature by demonstrating how TMC works in both directions at the same time, enhancing both autonomy and control.

The empirical findings support previous views on the disciplinary functions that prevails in the mobile apps in BC work and how the technology could support managerial control (Lee et al., 2015; Rosenblat & Stark, 2016; Möhlmann & Zalmanson, 2017; Ivanova et al., 2018; van Doorn, 2017; Cram & Wiener, 2020). However, through an examination of real-world cases within BC work, findings deviated from earlier statements about gig-workers having the autonomy to choose when and how long to work. The findings add a perspective to current research and discover how autonomy in scheduling work is not entirely transferred to the worker, but rather is a disciplinary incentive and a way of controlling and guiding the workforce. Existing research has begun to investigate the implications of gig work, and this study contribute to the field by answering questions on how gig-workers in the food-delivery industry experience their autonomy in terms of TMC. Research should further address TMC implications for the experience of diverse types of gig-workers.

Consistent with prior research, the findings among the WC cases support earlier assumptions in WC work, where RPA is stated to increase efficiency and productivity, reduce errors and free workers from monotonous tasks (e.g., Lacity & Willcocks, 2016a; Aguirre & Rodriguez, 2017; Hallikainen et al., 2018; Ranerup & Henriksen, 2019; Radke et al., 2020; Asatiani et al., 2019; Asatiani et al., 2020). However, the study reveals empirical findings that receive marginal support in existing literature, where workers are executing the same tasks as previously and not new, more engaging ones. Thus, the researchers should explore whether and to what extent freed up resources and time result in new competence and development of knowledge.

6.2 Implications for practice

There are several practical implications that could be drawn from this study in terms of how TMC impacts WC- and BC workers experience of autonomy. Overall, all workers express that they experience autonomy in their work. However, the findings indicate several contradictory realities relevant to present practice.

The WC workers in this study express satisfaction and heavily relied on robots when performing their tasks. However, considering that the WC work requires continuously innovating and learning (Drucker, 1999), one could assume that if the opportunity to practice basic tasks is removed by automation, the ability to learn and make effective decisions may decline. This could impact the ability for the workers to perform more complex tasks in the future. As a result, the experience of having autonomy and determining the procedures to be used in carrying out tasks could shrink, and invisible control mechanisms become more apparent. The WC organisations examined in this study could investigate this further and look for solutions to avoid stagnant development of skills and knowledge. Additionally, it could be useful for the organisations to investigate how to utilise the WC workers' diverse and creative thinking skills instead of risking them being made redundant.

The WC workers express overall satisfactions with the robots, findings reveal several interesting tensions between their actual experience of autonomy and how the technology has altered the reality in their work conditions, such as increased quality and efficiency versus role modifications. It could be interesting for the WC organisations to investigate the workers' role modifications in regard to automation and further improve the ramifications related to the impact of automation on job characteristics.

Information asymmetries seem to be widespread in the food-delivery environment (Boltanski & Chiapello, 1999/2007; Deleuze, 1990, as cited in Rosenblat & Stark, 2016). BC workers find themselves to a small extent familiar with new functions in the apps, and experience absent information about the app's measurements and ranking. This subordinate position empowers the app with enhanced control. The BC organisations should consider the consequences of this imbalance and strive for control transparency, as this could increase working morale and overall well-being (e.g. increased autonomy).

6.3 Limitations

A limitation of qualitative work is that it is not easily suitable for statistical analyses or industry-wide generalisations. However, TMC is still in its infancy and research in this field is still very exploratory (Cram & Wiener, 2020). As a result, qualitative work is needed to identify future areas for quantitative research. Furthermore, gig workers are an unlimited population, which makes statistical analysis challenging. A sub finding reveals how couriers in e.g. FD2 are defined as active even if they have not taken an order for several months.

The size and width of the samples also limit the generalisability of the findings. Despite a diverse selection of workers and their organisations, it only concentrates on a few industries; food-delivery, debt collection and education. To statistically assess the findings, larger-scale empirical investigations are necessary.

The perspectives of managers are absent in all cases. It is possible that the workers could exaggerate or embellish aspects of the system in some instances (Möhlmann & Zalmanson, 2017). Insights from management could have provided a more nuanced comprehension. However, the scope of this study was the worker's experience, and the results of this dissertation provide insight into the current situation and the workers' experiences.

Although an interview is a good technique for gathering detailed information about experiences, the research instrument used in this study has some limitations. As the interviews are carried out in the mother tongue (Norwegian), some nuances may disappear in a translated transcription. Everything said during an interview will not always be accurate or true. When it comes to perceived sensitive topics like workplace control mechanisms and autonomy, there is a risk that employees will embellish the truth.

To the authors knowledge, a framework for hinders and drivers of wellbeing (e.g., experienced workplace autonomy) in relation to TMC do not exist. It was seen as beneficial to borrow transferable parts of the METUX model from HCI (Peters et al., 2018) to provide the study with richer discussions on how TMC impacts WC- and BC workers' experiences of workplace autonomy. Although the METUX approach seems to perform well in interpreting elected cases, it would not necessarily work similarly in other TMC cases. Furthermore, this study did not

include all the spheres. A study containing a broader perspective may receive a different outcome.

Workers' experiences, particularly in BC cases, could be influenced by the local politics of specific aspects of their work (e.g., FD1 were pioneers of employing gig workers), implying that the findings of this study will not necessarily be generalisable to BC labour in e.g. other countries.

6.4 Future research avenues

The typical interaction between controllers and controllees' gets more complex with TMC according to Cram and Wiener (2020), as new participants such as technology architects and data scientists are included. Organisations such as DC and ES, have become increasingly reliant on a new (RPA) team that holds knowledge and information while keeping up with new processes that one could assume that neither controllers nor controllees are familiar with. This shifts some of the responsibility to those who develop and maintain technology (and related data), reducing the traditional controller/leader role. The role of leaders in TMC environments is an intriguing avenue of investigation for future research. If managers do not understand or have no say in the underlying TMC configuration, control is somehow transferred to data scientists and/or technology engineers. Future research should consider these new control actors, both controllers who control the user via TMC and controllees who report to traditional managers. There is also a need to understand how the controller role differs in TMC environments where technology is still primarily used for support (DC, ES) versus environments where technology is used to automate managerial control activities (FD1, FD2). Thus, future research should investigate how TMC changes the controller's role.

Controllees' appear to perceive TMC techniques based on physiological and emotional data (FD1 and FD2) as intrusive and invasive of their privacy, which might lead to resistance behaviour (Cram & Wiener, 2020). In addition, the findings illustrate that the BC cases use gamification tactics to "pull" their couriers. Couriers who feel deceived and overloaded as a result of the "flood" of messages and alerts that FD1 and FD2 give their couriers via their channels on a daily basis is potential downsides of utilising such gamification tactics. The findings in the conducted research suggest that nudging could be seen as a compromise to

autonomy. Future research could further investigate which consequences gamification tactics, enabled by TMC, might have on workers' well-being and/or performance.

Although literature on WC work presume that RPA will not result in layoffs (e.g., Lacity & Willcocks, 2015; Aguirre & Rodriguez, 2017), it is reasonable to assume that WC workers' advantages gained by e.g., new work assignments are accompanied with contrasting drawbacks, such as potential layoffs. Based on the findings in this study one could argue that WC workers may become obsolete, as the RPA has already taken over many of the previous tasks. This study gives reason to argue that although organisations as of today use RPA to relieve WC workers from boring, repetitive tasks, it appears to be limited knowledge about how RPA affects workers in their tasks, and whether and to what end automation may support or take over workers' jobs. Research should further investigate patterns of human-robot interaction and RPA's future impact on workers and their perception of automation technologies. Additionally, it would be interesting to further investigate a longitude perspective on the innovating and learning aspect when WC workers are freed from tasks when working with RPA and investigate how organisations can secure its intellectual capital.

7.0 Conclusion

The objective of this study is to contribute to the field of TMC by answering how TMC impacts WC and BC workers' experience of workplace autonomy.

TMC is found to simultaneously increase control and autonomy for both WC and BC workers. Regardless of context factors, control mechanisms and technology influence, the workers are of the perception that the technologies augment perceived autonomy. However, automation technologies are challenging the balance between autonomy and control. While RPA provide WC workers with more autonomy by relieving them of certain tasks, they find themself divided between their traditional functions and their new status as subjects of automation technologies, leaving WC workers in a somewhat vague structural position. Equivalent, findings in BC discover that autonomy in scheduling work is not entirely transferred to the worker, but is rather a disciplinary incentive and a way of controlling and guiding the workforce.

TMC acts as a mechanism in the previously identified paradox of control and autonomy (e.g., Miller & Friesen, 1982; Kanter, 1983, as cited in Feldman, 1989), where it both enhances autonomy and enhances control. If the opportunity to practise basic tasks is removed by automation in WC work, the ability to innovate and learn may decline. If autonomy in task scheduling is only possible if the BC worker submits to control mechanisms, then flexibility does not exist in practice. Thus, technologies of automation could be utilised to deprive workers of their agency and individuality.

Through the sophisticated use of automating technologies, organisations today have considerably greater control over their workers. As Hayek (1944) predicted in The Road to Serfdom, the scope of these technologies will presumably grow and organisations expand their use, ultimately resulting in the amassment of centralised control into tech and the potential abandonment of individualism and classical liberalism. One could argue that advancements in automation technologies are pushing workers down the road to serfdom, paved with the best intentions.

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Appendix 1: Consent form NSD

Information letter to participants

Want to participate in the research project

"The impact of technology-mediated control on worker autonomy"

This is a question to you about participating in the research project aiming to gather data for our master thesis surrounding the field of technology-mediated control and how it impacts worker autonomy. In this letter we will provide information about the aim of the project and what participating will involve for you.

Purpose
The study aims at establishing a foundation for the discussion of the parallels between white-collar and blue-collar workers' experience of technology in the workplace by studying workers' experience of TMC across higher and lower-level jobs. The purpose of this study is to understand how different dimensions of TMC impact workers' experience of autonomy. The research question is therefore formulated:

How does Technology-mediated control impact blue- and white-collar workers' experience of workplace autonomy?

This research project comes from the study program of the MSc in Information Systems: Digital Business Systems at Kristiania University College. The gathered information will be used in order to answer and discuss the presented research question.

Who are responsible for the research project?
[redacted] at Kristiania University College is responsible for the project.

Why are you asked to participate?
You are asked to participate caused by your interaction with technology in your daily work. About 14-16 individuals will be invited for the research project as interviewees with the purpose of creating a clearer image of the findings for the project.

What does participating involve?
By participating, the data will be gathered from you through a semi-structured interview where information about your work and your thoughts around technology-mediated control and autonomy will be in focus. The interview will take about 30-45 minutes, and the data is collected through an audio recording and handwritten notes.

The interview will thereafter be transcripted and sent to you for you to go through your answers and eventually provide feedback if wanted. All information in which can be tied to a specific person will be anonymized.

Participation is voluntary

It is voluntary to participate in the research project. If you choose to participate, you are free to withdraw your consent at any time without any reason. All your personal information will then be deleted. It will not have any negative consequences for you if you choose to withdraw. You can withdraw by either contacting [redacted] or [redacted].

Your privacy – who we store and use your information

You information will only be used for the purpose of answering the research question. There will only be us ([redacted] and [redacted]) and project responsible/supervisor [redacted], that can access the recordings and transcriptions of the interviews. The information will be anonymized in the research project. We treat the information confidential and in compliance with privacy regulations.

- The student and supervisor can access the information. As a participant, you will also get access to the recording.
- Your name and contact information will be replaced with a code in which is stored in a list separated from other data.
- The information will be stored on Kristiania University College's server for research.
- The information will not be used or moved outside of EU-borders and will be treated in compliance with GDPR-regulations.
- Participants will not be recognized in the final report.

What happens with your information when at the end of the research project?

Your information will be anonymized when the project is finished and approved, in which is planned to be 25.05.2022.

Your rights

As long as you can get identified in the data material, you can:

- access information gathered about you, and get a copy of the information,
- correct and edit information about you,
- delete information about you,
- complain to the national Data Inspectorate about treatment of your information

What gives us the right to treat your personal information?

We treat your information based on your consent.

On behalf of Kristiania University College, NSD - Norsk senter for forskningsdata AS has evaluated that the treatment of your personal information is in compliance with the privacy regulations.

Where can I find more information?

If you have questions regarding the project, or want to use your rights, contact:

- Kristiania University College by [redacted] (supervisor/project responsible) at [redacted], [redacted] (student) at [redacted] or [redacted] (student) at [redacted]
- Our privacy representative at personvernombud@kristiania.no

If you have questions to NSD regarding the evaluation of the project, contact:
NSD – norsk senter for forskningsdata AS at personverntjenester@nsd.no or on phone +47 55 58 21 17

Best regards,

_____ _____
(Forsker/Veileder) (Student)

Letter of consent

Letter of consent for the project "The impact of technology-mediated control on worker autonomy"

Researcher: [redacted] and [redacted] **Supervisor**: [redacted]

I have received and understood the information letter "Information letter to participants" sent from [redacted] and [redacted]. I consent:

- ☐ To participate in the interviews in context to the master thesis
- ☐ Audio recording of the interview
- ☐ Transcription of the interviews
- ☐ Researchers has access to transcriptions until the end of the project
- ☐ Citation in anonymized form used in the final report

I consent to that my information is treated until the end of the project

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(Signed by project participant, date)

Appendix 2: Interview guide

Interview guide:

Introduction:

- The purpose of the interview.
- How the data is processed. Clarify permission to record the interview.
- Brief review of what the interview will be about.
- Inform the interviewer how long the interview is expected to last.

Background:

To get a context:

- Tell us briefly about your educational background and/or previous work experience?
- Tell us briefly about your job: What tasks do you have and how do you work?
- Tell us briefly about how your workplace and your work tasks are organised?
  (*Keywords: structure and framework, projects, assignments, organisation*)
- What is the [technology] used for at work? Which processes are automated?

Autonomy:

(We use the term freedom instead of autonomy. This is done with the assumption that the word autonomy is foreign to some.)

- What do you associate with having freedom at work?
- How does the [technology] affect your experience of freedom at work?
- How does the [technology] affect how you proceed to carry out the work?
- In what situations do you experience having great freedom at work?
- When do you experience a lack of freedom at work?
- Tell us about how you experience your ability to influence and control your work?
  - *How does the [technology] affect this experience?*
- Tell us briefly about perceived freedom to choose how you want to perform your work tasks?
  - How does the [*technology*] affect this experience?
- How is your work measured?

Competence:

- [*If you worked in the corporation before RPA were implemented in the work processes:*]
  How do you experience your work tasks before and after the utilisation of RPA?
  - *Have work tasks been changed / influenced by implemented technology?*
- Could you explain what role / function the [*technology*] has for your work tasks?
- What challenges do you face in using the [*technology*] in your work?
- What would you describe as opportunities the [*technology*] has added to your work?
- How do you experience the [*technology*] software user interface?
- How do you experience that you get to use your total competence inventory at work? (The competence portfolio consists of formal education and previous experience)
- Do you have skills that you are not given the opportunity to use at work?
  - *What kind of competence is this?*
  - *How do you feel about not being able to use this competence at work?*

Relatedness:

- How does the communication with your immediate manager take place?
  - *Which channels are used?*
- How do you get feedback on the work you are doing - and from whom?
  - *How do you use the feedback?*
- How do you feel that the [*technology*] affects the contact you have with colleagues, customers and managers?
- Could you give us an example of the influence the [*technology*] has on your work life?
  - *What advantages and disadvantages do you see in this impact?*
- Who do you contact during the day, and how do you contact them?
  - *What is this contact controlled by?*

End:

- Do you have something you want to add?
- Could we contact you again if necessary?

Thank you so much for your time!