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A New Era of Control: Understanding Algorithmic Control in the Gig Economy

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Completed Research Paper

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Abstract

With the promise of autonomy, flexibility, and "being your own boss" the gig economy is growing to be one of the most important economic and social developments of our time. This growth is possible due to the platform's reliance on algorithmic control, which comprises the use of algorithmic technologies to control and align workers' behavior. Conducting a multiple-case study on the use of algorithmic control in two app-work platforms (Uber & Mjam) and two crowdwork platforms (Upwork & Freelancer) on the basis of established control concepts, we develop a holistic understanding of algorithmic control and show how platforms realize this new form of control along three dimensions: control allocation, control formalization, and control adaptiveness. We contribute also by introducing the concepts of control artifacts and internalized control as a step forward in explaining algorithmic control phenomena.

Keywords: algorithmic control, algorithmic management, gig economy, organizational control, algorithmic control framework

Introduction

By 2023 the gig economy is estimated to grow to a $455 billion industry with 11% of employees in the EU participating and 1 in 3 working Americans relying on freelancing in some form (Wong 2022). Coupled with the promise of autonomy, flexibility and the opportunity of "being your own boss", it is one of the most important economic and social developments of our time as by 2025 one-third of all labor transactions will be conducted through digital platforms (Standing 2021). What unites all platforms operating in the gig economy is their heavy reliance on algorithmic control (AC), which comprises the managerial use of algorithmic technologies, including large-scale collection and use of data to control and align worker behaviors with organizational objectives, previously performed by human managers (Cram and Wiener 2020; Kellogg et al. 2020; Möhlmann et al. 2021).

AC is considered the most controversial aspect of algorithmic management (AM). On the one hand, it promises benefits for employers in terms of economic value, based on improved efficiency in decision making, coordination processes, and organizational learning (Kellogg et al. 2020). On the other hand, even though gig workers do not perceive AC as a universally "bad thing" (Wiener et al. 2021), the possibility to continuously track and evaluate worker behavior and sanction it, if necessary automatically and in real time

(Pregenzer et al. 2020) may be perceived as too intrusive, resulting in various resistance behaviors (Möhlmann and Zalmanson 2017). Recent studies find evidence for opposing AC and the "iron cage" built by algorithms (Faraj et al. 2018), showing that gig workers can build workplace solidarity through collective action (Tassinari and Maccarrone 2020), can create "invisibility practices" (Anteby and Chan 2018), or might even engage in "algoactivism" (Kellogg et al. 2020) as these forms of control hinge on worker´s willingness to conform to the calculative rationalities that companies project onto them (Shapiro 2018).

Altogether, AC differs fundamentally from previous forms of control, as AC opens up the possibility to completely remove the human manager from the control process and therefore alters the controller-controlee relation fundamentally (Baptista et al. 2020). Given the rapid growth of the gig economy and the speed of technological advancement, many scholars argue that control research has not kept pace with the development and transformative impact of algorithmic technologies on organizational control (OC) (Cardinal et al. 2017; Kellogg et al. 2020). Therefore, the processes through which platforms control workforce and whether or how these control systems differ from one another or from previous systems is still relatively unknown (Griesbach et al. 2019). Even though previous studies have begun to bridge the gap between the state OC and the state of AC, they still lack a fine-grained discussion of control functionality and its complex implications, as described above. Therefore we want to shed light on AC systems in terms of how they exercise different forms of control simultaneously in real time, how they reward and sanction worker behavior, and how they interact and blend, creating an opaque control system (Pregenzer et al. 2020; Pregenzer et al. 2021a). This leads to our central research question: *How would concepts from organizational control help to better understand algorithmic control, and which conceptual adaptions may be necessary?*

Addressing this question is important as understanding the functionality of AC and the altered controller-controlee relation is needed to react to its effects on worker well-being, socio economic structures and the overall impact on our perception of work in the future. Furthermore, these findings help regulatory instances to derive measures to fix loop holes which are currently exploited (Shapiro 2018). We address this question by conducting a multiple-case study which analyzes AC in two app-work platforms (Uber & Mjam), and two crowdwork platforms (Upwork & Freelancer) according to a well-established control framework (Wiener et. al 2016, Wiener et al. 2019). With the ethnographic and netnographic study we answer the call for research to better understand the multi-stakeholder and socio-technical nature of AC implementation (Pignot 2021; Vallas and Schor 2020). Further, we contribute to the conceptualization of AC by introducing the concepts of control artifacts and internalized control, and by providing a structured discussion of its functionality resulting in an AC specific control framework. The paper is structured as follows: first we theorize AC in the gig economy, then we draw on selected OC concepts and establish a theoretical framework as the basis of our subsequent analysis. We then describe our study approach and present our findings in regards to the selected control concepts. On this basis we create a holistic understanding of AC leading to our AC framework.

Theoretical Background

Algorithmic Control in the Gig Economy

The term gig economy refers to the type of small task jobs (the "gigs") performed by workers contracted by organizations that use platforms as their operating model (Tassinari and Maccarrone 2020). The gig economy can be defined based on three criteria: (1) the use of digital platforms, mechanisms and processes (2) enable the de/re-construction of work into smaller, distributable tasks, which in turn (3) enables more flexible, short-term, and heterogeneous working arrangements (Tan et al. 2021, p. 3). Characteristic of platforms in the gig economy is the hierarchical triadic relationship between platform, customer and the workforce in which the platform empowered itself into the role of an active controller of the marketplace (Bucher et al. 2021; Duggan et al. 2020; Wiener et al. 2021). Gig work can be further divided into three key variants: capital platform work, crowdwork, and app-work (Duggan et al. 2020). In this study we focus on crowdwork, i.e., work-mediating digital platforms, such as Upwork and Freelancer, through which workers remotely complete tasks that can range from software coding, to survey completion, to web design and app-work, in our case Mjam and Uber, which summarizes service-providing platforms that utilize workers to perform tasks locally (e.g., transport and food-delivery) (De Stefano 2015).

One key to the empowerment of the platform is the technological development enabling the implementation of AM systems, i.e., systems for oversight, governance and control practices based on self-learning algorithms (Lee et al. 2015). AC can be seen as a component of AM and describes the managerial use of intelligent algorithms and advanced digital technology as a means to align worker behaviors with organizational objectives (Cram and Wiener 2020; Kellogg et al. 2020). The integral part in which AC differs from traditional forms of control is that decision-making and control may be exerted entirely through computerized systems or a technology interface (e.g., smartphone app) rather than by a human manager (humans out of the loop) (Cram et al. 2020). This introduction of a technological counterpart in the controller-controlee relation, which replaced the human controller, drastically changes the nature of the relation as the exercised control regulates or adjusts the behavior of the controlee (Kirsch 1996). As workers are no longer subject to human decisions, but to management decisions made by an opaque AC system, often combined with limited technical knowledge, this leads to algorithms being perceived as "black boxes" and increases technical opacity of these systems (Eslami et al. 2019). On the one hand, platform providers argue that algorithmic opacity is needed, as a form of organizational opacity, to maintain competitive advantages, protect intellectual property, and prevent malicious users from gaming the system (Eslami et al. 2019). On the other hand, scholars argue that platforms deliberately create "strategic opacity" to increase the efficiency of their AC and AM systems even more (Stohl et al. 2016).

Although AC systems are opaque and have altered the traditional controller-controlee relation drastically, they still represent a form of organizational control. Scholars argue that control research has not kept pace with the disruptive ways in which algorithmic technologies transform organizational control fundamentally (Cardinal et al. 2017; Kellogg et al. 2020). Nonetheless, drawing on these existing concepts in the following helps us to establish a solid theoretical foundation for understanding the opaque functionality of AC, allowing us to discuss the differences between previous control systems and AC, and to bridge the gap between the state of OC and the state of AC that we see in the gig economy today.

Selected Control Concepts from Organizational Control

Control in the organizational context can generally be defined as an evaluation process which directs attention, motivates and encourages organizational members to act in desired ways to meet an organizations objective (Long et al. 2002; Ouchi 1977). Scholars in information systems (IS) research are turning away from a process-oriented view toward a broader, behavioral conceptualization of control that implies that the controller is taking action to regulate or adjust the behavior of the controlee, which fits well to our research context of AC, as desired outcomes and corrective actions are often opaque (Kirsch 1996; Kirsch 1997).

Control Purpose – The first concept we draw on is control purpose as it helps to answers *why* controls are used and describes "the intentions that underlie the controller´s configuration (*what*) and enactment (*how*) of controls" and can be further conceptualized in the purpose of value appropriation and the purpose of value creation (Wiener et al. 2019, p. 1390) Based on the value-creation approach, control is interpreted as caring as the observers have beneficent motivations (such as developing and protecting the observed) in the value-appropriation approach the observers have contentious motivations (such as punishing the observed) (Anteby and Chan 2018).

Control Style - describes "the manner on which the interaction between controller and controlee is conducted" (Wiener et al. 2016, p. 755). A distinction is made between coercive (or authoritative) and enabling control styles (Adler and Borys 1996). Coercive control is designed to force compliance in opposite to an enabling control style which achieves compliance through providing flexibility and autonomy in the work process (Adler and Borys 1996). This formalization of control styles differs significantly along the features repair, transparency and flexibility (Adler and Borys 1996). Especially transparency, describing the degree of insight a worker has into the workings of a system, and flexibility, describing the level of flexibility workers have in getting their work done, are relevant in the context of AC (Adler and Borys 1996).

Control Systems, Portfolios and Process - Organizational control systems describe structures of multiple formal and informal control mechanisms (Cardinal et al. 2010). Formalization in this case describes the scope of written rules, procedures, and instructions and can be understood as a continuum between informal and formal (Adler and Borys 1996). The most commonly cited and widely used control systems are bureaucracies, markets, and clans, presented in the seminal work by Ouchi (1979; 1980). The characteristics of a bureaucratic control system are that the involved parties in a transaction are not free

agents but are in a hierarchical, often formally fixed (employment contract) relation in which a worker agrees based on (mostly) financial conditions to the right of the organization to appoint superior managers who can (1) direct work activities and (2) closely monitor the employees performance and assign value to it (Ouchi 1980). The concept of market control systems defines a market relationship as the transaction between two parties mediated by price, which also conveys all the necessary information for efficient control (Ouchi 1979). Market control systems can be divided into internal and external market systems (Cardinal et al. 2010). Pure external market control systems rely on the price mechanism as the control mechanism, while internal market control systems additionally rely on commission-based incentives and outcome-based performance programs (Cardinal et al. 2010). Clan systems rely on shared values, common beliefs and trust with the purpose of merging the personal goals of the employees with the organizational goals (Sitkin et al. 2020). Integrative control systems can be defined as a hybrid of the previously described systems as they combine parts of more than one system (Roth et al. 1994). More popular in the context of IS research is the concept of control portfolio, which describes a mix of informal and formal control mechanisms that help to implement control modes (Kirsch 1997). The control process can be divided in three phases: (1) specification and measurement of appropriate behaviors or outcomes; (2) evaluation of performance; and (3) rewarding or sanctioning (Kirsch 2004). This process is dynamic and repeats itself with constant adjustments to the control portfolio. Including these concepts into our theoretical framework allows us to capture the opaque nature of AC systems by matching them to these existent systems.

Control Modes and Targets - Control targets describe the target of control and refer to attributes of the production process that control mechanisms are intended to influence (Cardinal et al. 2004; Cardinal et al. 2010). They are divided in input, behavior and output targets based on the standpoint of their inherent temporal location in a process (Cardinal et al. 2017). Input targets focus on how material or human resources are selected, behavior targets are set to ensure performance, and output targets are used to align them with organizational goals (Cardinal et al. 2010). In her seminal work Kirsch (1996; 1997) introduced the related term "control modes", which is divided into informal modes of control (self-control and clan-control) and formal modes (behavior control and outcome control) and also answers to what control is applied or what control activities are put in place (Wiener et al. 2016; Wiener et al. 2019). To facilitate the terminological distinction between clans in a control system comprehension and clan-control, as a form of informal control mode, we find "peer-control" as a response of workers to their peers' behavior or performance to be more fitting and therefore use the term in our framework (Loughry and Tosi 2008). Further, in the following we only use the term control modes for also referring to control targets.

Control Mechanisms - Control mechanisms are defined as the individual, molecular units or organizational controls (e.g., policies, norms, rules, standards) that are applied to higher-level control modes which itself are part of a control system/portfolio (Cardinal et al. 2010; Kirsch 1997). Generally, they can be divided into formal and informal mechanisms but scholars (Cardinal et al. 2004; Long et al. 2002; Roth et al. 1994) suggest that individual control mechanisms can exhibit formal and informal attributes. Based on the presented concepts we introduce the theoretical framework for our study in Figure 1.
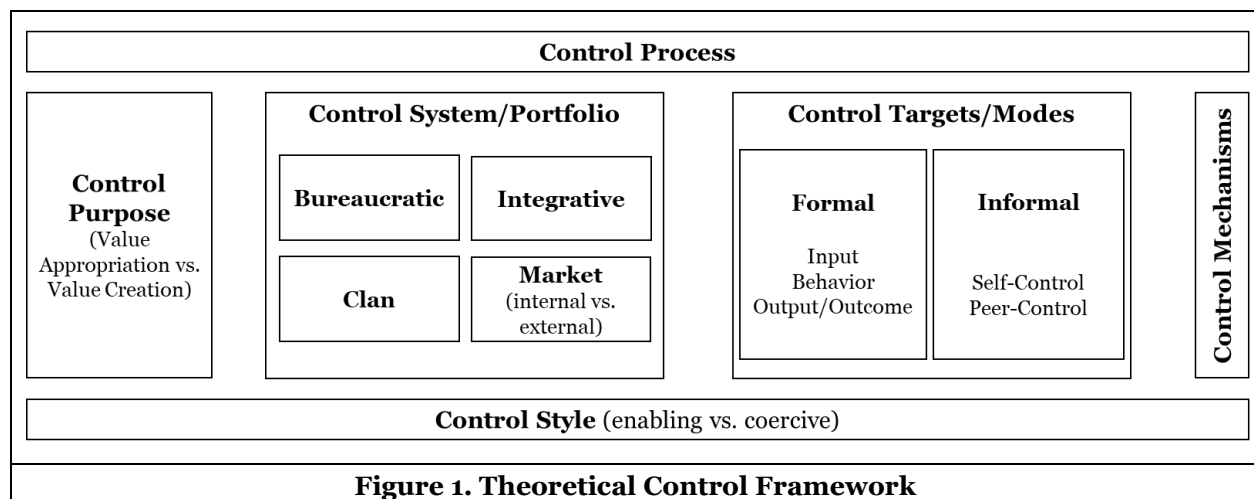

Figure 1. Theoretical Control Framework

Research Design

We conducted a qualitative study on the use of AC in in two app-work platforms (Uber & Mjam) and two crowdwork platforms (Upwork & Freelancer) based on the control framework presented above. The study is conducted as a multiple-case study, which uses ethnographic and netnographic approaches for data collection and triangulation, similar to the study by Lee et al. (2015), to assess reliability of the qualitative analysis (Madill et al. 2000). Multiple-case studies provide a stronger base for theory building as they enable comparisons grounded in varied empirical evidence (Yin 2009). Based on an extreme-case sampling technique we focused on two app-work (Mjam (food-delivery) and Uber (ride-sharing)) and two crowdwork (Upwork and Freelancer) platforms, as these categories of gig economy platforms most heavily use AC and are therefore particularly suitable for analyzing the functionality of AC (Eisenhardt and Graebner 2007; Gerring 2006).

Data Collection and Analysis

Data collection was conducted in a "bricolage" style, which consisted of combining multiple data sources and materials (Neuman 2014). For the Mjam case, the main data was collected through an ethnographic approach, as one of the project team members worked for the platform, which allowed for gathering empirical data in an ethnographic style (Brewer 2000). During the employment phase the team member also had employee-exclusive access to chat-groups and a mobile application (RoadRunner) as additional data sources. This gathering of internal documents and digital conversations, could be more granularly defined as netnography, a "specialized form of ethnographic research that has been adapted to the unique contingencies of various types of computer-mediated social interaction" (Kozinets 2012, p. 39). This netnographic approach was also used to collect data in the Upwork and Freelancer cases by extracting data from the reddit online forums *r/Upwork* and *r/freelance* via an application programming interface (API) and scanning it against a glossary of keywords developed by Bucher et al. (2021) to extract comments on AC. Also, in the case of Uber, data was gathered from the driver online forum *uberpeople.net*, which is one of the biggest forums for ride-sharing with more than 175.000 members. Additionally, a freelancer profile was created to gather insights of the application process and internal information. The same was done in the Uber case to better understand the sign-up process and barriers to entry. Also, Upwork offers a very detailed online documentation, which was analyzed besides other secondary data sources. In all four cases various other sources like websites, videos, blogs, and press releases were examined.

After finishing the data collection, we triangulated the various sources to create a comprehensive dataset, read it several times to get immersed, and then used content analysis to search for content which fitted to the defined control concepts (Andren 1981). In the following step, the project team coded and interpreted the identified data in regards to the control framework presented in Figure 1. A detailed coding example can be provided on request by the authors.

Case	Type	Description	Method	Main Data Sources
Upwork	Crowdwork	Freelancing platform	Netnography, Bricolage	Reddit online forum, annual report, official community forum, official website
Freelancer	Crowdwork	Freelancing platform	Netnography, Bricolage	Reddit online forum, annual report, official community forum, official website
Mjam	App-Work	Food-delivery platform	Ethnography, Bricolage	Ethnographic field work, personal work experiences, internal documents and communication
Uber	App-Work	Ride-sharing platform	Netnography, Bricolage	Online forum uberpeople.net, official website, videos, blogs, app
Table 1. Case Description				

Findings

Findings Regarding Control Mechanisms

During the analysis it quickly became apparent that it was sometimes difficult to identify control mechanisms as such, because it was opaque what exactly they control or what the corresponding control modes are. For example, the form of employment as a control mechanism in the case of Uber can be attributed to the control mode of self-control, as riders can decide completely on their own when they want to work, which further on fits to an enabling control style. However, from another perspective, this can also be attributed to strict input control, as Uber manages the entire supply side with a coercive control style and nudges the behavior of drivers according to its preferences. It became clear that many control mechanisms relate to formal control modes and are put into place with a coercive control style, which is enacted rather informal and opaque to establish information asymmetry. Across all analyzed platforms it became clear that control mechanisms often serve multiple control modes and achieve this by enacting control in an enabling style. At closer evaluation however, they heavily nudge workforce behavior in desired ways of the platform and help to create an opaque control portfolio. An example of this "soft control" (Pregenzer et al. 2020) is the push notification of Mjam and Uber, which permanently try to trigger certain behavior of their riders/drivers. We will discuss the functionality of these subtle behavior control mechanisms, which resemble nudges, in more detail in the discussion section.

Findings Regarding Control Modes, Targets and Style

In all the analyzed platforms, the first input control modes are applied in the selection process of the workforce. For Mjam and Uber, these hurdles are set comparatively low, as they focus primarily on the basic skills of their workforce (e.g., driver's license, legal age, work permit, capable smartphone). So, from a selection perspective there are almost no input control modes in place at the app-work platforms we analyzed. But once workers are admitted to the platforms, Mjam differs from Uber by adopting a shift system that, unlike Uber, offers more input control over managing workforce and therefore supply. Furthermore, the batch system at Mjam, which gives highly ranked riders the ability to book shifts first, can be considered an input control mode rather than a self-control mode as it reduces the flexibility of the workforce to choose their work hours freely. But it also has the function to motivate rider behavior to improve their outputs to get access to a higher batch category, which applies to a behavior control mode. But as riders have trouble comprehending the batch system calculation, they often become demotivated, and thus share their frustration in the group chat: e.g., one of the workers could not understand why s/he was still in batch level 3 (a rather low batch number) after working almost everyday for the last two weeks without any late starts or absences. Also, in this regard another worker sarcastically expresses his displeasure in calling the Mjam app genius as s/he is also still in batch level 3 after taking every order. In comparison, Uber's workforce appears to have a higher degree of self-control than Mjam's employees when it comes to choosing work hours.

In the case of crowdwork platforms, we can see stricter input modes in the selection of freelancers. Upwork receives more than 10.000 applications daily, but is able to react to each within 24 hours due to an algorithm, which checks the combination of freelancers' skills and experience, and only accepts a small fraction. Freelancers on Upwork and Freelancer have to submit bids for jobs, which is considered a self-control mode as it works like a self-selection process where the freelancers have complete control over which jobs they apply for. As already mentioned, many control mechanisms have multiple functions and help to quantify the achievement of multiple control modes. For example, all four platforms have implemented a feedback system where customers can rate the received service. Based on the feedback it is possible for the platforms to quantify the effectiveness of simple output controls, like customer satisfaction, as part of the control process and adapt the control portfolio accordingly, often in real time due to the flexibility of AC. However, feedback systems also affect employee behavior and function as behavior control modes, as employees try to perform well and often do emotional labor in exchange for good feedback (Rosenblat and Stark 2016). Sometimes workers bypass these mechanisms and figure out ways to manipulate the algorithm (Jarrahi and Sutherland 2019). For instance, the keyboard presses and mouse movements at Upwork are recorded in the case of hourly payed projects. It was found however, that these mechanisms are easily circumvented by setting up a second monitor or using a timer to work around screenshots (Wood et al. 2019). This behavior is also found on the customer side. In the case of Uber, it was

found that passengers place their pick up location outside of a surge zone, to avoid higher fares, and then call drivers to direct them to their actual location (Rosenblat and Stark 2016).

In summary, most of the control mechanisms identified for the app-work platforms (Mjam and Uber) apply to behavioral control modes, while for the crowdwork platforms (Upwork and Freelancer) we identified mostly self-control modes. We attribute this to three main reasons: (1) more individual work contents, (2) the workforce is higher skilled and is therefore of (3) higher value to the platform because of its unique skill set. Our analysis has also shown that this tight, algorithmically supported behavioral control is based on what we call control artifacts. We define a control artifact as an intangible, digitally available and retrievable source of information that acts as the control epicenter on which most control mechanisms of the control portfolio are based. In the case of Mjam and Uber this control artifact is the GPS signal. The efficiency of most control modes is monitored based on the GPS signal. The GPS signal forms the core of the control portfolio of Mjam and Uber and most app-work platforms. If the connection between the workers and the control artifact is interrupted due to a smartphone failure or loss of Internet connectivity, restoring algorithmic visibility is the top priority because the workers have to end their shift if they can't reconnect (Newlands 2021). In the case of Upwork and Freelancer, the control artifact is the communication channeling feature the platform uses to monitor communication between customer and freelancer. Upwork and Freelancer have put in place strict behavioral control mechanisms to ensure that all interactions between parties go through the platform, so that the platform has visibility over the entire communication process. For example, if one party mentions words like mail, skype or WhatsApp in the chat there is an immediate notice that all communication outside the platform is prohibited, giving the parties a constant feeling of surveillance. Crowdwork platforms strictly control communication because they fear opportunistic behavior of service agents who defect with customers off platform for future transactions (Zhou et al. 2021). In terms of control style, we see a slightly more enabling control style in the crowdwork platforms, which can be attributed to the reasons above and more use of self-control modes. In app-work, the style is more coercive, which leads to lower information transparency and ultimately to a lower intention of the workers to stay with the platform resulting in higher degrees of workforce turnover (Göttel 2021).

Control Concept	App-Work Platforms (Uber and Mjam)	Crowdwork Platforms (Upwork and Freelancer)
Control Modes answers to what control is applied (control target) or what control activities controllers put in place (Cardinal et al. 2004; Wiener et al. 2016)	Control Artifact: GPS Signal Platform access is controlled with low input control modes (e.g., smartphone, driver's license) Mostly behavior control modes are implemented. Control modes are linked, e.g., outcome control (e.g., driver rating) feeds back into input control through real time control process (e.g., deactivation if rating gets too low). High dependence on customer ratings (fear of deactivation)	Control Artifact: Communication Channeling Features Platform access is controlled with stricter input control modes (review of skills and experience during application process, skills exam) Freelancers are tied to the platform through the reputation system – the buildup reputation cannot be transferred between platforms. Higher levels of self-control than in App-Work due to higher required skills and task individuality. Circumvention of control modes.
Table 2. Result Summary for Control Targets/Modes		

Findings Regarding Control Systems, Portfolios and Process

In regards to market control systems the division into internal and external market control systems seems applicable to the analyzed platforms, as they unite aspects of both (Ouchi and Price 1978). On the one hand the platforms compete in an external market system against direct competitors for workforce, customers and ultimately market share. In these external markets, the price mechanism plays a controlling role, but other qualities like availability, service quality and speed of the offered services are more important to customers than price (Cachon et al. 2017). On the other hand, after a customer has chosen a platform or an employee's application has been successful, s/he enters the internal market system which the platform controls by withholding full market information to establish strategic opacity. This pseudo market narrative is reinforced by the platforms by referring to their workforce as freelancers (Upwork and Freelancer),

entrepreneurs (Uber) or riders (Mjam) and highlighting their autonomy, flexibility and self-responsibility. Price plays an important role in these internal market systems, although it is not set by natural market mechanisms, but in most cases by the platform. Uber uses base prices that are fixed and set by the platform. Besides that, Uber uses surge pricing and boost promotions as dynamic pricing mechanisms, which are mainly used to regulate supply and demand. At Mjam, we had similar findings, although not all employees are independent contractors, as 10% of riders are permanent and traditionally hired to cover the base load of jobs, which is rather atypical for app-work platforms. It seems like Mjam is more dependent on planning security to achieve a functioning internal market system, as they also rely on a shift system, which riders have access to once a week to sign up for shifts, to ensure supply. In addition, the shift system is regulated by a batch system based on various performance criteria to control that only the best performing riders belonging to a higher batch have the opportunity to work flexibly by choosing their preferred shifts ahead of riders from lower batches. Although there is a shift system, Mjam seems to have an intentional oversupply of workers. As one rider asked in the riders group chat if anyone from batch 4 (which is comparatively low) got a shift as s/he did not get a single one. To this another rider replied that s/he was online a exactly 4:01 pm and also could not get a shift and also mentioned that some weeks also riders in batch 3 struggle to get shifts. We also found evidence of oversupply at Uber, as there are often mass movements of drivers to a particular area due to surge zones which then often disappear, leaving drivers frustrated (Rosenblat and Stark 2016).

As for the mechanisms related to market control systems in the crowdwork platforms, there is a bidding system in place which allows freelancers to place an offer (either an hourly rate or fixed price depending on type of project) on projects posted by customers. But both analyzed platforms control the number of bids that can be placed with an internal currency (Connects (Upwork); Credits (Freelancer)) which forces freelancers to be more conscious. On the other hand, it is also possible for freelancers' profiles to be found and contacted by customers. Besides some soft restrictions, like the minimum hourly payment of 3$ and a constraint on the amounts of bids that can be placed, there is a far more impactful mechanism which skews the market regulation mechanism. Because Upwork and Freelancer act globally, freelancers on the platform have to face global competition resulting in vastly differing payment expectations (D'Cruz and Noronha 2016). Although our analysis clearly shows aspects of control that could be associated with (internal) market control systems, the analyzed platforms do not qualify as market control systems in our view. Pricing mechanisms may play an important role in shaping market dynamics but the allocation of supply and demand is ultimately not subject to these mechanisms, as it is controlled by the platform. Our findings suggest that platforms rather use positive aspects which are associated with market systems, like pointing out the low bureaucratic hurdles and autonomy, as selling propositions and label themselves as marketplaces.

The majority of the identified control mechanisms are associated with bureaucratic control systems although signifying mechanisms, like employment contracts, were mostly missing across all platforms. Only in the case of Mjam 10% of employees are in a traditional employment relationship linked to a contract with the platform. At Mjam, bureaucratic control mechanisms, which are characterized by clear rules and principles, are used primarily for quality management and the control of the supply. Bureaucratic requirements for the application process are kept to a minimum (capable smartphone, sufficient data flat rate, age of majority and work permit), which also illustrates the low barriers to entry for employees and the priority of the platforms to find replacements quickly, keeping the workforce dynamic. At Mjam, riders must sign up for a specific shift and are responsible for working during the shift they signed up for. If riders cancel a shift without a justified absence they get a "unexcused no-show", which negatively impacts their batch number (their position which regulates the access to shift booking). This resembles a rather strict bureaucratic control mechanism, comparable to a roster, which is common in more traditional organizations. Furthermore, the batch system and the necessity to document every work step (in the case of Mjam delivery pick-up and drop-off have to be confirmed by sending a picture) are control mechanisms which are associated with bureaucratic control systems. At Uber we identified similar mechanisms. Strict bureaucratic rules apply, especially when accepting rides: If drivers miss three requests in a row, they are automatically logged off for several minutes. Also, through the implemented rating systems Uber insures quality control by automatically deactivating drivers which fall below a certain rating. In the crowdwork platforms, the share of strict bureaucratic rules is significantly lower compared to the app-work platforms. This could be due to the reasons mentioned above. Furthermore, workforce in app-work (Uber, Mjam) might be less intrinsically motivated due to the coercive control style, which leads to the introduction of

even more bureaucratic rules and monitoring to prevent opportunistic behavior, leading to a vicious cycle (Anteby and Chan 2018). In crowdwork platforms, the workforce is on average more highly qualified and therefore also acts as a unique selling point for the platform to acquire new customers, which is why it is more interested in creating a pleasant working environment by enacting a more enabling control style to reduce staff turnover. In summary, most of the identified control mechanisms across all platforms can be associated with bureaucratic control systems, but following the definition of Ouchi (1979; 1980) there is a lack of a clear hierarchical, formally fixed working relation in the triadic platform construct. But even though there are often no formal contracts, things like changes to the app interface, that remove or hide certain information, could be considered contract adjustments without the need of mutual consent. It has been shown that platforms create a fairly tight bureaucratic control framework with the help of AC. What distinguishes these systems from the bureaucratic control systems of the past is that they realize close supervision without the expected degree of formalization, an aspect we will present in detail in the discussion section.

We could not identify control mechanisms associated with a clan control system. We attribute this to the high degree of individualization that the platforms reinforce, by not referring to their workers as employees, but rather emphasizing their independence and individuality. Also due to the nature of the work there is little interaction between workers, which is a prerequisite for clan control systems. In conclusion, it is difficult to clearly assign the implemented AC portfolios found in the analyzed platforms to an exact definition of the existing control systems. The observed control systems could most accurately be described as integrative control systems, implementing and blending a variety of control mechanisms associated with different systems.

Control Concept	App-Work Platforms (Uber and Mjam)	Crowdwork Platforms (Upwork and Freelancer)
Control System/Portfolio "configurations of multiple formal and informal control mechanisms" (Cardinal et al. 2010, p. 56)	Price mechanisms (surge pricing) play a role in a rather internal market perspective. Shift systems and promotions are used in a rather bureaucratic manner to ensure supply. Platforms have full control over price mechanism and other market information which results in information asymmetry that contradicts the definition of market control systems. Purposefully referring to workforce with labels which help to anchor false market narrative. Control mechanisms associated with bureaucratic systems are present although signifying mechanisms (employment contracts) are missing.	Price mechanisms functions more in a traditional market control system sense with the implemented bidding systems although global competition skews the price mechanism. More aspects which resemble market control systems than app-work platforms. Aspects of bureaucratic control systems are present in the form of strict communication monitoring, skills exams and feedback systems but signifying mechanisms (employment contracts) are missing. It is not possible to attribute the control modes to one specific control system.
Table 3. Result Summary for Control Systems/Portfolios		

Findings Regarding Control Purpose

For the concept of control purpose, the data is rather homogeneous across all four cases. In regards to value-creation purposes all four platforms create value by managing quality, safety and availability of transactions between parties. All four platforms act as mediators in this regard and provide a highly functional and reliable marketplace for participants, whether it be workers or customers. The value-creation purpose reflects the idea of the sharing economy, where the supply of capital and labor comes from decentralized crowds of individuals. In terms of value-appropriation, as the second type of control purposes, we see strong control mechanisms, which aim at preventing gaming and opportunistic behavior across all platforms. In the cases of Mjam and Uber there exists an explicit information asymmetry between platform and workers aiming at preventing riders or drivers from opportunistic and therefore rational decisions when choosing rides or orders. There is a lack of detailed information on orders or rides and also a time restriction in accepting them. This can lead to dissatisfaction, as in the case of a Mjam rider who had to deliver drinks over a long distance and commented on this sarcastically in the group chat that s/he is happy about delivering 12 liters of beverages (heavy delivery) to a location which is 3 km (short distance) away – another

rider shows his empathy by pointing out that such deliveries are "antisocial" and sarcastically adds that the rider can at least expect a large tip. Another one adds that this is another example for exploiting the delivery zone of 3.5km to the last meter.

Regarding the crowdwork platforms, we can see a stronger focus on trust with the Job Success Score (Upwork), Trust Score (Freelancer) and Talent Badges, which for customers represent value creation but for freelancers are rather a value appropriating tool, as it remains unclear on which exact metrics these scores are calculated. In the case of Freelancer, there are also special skills tests that freelancers can take to have their skills verified by the platform. Also, the flagging system, where different contents can be flagged as inappropriate, has a more value appropriating character for the freelancers as customers are clearly in the strong position and can flag freelancers' profiles while they can only flag selected job postings. In conclusion, the value appropriating measures outweigh the value creating aspects from the worker perspective. However, in cases where the purpose of the control mechanisms tends to benefit the customer, it disadvantages riders, drivers or freelancers, resulting in an ambivalent control purpose conception depending on the perspective.

Control Concept	App-Work Platforms (Uber and Mjam)	Crowdwork Platforms (Upwork and Freelancer)
Control Purpose intentions that underlie the controller's configuration (what) and enactment (how) of controls (Wiener et al. 2019)	The main purpose of the platform is to provide a functioning marketplace where supply meets demand to create value for itself, followed by customers, and only in third place is the workforce which is confronted with the value appropriated aspects of control to decrease opportunistic behavior.	The main purpose of the platform is to provide a functioning marketplace where supply meets demand to create value for itself but also controls its workers with more value creation purpose as it is more depended on the workforce. But in regards to communication channeling there are strong appropriation-oriented controls
Table 4. Result Summary for Control Purpose		

Discussion

Towards a Holistic Understanding of Algorithmic Control

Reflecting on the findings above, we see a strong tendency towards highly dynamic control portfolios, where feedback is given in real-time, creating the perception of an omnipresent algorithmic controller. This also leads to difficulties in clearly distinguishing different steps in the control process, different control modes and styles, as they interact and blend together. As such, we find that OC with its focus on concepts, defined by two independent anchor points, that are often treated as mutually exclusive (e.g., control purpose (value-appropriation vs. value-creation), control style (enabling vs. coercive), control formalization (informal vs. formal), control allocation (central vs. decentral)) limits the applicability of OC, and shows the fundamental difference between AC and previous control systems. It is this problem of control singularity, which is seen as a major factor in limiting the applicability of OC to today's multi-faceted and complex organizations in the gig economy (Cardinal et al. 2017). Control singularity describes approaches that consider only a singular type of control to be useful in a given context, as opposed to holistic approaches that assume that organizational control consists of multiple control approaches and focuses more on blending these (Cardinal et al. 2017). To develop an understanding of the blending and interactions of different control types, we introduce three key dimensions of organizational control, which we adapted to AC: allocation, formalization and adaptiveness (Cardinal et al. 2017).

Allocation of Control

AC offers the possibility for organizations to achieve new forms of allocating control. Over the past decades, organizations have continuously reduced their core activities while expanding their periphery by outsourcing activities to strategic partners. (Gulati and Kletter 2005). This inexorably led to a decentralization of economic power and ultimately control. However, this brings us to the paradox of control allocation through the use of technology that simultaneously asks for more and less control of key technological elements (Tilson and Lyytinen 2021). From our analysis, it appeared that for platforms using AC, it is possible to to keep control centralized, while also decentralizing it, as opposed to markets (which disperse it equally) or networks (which distribute it to trusted collaborators) (Vallas and Schor 2020). This

form of apparent decentralization of control to the other two parties (customer and worker) in the triadic relationship is a way platforms regain power (Vallas and Schor 2020). With algorithmic technology it becomes possible to achieve maximum centralization of control in creating the ultimate non-human manager, who is capable of real-time, "inperson", and individual control of workers and is almost unaffected by organizational growth and therefore unlimited scalable. Control aspects that are a weakness of the algorithm (control of subjective performance aspects) can then be decentralized to the other parties (customer or worker), while in reality remaining centralized under the decision sovereignty of the algorithm, since decentralization of control is not accompanied by actual decision-making power.

Illusion of Self-Control - We find this paradoxical control allocation, where control is decentralized while remaining centralized, in most self-control modes and the resulting flexibility that gig economy platforms seem to create. If control in the gig economy was indeed decentralized to the worker in the form of self-control, two main factors would have to be fulfilled: (1) workers' ability to self-schedule in combination with diverse and changing life situations and to (2) freely reject or accept job offers (Lehdonvirta 2018; Shapiro 2018). In terms of the first factor, this seems to be the case for Uber and partially Mjam as for the most part the worker is in control, since s/he is free to decide when and for how long s/he works. However, recent research has shown that self-scheduling is more profitable for the platform than centralized scheduling, as the organization can dynamically respond to an increase in demand by, for example, setting up surge zones (Uber) in high-demand areas to get more riders on the app, but also has huge cost savings by eliminating fixed costs like employee salaries. (Cachon et al. 2017). Ultimately, therefore, these opportunity costs have to be absorbed by the workers, as they must be available, accessible, and responsive to their platform without being guaranteed paid work (Rosenblat and Stark 2016). They must decide whether demand is profitable relative to the capacity offered at a given point in time (Cachon et al. 2017). Workers are in a constant state of deliberation as to whether an particular deal is worth it, how long they would need to wait for another to be sent to them and how their response to an offer will affect the offers they receive in the future (Calo and Rosenblat 2017). This leads to significantly reduced power to self-schedule and thus self-control.

The second factor that must be present in order to be able to speak of decentralized self-control is the possibility of the worker to freely decide which job/gig offers to accept. For an informed decision full information transparency is needed, which most of the time is not the case. Especially in app-based work (Mjam and Uber) we see platforms withholding significant information (restaurant or passenger address, distance, order details), putting a time penalty on the decision. They often choose a coercive control style and tone, as shown in the case of a Mjam-App notification reading*: "[…] Please accept the next order immediately".* However, we found differences between crowdwork and app-work, as crowdwork tasks require more or specific work skills on average. In the case of Upwork and Freelancer, freelancers and customers openly discuss work contents and compensation, but always under the surveillance of the platform. This is realized by controlling communication channels (control artifact). The control artifact functions as the epicenter where control is centralized, which is why platforms show high interest in protecting them. In summary, as skill requirements increase, power asymmetries decrease, as it becomes harder to remain power over the control artifact, resulting in a more even allocation of control between parties.

Customer Control - We found a similar form of pseudo decentralization in the customer-platform relationship. The platform itself does not have the human resources to control a workforce at the scale we see in the gig economy, and therefore relies heavily on AC. Although the services offered are highly standardized, which makes it possible to control them with AC, it is still not possible to completely remove the human controller from the loop (Baptista et al. 2020). Since most products in the gig economy are services, the perceived quality of these services is difficult to quantify and highly subjective to the individual, which limits the applicability of AC. Therefore, platforms delegate the qualitative service evaluation to the customer to some extent. This leaves workers subjected to an almost uncontrolled power of the customers, which shows itself in the role of rating and reputation systems (Muldoon and Raekstad 2022). On the one hand, these systems help to digitalize trust by minimizing anonymity and creating digital reputation. On the other hand, platforms use them as control mechanisms to control behavior and assess the efficiency of the control process. However, control is not actually reallocated and decentralized to the customers, as they only perform the evaluation part. The ultimate decision if and how a worker is sanctioned or rewarded based on a customer feedback lies in the hand of the algorithm and therefore the platform. This also helps to understand why workers are far more dependent on positive feedback, and "are at the mercy of random

people", who are often not aware and in control of the consequences of their ratings (Lee et al. 2015, p. 1610). The same applies for reputation scores like the Job Success Score (Upwork), Trust Score (Freelancer), Current Score (Mjam) and Badges (Uber). In the case of Upwork for instance, other researchers have found that freelancers form alliances with customers to circumvent the performance rating system, because reputation metrics are so important (Rahman 2019). Further studies show that freelancers invest money, time and effort to protect their ratings (Jarrahi et al. 2020; Kinder et al. 2019). The platform benefits from this seemingly allocation of control to the customer as it only has to lay the basic structure. The feedback system becomes a self-running control mechanism, were the customer takes over the evaluation part, but the decision on the consequences remains with the platform. Due to this, the platform can once again safe costs, which would otherwise be needed to employ human managers. Another gain is that the platform benefits from the digitalization of trust in the long term, as trust in the offered service increases with more and more reviews, and this digital reputation also acts as a lock-in mechanism for employees, as they cannot take their digital reputation with them when switching platforms.

In summary, platforms achieve this paradoxical allocation of control in the employee-relationship by decentralizing control over the decision of when to work to the employees, but keeping control over supply centralized using soft control mechanisms, such as dynamic pricing, surge pricing, and batch systems to nudge workers to a certain behavior without limiting their decision set, ultimately creating the illusion of self-control. Furthermore, in the customer-relationship, the service evaluation process, which cannot completely be performed by the algorithm, is decentralized to the customers but the decision-making power over consequential sanctioning or rewarding stays centralized under control of the platform. This paradoxical allocation of control is opaque because platforms appear to the outside world as market systems or open marketplaces where demand is met by supply and the platform itself plays only a mediating role. Values such as autonomy, flexibility, and the ability to be your own boss are advertised and are associated with high degrees of self-control and workers flexibility. Platforms imply that flexibility is a value in itself, which ignores that for some, routine and predictable employment with fixed hours may be more rewarding (Adler and Borys 1996; Tan et al. 2021). In addition, incentive schemes such as dynamic pricing give platforms control over the flexibility they promise their workers, which ultimately means that only the platforms benefit from the flexibility aspect, which further shows this pseudo decentralization (Muldoon and Raekstad 2022). The positive symbolic value of altruistic sharing and entrepreneurialism, helps gig economy platforms to portray an evenly distributed allocation of control, while depriving workers of their social and legal status as "employees" or "workers," and by depriving them of any possibility to challenge the existing power structure, which is reinforced by the opacity of algorithmic work processes that leave workers no room for self-control and flexibility and even put the customers to work (Pignot 2021).

Formalization of Control

The second dimension of organizational control we want to discuss in regards to AC is formalization, which describes the scope of written rules, procedures, and instructions in an organization (Adler and Borys 1996). In early organizational theory it was contested that with increased size of an organization its structure becomes more complex and differentiated, which decentralizes control, as managerial manpower to execute control cannot be increased infinitely (Pfeffer and Leblebici 1977). The organization is therefore in need for a greater degree of control formalization (higher proportion of codified jobs, resulting in less range of variation) to compensate for less personal control, which could be counteracted with the implementation of IS, as technology helps to perform managerial tasks and leaving managers with more time for personal control, therefore reducing the need for formalized control (impersonal control through rules and procedures) (Ouchi 1977; Pfeffer and Leblebici 1977). This of course describes an ideal type scenario and use of information technology as often the inefficient fit of IS can lead to an increase in bureaucracy and therefore the need for formalization (Niskanen 1968). With AC it became possible to fulfill the need of high formalization of control, as platforms in the gig economy are highly complex and need to manage large workforces globally, while simultaneously enacting control in rather informal ways. We found that many of the analyzed AC mechanisms are highly formal in the aspect of helping to produce highly standardized and codified jobs with a low range of variation but equally informal in the aspect of being intangible and invisible rules or procedures. Our findings show this dualistic formalization of control in what we call internalized control. It became apparent that most of the AC mechanisms are formal in terms of following a strict set of algorithmic rules, but due to platforms controlling the provided choice architecture, they achieve the

functionality of informal control mechanisms. Platforms achieve this by controlling two main features of the provided choice architecture: flexibility and transparency.

Flexibility - By exerting "soft control" (Pregenzer et al. 2020) or "soft paternalism" (Sunstein 2014, p. 584) similar to nudges, platforms reduce the flexibility by presenting a choice architecture, which influences workers decision by strategically withholding information and purposefully creating information asymmetries (Sunstein 2014; Thaler et al. 2014). An example of mechanisms that are considered nudges in the case of Uber are push notifications that drivers receive predicting high demand: *"Get ready for a big weekend in New Orleans!"* (Rosenblat and Stark 2016). Others encourage drivers to stay on course: *"You're almost halfway there, congratulations!"* (Scheiber 2017). Two conditions need to be fulfilled in order to speak of a nudge: (1) the set of choices available to the influenced party must either remain unaltered or be expanded – never constrained (choice-set preservation condition) and (2) the influenced party must easily be able to disengage in the behavior which the influence tactic is aimed at (substantial non-control condition) (Saghai 2013). However, these conditions were not always fulfilled in the soft control mechanisms we observed. For example, in the case of Uber when a driver is matched with a customer the algorithm can individually decide on the match conditions based on having full (local) market supervision, driver and customer information, misses important information (Blind Ride Acceptance), and on this basis can create a highly individual offer which has a high chance of being accepted by the driver. This in combination with the a priori reduced flexibility we discussed above, in regards to allocation of control, results in a constrained flexibility to decide. We argue that, in combination with low transparency, these soft control mechanisms become hard to resist, violating the non-control condition while seemingly fulfilling the choice-set preservation condition and can therefore not be considered nudges.

Transparency - Bucher et al. (2021) referred to what we call internalized control as "pacifying" the algorithm. A major role is played by the opacity of the algorithm, as workers are not aware of its exact functioning, leading to technical opacity, which ultimately results in a power asymmetry that leaves workers in a position of inferiority, as they are not able to understand the decision process, but are under constant surveillance (Jarrahi et al. 2021; Zuboff 2019). Thus, workers often have no choice but to share their experiences and practices with fellows, which is known as collective sensemaking, describing the collaborative development of plausible stories that rationalize the algorithmic decision process (Pregenzer et al. 2021b; Weick et al. 2005). Workers are aware that the algorithmic decision process consist of a formal set of technical rules, but due to the technical opacity they are not capable to understand its functionality, and thus assume that every decision is recorded and will be taken into account, and begin to attribute a kind of omnipotence to the algorithm as a result from malevolent sensemaking (Pregenzer et al. 2021b; Shapiro 2018). This malevolent sensemaking process then further increases power asymmetry as workers involuntarily shape perceptions of the materiality of the algorithm and reinforce the power of algorithms through their anticipatory compliance practices (Bucher et al. 2021). In essence, the workforce internalizes the feeling of constant control as part of their identity construction. In the attempt to pacify the algorithm the workers internally limit their choice set a priori, which is due to their high identification and the feeling of being constantly under surveillance, resulting in what we call internalized control (Pignot 2021).

In summary, by using formal computer-programmed rules and procedures (Gillespie 2014) AC achieves control in highly informal ways by controlling the flexibility and transparency of the choice architecture. This goes as far as to perceive the algorithm as technologically infallible and omnipotent, leading to a highly informal control mode of internalized control, capable of controlling an open choice architecture without actually limiting it.

Adaptiveness of Control

The third organizational control dimension we want to discuss in relation to AC is adaptiveness. This concerns especially the OC concepts control style, control purpose and the control process. Control adaptiveness describes the automatic adjustment of control mechanisms in real time to achieve or maintain a desired level of control portfolio performance (Landau and Zito 2006). Based on observed worker behavior on an individual level, the control process can be differentiated in two modes of operation: self-tuning operation and adaptive operation (Landau and Zito 2006). If the algorithm detects a deviation of worker behavior from the desired behavior, a self-tuning operation starts and sanctions worker behavior until the desired performance is achieved again. For this self-tuning operation, a value-appropriation purpose is used as opportunistic worker behavior was detected which must be contained. On the basis of a

value-appropriation purpose, a corresponding coercive control style is applied to sanction the worker and enforce compliance. In the case Mjam this is found if a rider declines two orders in a row and then receives a notification to accept the next order immediately. If the driver decides to refuse even the following, s/he will be deactivated, and will have to contact the dispatcher to continue working. If the worker's behavior matches the desired behavior, the algorithm starts an adaptive operation that aims to further optimize the worker's output. In the adaptive operation the algorithm operates all the time and chooses a value-creation purpose and an enabling control style to reward and motivate the worker. In the case of Uber push notifications like "*Get ready for a big weekend in New Orleans!*" (Rosenblat and Stark 2016) and "*You're almost halfway there, congratulations!*" (Scheiber 2017) are used in an adaptive operation.

This dynamic adaptation is enabled by minimizing the time component in which the control process can be performed through technological and algorithmic advances, allowing platforms to operate a highly dynamic control portfolio that enables much more granular and individualized control of the workforce. As the cycle time of the control process gets shorter, it becomes harder to distinguish between control modes, which is known as blending of controls (Pregenzer et al. 2020). This blending of control modes in addition to the high dynamic of the control process further increases opaqueness of the algorithmic processes. Based on the three discussed control dimensions we present the AC framework in Figure 2.
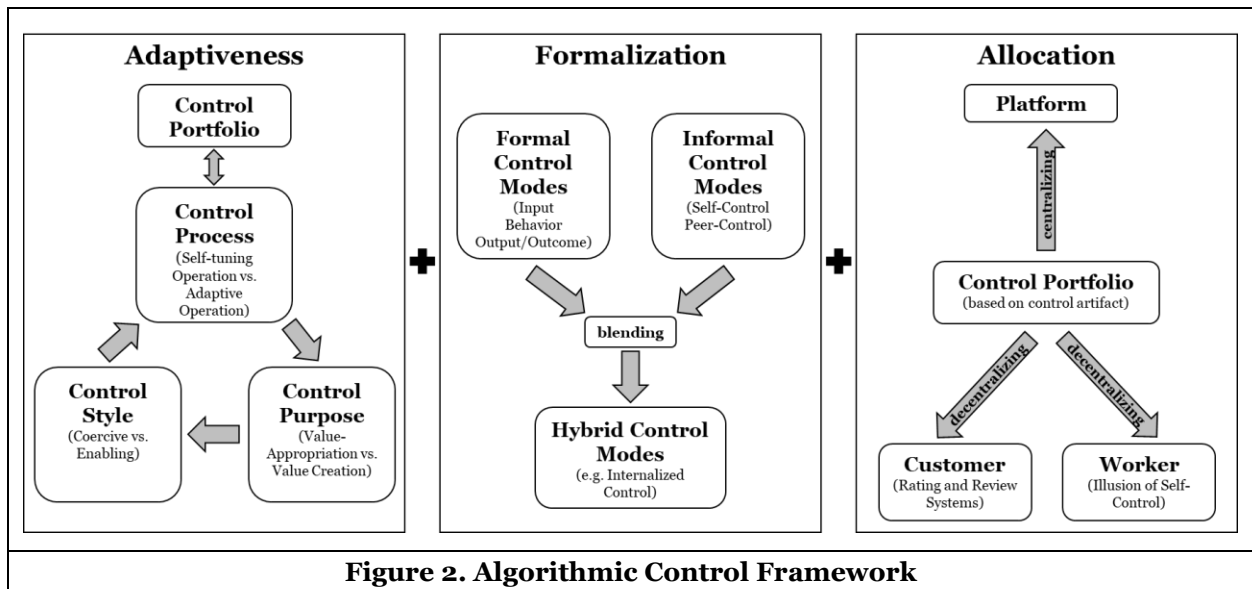

Figure 2. Algorithmic Control Framework

Conclusion

The goal of this study was to create a holistic understanding of AC through application of OC concepts and derive conceptual adaptations to capture the characteristics of AC. We find that traditional concepts from OC are applicable to AC in many regards and provide a good basis to study AC in the gig economy. However, they suffer from their singularity characteristics and therefore are limited in displaying the dynamic blending of control mechanisms along the three discussed dimensions: allocation, formalization and adaptiveness. We attribute these shortcomings to the fact that OC has not kept pace with organizational developments and how the use of algorithmic information technologies shapes the controller-controlee relation we see in today's gig economy platforms. Especially the categorization in control systems is no longer contemporary and rather restricting, as we see a high degree of control blending and dynamic control portfolios in the gig economy. With the resulting framework this study captures the characteristics of AC and is a step forward in in explaining algorithmic control phenomena.

Acknowledgments

References

Adler, P. S., and Borys, B. 1996. "Two Types of Bureaucracy: Enabling and Coercive," *Administrative science quarterly*), pp. 61-89.

Andren, G. 1981. "Reliability and Content Analysis," *Advances in content analysis* (9), pp. 23-43.

Anteby, M., and Chan, C. K. 2018. "A Self-Fulfilling Cycle of Coercive Surveillance: Workers' Invisibility Practices and Managerial Justification," *Organization Science* (29:2), pp. 247-263.

Baptista, J., Stein, M.-K., Klein, S., Watson-Manheim, M. B., and Lee, J. 2020. "Digital Work and Organisational Transformation: Emergent Digital/Human Work Configurations in Modern Organisations." Elsevier, p. 101618.

Brewer, J. 2000. *Ethnography*. McGraw-Hill Education (UK).

Bucher, E. L., Schou, P. K., and Waldkirch, M. 2021. "Pacifying the Algorithm–Anticipatory Compliance in the Face of Algorithmic Management in the Gig Economy," *Organization* (28:1), pp. 44-67.

Cachon, G. P., Daniels, K. M., and Lobel, R. 2017. "The Role of Surge Pricing on a Service Platform with Self-Scheduling Capacity," *Manufacturing & Service Operations Management* (19:3), pp. 368-384.

Calo, R., and Rosenblat, A. 2017. "The Taking Economy: Uber, Information, and Power," *Colum. L. Rev.* (117), p. 1623.

Cardinal, L. B., Kreutzer, M., and Miller, C. C. 2017. "An Aspirational View of Organizational Control Research: Re-Invigorating Empirical Work to Better Meet the Challenges of 21st Century Organizations," *Academy of Management Annals* (11:2), pp. 559-592.

Cardinal, L. B., Sitkin, S. B., and Long, C. P. 2004. "Balancing and Rebalancing in the Creation and Evolution of Organizational Control," *Organization science* (15:4), pp. 411-431.

Cardinal, L. B., Sitkin, S. B., and Long, C. P. 2010. "A Configurational Theory of Control," *Organizational control* (51:79), pp. 85-100.

Cram, W. A., and Wiener, M. 2020. "Technology-Mediated Control: Case Examples and Research Directions for the Future of Organizational Control," *Communications of the Association for Information Systems* (46:1), p. 4.

Cram, W. A., Wiener, M., Tarafdar, M., and Benlian, A. 2020. "Algorithmic Controls and Their Implications for Gig Worker Well-Being and Behavior," *ICIS*.

D'Cruz, P., and Noronha, E. 2016. "Positives Outweighing Negatives: The Experiences of Indian Crowdsourced Workers," *Work Organisation, Labour and Globalisation* (10:1), pp. 44-63.

De Stefano, V. 2015. "The Rise of the Just-in-Time Workforce: On-Demand Work, Crowdwork, and Labor Protection in the Gig-Economy," *Comp. Lab. L. & Pol'y J.* (37), p. 471.

Duggan, J., Sherman, U., Carbery, R., and McDonnell, A. 2020. "Algorithmic Management and App-Work in the Gig Economy: A Research Agenda for Employment Relations and Hrm," *Human Resource Management Journal* (30:1), pp. 114-132.

Eisenhardt, K. M., and Graebner, M. E. 2007. "Theory Building from Cases: Opportunities and Challenges," *Academy of management journal* (50:1), pp. 25-32.

Eslami, M., Vaccaro, K., Lee, M. K., Elazari Bar On, A., Gilbert, E., and Karahalios, K. 2019. "User Attitudes Towards Algorithmic Opacity and Transparency in Online Reviewing Platforms," *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, pp. 1-14.

Faraj, S., Pachidi, S., and Sayegh, K. 2018. "Working and Organizing in the Age of the Learning Algorithm," *Information and Organization* (28:1), pp. 62-70.

Gerring, J. 2006. *Case Study Research: Principles and Practices*. Cambridge university press.

Gillespie, T. 2014. "The Relevance of Algorithms," *Media technologies: Essays on communication, materiality, and society* (167:2014), p. 167.

Göttel, V. 2021. "Sharing Algorithmic Management Information in the Sharing Economy–Effects on Workers' Intention to Stay with the Organization,").

Griesbach, K., Reich, A., Elliott-Negri, L., and Milkman, R. 2019. "Algorithmic Control in Platform Food Delivery Work," *Socius* (5), p. 2378023119870041.

Gulati, R., and Kletter, D. 2005. "Shrinking Core, Expanding Periphery: The Relational Architecture of High-Performing Organizations," *California Management Review* (47:3), pp. 77-104.

Jarrahi, M. H., Newlands, G., Lee, M. K., Wolf, C. T., Kinder, E., and Sutherland, W. 2021. "Algorithmic Management in a Work Context," *Big Data & Society* (8:2), p. 20539517211020332.

Jarrahi, M. H., and Sutherland, W. 2019. "Algorithmic Management and Algorithmic Competencies: Understanding and Appropriating Algorithms in Gig Work," *International Conference on Information*: Springer, pp. 578-589.

Jarrahi, M. H., Sutherland, W., Nelson, S. B., and Sawyer, S. 2020. "Platformic Management, Boundary Resources for Gig Work, and Worker Autonomy," *Computer supported cooperative work (CSCW)* (29:1), pp. 153-189.

Kellogg, K. C., Valentine, M. A., and Christin, A. 2020. "Algorithms at Work: The New Contested Terrain of Control," *Academy of Management Annals* (14:1), pp. 366-410.

Kinder, E., Jarrahi, M. H., and Sutherland, W. 2019. "Gig Platforms, Tensions, Alliances and Ecosystems: An Actor-Network Perspective," *Proceedings of the ACM on Human-Computer Interaction* (3:CSCW), pp. 1-26.

Kirsch, L. J. 1996. "The Management of Complex Tasks in Organizations: Controlling the Systems Development Process," *Organization science* (7:1), pp. 1-21.

Kirsch, L. J. 2004. "Deploying Common Systems Globally: The Dynamics of Control," *Information systems research* (15:4), pp. 374-395.

Kirsch, L. S. 1997. "Portfolios of Control Modes and Is Project Management," *Information systems research* (8:3), pp. 215-239.

Kozinets, R. V. 2012. "Marketing Netnography: Prom/Ot (Ulgat) Ing a New Research Method," *Methodological Innovations Online* (7:1), pp. 37-45.

Landau, I. D., and Zito, G. 2006. *Digital Control Systems: Design, Identification and Implementation*. Springer.

Lee, M. K., Kusbit, D., Metsky, E., and Dabbish, L. 2015. "Working with Machines: The Impact of Algorithmic and Data-Driven Management on Human Workers," *Proceedings of the 33rd annual ACM conference on human factors in computing systems*, pp. 1603-1612.

Lehdonvirta, V. 2018. "Flexibility in the Gig Economy: Managing Time on Three Online Piecework Platforms," *New Technology, Work and Employment* (33:1), pp. 13-29.

Long, C. P., Burton, R. M., and Cardinal, L. B. 2002. "Three Controls Are Better Than One: A Computational Model of Complex Control Systems," *Computational & Mathematical Organization Theory* (8:3), pp. 197-220.

Loughry, M. L., and Tosi, H. L. 2008. "Performance Implications of Peer Monitoring," *Organization Science* (19:6), pp. 876-890.

Madill, A., Jordan, A., and Shirley, C. 2000. "Objectivity and Reliability in Qualitative Analysis: Realist, Contextualist and Radical Constructionist Epistemologies," *British journal of psychology* (91:1), pp. 1-20.

Möhlmann, M., and Zalmanson, L. 2017. "Hands on the Wheel: Navigating Algorithmic Management and Uber Drivers'," *38th ICIS Proceedings*).

Möhlmann, M., Zalmanson, L., Henfridsson, O., and Gregory, R. 2021. "Algorithmic Management of Work on Online Labor Platforms: When Matching Meets Control," *MIS Quarterly*).

Muldoon, J., and Raekstad, P. 2022. "Algorithmic Domination in the Gig Economy," *European Journal of Political Theory*), p. 14748851221082078.

Neuman, W. L. 2014. "Social Research Methods: Qualitative and Quantitative Approaches." Harlow, UK: Pearson Education Ltd. .

Newlands, G. 2021. "Algorithmic Surveillance in the Gig Economy: The Organization of Work through Lefebvrian Conceived Space," *Organization Studies* (42:5), pp. 719-737.

Niskanen, W. A. 1968. "The Peculiar Economics of Bureaucracy," *The American Economic Review* (58:2), pp. 293-305.

Ouchi, W. G. 1977. "Relationship between Organizational Structure and Organizational Control," *Administrative Science Quarterly* (22), pp. 95-113.

Ouchi, W. G. 1979. "A Conceptual Framework for the Design of Organizational Control Mechanisms," *Management science* (25:9), pp. 833-848.

Ouchi, W. G. 1980. "Markets, Bureaucracies, and Clans," *Administrative science quarterly*), pp. 129-141.

Ouchi, W. G., and Price, R. L. 1978. "Hierarchies, Clans, and Theory Z: A New Perspective on Organization Development," *Organizational Dynamics* (7:2), pp. 25-44.

Pfeffer, J., and Leblebici, H. 1977. "Information Technology and Organizational Structure," *Pacific Sociological Review* (20:2), pp. 241-261.

Pignot, E. 2021. "Who Is Pulling the Strings in the Platform Economy? Accounting for the Dark and Unexpected Sides of Algorithmic Control," *Organization* (28:1), pp. 208-235.

Pregenzer, M., Remus, U., and Wiener, M. 2020. "When Market Meets Bureaucracy: Toward an Integrative Framework of Technology-Mediated Control in the Gig Economy," *ECIS*.

Pregenzer, M., Remus, U., and Wiener, M. 2021a. "Algorithms in the Driver's Seat: Explaining Workers'reactions to Algorithmic Control,").

Pregenzer, M., Wieser, F., Santiago Walser, R., and Remus, U. 2021b. "Obscure Oversight: Opacity Drives Sensemaking and Resistance Behavior in Algorithmic Management,").

Rahman, H. A. 2019. *Invisible Cages: Algorithmic Evaluations in Online Labor Markets*. Stanford University.

Rosenblat, A., and Stark, L. 2016. "Algorithmic Labor and Information Asymmetries: A Case Study of Uber's Drivers," *International journal of communication* (10), p. 27.

Roth, N. L., Sitkin, S., and House, A. 1994. "Stigma as a Determinant of Legalization," *The legalistic organization* (137:168), pp. 1158-1170.

Saghai, Y. 2013. "Salvaging the Concept of Nudge," *Journal of medical ethics* (39:8), pp. 487-493.

Scheiber, N. 2017. "How Uber Uses Psychological Tricks to Push Its Drivers' Buttons," *The New York Times* (2).

Shapiro, A. 2018. "Between Autonomy and Control: Strategies of Arbitrage in the "on-Demand" Economy," *New Media & Society* (20:8), pp. 2954-2971.

Sitkin, S. B., Long, C. P., and Cardinal, L. B. 2020. "Assessing the Control Literature: Looking Back and Looking Forward," *Annual review of organizational psychology and organizational behavior* (7), pp. 339-368.

Standing, G. 2021. *The Corruption of Capitalism: Why Rentiers Thrive and Work Does Not Pay*. Biteback Publishing.

Stohl, C., Stohl, M., and Leonardi, P. M. 2016. "Digital Age| Managing Opacity: Information Visibility and the Paradox of Transparency in the Digital Age," *International Journal of Communication* (10), p. 15.

Sunstein, C. R. 2014. "Nudging: A Very Short Guide," *Journal of Consumer Policy* (37:4), pp. 583-588.

Tan, Z. M., Aggarwal, N., Cowls, J., Morley, J., Taddeo, M., and Floridi, L. 2021. "The Ethical Debate About the Gig Economy: A Review and Critical Analysis," *Technology in Society* (65), p. 101594.

Tassinari, A., and Maccarrone, V. 2020. "Riders on the Storm: Workplace Solidarity among Gig Economy Couriers in Italy and the Uk," *Work, Employment and Society* (34:1), pp. 35-54.

Thaler, R. H., Sunstein, C. R., and Balz, J. P. 2014. "Choice Architecture," *The behavioral foundations of public policy*).

Tilson, D., and Lyytinen, K. 2021. "Digitally Induced Industry Paradoxes: Disruptive Innovations of Taxiwork and Music Streaming Beyond Organizational Boundaries," in *Interdisciplinary Dialogues on Organizational Paradox: Learning from Belief and Science, Part A*. Emerald Publishing Limited.

Vallas, S., and Schor, J. B. 2020. "What Do Platforms Do? Understanding the Gig Economy," *Annual Review of Sociology* (46), pp. 273-294.

Weick, K. E., Sutcliffe, K. M., and Obstfeld, D. 2005. "Organizing and the Process of Sensemaking," *Organization science* (16:4), pp. 409-421.

Wiener, M., Cram, W., and Benlian, A. 2021. "Algorithmic Control and Gig Workers: A Legitimacy Perspective of Uber Drivers," *European Journal of Information Systems*), pp. 1-23.

Wiener, M., Mähring, M., Remus, U., and Saunders, C. 2016. "Control Configuration and Control Enactment in Information Systems Projects: Review and Expanded Theoretical Framework," *Mis Quarterly* (40:3), pp. 741-774.

Wiener, M., Mähring, M., Remus, U., Saunders, C., and Cram, W. A. 2019. "Moving Is Project Control Research into the Digital Era: The "Why" of Control and the Concept of Control Purpose," *Information Systems Research* (30:4), pp. 1387-1401.

Wong, S. I. 2022. "Job Crafting Can Help Digital Gig Workers Build Resilience," in: *Harvard Business Review*. https://hbr.org/2022/01/job-crafting-can-help-digital-gig-workers-build-resilience.

Wood, A. J., Graham, M., Lehdonvirta, V., and Hjorth, I. 2019. "Good Gig, Bad Gig: Autonomy and Algorithmic Control in the Global Gig Economy," *Work, Employment and Society* (33:1), pp. 56-75.

Yin, R. K. 2009. *Case Study Research: Design and Methods*. sage.

Zhou, Q., Allen, B., Gretz, R. T., and Houston, M. B. 2021. "Platform Exploitation: When Service Agents Defect with Customers from Online Service Platforms," *Journal of Marketing*), p. 00222429211001311.

Zuboff, S. 2019. "Surveillance Capitalism and the Challenge of Collective Action," *New labor forum*: SAGE Publications Sage CA: Los Angeles, CA, pp. 10-29.