Technical University Dortmund

Essays on Platform Work: Freelancers on Digital Labor Platforms

Doctoral Dissertation

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by

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Preface

Die vorliegende Doktorarbeit ist im Rahmen meiner Tätigkeit als wissenschaftliche Mitarbeiterin an der Professur Digitale Transformation der Technischen Universität Dortmund entstanden. An dieser Stelle möchte ich mich bei den vielen Beteiligten bedanken, die mich auf dieser Reise begleitet, angeleitet, unterstützt und ertragen haben.

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Dortmund, Juli 2023 Lisa Gussek

Abstract

Motivation: We are experiencing a radical change in people's work and professional lives, influenced by technologies such as digital platforms. Thus, more and more people are working independently as online freelancers on digital labor platforms and the number of different projects mediated and coordinated on these online markets is increasing. We argue that the current understanding of platform work is incomplete. First, many different perspectives exist in academic research on the defining characteristics of digital platform work and its multiple forms. Second, workers struggle to succeed on digital labor platforms and the corresponding challenges and success factors are not yet well understood. Third, it is still unclear whether, and especially how, platform work can be used as a long-term career option. Fourth, there is an unclear knowledge about the specifics of IT work on digital labor platforms.

Research Approach: In order to fill the research gaps described above, a mixed-method research strategy was used in this thesis. First, we collected and linked previous research findings to capture the status quo and derive avenues for future research. Based on this, we conducted four qualitative and quantitative empirical studies. First, we combined a latent-dirichlet allocation analysis of almost 3,000 forum posts from IT freelancers with an additional qualitative analysis. This was followed by two qualitative exploratory analyses using a total of 35 interviews with freelancers and clients on digital labor platforms and secondary data in the form of the personal online profiles and archival documents downloaded from the platforms. Finally, we analyzed a dataset of about 7,000 IT freelancer profiles using a negative binomial regression.

Results: This thesis provides several empirical findings. First, we develop a framework on digital labor platform research. By synthesizing findings from the literature, we develop a classification of forms of platform work and identify research gaps. Second, we synthesize and extend the challenges and identify discussion topics of online IT freelancers. We also illustrate specifics of IT freelancing. Third, we systematize the advancement, decline, and exit dynamics within a career model of online freelancing. We also define four underlying factors that alter freelancers' relationship with the platform. The probability of exit and the dependence and benefit of the platform change over time. Fourth, we illustrate the positive relationship between the use of signals and the success of IT freelancers. We develop a new signaling typology on digital labor platforms that includes three types of signals: activating, pointing, and supporting signals. Finally, we identify concrete IT-specific success factors.

Contribution: This work makes several contributions to theory and practice. We contribute to research on digital platforms by characterizing the forms of platform work, structuring and adding new aspects to the challenges of online freelancing, identifying success factors, and developing a long-term and dynamic freelance career model. We also contribute to the platform literature that addresses specific platform mechanisms by explaining lock-in effects and switching costs related to platform power. We also contribute to the career literature by illustrating that the careers of online freelancers do not fit traditional career theories or perceptions of boundaryless or protean careers. We contribute to signaling theory by proposing a typology of signals and analyzing the signaling environment as an under-researched aspect. Moreover, we provide empirical evidence on the specifics of IT work on digital labor platforms. We also contribute to research dealing with skill obsolescence or IT teams. Finally, our results on the platform exit dynamics contribute to research on IT turnover. For practice, our results provide insights for online freelancers, organizations or individuals as clients and the platform owners.

Limitations: This work is subject to several limitations that must be considered. First, the two qualitative studies are sensitive to researcher bias and subjectivity because of individual interpretations of the data. We used constant comparison and data triangulation to address this limitation. Second, limitations exist with respect to quantitative methods, particularly because we had to limit the analyses to a specific number of factors examined due to the datasets used. Other overarching limitations relate to the cases and data we selected, as much of our findings are based on only one case of a digital labor platform and on the perspective of workers as online freelancers.

Future Research: From this thesis, five starting points for future research emerge. First, it would be worthwhile to further investigate the navigation of negative reviews on digital labor platforms as online freelancers are highly dependent on their reputation. Second, we believe that digital labor platforms need to be better understood as incubators for entrepreneurship, as the exit strategies we identified included starting an own business. Third, a more detailed study of teams and groups on digital labor platforms would complement our work, as we have focused our studies mainly on the individual perspective. In addition, skill obsolescence on digital labor platforms would need to be studied more extensively. Finally, the client perspective on freelancing jobs is an important topic for future research to improve the overall interactions of the parties on digital labor platforms.

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List of Abbreviations

B	Benefit
BISE	Business & Information Systems Engineering Journal
C	Challenge
CON	Conference
DLM	Digital Labor Marketplaces
DV	Dependent Variable
E	Econometrics
ECIS	European Conference on Information Systems
EM	Electronic Markets Journal
fsQCA	Fuzzy-set Qualitative Comparative Analysis
GT	Grounded Theory
ICIS	International Conference on Information Systems
IS	Information Systems
ISJ	Information Systems Journal
IT	Information Technology
JNL	Journal
LDA	Latent Dirichlet Allocation
LR	Literature Review
Max	Maximum
Min	Minimum
MTurk	Amazon Mechanical Turk
NDA	Non-Disclosure Agreements
P	Publication
RQ	Research Question
Stdv	Standard Deviation
TM	Topic Modeling
VB	Varational Bayes
VHB	German Academic Association for Business Research
VIF	Variance Inflation Factors
WI	Internationale Tagung Wirtschaftsinformatik

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Part A

1 Introduction

"[…] the freelance revolution is thriving as part of a world-wide "rethink" of work. Although more than 2000 years old, freelancing has been made new by technology that enables a writer, photographer, software programmer, or AI specialist to live in Shenzhen while working for a company in Rome or agency in Buenos Aires." (Younger 2021)

This quote from the Forbes magazine illustrates the radical change in people's work and careers, influenced by technology like digital platforms. This thesis is about understanding how people work on digital platforms. In particular, we analyze the challenges, career dynamics, and success factors of online freelancers and thus help companies, platform owners, and workers to benefit from digital labor platforms.

1.1 Motivation

Globalization, rapid technological change in the form of digital platforms, algorithms, and artificial intelligence are increasingly accelerating labor markets and motivating companies to make greater use of various forms of online outsourcing, in which tasks are outsourced to qualified third parties via the Internet. In particular, the number of diverse projects and tasks mediated and coordinated through digital labor platforms is increasing, and alternative forms of work are becoming more popular (Jabagi et al. 2019; Kässi and Lehdonvirta 2018). Online freelancers play an important role especially in professions such as software engineering, digital marketing, design, image editing, writing, and translation (Blaising et al. 2021). As an additional, fast-growing labor market, the gig economy has thereby changed the way people work, caused a rethinking of work, and academic research in this area is growing steadily (Jabagi et al. 2019; Kuhn 2016). In times of great economic uncertainty, companies are also increasingly facing a talent shortage and need to find solutions to remain competitive. One solution may be the growing global pool of skilled online freelancers who are booked through digital labor platforms for projects or skills gaps (Upwork 2023). This is because online work via digital platforms is experiencing tremendous growth. Self-employed workers, including freelancers, temporary workers, and gig workers already accounted for 20-30% of the workforce in the US and EU-15 countries in 2016. This represents a total of 162 million people (McKinsey & Company 2016). Currently, over 70.4 million people are freelancers. By 2025, it is estimated that there will be 79.6 million and by 2028, it is estimated that there will be a full 90.1 million people working within the gig economy (Tsekov 2023).

In this thesis, we focus on location-independent online work, also called freelancing or crowdwork (Howcroft and Bergvall-Kåreborn 2019; Idowu and Elbanna 2022). More specifically, we study macro-crowdwork in digital labor markets such as Upwork, Fiverr, or Freelancer.com. These digital platform markets enable online transactions and matching between freelancers and companies as clients (Rai et al. 2019). To differentiate online freelancing from other forms of gig work, it can be noted that they deal with single, knowledge-intensive tasks (e.g., platforms such as Upwork). Moreover, they do not rely on collaboration and crowd intelligence in the form of competitions (e.g., platforms such as Topcoder) or complete micro-tasks (e.g., platforms such as Mechanical Turk), nor do they work offline in the form of gig work (e.g., platforms such as Uber) (Holthaus and Stock 2017).

The need to take a closer look at this form of work stems not only from observing its tremendous growth, but also from the fact that it is fundamentally different from traditional forms of work, as illustrated by previous research examining the benefits and challenges of online freelancing. Unlike traditional employment, online freelancers are self-employed and work outside of an organizational setting, which leads to work autonomy and time flexibility (Deng et al. 2016a; Gol et al. 2018), but also implies a great deal of personal responsibility for freelancers (Deng et al. 2016b; Durward et al. 2020). Due to global matching on digital labor platforms, there is high competition and heterogeneity of clients and jobs, leading to intense competition but also a large global supply of work opportunities (Bellesia et al. 2019; Bunjak et al. 2021). Moreover, the work is temporary and purely digital (Ashford et al. 2018; Deng et al. 2016a). This leads to limited and fully digital communication channels with existing information asymmetries (Claussen et al. 2018; Gegenhuber et al. 2020; Wong et al. 2021). Finally, freelancers are not controlled by a traditional supervisor but by algorithms, leading to dependence on feedback and evaluation systems (Duggan et al. 2020; Möhlmann et al. 2021). Online labor marketplaces are often associated with precarity and unfair working conditions in this regard. Digital platforms often exploit their position of power and online freelancers are treated unfairly or are exploited (Fieseler et al. 2019). These conditions underscore the importance of looking at online labor marketplaces and examining different aspects in more detail to shed light on the positive as well as the negative sides of this form of work and identify success strategies that address both sides.

Only then can online freelancers perceive and assess this new way of working as a promising long-term career option. People's work, career, and success expectations have changed fundamentally in recent years (Arthur and Rousseau 1996; Padavic 2005; Sweet and Meiksins 2013).

In particular, post-Covid, the normality of remote work has reinforced the benefits of the freelance economy (Mottola 2023). As a result, people's career assumptions have also changed completely (Alpar and Osterbrink 2020; Guan et al. 2020; Sweet and Meiksins 2013). The concept of career has been studied primarily within a fixed organizational framework structured in offline labor markets. However, the importance of working in digital labor markets is growing tremendously as described (Kässi and Lehdonvirta 2018). While previous research examines the conditions and challenges of this form of work, it does not focus on the entire career (Deng et al. 2016b; Durward et al. 2020; Kittur et al. 2013). However, a growing number of workers are pursuing online freelancing careers and adopting freelancing as a full-time career apart from traditional forms of employment (Idowu and Elbanna 2022).

For the discipline of information systems (IS), the issue of platform work is particularly relevant, as a significant percentage of freelance work falls into the area of information technology (IT). In particular, the labor platform Upwork has seen an increase in qualified freelancers, e.g., in computer programming and IT (Upwork 2021a). Therefore, in this thesis, we also specifically examine the field of IT freelancing on digital labor platforms, which includes technology and software development (app development, website design, and software testing) (Idowu and Elbanna 2022). Due to the rapid pace of digitization and the increasing use of technology in companies, IT professionals are becoming increasingly indispensable in almost all industries (Dinger et al. 2015). This leads to a high demand for IT professionals in various fields (Goles et al. 2009), which faces chronic skill shortages, high turnover rates in IT, and a growing talent problem (Apfel et al. 2020; Fuller et al. 2020; Wiesche et al. 2019). For this reason, the demand for IT professionals is higher than the supply. In this regard, digital labor platforms offer new opportunities as a new source of skilled digital labor for IT jobs (Fuller et al. 2020). However, when IT jobs are performed by freelancers on digital labor platforms, special aspects need to be considered, the implications of which remain to be analyzed in research. IT freelancers differ from other online freelancers in two aspects. First, IT work requires a high level of expertise that is constantly evolving. However, unlike in fixed organizations, online freelancers are responsible for the necessary continuing training and learning (Ang et al. 2015; Zhang et al. 2012). Second, IT projects often require a certain level of collaboration to be completed successfully. This is not the case for other freelance activities such as simple design tasks, translations, or image editing (Kudaravalli et al. 2017).

The described new phenomenon of platform work also especially in the IT field is becoming increasingly relevant for research. However, our understanding of this new form of work is still

in its early stages, which raises many open questions for research. Due to the increasing relevance and growth of work on online platforms, the special circumstances of this form of work compared to traditional work, and especially the specifics of IT work in this context, which is steadily becoming an increasingly important area of work, we address four distinct research questions that will guide this thesis.

1.2 Research Questions

The overall goal of this thesis is to improve our understanding of working on digital platforms, potential challenges and success factors, and career paths of online freelancers. Despite the increasing importance of platform work in practice, there are some unresolved issues in research regarding freelancing on digital labor platforms. This thesis combines literature on digital labor platforms as well as qualitative and quantitative data and different methodologies. We formulated four research questions, which are answered by the five embedded publications in Part B, which we describe in more detailed in the following.

In order to better understand the gig economy in all its aspects and to define the form of work as well as to differentiate between its forms, the first research question RQ1 will be answered. To answer this question, in this thesis we conduct a structured literature review in the IS and management literature and organize our findings around the concept of gig economy in relation to gig workers, gig work and digital work platforms, and to this end we draw some interesting insights. We examine the characteristics of and motivators for gig workers, the characteristics of gig work itself, the digital platforms that mediate gig work, and the structure of the gig economy as a framework. Answering this first research question also provides the foundation for the empirical studies of this thesis as we gain an overview of the research field and existing research gaps.

RQ1: *What different aspects of the gig economy have been studied in IS and management research and how are they interconnected?*

In order to further specify the characteristics of freelancing, to create the basis for the development of suitable strategies for success on digital labor platforms, and to investigate the specifics of IT work in this area, the second research question RQ2 is answered in this thesis. Due to the special circumstances of this form of work compared to traditional work and especially the specifics of IT work in this context, which is becoming an increasingly important field of work, it is of great importance to address this research gap. To answer this research question, we

examine online forum posts by IT freelancers using Latent Dirichlet Allocation (LDA) to identify relevant discussion topics. The identified topics will then be qualitatively analyzed and explained, taking into account the original posts, and combined into an aggregated model of IT freelancing on digital labor platforms. The answer to this second research question also forms the basis for further detailed empirical analysis of the individual characteristics and solution strategies of the challenges to support the success of freelancers on digital labor platforms.

RQ2: *What are the challenges of IT freelancers on digital labor platforms, how can they be structured and how are they interrelated?*

To develop a career model of online freelancing and examine the long-term career dynamics on digital labor platforms, the third research question RQ3 is addressed in this thesis. In the new complex work environment on digital platforms, freelancers are required to do more than what was previously required for success in many organizations, as there are fewer known career paths or patterns for lifelong careers on digital labor platforms. Therefore, it is important to shed light on how the long-term and dynamic career paths of freelancers evolve and how success develops over time. To answer the third research question, we conduct an exploratory analysis of freelancer careers. Based on 35 semi-structured interviews with freelancers from the IT sector, we develop a freelancer career model and systematize the advancement, decline, and exit dynamics.

RQ3: *How can long-term, dynamic career paths of freelancers be designed on digital labor platforms?*

In order to understand the success factors in more detail and simultaneously elaborate the special characteristics of IT work on digital labor platforms, this thesis finally answers the fourth research question RQ4. Thus, the signaling theory will be examined in the new context of digital labor platforms and a new typology of signals will be developed. To answer this research question, a quantitative analysis of 7,166 IT freelancer profiles from the freelance platform Upwork is used to investigate the relationship between the use of signals and the career success of IT freelancers. Specifically, we analyze how three types of signals influence the career success of IT freelancers: activating signals, pointing signals, and supporting signals.

RQ4: *How do different signals on digital labor platforms affect the career success of IT freelancers?*

1.3 Structure

This cumulative thesis consists of three parts. Part A describes the motivation, the research questions, and the structure of the thesis (Section 1). Afterward, the state of research and the conceptual background of this thesis are explained, i.e., the concepts of digital labor platforms, IT freelancing, and careers in the gig economy (Section 2). Finally, the research approach of this thesis is described by outlining the research strategy and research methods (Section 3). Part B includes the five peer-reviewed publications published as part of this thesis (Section 4-8). Finally, part C summarizes the findings from the publications presented in Part B (Section 9), discusses them (Section 10), provides implications for theory and practice (Section 11), outlines limitations of this thesis (Section 12) as well as avenues for future research (Section 13). A conclusion finishes the thesis. The structure of the thesis is summarized in Figure 1.

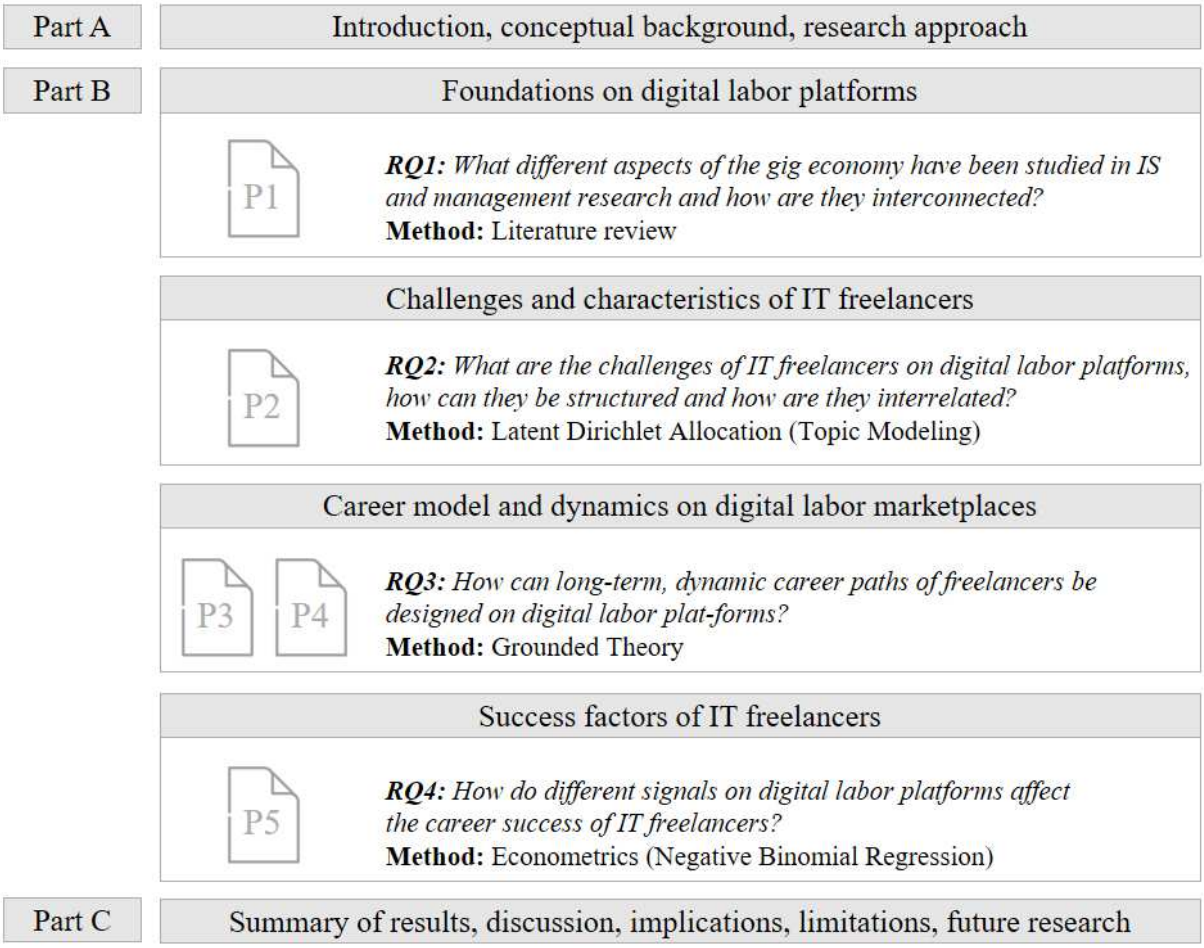

Figure 1. Structure of the Thesis

The following Table 1 gives an overview of the five embedded publications in this thesis. In the next paragraphs, we outline the research problem, the methodological approach, as well as the main contribution of each publication (P).

P1: The Gig Economy: Workers, Work and Platform Perspective (Gussek and Wiesche 2022a). In this publication, we collect and connect previous research findings that serve as a basis for future discussions. Starting with a collection of 139 publications on the gig economy, gig work and related terms, we identify some trends in the literature and the underlying research interests. In particular, we organize the literature around the concept of the gig economy in terms of gig workers, gig work, and digital platforms, and draw several interesting insights from the literature. Finally, we identify important gaps in the existing literature on working in the gig economy and provide guidance for future research.

P2: Challenges of IT Freelancers on Digital Labor Platforms: A Topic Model Approach (Gussek et al. 2023). In this study, we investigate challenges of IT freelancers working on digital labor platforms. Through a Latent Dirichlet Allocation analysis of 2,804 forum posts with over 20,000 comments from IT freelancers and additional qualitative analysis, we assign themes to each identified topic, cluster them into aggregated dimensions and illustrate the interrelationships in a model of IT freelancing. Thus, we examine the challenges of IT freelancers and synthesize them. We extend the challenges of online freelancing already outlined in the literature and identify four IT-specific challenges for IT freelancers.

P3: Understanding the Careers of IT Freelancers on Digital Labor Platforms (Gussek and Wiesche 2022b). In this publication, we aim to understand how the careers of IT freelancers evolve. IT work performed on digital labor platforms is not fully understood. Especially the collaborative nature of IT work and the high, rapidly changing skill level required, affects the career development of IT freelancers. Therefore, we conduct an exploratory analysis of twelve IT freelancers on a digital labor platform. We develop an IT freelancing career process model, outline advancement and decline mechanisms, and offer different exit options from the digital labor platform. We also illustrate the role of IT freelancer teams.

P4: Understanding the Careers of Freelancers in Digital Labor Marketplaces: The Case of IT Work (Gussek and Wiesche 2024). In this study, we examine the careers in digital labor marketplaces, because they differ from careers in offline labor markets due to volatility, global matching and platform mediation, the digital and temporary nature of work, and algorithmic management as particular platform working conditions. Therefore, to understand how working conditions in digital labor marketplaces influence the dynamic career paths of freelancers and what effects result from this interaction over the long-term career, we conduct an exploratory analysis using 35 interviews with freelancers and clients on digital labor platforms. We thus

contribute to the body of knowledge on alternative forms of work in digital labor marketplaces by developing a career model and outlining the dynamics of advancement, decline, and exit within platform careers. We also illustrate long-term career dynamics in terms of changes in platform benefit for freelancers, their dependency on the platform, and lock-in effects, as well as exit probabilities.

P5: IT Professionals in the Gig Economy: The Success of IT Freelancers on Digital Labor Platforms (Gussek and Wiesche 2023). In this publication, we investigate the success of IT freelancers on digital labor platforms. Drawing on signaling theory, a dataset of 7,166 IT freelancers is used to examine how activating, pointing, and supporting signals lead to success. Analysis was carried out using negative binomial regression. The results indicate that the three signaling types positively influence the objective career success of IT freelancers. This paper contributes to the literature by testing signaling theory in the new context of digital labor platforms, investigating IT specifics, and proposing support as a new type of signal for IT professionals on digital labor platforms.

No.	Authors	Title	Outlet	Type
P1	Gussek, Wiesche	The Gig Economy: Workers, Work and Platform Perspective	WI 2022	CON (VHB: C)
P2	Gussek, Grabbe, Wiesche	Challenges of IT Freelancers on Digital Labor Platforms: A Topic Model Approach	EM *(published 2023)*	JNL (VHB: B)
P3	Gussek, Wiesche	Understanding the Careers of IT Freelancers on Digital Labor Platforms	ECIS 2022	CON (VHB: B)
P4	Gussek, Wiesche	Understanding the Careers of Freelancers in Digital Labor Marketplaces: The Case of IT Work	ISJ *(under review, fourth round)*	JNL (VHB: A)
P5	Gussek, Wiesche	IT Professionals in the Gig Economy: The Success of IT Freelancers on Digital Labor Platforms	BISE *(published 2023)*	JNL (VHB: B)

Legend:

Outlet:
WI: Internationale Tagung Wirtschaftsinformatik
ECIS: European Conference on Information Systems
EM: Electronic Markets Journal
ISJ: Information Systems Journal
BISE: Business & Information Systems Engineering Journal

Type:
CON: Conference
JNL: Journal
VHB: German Academic Association for Business Research

Table 1. Overview on Embedded Publications

2 Conceptual Background

In this section, we shed light on the theoretical concepts we build on in this thesis. We first describe the context of the gig economy and digital labor platforms and define the different forms of platform work. We then illustrate the specifics of working on platforms by presenting the working conditions and clustering them into challenges and benefits. Since we are dealing with freelancer careers, we will describe relevant theories for this thesis and present previous literature on careers on digital labor platforms. Finally, we define IT freelancing as consisting of IT work and freelancing characteristics.

More and more consumers are paying for temporary access and sharing of products and services rather than buying or owning them (Matzler et al. 2020). The sharing economy has been studied from many perspectives, including customer engagement and the capabilities of technological platforms. However, for this thesis, labor in the sharing economy is of interest, i.e., on platforms such as Uber or Upwork. In this context, labor is considered in the literature as a kind of asset exchanged in the sharing economy (Chai and Scully 2019; Martin 2016).

2.1 Delimitation of the Forms of Platform Work

Multisided platforms enable direct interaction between two or more groups of customers or participants (Hagiu and Wright 2015). There are two groups of users on digital labor platforms the clients and the workers, between whom the digital platform mediates, see Figure 2 (Kost et al. 2020).

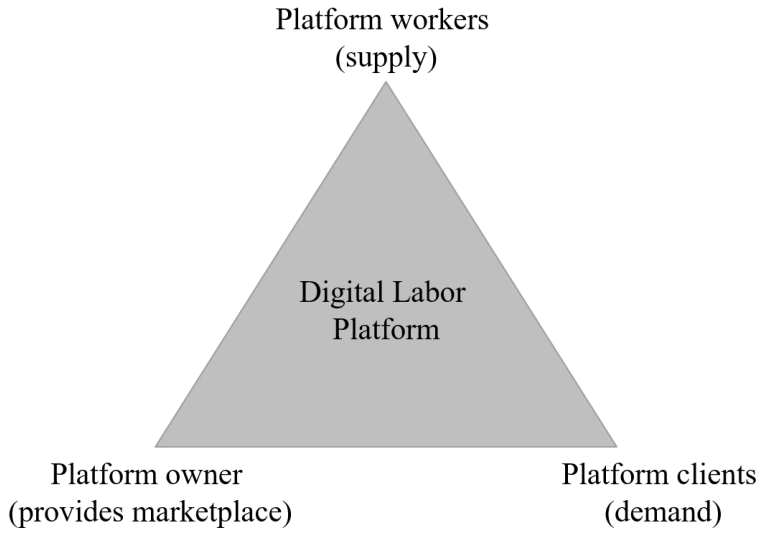

Figure 2. Three-sided Digital Labor Platforms

These online labor markets are defined as digital matching platforms that facilitate labor allocation in the global economy (Agrawal et al. 2015). These markets provide the digital infrastructure for payment, communication, search, feedback, and ranking of clients and freelancers, and mediate interaction between them (Rai et al. 2019).

Within the gig economy there are different platforms (Figure 4), which can be assigned to different forms of non-traditional (platform) work (Figure 3). In general, non-traditional work can be location-dependent (offline) or location-independent (online) (Duggan et al. 2020; Huang et al. 2020).

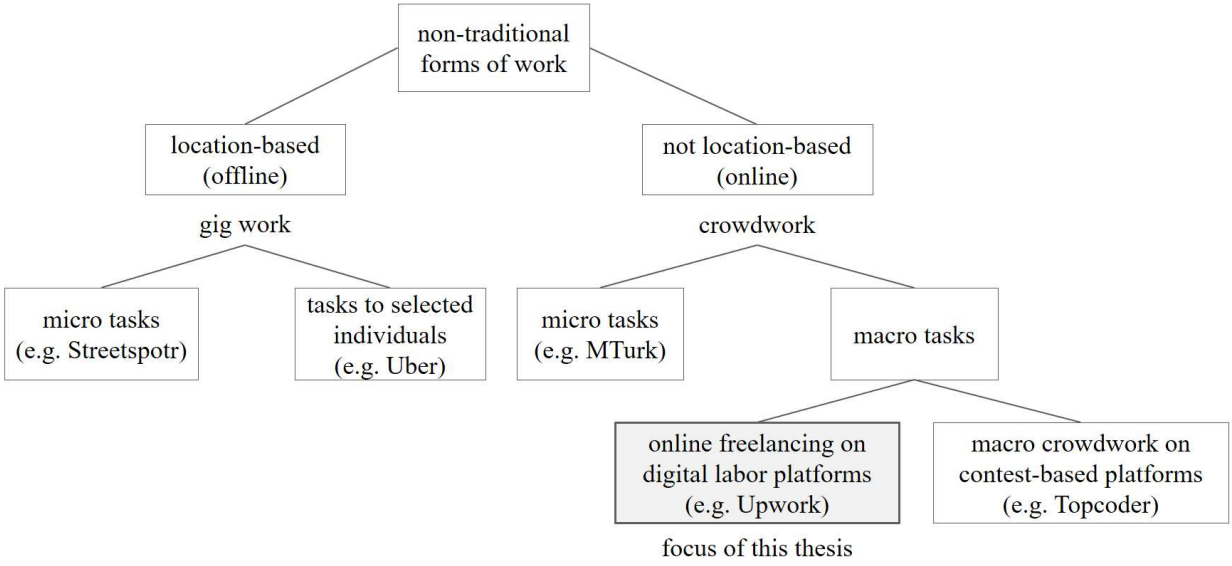

Figure 3. Non-traditional Forms of Work

Location-dependent work is also referred to as classic gig work and consists of "real-world" tasks (Stewart and Stanford 2017). It can consist of micro-tasks (e.g., on Streetspotr) that are solved by a large set of individuals or tasks assigned to selected individuals (e.g., on Uber) (Kaine and Josserand 2019).

Location-independent work is also referred to as crowdwork and is defined as work that is paid and whose execution is mediated by digital platforms (Howcroft and Bergvall-Kåreborn 2019; Idowu and Elbanna 2022). Crowdwork consists of micro or macro tasks (Kalleberg and Dunn 2016). Microtasks (e.g., on Amazon Mechanical Turk) are small, trivial, and largely repetitive tasks that can be completed in a short period of time (Heer and Bostock 2010; Holthaus and Stock 2017). In contrast, macro tasks involve considerable creativity and knowledge, usually taking a longer period of time (Idowu and Elbanna 2022; Majchrzak and Malhotra 2013; Wagner et al. 2021). In addition, a subtype of macro-crowdwork is competition-based platforms

(e.g., Topcoder) where workers can participate in competitions or "contests" (Jian et al. 2019). In contrast to competition-based crowdwork, this paper focuses on macro-crowdwork in digital labor markets (also called online labor markets) such as Upwork, Fiverr, or Freelancer.com. These enable online transactions and matching between freelancers offering their services and clients purchasing those services through digital labor platforms (Rai et al. 2019). They deal with single, knowledge-intensive tasks (such as IT tasks) and do not rely on collaboration and crowd intelligence in the form of competitions (Holthaus and Stock 2017).

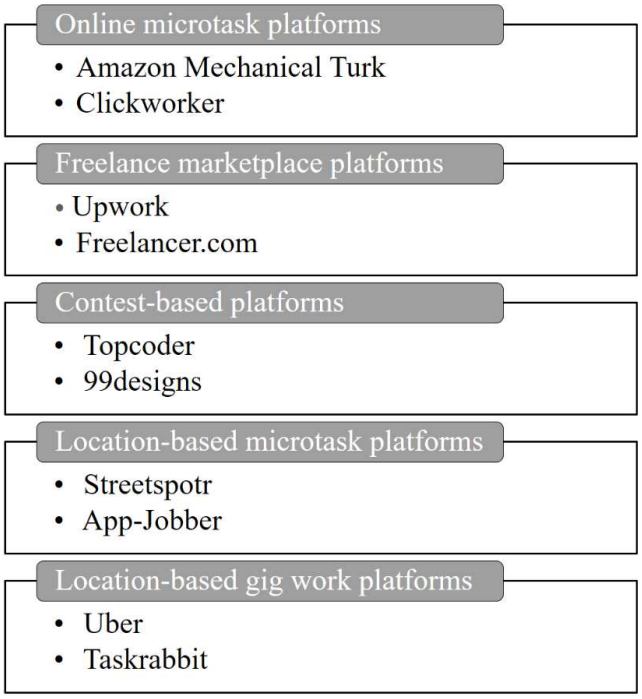

Figure 4. Platforms in the Gig Economy

Overall, we considered different **platform types** in the gig economy and, based on this, identified two defining characteristics that are common to all platforms in the gig economy:

(i) digital marketplace for mediating work between independent workers and clients

(ii) management through algorithmic control and reputation systems

On the different forms of platform work described, there is more and more research using a wide range of different definitions of work in the gig economy. In Table 2 we have mapped some definitions.

Definition	Reference
"Externalized paid work organized around 'gigs' (i.e., projects or tasks) that workers engage in without a formal appointment within a particular organization."	Caza et al. 2022
"Short-term independent freelance workers who contract with organizations or sell directly to the market."	Ashford et al. 2018
"…they are hired under 'flexible' arrangements, as 'independent contractors' or 'consultants,' working only to complete a particular task or for a defined time."	Friedman 2014
"A type of short-term contract work that links self-employed workers directly with clients via a technology platform."	Spreitzer et al. 2017
"Gig workers typically face irregular work schedules, provide capital equipment used in their work, provide their own place of work, are compensated on a piecework basis, and are organized around a web-based platform."	Stewart and Stanford 2017
"To be considered a gig worker, three primary characteristics (project-based compensation, temporary work, flexibility) must be present to some degree."	Watson et al. 2021
"…electronically mediated employment arrangements in which individuals find short-term tasks or projects via websites or mobile apps that connect them to clients and process payment."	Kuhn and Galloway 2019
"…freelance work generally connotes short-term employment relationships with a number of different clients and compensation on a project basis…"	Kuhn 2016

Table 2. Example Definitions of Platform Work from the Literature

Overall, we have considered various definitions of **platform work** and, based on these, have highlighted three defining characteristics that are common to all forms of platform work:

(i) self-employment and independence

(ii) work in the form of pre-defined, temporary tasks

(iii) digital organization of the work through digital platforms

In the following, we describe the more detailed working conditions of freelancing on digital labor platforms, as this specific form of platform work is the focus of this thesis.

2.2 Working Conditions of Online Freelancing on Digital Labor Platforms

Along four main clusters, we have illustrated below in Table 3 the particular working conditions of freelancing work on digital labor platforms, defining each condition as a challenge (C) or a benefit (B). The clusters illustrate the special conditions of online freelancing compared to traditional work in organizations and the work of offline freelancers.

Cluster	Working Conditions	Illustrative References
false self-employment and volatility	work independently and high personal responsibility (C)	Caza et al. 2022; Kost et al. 2020; Mayer et al. 2020
	work outside of an organizational environment (C)	Ihl et al. 2020; Kittur et al. 2013; Petriglieri et al. 2019
	high cost and time expenditure (C)	Wood et al. 2019; Zheng et al. 2015
	precarity and financial instability (C)	Ashford et al. 2018; Durward et al. 2016a, 2020
	autonomy (B)	Deng et al. 2016b; Deng and Joshi 2016; Durward et al. 2020
	flexibility (B)	Bellesia et al. 2019; Huang et al. 2020; Wood et al. 2019
global matching and platform mediation	matching of clients & workers through digital platforms (B)	Bellesia et al. 2019; Bunjak et al. 2021; Gu and Zhu 2021
	global competition (C)	Bucher et al. 2019; Kanat et al. 2018; Strunk et al. 2022
	wide range and heterogeneity of clients and jobs (B/C)	Deng and Joshi 2016; Mayer et al. 2020; Seifried et al. 2020
	market transparency (B)	Claussen et al. 2018; Seifried et al. 2020
digital and temporary work	digitally mediated work (B/C)	Deng et al. 2016b; Gol et al. 2019b; Irani and Silberman 2013
	temporary contract work (C)	Brawley and Pury 2016; Friedman 2014; Gol et al. 2019b
	transience of work (C)	Ashford et al. 2018; Bucher et al. 2019; Strunk et al. 2022
	social isolation and emotional tensions (C)	Petriglieri et al. 2019; Silberman et al. 2010; Wood et al. 2019
	different motivations and rewards (B/C)	Chandler and Kapelner 2013; Paolacci and Chandler 2014; Rogstadius et al. 2011
algorithmic management	algorithmic control (C)	Duggan et al. 2020; Rahman 2021; Wood et al. 2019
	reputation system (B/C)	Idowu and Elbanna 2022; Tóth et al. 2022; Yoganarasimhan 2013

Table 3. Overview of the Working Conditions on Digital Labor Platforms

First, the cluster of false self-employment and volatility illustrates the special conditions of platform work compared to traditional forms of employment in organizations. Freelancers work independently outside organizational structures through digital platforms (Burke and Cowling 2020; Kost et al. 2020). Therefore, they do not receive organizational (social) support (Idowu and Elbanna 2022; Ihl et al. 2020; Kost et al. 2020), are not supported by an organizational environment (Petriglieri et al. 2019), and do not benefit from managerial oversight and direct rewards or punishments for their work performance as in traditional organizations (Kittur et al. 2013). In addition, organizations play an important role in shaping careers in the traditional workplace, as they are responsible for promotions, training, and setting career development criteria (Rande et al. 2015). Therefore, this lack of support for online freelancers poses challenges. Moreover, platform work is often costly and time-consuming (Zheng et al. 2015), and workers often work at unsocial and irregular hours, which can lead to sleep disruption and exhaustion (Wood et al. 2019). In addition, platform work is characterized by precarity and financial instability (Ashford et al. 2018; Durward et al. 2016b; Petriglieri et al. 2019). There is no job security, and often, wages are low (Kittur et al. 2013; Wood et al. 2019). In addition, the independence of online freelancers also leads to benefits, such as increased autonomy (Deng et al. 2016a; Deng et al. 2016b; Durward et al. 2016b, 2020) and flexibility (Bellesia et al. 2019; Huang et al. 2020). This also has an impact on workers' careers, as it gives them greater autonomy and freedom in shaping their careers.

Second, digital platforms enable global matching of clients and freelancers by mediating work online, which provides online freelancers with many job opportunities worldwide (Bunjak et al. 2021; Gu and Zhu 2021). Digital platforms act as providers of technological functions and online environments (Bellesia et al. 2019). In addition, however, due to global connections on digital platforms, there is enormous competition among freelancers for jobs, which can be challenging (Kanat et al. 2018; Kittur et al. 2013; Strunk et al. 2022). Digital labor platforms bring together a large number of diverse individuals around the world (Acar 2019; Bucher et al. 2019). Moreover, there is a wide range and heterogeneity of clients and jobs (Deng and Joshi 2016; Kokkodis and Ipeirotis 2016; Wood et al. 2019). Workers face an almost infinite pool of employment opportunities that offer many different ways to shape their careers but also, in turn, increase competition (Seifried et al. 2020). Finally, the market transparency on digital labor platforms is huge. Since freelancer profiles are publicly accessible on the platform, freelancers can get detailed information about the career paths of other freelancers. Similarly, all job descriptions and prices can be viewed so workers can easily assess the skill requirements to their advantage (Seifried et al. 2020).

Third, platform work itself is special compared to offline freelancing because it is purely digital and temporary. Work on digital platforms is digitally mediated (Gol et al. 2018; Irani and Silberman 2013) and significant parts of the value creation take place through IT-enabled platforms that facilitate exchanges between workers and clients. This digital communication can be beneficial or challenging (Deng and Joshi 2016; Durward et al. 2016b, 2020). Moreover, work is not only digital but can also be defined as temporary contract work (Brawley and Pury 2016; Gol et al. 2019b). Thus, there are no long-term connections, but jobs over a specific period of time as flexible arrangements (Friedman 2014). Because of this granularity and decontextualization of tasks, workers are removed from the end product of their work, which can be problematic (Bucher et al. 2019; Strunk et al. 2022). The transient nature of platform work is therefore a challenge for professional development (Ashford et al. 2018). The digital nature of work also makes workers feel socially isolated (Wood et al. 2019) and vulnerable to emotional tensions (Ashford et al. 2018; Petriglieri et al. 2019). Moreover, on digital labor platforms, there is a certain anonymity in the work relationship (Silberman et al. 2010). Finally, workers are motivated to participate in platform work and develop their platform careers for various reasons, and the reward structure is often not only monetary (Seifried et al. 2020). For example, factors that increase the intrinsic motivation of a task, such as designing the task in a way that helps others (Rogstadius et al. 2011) or increasing the meaningfulness of the task (Chandler and Kapelner 2013), can improve the quality of the outcome. Extrinsic motivators, on the other hand, such as higher compensation, may not do so directly (Paolacci and Chandler 2014) or only if a portion of the compensation is offered as an unexpected gift in the form of an unconditional pay raise (Gilchrist et al. 2016).

Fourth, platform work is directed and controlled by algorithmic management, which is not the case with offline freelancing (Duggan et al. 2020; Wood et al. 2019). In this regard, algorithms create power asymmetries and thus limit freelancers' actions (Kinder et al. 2019; Wood et al. 2019). Previous research also shows that algorithms influence how and why online freelancers find work (Jarrahi et al. 2020; Jarrahi et al. 2021). Freelancers thereby experience algorithmic rating systems as a form of control, where the criteria for success and changes in those criteria are not always easy for freelancers to predict or influence (Jarrahi and Sutherland 2019; Rahman 2021). Moreover, unlike offline freelancers, online freelancers' successful careers are highly dependent on their reputation and clients' reviews on the platform (Cram et al. 2020; Hong and Pavlou 2017; Idowu and Elbanna 2022; Lin et al. 2018; Möhlmann et al. 2021; Tóth et al. 2022; Yoganarasimhan 2013). Freelancers cannot directly influence these evaluations, but the quality

of these ratings is very important as they serve as status indicators and can positively influence future job acquisition (Gussek and Wiesche 2023; Rahman 2021).

In summary, online freelance careers on digital labor platforms and offline freelance careers both differ from traditional careers in organizations in that they are characterized by a high degree of independence, uncertainty, and freedom (see cluster " false self-employment and volatility"). However, the concept of online freelancing careers can be distinguished above all from offline freelancing careers because careers on digital labor platforms are shaped by freelancers in a purely digital environment and in interaction with the digital platform (see clusters "global matching and platform mediation", "digital and temporary work", "algorithmic management").

2.3 Traditional and Nontraditional Careers

In the following, we present theories and models relevant to this thesis regarding the careers of online freelancers. We then describe the current state of research on careers on digital labor platforms.

2.3.1 Associated Theories

In order to distinguish platform work and careers on digital labor platforms from careers in the offline labor market, the life-span model and the concept of protean and boundaryless careers are relevant for this thesis. Furthermore, the signaling theory in the context of platform reputation systems is also a significant theory for this thesis.

Life-span Model

According to Super (1957), a career can be defined as a combination or sequence of occupational positions taken over a life span. The traditional career model assumes that careers are orderly and occur within a single occupation and organization (Levinson 1978; Super 1957). Super defines five phases of career development: (1) growth, (2) exploration, (3) establishment, (4) maintenance, and (5) decline (Super 1980).

The growth phase describes the initial formation of the self-concept, including skills, values, personality, interests, and experiences and the development of a basic understanding of the working world (Super 1980). The exploration phase follows. The individual experiments and tests the self-concept in this phase in his or her respective environment. In addition, the required education is obtained and the preferred occupation is learned (Smart and Peterson 1997). Within

the establishment phase, the individual then places him or herself in the world of work, integrates, and possibly changes occupational positions. The individual also sharpens occupational skills (Super 1953). Maintenance then extends into an individual's retirement and maintaining occupational status and position is the focus. Last, decline describes the retirement phase until the individual's death. The individual thus retires from professional life (Super 1980).

Protean and Boundaryless Career

Moreover, research has questioned the applicability of the traditional career model described above when considering a work environment in which careers are increasingly shaped by multiple, diverse employers (Arthur and Rousseau 1996; Sullivan 1999). In this context, research refers to nontraditional careers as "boundaryless careers" or "protean careers" (Arthur 1994; Hall and Mirvis 1995). Boundaryless careers are not limited to a single company or organization, but span a variety of temporary projects across the boundaries of different employers or occupations (Arthur and Rousseau 1996; Greenhaus et al. 2008). Boundaryless careers are described in terms of psychological and physical boundary crossing (Greenhaus et al. 2008). In this context, physical mobility refers to the actual change of jobs across boundaries such as firms or occupations (Briscoe and Hall 2006; Sullivan and Arthur 2006). Physical mobility is thus an objective career change, while psychological mobility is defined as a subjective career change (Sullivan and Arthur 2006). A protean career, in contrast, is self-directed, proactively managed, and driven by values and goals that are personally meaningful (Briscoe and Hall 2006). It is defined by psychological mobility, which relates to changing a particular job (Sullivan and Arthur 2006).

Signaling Theory

Furthermore, for the career success of freelancers, signaling theory is important to reduce uncertainties on digital labor platforms and to generate jobs. The signaling theory describes the process by which one party (referred to as an agent) uses signals to credibly communicate various information about themselves to another party (the principal) (Matsubara and Kagifuku 2016). A signal can be defined as a visible characteristic of an object, person, or organization (Spence 1973). These signals, in turn, reduce information asymmetry between parties and are considered beneficial to the formation of contracts. Accordingly, signaling theory has been explored in a variety of contexts, including e-commerce (Mavlanova et al. 2016; Wells et al. 2011), marketing (Kirmani and Rao 2000; Robbins and Schatzberg 1986), and labor markets (Spence 1973). In traditional labor markets, there are many possible signals, such as various

personal characteristics, education, work experience, race (Spence 1973), or cognitive and social skills (Piopiunik et al. 2020). Previous research has mainly focused on signals that can be distinguished according to their associated costs and thus credibility, so-called assessment and conventional signals (Donath 2007; Holthaus and Stock 2018), or according to whether they are self-reported or reported by a third party, so-called internal and external signals (Mavlanova et al. 2016; Spence 1973). Moreover, there is no consensus in previous research on the effectiveness of signals in online labor markets such as digital labor platforms (Durward et al. 2016b; Gefen and Carmel 2008; Hukal et al. 2020).

2.3.2 Literature Review of Careers on Digital Labor Platforms

The concept of career has been studied primarily in an organizational framework structured in offline labor markets. However, the importance of working in digital labor markets, where global matching between freelancers and clients occurs through digital labor platforms (Bunjak et al. 2021; Gu and Zhu 2021), is increasing (Kässi and Lehdonvirta 2018). Since freelancers can be classified as self-employed, they have to take care of things that are traditionally handled by employers, such as their health insurance, education, or career (Ashford et al. 2018; Friedman 2014; Kost et al. 2020). The lack of clear and available career paths is a major challenge. Businesses as employers can provide some clarity about the expected career paths individuals can take to advance (Tolbert 1996). However, this clarity does not exist for online freelancers (Ashford et al. 2018).

Recent research has begun to examine the careers of workers on digital labor platforms (Idowu and Elbanna 2022; Tóth et al. 2022). A detailed review of the main findings of previous literature is presented in Table 4. In general, the literature suggests that careers on digital labor platforms differ from traditional careers within a firm (Blaising et al. 2021; Caza et al. 2022). In digital labor markets, there are no clear, available, and relevant career paths (Ashford et al. 2018). Workers often move in "in-between spaces," between work roles, organizations, and career paths (Ibarra and Obodaru 2016). Research also points to fragmented careers (Blaising et al. 2021) and high uncertainty of career paths (Caza et al. 2022). In addition, platform careers are unpredictable, risky, and build slowly across multiple projects, relationships, and environments (Caza et al. 2022). Moreover, workers on digital labor platforms are responsible for their own professional development (Kost et al. 2020).

Main Finings	Source
Identify critical non-technical skills for gig workers, uncover how they are developed at different stages of adaptation to working on gig economy platforms, and highlight different strategies for thriving in the gig economy.	Frenzel-Piasentin et al. 2022
Freelancers who work with an agency have a much higher likelihood of employment and higher pay and wages early in their careers compared to similar workers without an agency affiliation. This advantage declines after high-quality nonagency workers have received good public ratings.	Stanton and Thomas 2016
New freelancers engage in self-directed socialization as they proactively seek support that is not directly provided by the platform or their clients. This support helps them resolve ambiguity in their professional identity, learn how to self-manage platform work, build credibility, and overcome self-doubt in their new careers.	Blaising and Dabbish 2022
Social capital created outside of sharing economy platforms cannot be easily transferred to these platforms. Moreover, transferring social capital between platforms is difficult. Building platform-specific social capital is highly dependent on reputation systems in the form of ratings and reviews.	Tóth et al. 2022
A long-term commitment to online freelancing entails a number of financial, emotional, relational, and reputational burdens that represent the effort required to sustain an online freelancing career.	Blaising et al. 2021
Crowdworkers develop a kind of career path and go through five stages in this career path on digital labor platforms.	Idowu and Elbanna 2022
Boundaryless careers in the gig economy might be an oxymoron, because intra- and inter-firm career boundaries limit the development of relevant career competencies of gig workers and thus limit their mobility.	Kost et al. 2020
Higher levels of self-directed career management and a boundaryless mindset of freelancers predicted higher employability and career engagement. In addition, employability and career engagement acted as mediators between career attitudes and subjective career success.	Lo Presti et al. 2018
It is unclear how gig workers navigate different occupations over time, and whether notions of careers, career paths, and advancement opportunities are relevant or irrelevant.	Ashford et al. 2018

Software freelancers engage in what is known as software gigging, a cyclical process of gig hunting and gig execution that involves multiple activities at a time and becomes increasingly lucrative and flexible as one progresses through the gigging stages of noob, rock star, and super rock star.	Sison and Lavilles 2018
The career anchors of technology workers who participate in crowdsourcing continue to evolve in light of emerging dynamics in the IT job market.	Taylor and Joshi 2019

Table 4. Previous Findings Regarding Careers on Digital Labor Platforms

In summary, previous studies only examine the conditions and challenges of this form of work, not the entire career (Deng et al. 2016b; Durward et al. 2020; Kittur et al. 2013). However, a growing number of workers are pursuing careers outside of traditional employment and are adopting work on digital labor platforms as a full-time occupation (Idowu and Elbanna 2022).

2.4 IT Work on Digital Labor Platforms

In the following, the concept of IT freelancing is explained in more detail. Figure 5 provides an overview of the composition of the concept of IT freelancing based on the characteristics of the two sides associated with it: Freelancing and IT Work. We will contrast the two sides below to define IT freelancing.

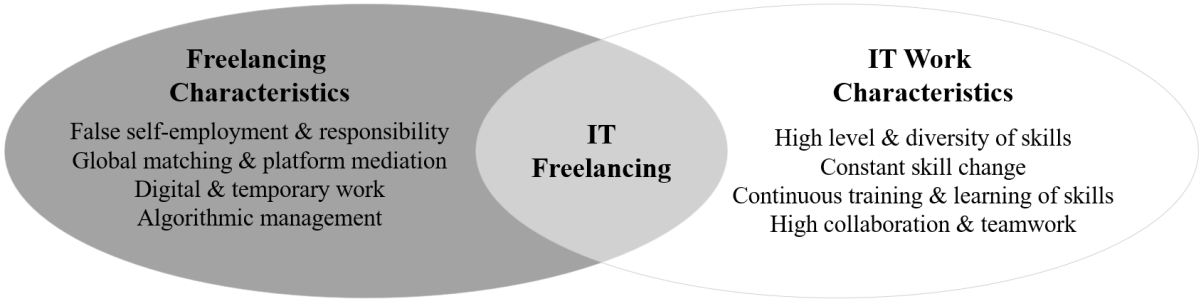

Figure 5. Composition of the Characteristics of IT Professionals as Freelancers

2.4.1 Freelancing Characteristics

Online freelancers (left side in Figure 5) can be classified as independent, self-employed contractors, as previously described. They are not employed in traditional "jobs" with permanent employment and permanent affiliation to one company, but work mainly on their own as "freelancers" under flexible, temporary arrangements. They are only loosely employed for a specific task or for a specific period of time. This leads to a high degree of responsibility for their own

careers (Ashford et al. 2018; Friedman 2014). Another characteristic is the coordination, mediation, and execution of work online through digital labor platforms (Agrawal et al. 2015; Popiel 2017). These platforms provide the digital infrastructure for all necessary mechanisms, such as matching, payment, communication, feedback, and ranking systems, and mediate the interaction between clients and freelancers through algorithmic management (Duggan et al. 2020; Kinder et al. 2019).

2.4.2 IT Work Characteristics

IT work (right side of Figure 5) is critical to most organizations (Guzman et al. 2008). IT professionals are an important part of sociotechnical systems that integrate information, work processes, and data processing (Niederman et al. 2016). They are increasingly indispensable due to digitalization and the use of technology in companies (Dinger et al. 2015). This is leading to a high demand for IT professionals in various fields, which are facing an increasing talent and skills shortage (Goles et al. 2009). Table 5 depicts the key characteristics of these IT workers.

IT Work Characteristics	Source
high skill level	Niederman et al. 2016; Zhang et al. 2012
diversity of skill	Guzman et al. 2008; Niederman et al. 2016
constant skill change	Fu 2011; Joseph and Ang 2001
continuous training and learning of skills	Pazy 2004; Zhang et al. 2012
high collaboration and teamwork	Ang and Slaughter 2001; Kudaravalli et al. 2017; Levina 2005; Majchrzak et al. 2005

Table 5. IT Work Characteristics

IT professionals develop and manage IT resources such as hardware, software or data. In doing so, they perform a wide range of IT tasks and therefore need to have a high level and wide diversity of skills (Niederman et al. 2016; Zhang et al. 2012). Unique IT-related skills and technical skills are important, but soft and interpersonal skills such as communication skills are also important (Guzman et al. 2008). Constant change and evolution and the need to learn and adapt knowledge in an intellectually demanding work context are characteristics that distinguish the IT profession from other professions (Riemenschneider and Armstrong 2021).

In addition, the concept of obsolescence is important in IT. It describes the idea that obsolete skills are less valuable and the person in question is less capable than a person with newer skills. This can be particularly problematic for IT professionals because technological change means that the technologies they work with, and thus the skills they require, change and evolve especially frequently (Fu 2011; Guzman et al. 2008; Joseph and Ang 2001; Lee et al. 1995;

Niederman et al. 2016; Riemenschneider and Armstrong 2021). In terms of IT professionals' job skills, this means that once valued skills are no longer in demand because they no longer fit the demands of the job and therefore lose value and contribute less to their performance (Blanton et al. 1998; Joseph and Ang 2001; Rong and Grover 2009). Therefore, the constant threat of obsolescence and the natural evolution of IT jobs force IT professionals to constantly adapt and develop their skills (Pazy 2004; Zhang et al. 2012). There is also a high demand for education, training, and updating (Matook and Blasiak 2020; Zhang et al. 2012).

Finally, IT work often requires collaborative efforts in architecture design and component integration (Levina 2005; Majchrzak et al. 2005), as well as working in teams (Ang and Slaughter 2001; Kudaravalli et al. 2017).

2.4.3 IT Freelancing

IT freelancers (intersection in the middle of Figure 5) conduct software development online as independent contractors rather than as employees of a permanent company (Sison and Lavilles 2018). This IT freelancing consequently results from the described aspects. The outlined characteristics of both sides meet here and lead to new open questions about their interplay and the implications of these characteristics.

More and more IT professionals are working as freelancers on digital labor platforms. The current work environment, where developers are involved in multiple, simultaneous projects on a variety of digital labor platforms, creates a new, complex, and fragmented work environment (Watson Manheim and Ahuja 2019). Well-known platforms such as Upwork or Fiverr mainly offer IT project categories such as app and website development or data analytics (Wagner et al. 2021). In this thesis, we therefore examine the special form of freelancing regarding IT tasks, which is to be distinguished from other freelancing sectors. Two aspects are particularly relevant here.

First, because a wide range of skills is especially important for IT freelancers, as IT work itself requires many skills and these are even more important on digital labor platforms, where global connection requires workers to differentiate themselves from their competitors to succeed (Gandini 2016; Jarrahi et al. 2020; Jarrahi et al. 2021; Sison and Lavilles 2018). IT freelancers do not work exclusively on repetitive, small tasks that require low skill levels, but also perform more complex tasks with higher skill requirements. Compared to tasks in other areas of free-

lancing, such as design or translation tasks, IT tasks are therefore more complex, interdependent, and constantly evolving (Stol and Fitzgerald 2014). IT freelancers in the context of digital labor platforms must also be particularly responsive to the risk of skill obsolescence, as they have a higher level of personal responsibility for continuous training, updating, and learning than permanent IT workers (Graham et al. 2017; Kost et al. 2020; Spreitzer et al. 2017).

Second, as described, IT workers often work collaboratively and in teams, which is not common in other online freelancing areas (Ashford et al. 2018; Friedman 2014). Freelancers on digital labor platforms typically work alone rather than in teams, for example, when translating text or performing simple design or image editing tasks (Ashford et al. 2018). However, for freelancers in the IT sector, collaboration and teamwork can increase success and contribute to career advancement on the platform (Gussek and Wiesche 2022b, 2023).

In conclusion, we have developed the following definition of IT freelancing based on the literature.

Definition: IT Freelancer
IT freelancers integrate information, work processes and data processing, develop and manage IT resources such as hardware, software, or data as knowledge-intensive tasks involved in multiple, simultaneous, location-independent projects on various digital labor platforms as independent contractors rather than as employees of a permanent company.

3 Research Approach

3.1 Research Strategy

In this section, we explain the research design of this thesis. To answer the research questions for this thesis, we use a mixed-methods strategy. For this purpose, we combine qualitative and quantitative data and analysis by using literature analysis, grounded theory, text mining, and regression analysis.

As described in Section 1.2, existing theories and findings are not sufficient to adequately explain platform work as a phenomenon. The mixed-methods research strategy we use provides a powerful mechanism to deal with such situations and subsequently make contributions to theory and practice. Mixed-methods research has two key advantages (Venkatesh et al. 2013; Venkatesh et al. 2016).

First, such an approach can combine the advantages of quantitative and qualitative research methods. The combination allows for the simultaneous investigation of confirmatory and exploratory research questions (Teddlie and Tashakkori 2003; Teddlie and Tashakkori 2009). In IS research, qualitative methods have been used more for exploratory research to develop a deeper understanding of a phenomenon or to gain new theoretical insights inductively (Punch 2013; Walsham 1995). In contrast, quantitative methods have been used more for confirmatory studies, such as testing theories and relationships (Venkatesh et al. 2013).

Second, this approach can produce more meaningful results than a single method allows (Teddlie and Tashakkori 2003; Teddlie and Tashakkori 2009). Thus, the limitations and disadvantages of each method can be reduced (Greene 2007). A mixed method strategy can take advantage of the complementary strengths and non-overlapping weaknesses of different methods and gain comprehensive insights into various phenomena of interest that cannot be fully understood using a quantitative or qualitative method in isolation (Johnson and Turner 2003). Meta-conclusions therefore become possible (Venkatesh et al. 2013).

Hence, in this paper, different methods are applied, using literature review (P1) and grounded theory (P2, P3, P4) in terms of qualitative methods, and text mining (P2) as well as regression analysis (P5) in terms of quantitative methods.

3.2 Research Methods

While each study contains detailed information on the method used, we provide a brief background on each method used in this thesis in the following section. In Table 6, we summarize which method we used in which of the embedded publications.

Publication	LR	TM	GT	E
The Gig Economy: Workers, Work and Platform Perspective (P1)	●			
Challenges of IT Freelancers on Digital Labor Platforms: A Topic Model Approach (P2)	○	●	○	
Understanding the Careers of IT Freelancers on Digital Labor Platforms (P3)	○		●	
Understanding the Careers of Freelancers in Digital Labor Marketplaces: The Case of IT Work (P4)	○		●	
IT Professionals in the Gig Economy: The Success of IT Freelancers on Digital Labor Platforms (P5)	○			●

Legend:
- ● Primary method used in the publication
- ○ Secondary method used in the publication

LR: Literature Review
TM: Topic Modeling
GT: Grounded Theory
E: Econometrics

Table 6. Overview of Research Methods Applied in the Embedded Publications

3.2.1 Structured Literature Review

Reviewing and analyzing existing research literature is an important step and often the basis for conducting a research project. The purpose of a structured literature review is to better understand the topic under investigation in all its aspects and to identify and organize the relevant publications. Furthermore, gaps and tensions in existing literature can thus be identified, allowing future research questions to be derived (Webster and Watson 2002). Systematic literature reviews offer the most comprehensive approach among the various methodologies, as they aim to provide an exhaustive coverage of the relevant literature (Cooper 1988). Several guidelines have been developed in research, such as those of Webster & Watson (2002) or vom Brocke et al. (2009).

To identify relevant literature, scientific databases are searched using keywords and then both backward and forward searches are performed. Within a backward search, publications identified by the keywords are further examined for used references that are also potentially relevant to the analysis but were not identified in the first search step. Likewise, in a second step, the forward search identifies and reviews additional publications that cite the publications found in

the initial keyword search (Levy and Ellis 2006). Both approaches can generate additional relevant keywords that are used to supplement the literature search in the subsequent procedure. Afterward, relevant publications are screened and coded concerning their key findings on the central aspects. A concept matrix can help in this procedure (vom Brocke et al. 2009; Webster and Watson 2002).

In this thesis, we examined the existing literature on the gig economy, gig workers, gig work, gig platforms and related terms (P1). We used the keywords gig economy, sharing economy, gig work, gig labor, platform work, micro-task, uberization, collaborative economy, freelance work, new form of work, precarious work, self-employment, crowd work, crowdsourcing, crowdfunding and various modifications. For our sample, we selected IS and management journals from the AIS Senior Scholars' Basket of 8 and the FT50 Management Journal Ranking. However, we did not limit the search to these journals. We also included hits from additional journals to include other relevant gig economy topics in addition to sources from the IS discipline. In addition, we considered published conference proceedings such as ICIS, ECIS, and HICSS. We then coded the publications selected by title, keywords, and abstract along four main coding dimensions. By summarizing the key issues and findings along the four coding dimensions, we were able to highlight the main areas of existing research and identify topics for future research. This literature review thus served as a foundation for subsequent studies and helped us link our empirical findings to previous research on platform work.

3.2.2 Topic Modeling - Latent Dirichlet Allocation

The most commonly used topic model in the IS field is the LDA model (e.g., Caron et al. 2021; Geva et al. 2019), a hierarchical Bayesian model that describes a generative process of document generation (Blei et al. 2003). The goal of this unsupervised modeling technique is to infer a predetermined number of topics as latent variables from the observed distribution of words in each document of a text corpus. In particular, a topic is defined as a multinomial distribution over a vocabulary of words, a document is a collection of words from one or more topics, and a corpus is the set of all documents. In the following, we explain how the LDA analysis can be used to derive topics from a document corpus. The LDA analysis procedure is shown in Figure 6. It requires first performing preprocessing steps and then applying LDA to the collected data based on some hyperparameters and the number of underlying topics.

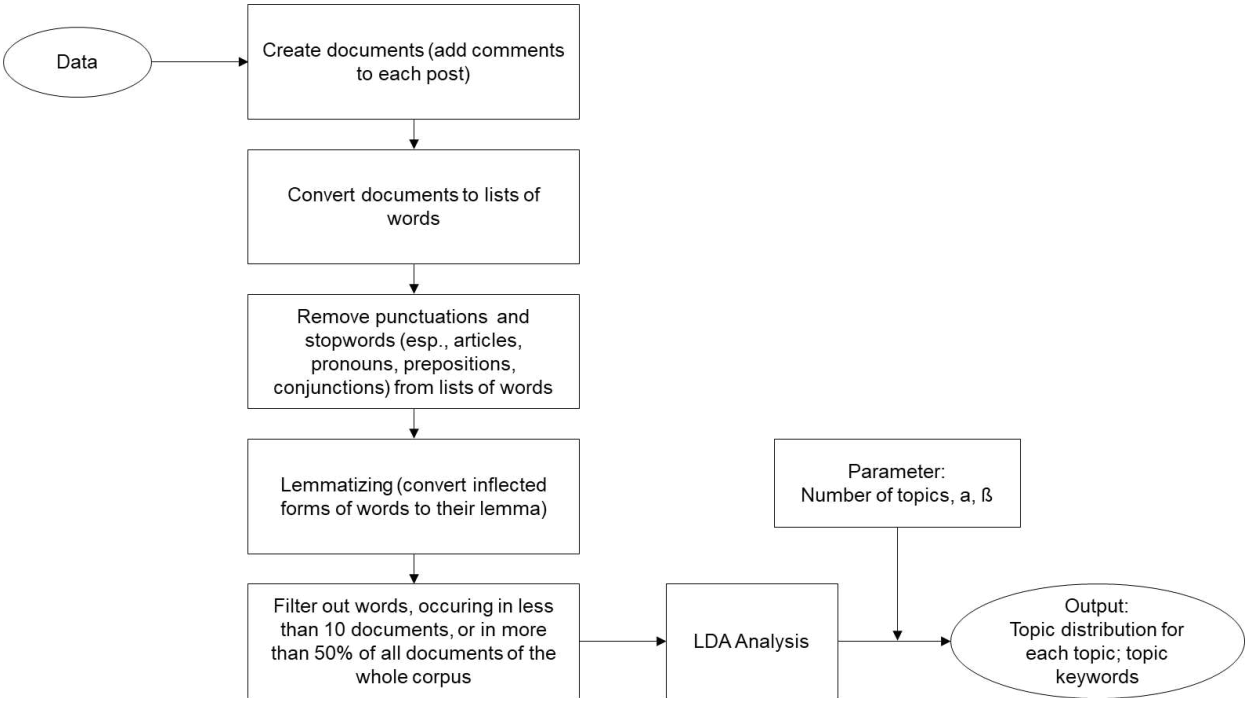

Figure 6. LDA Analysis Procedure

Before running the LDA on collected data, researchers need to do some preprocessing steps. First, posts and comments should be grouped into documents and the documents converted to word lists. Second, the data should be transformed with common practices from the natural language processing area in order to prepare them for the topic modeling as previous organizational studies in the context of topic modeling have done (e.g., Hannigan et al. 2019; Kaplan and Vakili 2015). With respect to Stop-Word Elimination and Lemmatization, WordNetLemmatizer in the NTLK package can be used, a leading platform for building Python programs to work with human-language data. Furthermore, low-frequency words, which only appear in less than ten documents, and high-frequency words, which appear in more than 50% of all documents should be removed.

After the preprocessing steps, LDA furthermore requires some parameters for analysis. First, a predetermined number of topics T is needed. To find the optimal number of topics, a measure is needed to evaluate the results of the model. A widely used measure for evaluating topic models, and also originally used by Blei et al. (2003), is perplexity. This measures how well a trained LDA model can predict a sample of held-out documents regarding their topic distribution. However, measures such as perplexity, while suitable for measuring model performance, lack in determining the meaningfulness of the computed topics from a human perspective (Chang et al. 2009). For this reason, coherence measures that directly evaluate the topics found based on

their semantic coherence were proposed. Within the area of coherence measures, the C_V measure shows the highest correlation with human topic-ranking (Röder et al. 2015; Syed and Spruit 2017). Further hyperparameters for the algorithm are α and β. The α affects the distribution of topics to a given document, so that a lower α leads to a more unique assignment of documents to fewer topics. The β is an assumption about the size of the topics, that means a smaller β leads to topics consisting of fewer words (Blei et al. 2003). The two values should be set so $\alpha = 50/T$ and $b = 0.1$ (Griffiths and Steyvers 2004). The final topics are output as collections of words, and they must be manually evaluated according to the representing content.

In the following LDA-analysis step, Gensim can be used, one of the most commonly used open-source Python topic-modeling packages, used and cited in over 500 commercial and academic applications. Thus, researchers can work with the Python library Gensim to build a topic model and train the LDA model with varational Bayes (VB) sampling (Hoffman et al. 2010).

Since the LDA algorithm does not label the topics, the researcher must interpret them. Therefore, to elicit the meaning of the topics, qualitative approaches can be used to code the topics (Jiang et al. 2021; Karanović et al. 2021). Applying grounded theory to interpret the topics generated by the LDA analysis enables the identification of relevant mechanisms and their interactions among them, as it aggregates the topics into higher-order dimensions, thus enabling an understanding of the essential components of the underlying data (Croidieu and Kim 2018; Gioia et al. 2013).

In this thesis, to build on the structured literature review and gain further insights into the relevant topics of the platform work, we applied the LDA analysis (P2). More specifically, we examined posts by IT freelancers on the r/Upwork forum on Reddit in depth to obtain a comprehensive understanding of the topics discussed by IT freelancers. The final dataset contains 2804 posts with more than 20,000 comments posted on r/Upwork over a three-year period ending in January '22. We used topic modeling to structure and then qualitatively analyze this dataset. Thus, we leverage the strengths of LDA analysis and explore the challenges IT freelancers face on digital labor platforms. Based on the results of the LDA analysis and the qualitative analysis of the forum posts, we identified 14 Topics in IT freelancer forums and illustrated a detailed overview of the topics and aggregated dimensions.

3.2.3 Grounded Theory

When there is a scarcity of knowledge and studies on a topic, a research design should be chosen that allows for the development of theoretical depth and detailed understanding of new, unexplored phenomena (Urquhart et al. 2010). To this end, an exploratory and inductive approach can be used (Glaser and Strauss 1967; Strauss and Corbin 1990), which follows grounded theory. The goal of these approaches is to develop theory from observations of interesting phenomena by interatively coding data with increasing abstraction. This coding begins with open coding of the data to look for recurring first-order concepts. In open coding, data passages are marked with open codes, which are short descriptive statements that summarize the core idea of the text passage (Wiesche et al. 2017). Subsequently, the open codes are categorized and summarized (second-order themes) by the researcher and set in relation to each other. These individual steps are referred to differently. Glaser (1978) labels the coding as open, selective, and theoretical, while Strauss (1987) labels the steps as open, axial, and selective coding. In addition to the coding, memoing is important to support the coding process. Throughout data analysis, memos are used to capture ideas (Glaser 1978; Wiesche et al. 2017). Data collection and analysis continue until theoretical saturation occurs, that is, when it can be determined that new data no longer provide new information and the model cannot be further refined (Glaser and Strauss 1967; Strauss and Corbin 1990; Strauss and Corbin 2003). Most recently, the central procedure throughout the analysis is constant comparison. This involves constant comparison of empirical data in one category with other empirical data in the same category to develop theoretical understanding and relationships. An iterative approach also involves constant comparison between the literature and the data (Urquhart et al. 2010).

To address the research challenge on the complex career dynamics of freelancers on digital labor platforms that change over time, we used the exploratory grounded theory methodology in this thesis (P3 and P4). Data analysis followed the framework proposed by Strauss & Corbin (1990) for developing grounded theory and the three-step coding process described by Gioia, Corley & Hamilton (2013). We studied a heterogeneous sample of IT freelancers on different digital labor platforms, relying on 33 semi-structured interviews with IT freelancers, 2 semi-structured interviews with clients, our respondents' personal online profiles, and archival documents downloaded from the platforms to support our theory-building process. In this process, the interviews were recorded, transcribed, anonymized, and coded in AtlasTi. To ensure the reliability of our analysis, 20% of the interviews were recoded by a research assistant not involved in the project. We reflected on our categories with the existing literature, refined the

categories again based on this, and conducted additional rounds of interviews that ultimately led to theoretical saturation. We then synthesized the data structure into a model of freelance careers by illustrating the relationships between our codes and categories.

3.2.4 Econometrics - Negative Binomial Regression

Econometrics is the application of statistical methods to economic data in order to give empirical content to economic relationships (Eatwell et al. 1990). More precisely, it is the quantitative analysis of economic phenomena based on the simultaneous development of theory and observation, linked by appropriate methods of inference (Samuelson et al. 1954). One type of economic data that can be analyzed using econometric methods is digital trace data, which are records of activities (traces) performed through an online information system (digital). They have two important properties. First, they are existing data, not data produced for research. Second, they are event-based rather than summarized data (Howison et al. 2011). Because digital trace datasets are not collected primarily for research purposes, researcher-induced bias is eliminated (Lindberg 2020).

A prominent tool in econometrics is the regression analysis, that generally describes a statistical procedure, which is used to estimate the relationship between a dependent variable (DV, also called outcome) and one or more independent variables (IV, also called predictors). Generally, there are different models for regression analysis, for example, linear, poisson, negative binomial, logistic or probit regression. The process for choosing the model for data analysis is shown in Figure 7. To find the correct model for regression analysis, the DV must be considered (Backhaus 2016).

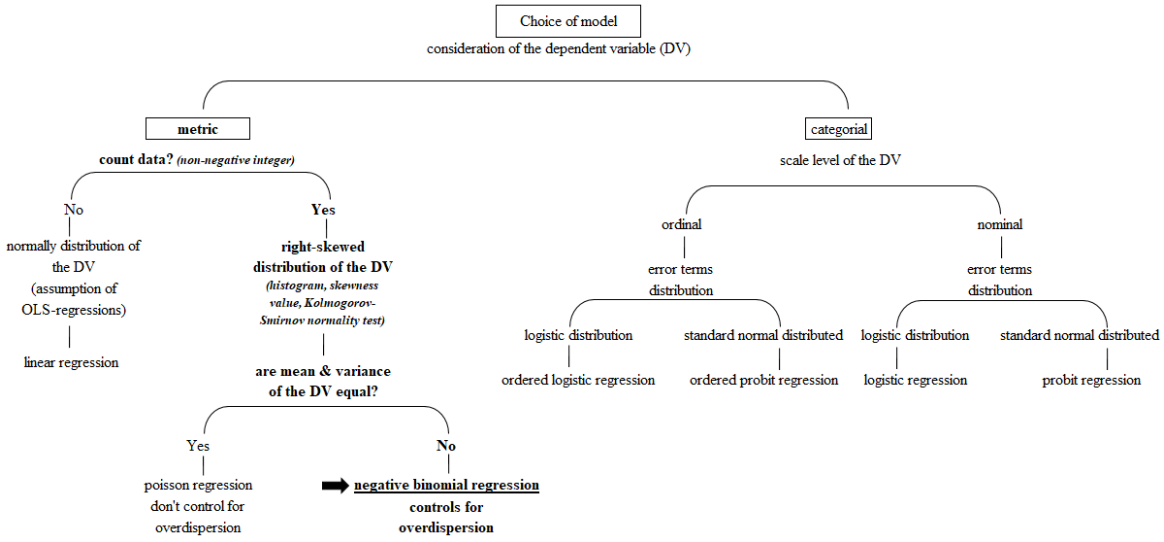

Figure 7. Process of Model Choice for Data Analysis

In this thesis, we used digital trace data and negative binomial regression (P5) to study the success factors of IT freelancers on digital labor platforms. The decision steps for the model choice are shown in Figure 7. The path in bold reflects our choice for data analysis. Our dependent variable of interest, objective career success of IT freelancers within one year (rounded to integer values), is a non-negative integer with a limited range and therefore represents count data. Our DV is therefore not normally distributed. We confirmed this by three tests. First, this is evident from the histogram of the DV. Second, the value for the skewness of the distribution of the DV is positive. Third, we performed a Kolmogorov-Smirnov normality test, which, with a p-value of less than 0.001, proves that there is no normal distribution of the DV. These results further suggest a right skewed distribution. Parametric tests, such as linear regression, are insufficient in this case and violate the assumptions of ordinary least squares regression. Under these conditions, a transformation (e.g., a log transformation) of the DV can be used, but interpretation of these transformed values can be difficult and statistical power would be lost. Poisson regression models and negative binomial models better approximate a right-skewed distribution, as is the case with count data, and are the most appropriate econometric approaches (Coxe et al. 2009; Wooldridge 2016). In this regard, a Poisson regression model is based on equivalence between the mean and variance of the DV. However, we found overdispersion in our DV, which means that the regression approach used should control for overdispersion. The standard deviation (Stdv = 13.278) was almost three higher than the mean (mean = 4.534). Therefore, we choose negative binomial regression (Gardner et al. 1995). Unlike Poisson regression, negative binomial regression corrects for overdispersion by calculating an additional parameter in the regression (Wooldridge 2016). We ran the negative binomial regression in SPSS and calculated the Exp(b) coefficients to better interpret our results. We also check the robustness of our results by using an alternative measure of the objective career success.

Part B

4 The Gig Economy: Workers, Work and Platform Perspective (P1)

Title	The Gig Economy: Workers, Work and Platform Perspective
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Publication	Internationale Tagung Wirtschaftsinformatik (WI 2022)
Status	Published
Contribution of first author	The first author participated in the problem definition, research design, data collection and analysis, interpretation as well as in the conceptual development and reporting. She further significantly contributed to the creation of the manuscript.

Table 7. Fact Sheet Publication P1

Abstract. In recent years, the gig economy has changed the way many people work. This research phenomenon has attracted scientists from many different fields to an emerging field of research. Given the actuality of the topic and diversity of perspectives, there is a great need to collect and connect research findings that serve as a basis for future discussions. Starting with a collection of 139 publications on the gig economy, gig work and related terms, we identify some trends in the literature and the underlying research interests. In particular, we organize the literature around the concept of the gig economy in terms of gig workers, gig work, and digital platforms, and draw several interesting insights from the literature. Finally, we identify important gaps in the existing literature on working in the gig economy and provide guidance for future research.

4.1 Introduction

In recent years, the gig economy has changed the way people work and is growing as an area of academic investigations. Traditional work designs will be increasingly complemented by smaller tasks – so-called gigs – that are mediated and coordinated via digital platforms (Ashford et al. 2018). More than one-fifth of the U.S. workforce works independently, outside of organizations in the gig economy (McKinsey & Company 2016; Petriglieri et al. 2019). This additional, rapidly growing labor market has many advantages like work autonomy and job and time flexibility (Deng et al. 2016a; Gol et al. 2018). However, there are also risks and challenges, as the self-employed "gig workers" will have to compete in a larger, more competitive labor market to be successful (Ashford et al. 2018; Friedman 2014; Kuhn and Galloway 2019).

This described new phenomenon of gig work is becoming increasingly interesting for research. However, our understanding of this new form of work is still in its early stages and this raises questions about the future of work. For the discipline of information systems (IS), this topic is very relevant as the gig economy offers new opportunities for information technology (IT) work with the ever-increasing demand, chronic skills shortage, and growing talent problem. Digital labor platforms can thus serve as a new source of skilled digital workers for IT jobs (Fuller et al. 2020). Another aspect of importance to the IT field is that technology plays an important role in mediating gig work, as gig workers organize their work online via digital platforms (Kuhn 2016; Kuhn and Galloway 2019). The effect of this use of technology, as well as the characteristics and opportunities of gig work in the IT labor marketplace, have been little researched so far (Leicht et al. 2016b; Leicht et al. 2016a; Taylor and Joshi 2018). The potential new source of qualified digital workers for IT jobs should be investigated in the future. Due to the described fact that gig work is organized via digital platforms in a technology-mediated manner, the role of the platforms in the ecosystem of the gig economy and the effects of this work through IT must also be specified (Kuhn 2016; Kuhn and Galloway 2019).

Literature reviews on specific aspects of the gig economy have been conducted, particularly on crowd work (Buettner 2015; Nevo and Kotlarsky 2020; Pedersen et al. 2013), the sharing economy (Sutherland and Jarrahi 2018), and some particular aspects of gig work, such as the organization and experience of gig work (Kaine and Josserand 2019) or the normative control in platform work (Ens 2020). The overall perspective of the gig economy, the characteristics of the individual perspectives and how the gig workers, the work and the platform are connected do not exist by now. Moreover, the various forms of work in the gig economy have not yet been

clearly differentiated and defined. In order to better understand the gig economy in all its aspects and to structure the findings, the following research question will be answered: *What different aspects of the gig economy have been studied in IS and management research and how are they interconnected?* We conduct a structured literature review in IS and management literature and organize our results around the concept of the gig economy in relation to gig workers, gig work, and digital labor platforms and draw several interesting insights from research, for this purpose. We examine characteristics of and the motivators for gig workers, the characteristics of the gig work itself, the digital platforms that mediate gig work and the whole gig economy as a framework.

The structure of this paper is as follows. The next section defines the central constructs to provide a theoretical foundation for the topic. After describing the methodology, the subsequent section presents the four main dimensions: the gig worker, the gig work, the gig platform and the whole gig economy. Afterwards the results are discussed and finally, limitations and issues for future research are described.

4.2 Background

In this section, we define the relevant constructs and their relationships. We also describe the concepts of crowd working and the sharing economy related to the gig economy and clarify the importance of these concepts for this literature research.
Globalization, technological change and economic uncertainties, not least due to the Covid-19 pandemic, have led to a restructuring of labor relations that affects the structure of labor markets (Arthur and Rousseau 1996; Padavic 2005; Sweet and Meiksins 2013). These new structures include the gig economy. The term is derived from the employment of musicians who perform for a certain show. Today, the term is used to describe a wide range of employment relationships. Gig workers are employed in many areas, such as coffee shops, factories, food delivery services, cab drivers, dog walkers, IT installation managers, accountants, lawyers, and business consultants (Friedman 2014).

An increasing number of people are working via digital labor platforms. In doing so, they are not employees and do not fit the traditional notions of independent contractors or self-employed (Kuhn and Maleki 2017). Conventionally, a self-employed person is considered to work directly for the labor market or offer their services to one or more companies without becoming a part of them. Self-employed workers are independent and have a high degree of autonomy. New types of workers in the gig economy - who are coordinated through a digital platform and

choose for themselves when, how long, and whether to perform certain task - therefore seem to fit more into the category of self-employed and less into a traditional employment relationship in form of a permanent contract (Todolí-Signes 2017).

The work context in the gig economy consists primarily of temporary employees, and an increasingly large part of the workforce consists of people who are either loosely linked to an organization or sell directly to a market (Cappelli and Keller, JR 2013; Deng et al. 2016b; Kuhn 2016; Petriglieri et al. 2019; Spreitzer et al. 2017). As a result, more and more workers are no longer employed in classic "jobs" with a long duration of employment and a constant connection to a company. They work in the form of "gigs" (defined as a short-term job mediated through a digital platform) with short contracts, under flexible agreements as "independently" hired and work only to complete a specific task or for a defined period of time. Therefore, there is no longer a real connection between employee and employer (Friedman 2014; Spreitzer et al. 2017). Moreover, gig workers organize their work online via digital labor platforms such as Uber or TaskRabbit. Thus, the work is technology-mediated. These platforms act as mediators, connecting workers with clients and companies for the completion of different tasks (Kuhn 2016; Kuhn and Galloway 2019).

Work within the described gig economy has become commonly known as gig work. In addition to the classic gig workers who perform location-based in-person service tasks offline (Kuhn 2016), this literature review also considers other new forms of work in the gig economy, such as crowd work. Crowd work is a new form of digitally mediated gainful employment and part of the gig economy (Durward et al. 2016a). It reflects a digital form of employment based on the principles of crowdsourcing. Crowd work involves the outsourcing of work to an undefined and usually large number or network of people in the form of an open call on IT-enabled platforms (Howe 2006; Kittur et al. 2013; Todolí-Signes 2017). In contrast to classic gig work, this form of work is not location-based but is performed online only (Durward et al. 2016a).

Besides the aspect of the gig economy, the sharing economy is a closely related term. A growing number of consumers are paying for temporary access to, or sharing of products and services rather than buying or owning them themselves (Matzler et al. 2020). The sharing economy was examined from many angles, including customer engagement and the capabilities of the technological platforms. However, for this paper, the work in the sharing economy is interesting, i.e., on platforms such as Airbnb or Uber. Work was considered as a type of asset that is exchanged in the sharing economy (Chai and Scully 2019; Martin 2016).

To cover all aspects of the gig economy and to get a broad overview of the relevant literature, aspects of the sharing economy and crowd work were also included in this paper. The term “gig work” in this paper therefore includes crowd workers and workers in the sharing economy. In literature, the type of work in the gig economy was not sufficiently differentiated. Therefore, we will first consider all forms of work in the gig economy. The forms and tasks of work in the gig economy will have to be examined in a more differentiated way in the future. To this end, we propose a differentiation or classification of the various forms of employment in the gig economy in the discussion.

4.3 Method

The purpose of this review is to better understand the gig economy in all its aspects and to organize the literature around the concept of the gig economy. Therefore, we searched for publications that focus on the gig economy, gig workers, gig work, gig platforms and related terms. We screened relevant outlets according to the guidelines of vom Brocke et al. (2009) and Webster and Watson (2002) and then grouped the literature into categories including the individual working in the gig economy, the work being done, the gig platform and the overall gig concept. In our sample, we selected IS and management journals from the AIS Senior Scholars' Basket of 8 and the FT50 management journal ranking. However, we have not limited the search to these journals. Hits from additional journals were also included to cover other relevant topics of the gig economy besides the sources from the IS discipline. In addition to the AIS basket of 8, the following journals published the most paper on the gig economy (number of articles in brackets): JBV (14), ETP (11), JMP (9), JBR (6), MISQE (6), MS (5). We further included published conference proceedings such as ICIS, ECIS, and HICSS. The search string and more detailed information are shown in Table 8.

Outlet	Search	Hits	Selected
AIS Senior Scholars' Basket of 8 (ISR, JMIS, JAIS, ISJ, JSIS, MISQ, JIT, EJIS)	*"gig economy" OR "sharing economy" OR "gig work*" OR "gig labo?r" OR "platform work*" OR "micro-task*" OR "uberiz*" OR "collaborative econom*" OR "freelance work*" OR "new form* of work" OR "precarious work*" OR "self-employment" OR "crowd work" OR "crowdwork*" OR "crowdsourc*" NOT "crowdfund*"*	56	13
FT50 Management Journal Ranking (e.g. JBV, ETP, MS, AMJ, AMR, ASQ, CAR)		193	52
Additional Journals (MISQE, JMP, JBR, JOB, JEM, HRMJ, JOM, AJM)		39	25
Conferences (ICIS, ECIS, HICSS)		92	30
	forward/backward search	-	17
	Total	380	**139**

Table 8. Summary of the Literature Search Process

In this data set, we first screened the title and then the abstract of all 380 articles and identified 122 relevant publications. Then we performed a forward and backward search based on the articles collected so far, looking mainly for theoretical foundations, further new applications and results. This resulted in 17 additional publications. In total, the sample consists of 139 articles. Table 8 provides a summary of the literature search process.

Furthermore, some articles were excluded by an exclusion procedure based on three criteria: (i) the consumer or the organizations that engage gig workers are the main perspective of the paper; (ii) the sharing economy is the topic of the paper, but the work is not in focus; (iii) the paper examines internal crowdsourcing, which affects employees within an organization and not gig workers as self-employed (Zuchowski et al. 2016).

4.4 Results

In this section of the paper, we summarize and connect the insights from the literature review on the phenomena of the gig economy following the four described main coding dimensions. Figure 8 shows our framework on research topics in the gig economy.

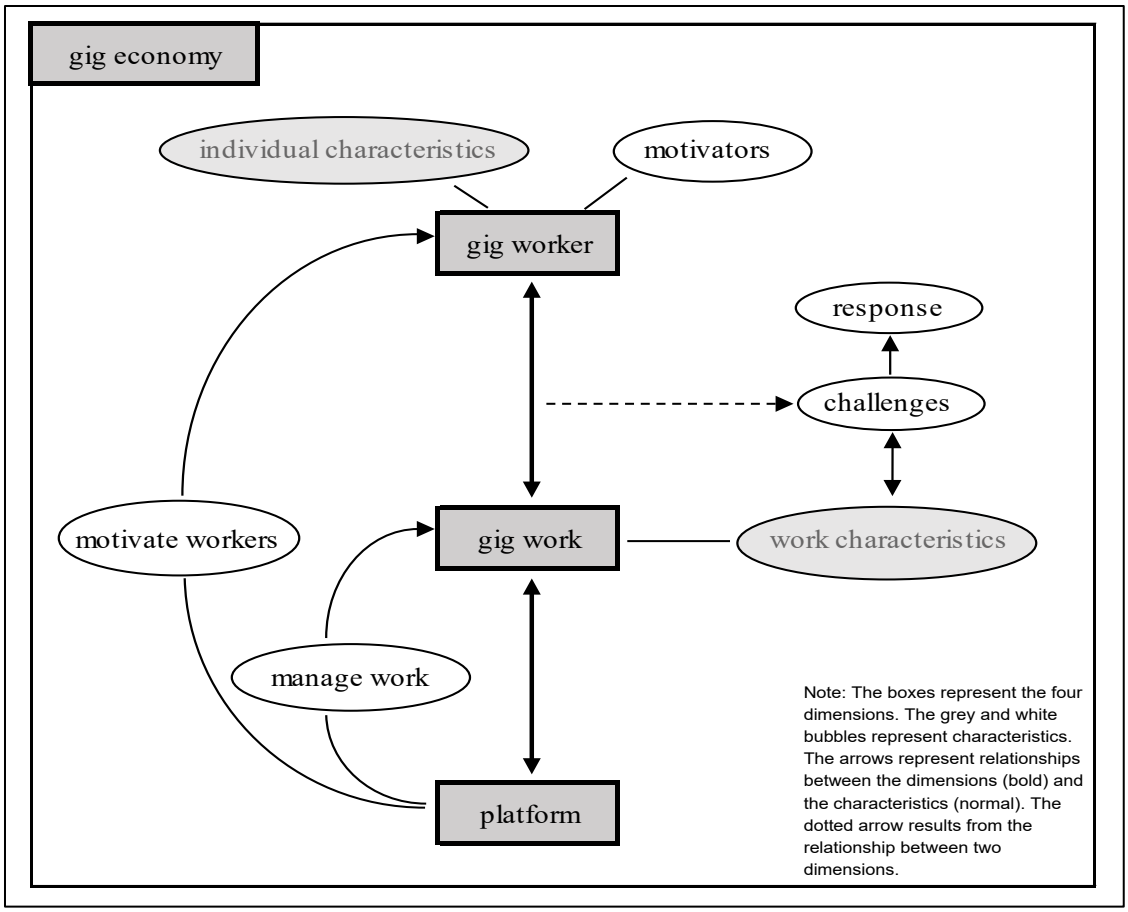

Figure 8. Framework on Research Topics in the Gig Economy

4.4.1 Gig Worker

From the gig worker perspective, two aspects have been examined (see Table 9).

Dimension	Characteristics		Aspects (illustrative citation)
gig worker	individual characteristics	background	gender (Bates 1995), social class and religion (Audretsch et al. 2013), education (Walter et al. 2013), race (Fairchild 2008a), family (Mungai and Velamuri 2011)
		personal traits	risk propensity (Nieß and Biemann 2014), indiv. attributes (Patel and Thatcher 2014)
	motivators (drivers, benefits)		autonomy (Ashford et al. 2018), flexibility (Friedman 2014), monetary compensation (Jiang et al.), self-growth (Gol et al. 2018), task variety (Deng and Joshi 2016), low entry barriers (Huang et al. 2018)

Table 9. Summary of the Results for the Gig Workers

First, the question arises who works self-employed and what individual characteristics the gig workers have in terms of their background and their personal traits. Most of the academic literature to date has analysed only the characteristics of the self-employed and not specifically those of self-employed gig workers. However, since gig workers can be classified as self-employed, this paper presents the aspects that have been studied. In the discussion section, this assumption is critically considered.

Regarding the background of self-employed many researchers investigate the influence of gender (Greene et al. 2013; Harms et al. 2020; Walter et al. 2013). Furthermore, Audretsch et al. (2013) point out that some religions are relatively conducive to self-employment, while others harm the choice of self-employment. In addition, people belonging to social classes that are lower in the social hierarchy are less likely to be self-employed. Regarding education, highly educated individuals are likely to enter self-employment (Bates 1995). Other studies investigate the influence of race on the decision to work self-employed (Fairchild 2008a, 2008b, 2009).

Besides the background of the workers, personality traits also play a role in the decision to become self-employed. The authors Patel and Thatcher (2014) find that openness to experience and autonomy increase persistence in self-employment, whereas neuroticism reduces persistence in self-employment. Besides, Keith and Harms (2019) investigate how different types of gig workers operate in the gig economy. The authors distinguish between workers who (or not) consider gig work as their primary income and those who (or not) consider it a job.

Many factors and advantages of gig work drive people to this new form of work. In addition to monetary compensation, work autonomy and job and time flexibility are major advantages of working in the gig economy (Ashford et al. 2018; Deng et al. 2016a; Deng and Joshi 2016; Gol et al. 2018). Friedman (2014) highlights the flexibility to be home at uncommon hours to care for children or to fulfill other family responsibilities. Furthermore, Jiang et al. call monetary compensation, self-improvement, time management and emotional rewards as advantages of crowd work. Another advantage for the gig workers is the low entry barriers and flexible working arrangements, allowing individuals to work wherever and whenever they want (Huang et al. 2018).

4.4.2 Gig Work

The characteristics of work in the gig economy are special and distinguish gig work from traditional forms of work. Through the literature review, we have identified three main characteristics of gig work: (i) self-employment, (ii) work in form of pre-defined small tasks (gigs) and (iii) digital organization of the work (see Table 10).

Dimension	Characteristics	Aspects (illustrative citation)
gig work	work characteristics	self-employment (Petriglieri et al. 2019), work in form of pre-defined small tasks (Friedman 2014), digital organization of the work (Kuhn and Galloway 2019)
	challenges	high personal responsibility (Kost et al. 2020), lack of career-paths (Ashford et al. 2018), financial instability, precarity (Petriglieri et al. 2019), perceived fairness (Fieseler et al. 2019), high costs and time expenditure (Wood et al. 2019), the transience of work (Ashford et al. 2018), social isolation, emotional tensions (Petriglieri et al. 2019), communication problems (Gegenhuber et al. 2020)
	responses	holding environment (Petriglieri et al. 2018), resilience, proactivity, self-organization (Ashford et al. 2018), new application of skills and expertise (Damarin 2006)

Table 10. Summary of the Results for the Gig Work

The work context in the gig economy is comprised primarily of short-term independent workers (Cappelli and Keller, JR 2013; Kuhn 2016; McKinsey & Company 2016; Petriglieri et al. 2019). The workers are no longer employed in traditional full-time jobs with a long period of employment and a constant connection to a company. They work in form of "gigs" or pre-defined small tasks with short contracts and under flexible agreements. Furthermore, only a certain task is completed or they work for a certain period of time (Friedman 2014). In addition, the gig workers organize their work online via digital labor platforms such as Uber or TaskRabbit. The work is therefore technology-mediated. These platforms act as mediators and connect workers with clients and companies for the completion of different tasks (Kuhn 2016; Kuhn and Galloway 2019).

From these characteristics, several implications and challenges for work and workers arise. Petriglieri et al. (2018) point out in their study that without the protection and support of a traditional employer, the gig workers feel a variety of personal, social and economic fears. Since the gig workers can be classified as self-employed, they have to take care of things that are traditionally handled by employers, such as their health insurance, training or their careers

(Ashford et al. 2018; Friedman 2014; Kost et al. 2020). The lack of clear and available career paths is a major challenge. Organizations as employers can provide some clarity about the expected career paths on which individuals can progress (Tolbert 1996). However, this clarity does not exist for gig workers (Ashford et al. 2018).

The burden of economic risk is shifted more to the workers (Friedman 2014). Therefore, financial instability, precarity and job insecurity pose a challenge to the viability of workers in the gig economy. Those who work in the gig economy describe themselves as living very close to the economic edge (Petriglieri et al. 2019), with unpredictable work that leads to highly volatile incomes, and concerns about maintaining basic income (Ashford et al. 2018). In addition, the perceived fairness of gig work is often low (Alpar and Osterbrink 2018; Fieseler et al. 2019). Working in the gig economy also involves many unpaid expenses and costs. Gig workers have to bear the cost of any equipment they may need themselves. Also, the time spent on registration, profile design and job search on the diverse gig platforms is necessary but not paid [e.g. Wood et al. 2019]. Another challenge is the transience of gig work, since gig work consists of short-term contracts as described above (Ashford et al. 2018). Furthermore, the fact that the workers organize their work digitally results in social isolation and emotional tensions (Petriglieri et al. 2019). The physical separation from others is a challenge for gig workers, as they often lack career mentors or role models. Thus, they have fewer opportunities to develop skills (Grugulis and Stoyanova 2011). Finally, there is seldom a social interaction with the employer or the customer because the gig workers organize their work via the digital platform (Friedman 2014).

It is clear from the many challenges that workers in the gig economy need responses, skills and strategies to survive and succeed in this new form of work. In the literature, studies have developed the concept of the “holding environment” (Petriglieri et al. 2018, 2019). The studies find that the independent gig workers develop a physical, social and psychological space for their work to master the described tensions and challenges. They cultivate four types of connections to place, routines, purpose and people, which help them to endure the emotional ups and downs of their work and gain energy and inspiration from their freedom (Petriglieri et al. 2018). Ashford et al. (2018) highlight the important reactive and proactive behaviors that can help gig workers seize the opportunities of this economy without failing to meet the challenges: resilience (adapting effectively to disturbances), proactivity (acting in advance to create desirable outcomes) and relational behaviors (architecting and managing a relational infrastructure). Cognitive capabilities are also helpful (thinking flexible and adaptively in the gig economy). Gig

workers have to organize things themselves and need to register on different gig platforms, design their profiles and search for jobs on many platforms at the same time (Ashford et al. 2018; Ma et al. 2018). Furthermore, the transience of work requires gig workers to apply their skills and expertise to new combinations of tasks when moving between jobs (Ashford et al. 2018; Damarin 2006).

4.4.3 Gig Platform

From the perspective of the gig platform, it is important to motivate the gig workers to use the platform and keep them on the platform (Boons et al. 2015; Jabagi et al. 2019). On the other hand, the platform providers have to manage, control and monitor the gig work in various ways (Lee et al. 2018; Moisander et al. 2018).

Dimension	Characteristics	Aspects (illustrative citation)
gig platform	motivate workers	employee engagement (Bucher et al. 2019), feelings of pride and respect (Boons et al. 2015), social dialog and communication (Gegenhuber et al. 2020), perceived fairness in pay (Alpar and Osterbrink 2018), platform architecture (Jabagi et al. 2019), career anchors (Taylor and Joshi 2019), reputation (Benson et al. 2020)
	manage work	regulation (Karanović et al. 2021), governance (Gol et al. 2019b), control (Lee et al. 2018)

Table 11. Summary of the Results for the Gig Platform

In business models of location-based platform companies (e.g. Uber), topics such as organizational attractiveness, satisfaction as well as employee retention and motivation are very relevant. For example, Uber and Lyft actively compete with each other to recruit drivers (Kuhn 2016; Lee et al. 2015). In addition, Boons et al. (2015) point out that feelings of pride drive members' ongoing activities on an online crowdsourcing platform and that the platform can increase workers' sense of pride and respect by using specific organizational communication practices. The role of communication between platform and worker is also examined by Gegenhuber et al. (2020). The authors examine platforms that enable crowd workers to communicate task-related topics in order to ensure the availability of crowd workers and the quality of output. Another aspect is the payment of the gig workers. Research has shown that pay that is perceived as not very fair means that crowd workers can put less effort into a task or leave the platform (Alpar and Osterbrink 2018). Jabagi et al. (2019) examine how the architecture of digital labor platforms (and the characteristics of the jobs mediated by these IT artifacts) can influence self-motivation. Furthermore, the findings of Taylor and Joshi (2019) reveal ways in

which the career anchors of technology workers participating in crowdsourcing are evolving in the face of the emerging dynamics in the IT employment marketplace. Most recently, Benson et al. (2020) are investigating reputation systems to help employees identify good employers. Due to the impact of employer reputation, gig platforms must build a good reputation to compete for gig workers as employees against other employers.

In addition to motivating the gig workers, the work on the platform itself must be monitored, regulated and controlled. Karanović et al. (2021) show that Uber drivers do not always submit to the organizational solutions imposed on them, they also actively resist or complement them. Furthermore, research often investigated the governance of gig workers (Gol et al. 2019b; Moisander et al. 2018). For example, Gol et al. (2019b) examined the governance mechanisms of gig workers and the relationships between these mechanisms and organizational value creation. The importance of control on gig platforms is another research topic. Without proper control, the behavior of the online community may not be in line with the platform's objective, which may lead to poor performance by the platform (Lee et al. 2018).

4.4.4 Gig Economy

From the perspective of the entire gig economy, three dimensions were identified, as shown in Table 12.

Dimension	Characteristics	Aspects (illustrative citation)
gig economy	impacts on traditional markets and industries	disruption (Zhang and Sia 2019), demand (Zervas et al. 2017), market competition (Li and Srinivasan 2019)
	impacts on labor market	unemployment (Guo et al. 2019), wage (Li et al. 2018), participation (Huang et al. 2020)
	societal impacts	crime rate (Han and Wang 2020), cohesion and trustworthiness of online information (Rinta-Kahila and Soliman 2017), discrimination (Edelman et al. 2017), privacy (Teubner and Flath 2019)

Table 12. Summary of the Results for the Gig Economy

Many branches of industry and traditional business models are disrupted or displaced by the gig or sharing economy. Digital platforms connect and facilitate transactions between market parties. These platforms threaten the way established companies do business and they must respond to these threats (Zhang et al. 2018; Zhang and Sia 2019). The market entry of gig or

sharing platforms disrupt the traditional markets and has an impact on the prices and demand in the industries (e.g. Uber disrupt the transport industry) (Chang and Sokol 2020; Li and Srinivasan 2019; Pan and Qiu 2018; Zervas et al. 2017; Zhang and Sia 2019). The new gig economy has also changed the competitive landscape in traditional industries with established companies with fixed capacity and volatile demand (Li and Srinivasan 2019).

The gig economy is also having an impact on the labor market. The emergence of gig platforms brings new opportunities and challenges for local labor markets (Guo et al. 2019; Li et al. 2018). They can complement traditional offline workers by facilitating the coordination of services and creating jobs for them, or they can replace offline workers by increasing competition among them (Guo et al. 2019). Li et al. (2018) examine the impact of sharing economy platforms (especially Uber) on labor force participation, unemployment rate, supply and wages of low skilled workers. The authors' results show that Uber increases labor force participation and lowers the unemployment rate of people below the poverty line. Further studies find that unemployment in the offline labor market has a positive impact on the participation of gig workers (Huang et al. 2018; Huang et al. 2020).

Finally, the rise of the gig economy can have social impacts (Cui et al. 2020; Edelman et al. 2017; Han and Wang 2020; Rinta-Kahila and Soliman 2017; Teubner and Flath 2019). Han and Wang (2020) found a positive association between commercial home sharing and the increase of the crime rate. Another social aspect is crowdturfing as a form of cyber deception, the consequences of which are destructive to the cohesion and trustworthiness of online information (Rinta-Kahila and Soliman 2017). Recent research has also highlighted widespread discrimination of hosts against guests of certain races in online marketplaces (Cui et al. 2020; Edelman et al. 2017). Finally, the online marketing of personal resources in the sharing economy is by nature associated with the disclosure of personal and sometimes intimate information, which makes privacy important (Teubner and Flath 2019).

4.5 Discussion

In this section, we discuss central issues for future research on the gig economy based on the analysis of the existing literature.

4.5.1 The Form of Work and the Nature of the Work Tasks

Our review identified 139 articles that focus on various aspects of the gig economy. Since the nature of work in the gig economy was not properly differentiated in all studies, we suggest that

the forms and tasks of work in the gig economy will have to be explored in the future in a more differentiated way, as this may lead to different results in many areas. In order to better differentiate the terms and constructs of the forms of work in the gig economy, we propose a differentiation of gig work in Table 13.

		location dependency	
		location-based (offline, physical)	**not location-based (online, virtual)**
person dependency	**bound to persons**	gig work task to an individual *hospitality services (e.g. Airbnb)* *transport services (e.g. Uber)* *logistic services (e.g. Deliveroo)* *households services (e.g. Taskrabbit)*	freelancing-based crowd work task to an individual *freelancing (e.g. Upwork, Fiverr)*
	not bound	gig work task to many individuals *local micro-tasking (e.g. Streetspotr)*	competition-based crowd work task to many individuals *micro-tasking (e.g. Amazon MTurk)* *creative contests (e.g. 99designs)*

Table 13. Classification of Work Forms in the Gig Economy.

The three work characteristics presented apply to all forms of work: self-employment, work in form of "gigs" and the digital organization of the work via digital platforms. According to location and person dependency, the forms can be further differentiated as follows. The studies in the literature, which actually deal with gig work (according to the classification in Table 13), are small (in this review only 18 articles of 139). If gig work would be regarded differentiated, interesting results could be obtained.

Since gig work takes place offline and in the physical world rather than crowd work, individual risks may be higher, as for example work or traffic accidents might happen. A distinction regarding the rights and conditions of gig workers could also help. With a distinction, more differentiated outcomes could help platform providers to better control and manage workers in the gig economy with different measures depending on the type of work. In this literature review, many of the motivators and drivers of self-employment were related to gig workers. In the future, it should be investigated whether the motivation of gig workers differs from that of the classic self-employed. In addition to self-employment, gig workers, as described in chapter 4.4.2, have additional special characteristics such as working in the form of gigs and working via digital work platforms (Friedman 2014; Kuhn 2016; Kuhn and Galloway 2019). Self-employed on the other hand do not always perform independent "gigs" as employees of the platform.

Besides to the form of work, the type of tasks completed is a dimension of work that has been little studied (e.g. Jabagi et al. 2019). It is also possible that the type and characteristics of gig platforms play a role. These two aspects should be put into relation. Some platforms contain repetitive tasks that require low skills (e.g. drivers on Uber), and some platforms contain more complex or creative tasks that require high skills (e.g. creative freelance work on Upwork). Furthermore, the required prior knowledge to complete the tasks is different (e.g. high prior knowledge required for crowdsourced software testing vs. low prior knowledge required for household services on Taskrabbit). Another possible differentiation is the way the tasks are solved. Sometimes specified solutions are required (e.g. in local micro-tasking on Streetpotr) and sometimes there is more freedom to complete the tasks (e.g. design tasks on Fiverr).

4.5.2 IT Specific Focus and Current Developments

Secondly, we suggest that more emphasis should be placed on IS specific aspects, given the limited focus and the fast-paced development of technology. More research is needed on gig work in the discipline of IS. The special characteristics and chances of gig work in IS have not been investigated much so far. Topics covered include crowdsourced software testing (Leicht et al. 2016b; Leicht et al. 2016a) or IT crowdsourcing where clients post IT projects on a crowdsourcing platform for digital crowd workers to bid on (Taylor and Joshi 2018). This new source of skilled workers for IT jobs should be investigated in the future (Kuhn 2016; Kuhn and Galloway 2019).

Furthermore, the implications of current developments must be investigated in the future. Gig work is becoming increasingly relevant due to current phenomena such as ever advancing globalization, ongoing technological changes, and economic uncertainties (Arthur and Rousseau 1996; Padavic 2005; Sweet and Meiksins 2013). For example, the Covid-19 pandemic highlights the increasing need for research in the field of gig work. On the one hand, services such as food couriers or online work have become part of everyday life due to the risk of infection. On the other hand, the pandemic also highlights the precarious situation of employees from the gig economy. These gig workers work as freelancers rather than full-time employees and therefore have few protective measures such as sick pay, guaranteed wages or health care, which are crucial in a crisis like the Covid-19 pandemic. Even if public health agencies recommend social isolation to insulate people from the virus, gig workers must continue to work with others to secure their income (Conger et al. 2020).

4.5.3 Implications of the Work Characteristics

Thirdly, the effects of the work characteristics were clearly shown in this literature review (chapter 4.4.2), but some implications of this particular form of work are still unclear. On the one hand, few researchers have yet come up with responses to the many challenges of gig work (Ashford et al. 2018; Petriglieri et al. 2018, 2019). However, special skills and strategies are important and necessary to be successful with this special form of work and should therefore be further explored in the future.

On the other hand, the high degree of personal responsibility of gig workers, for example for their careers, training and learning, and the effects of this responsibility on the workers have been little researched so far. While research is increasingly investigating how people work in the gig economy in the short term, little research has been done on how gig workers can work in this way for an entire career or their entire life. It is also still unclear how people in the gig economy find their way around in different professions and industries over time and whether terms such as career trajectories, pathways and advancement are relevant or irrelevant (Ashford et al. 2018). Furthermore, the workers themselves are responsible for their training, further education and lifelong learning. For these reasons, the long-term perspective needs to be explored more and the question of who can support the gig workers in these matters needs to be answered.

4.5.4 Contributions to Research and Practice

Our study makes several contributions to IS research and practice. First, we provide a broad overview of research on the gig economy and the main aspects of the topic, and we bundle the results in different dimensions. Especially the four result tables and the framework on research topics in Figure 1 help to sort the previous results by developing a structure for the gig economy and the relevant perspectives. Second, we contribute to the IS literature by expanding the knowledge about the perspectives of the gig worker, the gig work, the gig platform and the gig economy and the relevant implications of this form of work from different perspectives were clarified. Furthermore, we developed a demarcation of the terms gig work and crowd work (Table 6), as these have not been clearly defined so far. Third, we identify relevant gaps in research. Fourth, we emphasize the relevance of the topic, especially for the future of work, organizations from the IT industry and other disciplines and platform providers in the gig economy. Finally, this study is also relevant to practice by showing how important it is to consider and combine the different perspectives of the gig economy. From the perspective of the gig workers, we highlighted challenges that arise from the specific characteristics of gig work that

workers have to deal with. From the perspective of the gig platform, providers need to manage, control and monitor the gig workers to be successful. Finally, there are important impacts on society and the labor market and many industries.

Despite valuable contributions, our study underlies several limitations. First, the literature search may not cover all relevant studies due to the choice of outlets and keywords. Second, the selection of sources is subjective, despite the systematic approach. Third, there may be other relevant topics for future research that were not identified in this study. These could be discovered by future work.

5 Challenges of IT Freelancers on Digital Labor Platforms: A Topic Model Approach (P2)

Title	Challenges of IT Freelancers on Digital Labor Platforms: A Topic Model Approach
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Contribution of first author	The first author participated in the problem definition, research design, data collection and analysis, interpretation as well as in the conceptual development and reporting. She further significantly contributed to the creation of the manuscript.

Table 14. Fact Sheet Publication P2

Abstract. Freelancers working on digital labor platforms have to deal with many challenges. IT freelancers should be considered separately due to special characteristics such as high skill level or collaborative nature of IT work. Through a Latent Dirichlet Allocation analysis of 2,804 forum posts with over 20,000 comments from IT freelancers and additional qualitative analysis, we assign themes to each identified topic, cluster them into aggregated dimensions and illustrate the interrelationships in a model of IT freelancing. Thus, we examine the challenges of IT freelancers and synthesize them. We extend the challenges of online freelancing already outlined in the literature and identify four IT-specific challenges for IT freelancers. Therefore, we improve our understanding of how IT work is performed on digital labor platforms and which particular aspects should be considered in future research. Furthermore, we highlight implications for practitioners, i.e. IT freelancers on the one hand and platform owners on the other hand.

5.1 Introduction

Online labor marketplaces are often associated with precarity and unfair working conditions (Fieseler et al. 2019). Digital platforms often exploit their position of power and online freelancers are treated unfairly or they are exploited. Furthermore, online workers face enormous insecurity, for example regarding income or insurance (Ashford et al. 2018; Petriglieri et al. 2019) or dependence on feedback and rating systems, as well as limited and purely digital communication channels with existing information asymmetries (Claussen et al. 2018; Gegenhuber et al. 2020; Wong et al. 2021). These conditions underline the importance of taking a social perspective on online labor market places and how digital labor platforms affect working conditions, equity, and employee satisfaction. This is reinforced by the growing importance of these markets as measured by the number of projects and tasks on these platforms (Jabagi et al. 2019; Kässi and Lehdonvirta 2018). In 2020, about 36% of the U.S. labor force (59 million people) worked as freelancers (Upwork 2020). The platform Upwork in particular has seen an increase in qualified freelancers, e.g. in the fields of computer programming and IT (Upwork 2021a). In addition, TopCoder CEO Mike Morris reported a spike in demand for quality engineers and software developers on their platform during the Covid-19 pandemic (Younger 2020).

In this paper, we focus on location-independent online work, also called crowdwork (Howcroft and Bergvall-Kåreborn 2019; Idowu and Elbanna 2022). More specifically, we explore macro-crowdwork in digital labor markets such as Upwork, Fiverr, or Freelancer.com. These markets enable online transactions and matching between freelancers and clients who purchase the services offered through digital labor (Rai et al. 2019). They deal with single, knowledge-intensive tasks. They do not rely on collaboration and crowd intelligence in the form of competitions (e.g., Topcoder) or handle micro tasks (e.g., Mechanical Turk), nor do they work offline in the form of gig work (e.g., Uber) (Holthaus and Stock 2017).

The necessity of taking a closer look at this form of work arises not only from the observation of its enormous growth but also from the fact that it is different from traditional forms of work, as prior research suggests, dealing with advantages and challenges of online freelancing. In contrast to traditional employment, online freelancers are self-employed and work outside of an organizational environment (Deng et al. 2016b; Durward et al. 2020). Due to the global matching on digital labor platforms, there is a high competition and broad heterogeneity of clients and jobs (Bellesia et al. 2019; Bunjak et al. 2021). Additionally, the work is temporary

and purely digital (Ashford et al. 2018; Deng et al. 2016b). Finally, freelancers are not managed by a traditional supervisor, but by algorithms (Duggan et al. 2020; Möhlmann et al. 2021).

For the discipline of information systems (IS), this subject is particularly relevant, as a considerable share of freelancing jobs falls into the area of information technology (IT) work. Therefore, in this paper we specifically examine IT freelancing, which can be defined as the field of IT work on digital labor platforms that includes technology and software development (app development, website design, and software testing) (Idowu and Elbanna 2022). IT work has characteristics that can differentiate an execution of work on digital labor platforms from other areas, which makes it worth taking a closer look. IT work is particularly relevant for many companies due to the general trend toward digitization, and especially in the context of the pandemic, which is countered by a shortage of qualified workers (Alpar & Osterbrink, 2020; Dinger et al., 2015; Goles et al., 2009). However, when IT work is performed by freelancers on digital labor platforms, special aspects need to be taken into account. IT freelancers differ from other online freelancers in two aspects. First, a high skill level is required for IT work, which is constantly evolving (Ang et al. 2015; Zhang et al. 2012). Second, a level of collaboration is often required on IT projects to complete them successfully. This is not the case with other freelancing activities such as simple design tasks, translations or image editing (Kudaravalli et al. 2017).

Related research examined multiple team affiliations in software development freelancing (Watson Manheim and Ahuja 2019), addressed the motivations of highly skilled workers to participate in crowdsourcing platforms (Gol et al. 2018), explored the importance of enhancing professionals' non-technical skills for developing information systems in gig work environments (Frenzel-Piasentin et al. 2022), investigated the entrepreneurial behavior of IT freelancers (Sultana et al. 2019) and looked at the career trajectory of IT professionals in IT crowdsourcing (Taylor and Joshi 2019).

However, IT freelancers in general and their special challenges on digital labor platforms in particular have not yet been sufficiently researched. It remains unclear whether the challenges already known from the literature in other freelancing fields also apply in the same way to IT freelancers, how they may need to be adapted, and which concrete IT-specific challenges arise from the IT characteristics described (Goles et al. 2009; Zhang et al. 2012). Furthermore, it is not yet clear how the individual challenges can be structured as well as synthesized and to which area of freelancing they should be assigned, as most studies only examine one specific challenge

and do not take an overall view of the challenges and problems of online freelancing (Caza et al. 2022; Deng et al. 2016b; Möhlmann et al. 2021). Moreover, previous methodological approaches are limited in that they look at single aspects based on mostly small datasets and are not able to examine a comprehensive overview and at the same time the necessary depth about the interrelated challenges of online freelancers (e.g., Claussen et al. 2018; Ludwig et al. 2022; Rahman 2021; Tóth et al. 2022).

In this study, we address the research gaps described above for several reasons. Working in online marketplaces is steadily increasing in relevance and more and more people are using this non-traditional form of work as a serious career path alternative. Compared to traditional work, however, special circumstances prevail in the environment of digital labor platforms as described, leading to an interplay of unique new challenges to which workers, clients, and platform owners must respond. In particular, the specifics of IT work in this context, which is becoming an increasingly important area of work in the context of digitalization and globalization, need to be examined. Only by understanding these aspects better can platform work represent a sustainable, fair and promising career alternative in the long term. For these reasons, we answer the following research question: *What are the challenges of IT freelancers on digital labor platforms, how can they be structured and how are they interrelated?*

To answer our research question, we examine online forum posts of IT freelancers using Latent Dirichlet Allocation (LDA) (Blei et al. 2003) to identify relevant discussion topics. The identified topics are then qualitatively analyzed and explained in light of the original posts and synthesized into an aggregate model of IT freelancing on digital labor platforms. We thus make three main theoretical contributions to research. First, through this unique mixed methods approach (LDA and qualitative analysis) of an enormously large cross-platform dataset of online forum interactions, we gain detailed insight into how IT freelancers interact. Second, our analysis reveals several challenges that have been little studied, thus we extend some challenges already identified in the literature and structure them in an IT freelancer model. We also synthesize the findings into a future research agenda that illustrates how the implications of our findings could be further explored in research. Third, we identify four emerging IT-specific issues for IT freelancers on digital labor platforms with various associated challenges. In doing so, we improve our understanding of how IT work is performed in the gig economy on digital labor platforms and what makes IT work special.

The structure of this paper is as follows. The next section reviews the relevant definitions and describes related research to present the state of knowledge. After describing the data and the methodology, the subsequent section presents the identified challenges of IT freelancing, supported by quotes from the original posts. Afterwards the results are discussed and finally, limitations and issues for future research are described.

5.2 Literature Review

5.2.1 Challenges of Freelancers on Digital Labor Platforms

Digital labor platforms enable transactions between workers who offer their services online and clients who purchase those services through the platform (Rai et al. 2019). In this context, the service can be location-independent and online (crowd work or freelancing) or location-dependent and offline (gig work) (Duggan et al. 2020; Huang et al. 2020). Location-based work is also referred to as classic gig work and consists of "real-world" tasks in the offline environment (Stewart and Stanford 2017). In contrast, freelancing through digital labor platforms, in contrast, is done purely online and location-independent (Ågerfalk and Fitzgerald 2008; Burke and Crowling 2015). Especially the knowledge work in skilled fields such as software engineering, digital marketing, or writing and translation, this form of work plays an important role (Blaising et al. 2021). In this regard, online freelancers can be characterized as independent and autonomous contractors. They do not perform traditional jobs with permanent employment and constant commitment to a company, but usually work alone under flexible arrangements. They are only loosely employed for a specific task or for a specific period of time. On the one hand, this leads to a high degree of autonomy. On the other hand, it also leads to a high degree of personal responsibility for further training, insurance, career planning, or the procurement of work equipment (Ashford et al. 2018; Friedman 2014). In addition, too much freedom and autonomy can lead to an digital overload, which can have a negative impact on performance (Bunjak et al. 2021). Another characteristic is the coordination and completion of work online via digital labor platforms (Agrawal et al. 2015; Popiel 2017). These platforms provide the digital infrastructure for all mechanisms such as payment, feedback, communication, or rating systems, and mediate interactions through global matching between online freelancers and clients (Rai et al. 2019). Previous research has highlighted challenges for freelancers on digital labor platforms, which are listed in Table 15 with illustrative studies.

The matching of clients and freelancers takes place through digital platforms and there is a wide range and high heterogeneity of clients and jobs on the platforms. Thus, global market transparency is achieved which leads to **global competition** on digital labor platforms (Claussen et al. 2018). In addition, freelancers are faced with **high costs and time expenditure**, which are often unpaid. Therefore, freelancers must pay for any equipment they might need themselves (Wood et al. 2019). In addition, algorithmic systems perform job matching, create freelancer rankings and enable work monitoring, which leads to **algorithmic control** (Duggan et al. 2020). These rankings are additionally supplemented by a **reputation system** on the platform. Freelancers depend on feedback and reviews from clients to get new jobs (Tóth et al. 2022). Furthermore, freelancers are self-employed and lack the context of a fixed organization or permanent employer. They have a **high personal responsibility** and therefore possess a lot of freedom and a high degree of autonomy (Petriglieri et al. 2019). This also leads to high career path uncertainty (Caza et al. 2022; Taylor and Joshi 2019). The **digital organization and mediation of work** through platforms can also lead to problems in interaction and communication between clients and freelancers including challenges regarding feedback (Wong et al. 2021). Another challenge is the **financial instability and precarity** of freelancers. Unpredictable work is leading to highly fluctuating incomes and concerns about maintaining basic incomes for the freelancers (Scuotto et al. 2022). Moreover, freelancing work consists of short-term contracts with different clients. The freelancers therefore face a high **transience of work**, because they handle **temporary contract work** (Ashford et al. 2018). This can for example lead to identity and motivation challenges (Ashford et al. 2018; Chandler and Kapelner 2013). The last challenge identified is the **social isolation and the emotional tensions** on digital labor platforms. Freelancers have no permanent colleagues as in traditional jobs. There is rarely any social interaction with employer or clients as freelancers organize their work via digital platform (Silberman et al. 2010).

Challenge	Illustrative Studies
Global competition	Claussen et al. 2018; Kanat et al. 2018; Strunk et al. 2022
High costs and time expenditure	Wood et al. 2019; Zheng et al. 2015
Algorithmic control and monitoring	Duggan et al. 2020; Jarrahi et al. 2021; Möhlmann et al. 2021; Rahman 2021; Wang et al. 2022; Wu et al. 2019
Reputation system	Graham et al. 2017; Kanat et al. 2018; Tóth et al. 2022; Yoganarasimhan 2013
High personal responsibility	Caza et al. 2022; Kittur et al. 2013; Kost et al. 2020; Petriglieri et al. 2019
Digital organization and mediation of work	Bunjak et al. 2021; Gegenhuber et al. 2020; Gol et al. 2019a; Kost et al. 2020; Ludwig et al. 2022; Wong et al. 2021
Financial instability, precarity	Ashford et al. 2018; Durward et al. 2020; Petriglieri et al. 2019; Scuotto et al. 2022
Transience of work, temporary contract work	Ashford et al. 2018; Brawley and Pury 2016; Bucher et al. 2019; Caza et al. 2022; Gol et al. 2019a
Social isolation, emotional tensions	Ashford et al. 2018; Caza et al. 2022; Gussek and Wiesche 2023; Petriglieri et al. 2019; Silberman et al. 2010; Wood et al. 2019

Table 15. Challenges on Digital Labor Platforms

After presenting the content issues related to the challenges of online freelancers identified in the literature, the methodological approaches used are presented in the following Table 16. These methodological approaches are mostly either qualitative and based on interview data (e.g., Rahman 2021; Tóth et al. 2022) or survey data (e.g. Bunjak et al. 2021; Durward et al. 2020) or follow an econometric approach (e.g., Claussen et al. 2018; Ludwig et al. 2022).

Methodological Approaches	Illustrative Studies
Interview based Study	Möhlmann et al. 2021; Strunk et al. 2022; Tóth et al. 2022; Wong et al. 2021; Wood et al. 2019
Case Study (e.g., interviews, social media data, archival data, platform data, platform observations)	Gegenhuber et al. 2020; Gol et al. 2019a; Rahman 2021; Scuotto et al. 2022; Silberman et al. 2010
Experimental Study	Brawley and Pury 2016; Wong et al. 2021
Survey based Study	Bucher et al. 2019; Bunjak et al. 2021; Durward et al. 2020; Kittur et al. 2013; Strunk et al. 2022; Wang et al. 2022; Wood et al. 2019
Econometrics Study (platform data)	Claussen et al. 2018; Kanat et al. 2018; Ludwig et al. 2022; Zheng et al. 2015
Literature Review Study	Ashford et al. 2018; Duggan et al. 2020; Jarrahi et al. 2021; Kost et al. 2020

Table 16. Methodological Approaches to Investigate Challenges on Digital Labor Platforms

5.2.2 IT Freelancing on Digital Labor Platforms

More and more IT professionals are working as freelancers on digital labor platforms as IT freelancers. They are working on multiple, simultaneous projects on a variety of digital labor platforms, creating a new, complex, and fragmented work environment (Watson Manheim and Ahuja 2019). Well-known platforms such as Upwork or Fiverr primarily offer IT project categories such as app and website development or data analytics (Wagner et al. 2021). Therefore, in our paper we investigate the special form of IT freelancing, which must be distinguished from other freelancing areas. To date, these IT freelancers have not been adequately studied to determine whether the challenges described in Table 15 also apply to IT professionals on digital labor platforms, how they need to be adapted, and what specific challenges are unique to IT freelancers.

IT professionals are increasingly indispensable due to digitization and the growing use of technologies in companies (Dinger et al. 2015). This leads to a high demand for IT professionals in various fields, which is facing a growing talent and skill shortage (Goles et al. 2009). Two main

IT characteristics make IT work on digital labor platforms particularly different from traditional online freelancing.

First, IT professionals perform a wide range of IT tasks, thus requiring a high level and variety of skills (Zhang et al. 2012). In this context, the phenomenon of skill obsolescence describes the idea that outdated skills are less valuable and the person in question is less capable than individuals with newer skills. This can be particularly challenging for IT workers as technologies, and therefore the skills required, change and evolve rapidly (Fu 2011; Guzman et al. 2008; Niederman et al. 2016; Riemenschneider and Armstrong 2021). Therefore, IT professionals are forced to respond to the constant threat of obsolescence by training, learning, and updating skills (Zhang et al. 2012). On digital labor platforms, these aspects additionally pose a particular challenge for IT freelancers, as they need to further differentiate themselves from global competition by meeting high skill requirements in order to be successful (Gandini 2016; Jarrahi et al. 2021). Compared to tasks in other freelance fields such as design or translation tasks, IT tasks are more complex, interdependent, and constantly evolving (Gussek and Wiesche 2022b; Stol and Fitzgerald 2014).

Second, IT work often requires working in teams (Ang and Slaughter 2001; Kudaravalli et al. 2017) or collaborative efforts in designing architecture and integrating components are necessary (Levina 2005; Majchrzak et al. 2005). However, freelancers on digital labor platforms usually do not work in teams but alone, e.g., translating texts or performing simple design or image editing tasks (Ashford et al. 2018). For freelancers in the IT sector, however, collaboration and teamwork can increase success and help with career advancement on the platform (Gussek and Wiesche 2022b).

Despite the described uniquness of IT freelancers, there is limited research on online IT freelancers so far. Gol et al. (2018) address the motivations of highly skilled workers to participate in crowdsourcing platforms. Stol and Fitzgerald (2014) show that crowdsourcing in IT works better for specific software development tasks that are less complex and without dependencies. In addition, Watson-Manheim and Ahuja (2019) study software development teams in the gig economy. Furthermore, Alpar and Osterbrink (2020) show the shift from permanent to temporary employment in IT as a change due to the Covid 19 pandemic. Furthermore, Frenzel-Piasentin et al. (2022) examine the importance of improving the non-technical skills of professionals for the development of information systems in the gig economy. Kanat et al. (2018) address survival in global online labor markets for IT services. Finally, Taylor and Joshi (2019) address

the career trajectories of IT professionals in IT crowdsourcing, and Sison and Lavilles (2018) examine the practices of freelancers in software development in the Philippines.

In summary, it remains unclear in existing research how the individual challenges can be structured and synthesized and to which area of freelancing work they can be assigned because most research examines only a specific challenge and fails to take an overall view on the challenges and problems of freelancing. In addition, the methodological approaches used so far are limited to the extent that they look at individual aspects based on mostly small data sets and cannot examine a comprehensive overview and simultaneously a necessary depth of the interrelated challenges of online freelancers. Moreover, it is clear that IT freelancers in general and specifically their particular challenges have not been sufficiently researched to date. Whether the freelancing challenges identified in previous literature also apply to IT freelancers on digital labor platforms, how they need to be adapted, and which concrete IT-specific challenges arise from the two IT characteristics described above has not yet been researched.

5.3 Data and Method

5.3.1 Data

The underlying dataset consists of postings in the forum r/Upwork on Reddit[1]. Reddit is ranked the 14th most popular website in the world (Alexa Internet 2022), even higher in some countries like the United States (6th), the United Kingdom (7th) and Germany (10th) and offers users to create sub-forums (subreddits) that others can join. The Upwork subreddit alone has more than 29,000 users as of April 2022. One advantage of online forum data as a research source over survey or interview data is what is referred to as naturally occurring and unobtrusive data. Participants were not influenced or guided by a predefined discussion framework or the researcher's own categories or expectations (Guo and Yu 2020; Silverman 2010).

Since we wanted to analyze only discussed topics from IT freelancers, we had to filter the data to include only posts from the IT field. We therefore filtered the data with appropriate keywords. We filtered the posts in this forum for 100 IT-specific terms, like skills, software, or tasks. These search terms include terms that clearly indicate IT freelancing (e.g., C++, full stack development), but also terms that are less clear and are used in related freelancing activities as well (agile, admin support). This selection was made to get a comprehensive picture of the

[1] https://www.reddit.com/r/Upwork/

topics discussed by IT freelancers. A detailed list of the terms can be provided on request by the authors. To verify that our filtering process includes only IT specific posts, we manually reviewed a sample of posts (Jiang et al. 2021). The final dataset contains 2804 posts with more than 20,000 comments released on r/Upwork over three years until January'22, the time was limited to ensure that the topics discussed are highly contemporary. All used posts and comments together comprise 1.43 million words.

Freelancers predominantly use social media platforms, such as Reddit, to discuss about problems and challenges, because the freelancing platforms themselves offer few opportunities to do so. For Upwork there is an official community platform (https://community.upwork.com/), but in the perception of many freelancers, it is moderated too much, particularly when criticizing Upwork, and thus does not offer the possibility for free exchange. Moreover, this forum is used by comparatively few freelancers, which illustrates the low number of postings. The subforums for IT freelancers and admin support include, without time restriction, have about 500 posts. For this reason, while we use this forum for a cross-check, we focus on the larger, more active and freer Reddit forum.

5.3.2 Analysis

We proceeded in two steps in our analysis. First, to analyze the forum posts, we applied the Latent Dirichlet Allocation (LDA), a machine learning algorithm, widely used in the research field of IS (e.g., Caron et al. 2021; Geva et al. 2019) that aims to identify a predetermined number of topics in a text corpus. We first performed some preprocessing steps and then applied LDA to our collected data, which is based on some hyperparameters and the number of topics. The details of the LDA analysis are provided in the appendix (A).

Once the algorithm has identified the topics, their meaning must be interpreted based on grounded theory principles (Croidieu and Kim 2018; Gioia et al. 2013). Therefore, second, we followed an established process for interpreting the generated topics (e.g., Karanović et al. 2021) to add depth to our results.

5.3.3 Topic Modeling Overview and Procedures

To address our research question, we first apply the LDA analysis, that aims to identify a predetermined number of topics in a text corpus. The text corpus consists of unordered documents, in our case each individual post including the related comments is a document, and a document in turn consists of a set of unordered words. In order for the documents to be processed by the

algorithm as input, some preprocessing steps must be applied, as shown in Figure 9. The idea behind the algorithm is that each document can be represented as a mixture of topics, and each topic as a mixture of words. Hyperparameters for the algorithm are α and β. The α affects the distribution of topics to a given document, so that a lower α leads to a more unique assignment of documents to fewer topics. The β is an assumption about the size of the topics, that means a smaller β leads to topics consisting of fewer words (Blei et al. 2003).

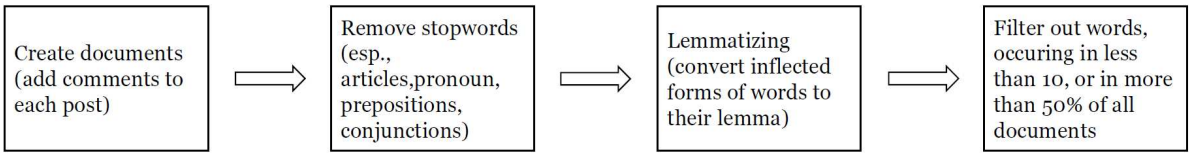


Figure 9. LDA Preprocessing Steps

LDA furthermore requires a predetermined number of topics T. To find the optimal number of topics, we need a measure to evaluate the results of the model. A widely used measure for evaluating topic models, and also originally used by (Blei et al. 2003) is perplexity. This measures how well a trained LDA model can predict a sample of held-out documents, regarding their topic distribution. However, measures such as perplexity, while suitable for measuring model performance, lack in determining the meaningfulness of the computed topics from a human perspective (Chang et al. 2009). For this reason, coherence measures were proposed that directly evaluate the topics found, based on their semantic coherence. Within the area of coherence measures, the C_V measure shows the highest correlation with human topic-ranking (Röder et al. 2015; Syed and Spruit 2017). We ran the algorithm for $T = [5,10, \dots,95,100]$, and evaluated the emerged topics using, whose scores are shown in Figure 10.

Because LDA uses random numbers in the training steps and statistical inference, the mean of the score from 10 runs, as well as the standard deviation, are presented. The highest coherence value is scored for a topic number of 15. Further hyperparameters are set to values of $\alpha = 50/T$ and $b = 0.1$ (Griffiths and Steyvers 2004). The final 15 topics are output as collections of words, and they must be manually evaluated according to the representing content.

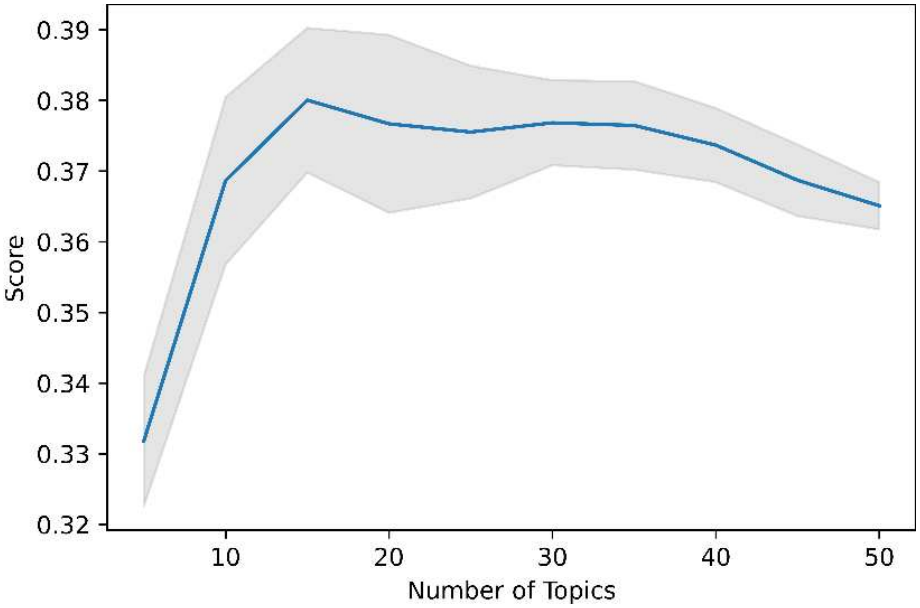


Figure 10. LDA Topic Scores

5.3.4 Topic Modeling Interpretation

Since the LDA algorithm does not label the topics, the researcher must interpret the topics. Therefore, to elicit the meaning of the topics, we used a qualitative approach to code the topics and followed a process that similar studies have also followed (Jiang et al. 2021; Karanović et al. 2021). Applying grounded theory to interpret the topics generated by the LDA analysis enables the identification of relevant mechanisms and their interactions among them, as it aggregates the topics into higher-order dimensions, thus enabling an understanding of the essential components of the underlying data (Croidieu and Kim 2018; Gioia et al. 2013).

The first step was to examine raw generated topics, which we interpreted based on the best fitting and associated words that generated each topic. All three authors independently labelled all topics and discussed discrepancies to reach consensus on topic themes (see Table 17). The themes should be (1) specific enough to provide the clearest possible distinction from other topics and (2) general enough to encompass as many words from the word collection as possible. We look at two different word lists for each topic. First, the list with the 30 most frequent words in the respective topic and second, the list with the 30 words whose frequency of occurrence in this topic has the highest share of the frequency of occurrence in all posts. The first list, on the one hand, partly consists of rather generic words that occur frequently throughout the corpus and thus inevitably also in individual topics, but which have limited specific reference to a particular topic. On the other hand, the second partly consists of words that occur almost exclusively in the selected topic, but which may occur only very rarely overall, so that

they are already very specific even for the selected topic. The theoretically optimal word, for the representation of a topic, would therefore appear in both lists, since it occurs very often in posts to this topic, measured in absolute number, and furthermore even occurs exclusively in this topic. Since these theoretically optimal words occur rarely (highlighted in bold in Table 17), we argue that a selected mixture of the frequent, but partly generic (normal), and the very specific words (italic), is a reasonable indicator of the underlying topic.

When identifying the topics from the word lists, one topic turned out not to be suitable for further analysis (Karanović et al. 2021). The words, and accordingly the posts, in which this topic was given a high weighting, dealt with the freelancing area of writing and translation. The occurrence of this topic is due to the deliberately broad choice of terms for the selection of Reddit posts to be used, as explained above. This topic will not be further considered due to its lack of IT relevance.

In a second step, we grouped the themes into aggregate dimensions by applying a qualitative interpretation. The first and second author interpreted the most representative forum posts of each generated topic for underlying challenges discussed by the IT freelancers and then grouped them into aggregate dimensions (see Table 17). These are explained and illustrated with quotes in the results chapter. In addition, 800 posts and their associated comments, representing approximately 30% of the dataset, were qualitatively coded by a third independent person from the research team who was unaware of the LDA topics. In this process, the qualitative coding matched the LDA topic assignment per post in most cases.

Based on the analysis outcomes and the qualitative analysis of the forum posts, we have developed Table 17, which provides a detailed overview of the data structure of topics, assigned words, themes, and aggregated dimensions.

Topic	Best Fitting and Associated Words	Theme	Aggregate Dimension
1	**new**, try, platform, project, thanks, hire, gig, best, guy, start, help, chance, requirement, hope, **fiverr**, *toptal*, *freelancercom*, *browse*, *inconvenience*, *unverified*, *navigate*, *whine*, *selection*, *overlook*, *disadvantage*, *belong*, *awhile*, *skim*	Platform Onboarding and Platform Switch	**Platform Start**
2	**proposal**, *attachment*, *introduction*, *customize*, post, apply, *applicant*, application, **description**, land, hire, write, **cover**, **letter**, bid, response	Job Application	**Gig Acquisition**
3	**invite**, **invitation**, **talent**, **badge**, **rise**, **profile**, **search**, *visibility*, view, history, **feed**, plus, *hide*	Platform Visibility	
4	contract, project, **scope**, **escrow**, pay, **milestone**, dispute, change, **revision**, complete, submit, **deadline**	Gig Project Management	**Gig Execution**
5	**screen**, *desktop*, *laptop*, *monitor*, *keyboard*, *timer*, *mouse*, phone, **tracker**, **manual**, **screenshots**, *billing*, **app**, *diary*, *clock*, *pause*, *timer*, *speed*, *browser*, hour, week, minute, *log*, contract, **protection**, **record**	Platform Labor Monitoring	
6	**feedback**, **star**, **leave**, **rating**, **score**, **negative**, **review**, *satisfaction*, bad, poor, contract, **private**, **affect**, *jss*, honest, ask, *hurt*, **remove**, **close**	Feedback and Rating	
7	**rate**, **raise**, *pricing*, hour, price, **charge**, hourly, high, budget, day, offer, bid, *discount*, *gradually,* increase*, flat, bargain,* cheap, value	Gig Project Finances	**Finances**
8	**tax**, *boost*, *expense*, *profit*, *insurance*, *vacation*, *covid*, **pay**, money, business, fee, **income**, cost, spend, *revenue*, *net*, saving, *stable*	Entire Finances of Freelancing	
9	*asshole*, *unpaid*, **scam**, fuck, **test**, *difficult*, *caution*, *clueless*, nda, free, pay, red, flag, ask, outside, report, accept, rule, platform, *zoom*, *agreement*, *interact*, *officially*, *middleman*, *ethical*, *forbid*	Client Management	**Platform and Client Relationship**
10	**bank**, check, receive, money, address, **verification**, payment, **paypal**, **card**, *deposit*, **account**, contact, support, **ban**, **suspend**, reason, issue, fake, scam, forum	Platform Rules and Sanctions	

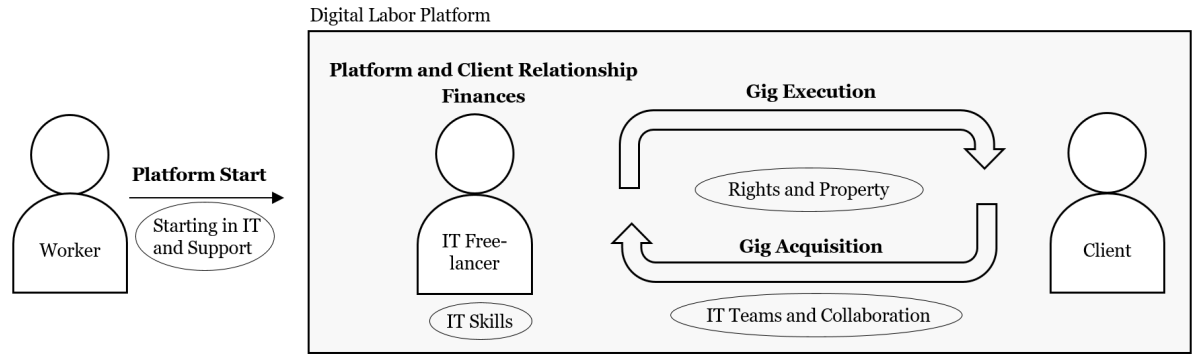
11	*certificate*, *python*, *backend*, *frontend*, *aws*, *nodejs*, *django*, professional, *devops*, start, help, advice, learn, *collaborate*, *affiliate*, *guidance*, experience, idea, build, helpful	Starting in IT and Support	**Topics unique to Freelancing in the IT Profession**
12	ask, right, **availability,** share, send, let, file, share, provide, *github*, *asset*, *eligible*, *property*, *intellectual*, *commercial*, *ownership*, *specification*, *accurately*, *technically*, *forbidden*, information	Rights and Property	
13	hire, **agency**, software, developer, people, offer, **code**, person, build, team, create, lead, manage, solution, individual, *outsource*, *role*, *api*, *consult*, *viable*, *integration*, *organization*, linkedin, *crm*, *devs*, *coder*, *implementation*	IT Teams and Collaboration	
14	**wordpress**, *excel*, *javascript*, *virtua*l, *php*, *adobe*, *java*, medium, *photoshop*, *animation*, *html*, website, create, development	IT Skills	

Table 17. Overview of the Data Structure

5.4 Results

In the following, we present the results of the analysis in detail and describe the individual aggregated dimensions with their assigned themes and their corresponding challenges. For this purpose, we use exemplary quotes, which have been assigned to the respective topic, from our dataset to clarify the descriptions and contexts. Furthermore, we structure the results in an aggregated model of IT freelancing on digital labor platforms (Figure 11), which shows where and when the challenges occur.

As described in the method section, the 14 topics from the quantitative LDA analysis were additionally analysed in detail by a qualitative analysis of the forum posts. On this basis, we clustered the topics into aggregated dimensions (Table 17). To illustrate the interrelationships of these dimensions and the IT specifics, we develop an aggregated model of IT freelancing on digital labor platforms in Figure 11.



Note:
The bold headers represent the aggregated dimensions, regarding overall online freelancing and the oval frames represent the IT-specific topics belonging to the "Topics unique to Freelancing in the IT Profession" aggregated dimension.

Figure 11. Aggregated Model of IT Freelancing on Digital Labor Platforms

The 5 aggregated dimensions, regarding the overall online freelancing, are shown in bold. The four IT-specific topics of the 6th aggregated dimension "Topics unique to Freelancing in the IT Profession" are clarified in the model by the oval frames: Starting in IT and Support, Rights and Property, IT Teams and Collaboration and IT Skills. Thus, the start in the platform environment is clear, followed by a cycle of gig acquisition and gig execution on the platform. This is influenced by the relationship between the IT freelancer, the digital labor platform and the clients. The four IT-specific topics can thus be assigned to the individual parts of the model depending on whether they relate to the IT freelancer, the work process or the platform start. The individual parts of the model are described in more detail in the following.

5.4.1 Platform Start

Topic 1: Platform Onboarding and Platform Switch

A big issue for IT freelancers is the onboarding on the platform. The initial profile creation and the following profile design is the first step of a platform activity. This process poses many challenges. Without projects and thus without customer reviews that can be proven, finding jobs on the platform is extremely difficult. Especially getting the first job is a big challenge for IT freelancers, as they cannot prove any expertise yet and therefore it is difficult for customers to build trust to book the IT freelancer.

In addition, many IT freelancers try out different platforms in the beginning to find the most suitable one. After all, once a certain reputation has been built on one platform, switching to an alternative platform is fraught with challenges. Reviews on one platform cannot be easily ported

to another. The IT freelancer would therefore again have no experience to show and would start again with getting jobs. Consequently, the dependency on a platform increases the more successful an IT freelancer is on a platform.

> *"Hi everyone, i'm 28 years old web developer who started doing freelance 6 months ago, i've been working on fiverr, i got some good projects and clients who also left a nice review + 5 Starts rating. Now i want to switch to upwork so i can work based on hourly rate and increase my earnings, cause prices at fiverr as we all know is pretty low […]"*

5.4.2 Gig acquisition

Topic 2: Job Application

Regarding the application process for jobs on the platform, convincing the customer is especially challenging for IT freelancers. The writing of proposals and the cover letter must accordingly be so good that the IT freelancer is selected over the very large competition on the platform. This often requires a very large number of requests or proposals, which are often ignored or rejected, in order to get a job.

> *"I have recently started working on Upwork, […] and I have secured four small jobs […]. So far all my clients loved my work […] most of them particularly noted that my proposal was "very good" and "amongst the best they had received". Yet most of my proposals get no reply from the clients, I have submitted 30 proposals, so far six replied one ghosted and five secured, the rest never replied. […]"*

Topic 3: Platform Visibility

Another challenge is the uncertainty or lack of clarity about the visibility and display order of IT freelancers for customers. The influence that the platform has on matching is particularly unclear here. There are also concerns about various sanctions, such as being less visible. These sanctions can result in an IT freelancer receiving fewer job invitations and so-called interviews with potential clients. In addition, it is often not clear how and when an IT freelancer receives a profile badge to attract customers' attention.

> *"If we decline an interview with reason "Too busy on other projects" will our visibility in clients' future searches decrease? Will, in some way, Upwork consider that we are generally busy and put us in a more "hidden" mode?"*

5.4.3 Gig execution

Topic 4: Gig Project Management

Once a project has been acquired, successful execution of that project poses further challenges. There are different project phases to manage: the contracting, payment arrangements, execution and the associated choice of whether to work on an hourly or milestone basis, and the final completion and closure of the project. Along this process of work execution, different challenges arise. For example, customers often request a large number of revisions that were not previously agreed upon. However, due to the power of the client, IT freelancers can do little about it for fear of receiving a bad review. Other clients rarely respond and unnecessarily delay project completion. In addition, IT freelancers often face the problem that clients suddenly stop responding or cancel the project without explanations. Furthermore, agreements regarding time off, for example for vacation, can be problematic.

> *"I'd like some advice on creating milestones when submitting a proposal for jobs with vague descriptions. […] How do you break a job into milestones when the client hasn't given enough information for you to accurately do so? […] I've only done hourly jobs on Upwork so far and welcome any advice on taking fixed price jobs."*

Topic 5: Platform Labor Monitoring

Since clients cannot directly supervise work on digital work platforms as they can in traditional jobs, labor monitoring on platforms is different. IT freelancers need to record their work hours in different ways, for example in an app, in order to provide proof of hours worked. Major challenges are the technical aspect on the one hand and the critical aspect of data protection on the other, which is often ignored. For example, automatic screenshots are taken at random times so that the customer can monitor what exactly the IT freelancer is doing at work. Privacy is thus often violated. Example situations where such a screenshot can be misunderstood are when the IT freelancer is listening to music while working and just changes the song or when an aspect of the work is googled, which might make the client think that the IT freelancer does not sufficiently master the required skills of the project.

> *"Sometimes I'd like to search for someone as simple as linking a js file maybe because I forgot, I wouldn't be able to do so because I'm unsure if the app will take a screenshot of that and the client might think that I'm incompetent because I searched for something as basic as that."*

Topic 6: Feedback and Rating

The already mentioned importance of (star) ratings for success on digital labor platforms leads to a number of further challenges. Negative reviews can consequently set IT freelancers back in their success and weigh more heavily than a positive review. Many IT freelancers also actively ask for feedback from clients and try to understand the formation of the job success score (JSS) formed from the reviews. However, this score is not fully transparent and therefore not controllable.

> *"I recently got a bad client. I made the mistake of accepting this work with a low budget but for something that had to be done in days. The client went on and on with new changes. […] The work was completed. And she then changed the website herself. She ruined it […]. She then came to me to express that the work was not done as she wanted and that it had issues (which she created). I' ve even corrected the issues and asked to release the milestone. She didn't respond […]. I submitted the work for payment and got paid by Upwork after 14 days. A month after, she sent me a quick message to express how disappointed she is. It's like I killed her son. The work had no issues. I'm not a beginner and I know what I'm doing. […] And I know that I will get a bad feedback which will probably affect my good profile. […]"*

5.4.4 Finances

Topic 7: Gig Project Finances

Another challenge relates to finances regarding individual gig projects. It is particularly difficult to determine the optimal price for a project. If this is too low, the IT freelancer sells himself short and misses out on income. However, if it is set too high, the contract may not be signed because the competition on the platform is very high and clients will choose a cheaper freelancer. Especially at the beginning, the price can not be set high but only increased over time.

> *"So I recently started freelancing on UpWork and I started at a really low hourly rate and then when I went to raise my rate for one of my customer she decided to drop me. […] Is there anything I could have done differently? I'm still underpricing myself for my specific web dev niche."*

Topic 8: Entire Finances of Freelancing

Generally, challenges exist at the level of the entire online freelancing activity. Significant issues are mainly ambiguities or uncertainties about tax issues, insurances regarding the activity

or the high fees that the platform requires. For the quasi self-employed IT freelancers, these aspects are particularly challenging, because they are responsible and have to take care of everything themselves.

> *"I started freelancing at the beginning of the pandemic and I've made a bit of money from Upwork […]. I haven't done my own taxes before so I am a bit lost and overwhelmed. Any advice would be really appreciated […]."*

5.4.5 Platform and Client Relationship

Topic 9: Client Management

The management of clients or the relationship with clients is also a challenging issue in IT freelancing. There are numerous complaints about clients for many reasons. For example, clients often do not pay, post scam projects online or demand services without paying for them.

> *"Some asshole hired me for a small edit. It was maybe a page, so I did what I always do and fired up Word and delivered with tracked changes. […] He immediately says it's crap and wants to negotiate. We all know he meant refund, but if you don't like a test edit, you don't get your money back. You pay and move on. That's what most people do, but this guy was on a mission. He proceeds to snapshot a post on here from a couple weeks ago where I said I don't even try (in regards to bidding on contracts) and tells Upwork that I'm scamming people. […]"*

In addition, challenges arise when customers want to break the rules of the platform. However, this potentially leads to sanctions by the platform for the IT freelancer (see Topic 14). For example, customers ask if the projects, the communication or payment can be handled outside the platform. As described, this increases the risk for IT freelancers on the one hand, because they work without the protection of the platform. On the other hand, there are advantages for both sides. For example, costs can be saved because the platform would retain a share of the profit when the project is completed via the platform, which would then be retained by the other two parties.

> *"[…] the client sends me an external link for the job application, suggesting I apply through there. Then she sends me her personal email for future contact, and just for good measure she also suggests we get on a Skype call together. I guess this leads to a natural conclusion of also wanting to pay me through their own payment funnel and not on Upwork. […] it*

puts freelancers in a horrible situation. We are forced to then explain the rules of the platform, which some clients take the wrong way, and put the job in jeopardy […].”

Topic 10: Platform Rules and Sanctions

Finally, the already mentioned rules of the platform are an important topic as well as the associated sanctions for rule violations. There are many complaints from IT freelancers about the platform, whose often quick sanctions are perceived as unfair and can hinder the success of IT freelancers. The most common sanction is the blocking of the IT freelancer's account. Reasons for this blocking are manifold. For example, time off due to vacation, project completion or communication outside the platform, customer complaints, payment problems, failed ID verifications, or a change in work or home location can lead to the account being blocked.

“I've been working with Upwork since like forever, but recently I've been noticing dodgy things with them […]. They blocked my bank accounts with a Payment method verification in progress, as allegedly the beneficiary name is mismatched. (it's not) […]. Now I have $4k stuck with them. Waiting for the support team to follow-up. […] they blocked my account entirely pending a Verrification (ID and face) + photo on profile. […].”

The consequences of such account suspensions are severe for the IT freelancer, as they may have to recreate their profile, lose their reputation and access to their clients, and suffer damage to their image and trust. The following specific example also shows that the widely discussed great advantage of online freelancing, that work can be done from anywhere, does not always apply. The platform and its rules make this freedom aspect of IT freelancing much more difficult.

“I have been on Upwork for about 5 months […]. I traveled to Thailand and continued working on Upwork from there. When I came back to the US, my account was suspended and they wanted me to verify my identity and location. I was able to verify my identity easily but had an issue with my location […]. Is it possible to make a new account and start over? Wouldn't be ideal to lose my reputation I had started to build from that account but better then nothing […].”

5.4.6 Topics unique to Freelancing in the IT Profession

Topic 11: Starting in IT and Support

When freelancers start on the platform in the IT sector, additional challenges exist. At the beginning, it must be decided whether the IT freelancer wants to specialize and offer a single service, or whether he or she wants to serve several skill areas and thus operate more as a generalist. This choice can be difficult if it is unclear how high the demand is in certain areas. Also, choosing a set of technologies and skills that the IT freelancer will focus on to complete projects professionally in that area is usually difficult.

> *"Should I move to Full stack dev or stay? […] Mostly my job doing an academic writing that publishable into journals or conference […]. I was thinking to move to other niche such as web app development might be using Django or node.js. How is the niche?"*

In addition, challenges arise regarding individual IT skills or other IT specific issues such as loneliness or lack of IT expertise of the client for which the IT freelancers seek support and help. For example, sometimes the client does not have enough technical knowledge to actually use the results of an IT project, such as a programmed code, without help.

> *"I've been taking on some Python Development odd jobs here and there for some extra cash. For whatever reason, I have been most successful with clients who aren't necessarily very good with technology, but have an idea they would like to see through to fruition […]. The problem comes when it's time to hand off the script, which I created on Linux inside a Virtual Environment, for them to run on their outdated Windows PC […]. I can usually get the script working on their computer. But I sort of feel like I'm sending a kid off into the woods with a flashlight and a pat on the back. "Good luck and thanks for the money!" […]"*

Topic 12: IT Teams and Collaboration

Especially in IT the projects are extensive and require a high skill level. To solve this challenge, many IT freelancers use teams or collaborations with other IT freelancers. On the one hand, the critical aspect of time can be overcome by dividing the work in the project and thus successfully completing more projects in the same time to increase reputation. On the other hand, the team members can complement each other in terms of the required skills and it is not necessary that one IT freelancer can handle all the tasks. This help in the team is therefore especially important for IT freelancers. In addition to the private formation of such teams, the platform offers the possibility to create so-called agency profiles. However, there is a lot of confusion among IT

freelancers about this, for example, whether it is worthwhile to create an official agency or what exactly the creation of such a shared profile looks like.

> *"Is it a good idea to gather a team of developers to get jobs on upwork? I'm from the IT field […]. The reason to gather a team is that so we can help each other. I just got one job at upwork and I got a bad review. The client wanted me to complete the tasks fast. The tasks were kind of simple but the problem was that I didn't get the project from scratch so I had many problems with it. […] Also the project was not organized and they didnt use best coding pratices what made more difficult to understand the application. […] So what's your opinion on gather a team to find jobs so we can help each other? […]"*

Topic 13: Rights and Property

Another aspect of platform IT work are the rules regarding rights and property of developed products. Especially in IT projects, the content and data of the clients are often private and confidential, so certain agreements have to be signed by the IT freelancer at the start of the project, so-called non-disclosure agreements (NDA). Due to this fact, it is difficult for IT freelancers to show their successfully completed projects to potential new clients for self-promotion purposes. So-called portfolios or work samples can often not be easily shown to new clients. In this regard, however, there are many uncertainties regarding the rights to the work results and the property.

> *"[…] I'm aware the default Contract Terms we agree on when accepting a contract say that now client owns all rights related to the work, including intellectual property (also taking away the freelancer's right to use that work for self-promotion). Most of my clients tell me over the chat that they are ok with me using the work in my professional portfolio. […] I know it doesn't matter, but in my country (Spain) it's not allowed to sell intellectual property, and I'm culturally uncomfortable with that."*

Topic 14: IT Skills

Lastly, it can be challenging to keep up to date with the latest skills in demand in the IT area. The market demand has to be constantly monitored and the skills have to be adapted accordingly to stay up to date on the platform. In addition, skills that were once in demand can quickly become outdated, which requires continuous training and updating of IT freelancers to be and remain successful. Finally, customer requirements in the IT sector are particularly high and

sometimes very specific, which is why simply mastering many skills is often not enough to get a job.

> *"[…] While waiting on my next data-related Upwork gig and also to figure out what new skills I might be looking into, I've been collecting jobs data from the official Upwork RSS feed since 1st October 2020. […] I've gotten 302427 unique job postings out of the data. Here are the overall top 20 skills as included by the clients in the job postings: …"*
> *"Why are almost all the jobs related to WordPress? Reason: I'm freelancer who want to work on some freelance jobs as a Frontend Developer using HTML, CSS (SASS), JavaScript (Reactjs), Bootstrap, etc., but mostly jobs are related to WordPress with which I have no experience."*

5.5 Discussion

Our study makes several theoretical contributions to research. First, we investigate challenges on online labor platforms through a unique mixed method approach (LDA and qualitative analysis) of an enormously large cross-platform dataset on online forum interactions. We study unique dynamics and thus gain detailed and comprehensive insight into the interactions of IT freelancers.

Second, we shed light on the various issues and resulting challenges of IT freelancers and bundle them into aggregate dimensions and a model of IT freelancing (Figure 11). In doing so, we structure and extend the challenges of online freelancing already identified in the literature and synthesize the findings into a future research agenda (Table 19) that clarifies how the implications of our findings might be further explored in research.

Third, we identify four new IT-specific topics for IT freelancers on digital labor platforms with the described associated challenges. Thereby, we improve our understanding of how IT work is performed in the gig economy on digital labor platforms by IT freelancers and which particular aspects should be considered in future research. Our results contribute to the discussion of what makes IT work special and challenge already studied IT characteristics in a new context, the digital labor platforms. Furthermore, we highlight implications for practitioners, i.e., IT freelancers on the one hand and platform owners on the other.

5.5.1 Implications of the Unique Mixed Method Approach and Large Cross-Platform Dataset

The first theoretical contribution of our study lies in the unique methodology used and the large cross-platform dataset on online forum interactions investigated. We thus examine unique dynamics through LDA analysis and gain a detailed and comprehensive insight into the online interactions of IT freelancers through the subsequent qualitative analysis. Comparing the most commonly used methodological approaches in previous research on challenges on digital labor platforms highlights our contribution, as only small or single case datasets have been mostly explored through qualitative (e.g., Rahman 2021; Tóth et al. 2022) or econometric methodologies (e.g., Claussen et al. 2018; Ludwig et al. 2022). However, our data source and the LDA methodology used are particularly relevant to the online freelancing space under consideration, as freelancers often use communication channels that are not allowed by digital labor platforms (such as Upwork). They help and learn from each other as a kind of team or colleague, even though they are actually competitors in the global platform market. This unique insight into the interaction of IT freelancers represents a new contribution to the existing literature.

Moreover, our study indicates that interaction in online forums (as our analyzed data source) is a promising and rich source of information and help for IT freelancers, potentially replacing the actual lack of colleagues and social connections on digital labor platforms. This aspect is particularly relevant in the IT sector because, as described, IT freelancers often rely on collaboration and need to continuously develop their skills, where lack of support from supervisors and training provided by them can be replaced by help from other IT freelancers. Thus, we contribute to the literature around the concept of the holding environment (Petriglieri et al. 2018, 2019) by explaining and adding online forums as support for working on digital labor platforms. Thus, connections with people are possible through the use of online forums. We also show that this way of using online communities can be a promising source for IT freelancers as knowledge workers on platforms, contributing to the literature on online communities and participation in them (Chung et al. 2010; Wang et al. 2012).

5.5.2 Synthesizing and Extending Challenges for IT Freelancers

As a second theoretical contribution, our paper extends the literature on digital labor platforms and freelancing by synthesizing the challenges of online IT freelancing and structuring them in terms of where they occur (Figure 11). We identified the aggregate dimensions of platform start, gig acquisition, gig execution, finances, and platform and client relationship, each of

which encompasses distinct topics. In addition, we described many challenges within the topics through a qualitative analysis of the forum posts. Thus, we can clarify in the following which aspects we contribute to the freelancing challenges already identified in the literature. In Table 18, we connect the previous literature (Table 15) with our empirical findings (Table 17) along the aggregated dimensions and illustrate the areas in which further research is needed in Table 19.

Platform start: When IT freelancers enter the platform labor market, competition is particularly high and onboarding is very challenging as it is difficult to get the first job without prior reviews. Platform lock-in develops because reviews are not potable. A switch to other platforms is therefore difficult and the platform dependency increases with increasing success on the platform.

Gig acquisition: In addition, we contribute to the literature that has identified global competition and high necessary job application costs as freelancing challenges, often resulting in working unsocial and irregular hours (e.g., Wood et al. 2019). We found that for IT freelancers, it also takes a very large number of requests or applications that are often ignored or rejected to get a job. We also show that IT freelancers feel a lot of uncertainty regarding the visibility of their profile on the platform and do not understand the algorithm. They are afraid of the impact on their visibility and ranking. Thereby, we contribute to the literature that has studied algorithmic control and its implications as freelancing challenges (e.g., Möhlmann et al. 2021).

Gig execution: To the challenge of personal responsibility regarding gig work management (e.g., Caza et al. 2022) we add the strong dependence of IT freelancers on clients, who hold a high position of power. In addition, regarding the research on work monitoring on platforms (e.g., Wang et al. 2022), we highlight the critical aspect of data protection and privacy for example by automatic screenshots of IT freelancer screens. In addition, there is some research on feedback and rating on digital labor platforms that has highlighted freelancers' dependence on good reviews (e.g., Yoganarasimhan 2013). We add to this challenge that IT freelancers need to avoid bad ratings at all costs in order to keep getting jobs. One negative review can have a very large negative impact on IT freelancer success.

Finances: Regarding gig project finances, the literature has examined the strongly varying incomes (e.g., Ashford et al. 2018). Through our analysis, it is also clear that pricing individual tasks is very challenging and that the pricing strategy changes with increasing success of IT

freelancers. Moreover, when considering the freelancer's overall finances, it is already understood that there is no base income for freelancers and they are on their own without a supporting organization (e.g., Scuotto et al. 2022). However, there are also uncertainties regarding taxes or the high fees that the platform charges.

Platform and client relationship: Through the digital organization and mediation of work, communication challenges arise, which also affect the feedback for freelancers (e.g., Wong et al. 2021). We contribute to this literature by clarifying that IT freelancers have to deal with the power of the client, who often do not pay or post scam projects. Furthermore, clients often require IT freelancers to break the rules of the platform, which can have negative consequences for freelancers. Finally, it is evident that the previous literature has not yet identified platform rules and sanctions as a freelancing challenge. We illustrate that sanctions such as platform exclusion can have large career consequences for IT freelancers. They are very dependent on their platform profile, as the reputation they have developed is not transferable to other platforms. The power of the platform can therefore have negative consequences.

Topic	Theme	Corresponding Literature Stream	Contribution
1	Platform Onboarding and Platform Switch	Challenge not identified in the literature	High competition in the beginning, increasing platform lock-in
2	Job Application	Global competition, wide range and high heterogeneity of clients and jobs, high costs and time expenditure (Claussen et al. 2018; Zheng et al. 2015)	Large number of requests or proposals required
3	Platform Visibility	Algorithmic control and monitoring with job matching and freelancer rankings (Möhlmann et al. 2021; Rahman 2021)	Uncertainty about visibility and fear of its degradation
4	Gig Project Management	High personal responsibility, freelancers are self-employed and lack the context of a fixed organization or permanent employer, high career path uncertainty (Ashford et al. 2018; Caza et al. 2022)	Dependence of IT freelancers on clients and power of the client
5	Platform Labor Monitoring	Algorithmic control and monitoring, with job matching and freelancer rankings (Wang et al. 2022; Wu et al. 2019)	Data protection and privacy issues

6	Feedback and Rating	Reputation system, freelancers depend on feedback and reviews from clients to get new jobs (Tóth et al. 2022; Wong et al. 2021)	Strong impact of negative ratings
7	Gig Project Finances	Financial instability, precarity, unpredictable work is leading to highly fluctuating incomes (Graham et al. 2017; Wood et al. 2019)	Pricing for jobs is difficult and changes with increasing success
8	Entire Finances of Freelancing	Financial instability, precarity, unpredictable work is leading to concerns about maintaining basic incomes, high personal responsibility, freelancers lack the context of a fixed organization or permanent employer, high career path uncertainty (Durward et al. 2020; Kost et al. 2020)	Uncertainties about tax issues or the high fees that the platform charges
9	Client Management	Digital organization and mediation of work, problems in interaction and communication between clients and freelancers including challenges regarding feedback (Ludwig et al. 2022; Silberman et al. 2010)	Clients exploit their position of power to the disadvantage of IT freelancers
10	Platform Rules and Sanctions	Challenge not identified in the literature	The power of the platform in the form of (not always fair) sanctions can have severe consequences

Table 18. Comparison of Previous Literature and Findings on the Challenges of IT Freelancing

By synthesizing our findings and comparing them to the previous research literature (Table 18), we clarify below what our results regarding the aggregate dimensions imply in an integrated context. To this end, we propose a future research agenda (Table 19) and illustrate how the implications of our findings should be further explored.

Aggregate Dimension	Directions for Future Research
Platform Start	• What are the main reasons why online freelancers give up and exit a digital platform career in a highly competitive environment? • How can platform owners foster and support the lack of initial trust between online freelancers and clients when there are no client relationships or platform reputation yet?
Gig Acquisition	• How do negative client reviews affect careers and platform visibility and what are suitable strategies to circumvent negative feedback? • How do aspects such as discrimination or social and cultural barriers affect gig acquisition and how can diversity and inclusion be ensured in such online markets?
Gig Execution	• How do new innovative technologies (e.g., generative artificial intelligence) affect gig execution or do such technologies destroy jobs on digital labor platforms? • How can a transfer of platform reputation to the offline labor market or to other digital platforms be designed and how can offline experiences be transferred to digital platforms?
Finances	• What impact do geographical location factors, exchange rates, inflation or economic fluctuations have on competitiveness and prices on digital labor platforms? • How does price dumping and unfair competitive practices unfold on these platforms?
Platform and Client Relationship	• How do illegal practices occur on digital labor platforms (e.g., reuse of work results or circumvention of the platform) and what ethical problems arise from these practices? • What factors are relevant from the client's perspective and how do clients efficiently cut contracts and manipulate and manage online freelancers?
Topics unique to Freelancing in the IT Profession	• How can the dissonance between the growth of digital labor platforms and the limited collaboration of IT freelancers be addressed and what dimensions of new types of virtual organizations and collaboration can be identified on digital platforms? • How can platform owners help to protect the property rights of online freelancers and what specific role do data protection rules and regulations play in IT work on digital platforms?

Table 19. Future Research Agenda

5.5.3 Specifics of IT Work on Digital Labor Platforms

The third theoretical contribution of our paper to IS research are the identification and investigation of the specifics of IT work on digital labor platforms. Freelancing in the IT industry has been around for a very long time, but work on digital platforms has not progressed as far. Some of the IT characteristics already identified in the literature, such as the high demand for IT professionals (Prommegger et al. 2020b) or the rapid technological change, which requires constant learning and training (Benamati and Lederer 2001; Joseph et al. 2011), also apply to digital labor platforms. However, some aspects need special attention on digital labor platforms. Therefore, in our paper we contribute new aspects to previous IT literature. In our LDA analysis, we identified four IT-specific challenges arising from the two IT characteristics described in the background section: Starting in IT and Support (topic 11), Rights and Property (topic 12), IT Teams and Collaboration (topic 13) and IT Skills (topic 14). In the following, we will contrast the specifics of IT work with the aspects of work on digital labor platforms and thus specify IT work in a new context: IT freelancing on digital labor platforms. In doing so, we show how the four identified IT topics can be classified and that the IT specifics on digital labor platforms are special and thus contribute to the IS literature dealing with the specifics of IT work.

First, IT work requires a high level of skills, which are related to extreme demands on the profession in the context of constant change in IT (Guzman et al. 2008; Niederman et al. 2016). Furthermore, the facets of knowledge required and the necessary continuous refinement and adaptation of the knowledge base distinguish the IT profession from other professions (Riemenschneider and Armstrong 2021). We could find these aspects in the IT specific topics “Starting in IT and Support” and “IT Skills”. However, on digital labor platforms the described aspects are particular. As technological developments in IT result in frequent skill obsolescence, IT freelancers need to respond to this with appropriate updating, learning and training. On digital labor platforms, however, they are on their own on the one hand, which is why they have to take care of training and updating on their own without organizational support. On the other hand, the digital labor platform enables a broad and simple market overview through the easy visibility and transparency of the job situation and competition in the field of work. This makes it easier to recognize which skills are in particular demand at which point in time and where it would be most worthwhile to continue training and learning. Nevertheless, these two arguments also mean that the starting process in IT on digital labor platforms is especially difficult compared to other freelancing jobs such as translation tasks. In traditional markets, the demand for

IT staff is very high, which is why professionals often do not have a problem finding employment. This is less easy on digital labor platforms due to the global competitive situation. In addition, specialization in a certain skill area is often not possible at the beginning of a platform career, since building a reputation requires accepting simpler jobs that may not be from the IT field. However, this generalization to several skills is not efficient in the long run, especially in IT, because, as described above, technology develops quickly in each skill area and the IT freelancer has to stay up to date in order to continue to get jobs on the digital labor platform.

Second, IT work and projects in IT often require a lot of collaboration, for example, to integrate different components (Levina 2005; Majchrzak et al. 2005), as well as teamwork (Ang and Slaughter 2001; Kudaravalli et al. 2017). We were able to find these aspects in the IT specific topics "Starting in IT and Support" and "IT Teams and Collaboration". On digital labor platforms, in turn, these IT specifics are also particular as collaboration among online freelancers is not common and they have limited opportunities for interaction. The exchange between IT freelancers is therefore restricted by the platform and few integrated collaboration tools are available. Especially the digital nature of the workspace and the work itself leads to problems regarding the formation of IT teams on the platform. This makes coordination and collaborative work more difficult. Yet, as described, this is often necessary in IT and despite the challenge of limited collaboration, digital labor platforms continue to grow, especially in IT. Consequently, help from other IT freelancers with specific problems is particularly important in IT, but is also made more difficult on the platform by limited opportunities for communication between the IT freelancers.

Third, IT professionals often work with large amounts of client data, which is confidential. Furthermore, work results such as software are frequently licensed. We could find these two aspects of IT work in the IT specific topic of "Rights and Property". Although these characteristics of IT work are usually not very problematic in traditional labor markets, they can lead to a number of challenges on digital labor platforms. For IT freelancers, as described, it is essential for success to demonstrate a reputation and show past work results to potential new clients in order to build trust and get jobs. A portfolio of work samples can facilitate this convincing of new clients. However, this may be impossible for IT freelancers if the completed IT work results are confidential or licensed. Also, the nature of IT work often makes it difficult to create and present work samples to clients, as software can be difficult to tangible and show.

5.5.4 Practical Contributions

This research also has practical implications. Along the six aggregated dimensions, we provide a basis for online freelancers, clients, and platform owners to be aware of, evaluate, and respond accordingly to the challenges of platform work.

First, we clarify the difficult platform start. However, freelancers should not quit, because the competition will be less as they become more successful. Nevertheless, they should focus on one platform early on to build a reputation. Clients, in contrast, should also give a chance to freelancers who do not yet have reviews on the platform, because reputation is not the only indicator of quality. Second, our results show that in terms of gig acquisition, it often takes many requests from freelancers and good proposals to get jobs. The clients should give positive feedback if possible to support the further development of the freelancers. Platform owners could additionally make the platform algorithms more transparent in the future to remove uncertainties of the freelancer rankings. Third, we underline the need for platform owners to pay attention to data protection and privacy within gig execution when monitoring freelancers' work. Clients should be aware that negative reviews can harm freelancers' careers. Fourth, in terms of finances, we show that freelancers can sensitively adjust prices over time and should take care of financial security on their own. Fifth, the platform and client relationship is characterized by power imbalances and platform owners should not favor clients at the expense of freelancers. Both parties should not exploit their power position and the platform rules should be fair and comprehensible. Finally, our findings on IT specifics on digital labor platforms illustrate that IT freelancers can particularly benefit from the help of other IT freelancers, both at the beginning of their career and through team building during career development. On the one hand, this allows workers to receive content-related support in completing their tasks. On the other hand, it also helps them build an emotional network to be more successful. In addition, IT freelancers should always keep their knowledge up to date and deal with IT-specific challenges such as data protection. It also highlights a necessary response from platform owners. They should react to the IT specifics with suitable measures to retain and support IT freelancers on the platform in particular.

Overall, it is clear that new challenges arise for workers on digital platforms compared to traditional employment. In the current design of platform work, the attractiveness of the work situation of IT freelancers on digital labor platforms is reduced by the enormous challenges. Especially if platform owners are aware of the identified challenges and IT specifics, they can

make their platforms more successful and make platform work in the form of freelancing overall fairer.

5.5.5 Limitations and Future Research

We acknowledge several limitations of this study. As described in the method section, we chose words as IT search terms that are typically, but not necessarily exclusively, used in the IT context, which can lead to the fact that other posts (not related to IT work) were also included in the LDA analysis. Some of these posts fall into the excluded topic of writing and translation, others belong to areas adjacent to IT, such as video editing, and occur as noise over all topics. We argue that this does not distort our findings, since our explanations do not rely on the word lists only, but considers the underlying full posts, where we deliberately did not recognize these posts for this reason.

Moreover, in our paper we only consider the Reddit area in relation to the Upwork platform. Although freelancers from other platforms are also active on this forum, future research could specifically examine other platforms. Platforms such as Fiverr or Freelancer.com, for example, function similarly to the Upwork platform in terms of mechanisms and job allocation, so we assume generalizability of our results to these platforms, which should be verified in future research. In addition, many freelancers are not only active on one platform, which is why their challenges probably exist across platforms. Also, our dataset includes posts from a limited time period, 2019 to 2022, so we were only able to identify topics that were discussed during that time period. However, this temporal limitation ensures a high degree of timeliness of the analyzed content. In addition, there could also be other IT-specific topics that are not discussed in the Reddit forum. The advantage of the Reddit website is that it is not monitored by e.g., labor platform owners and IT freelancers can express their opinions more freely. We still used the subforum for IT workers in the official Upwork forum, mentioned in the methodology, for a cross-check of our results, and were able to validate the main points, but less explicitly. This is justifiable by a discussion culture influenced by stronger monitoring and moderation, and by the smaller size of the dataset, due fewer users, and less activity. However, we cannot exclude that there are further topics and challenges, which aren't discussed in the considered sources. Particularly, we only examine the information discussed by freelancers who engage in communication outside of the platform. Future research could additionally analyze other sources where IT freelancers exchange opinions (such as other platform own forums or social media groups)

or use surveys and interviews to investigate whether there are further challenges that are not discussed in online forums.

Finally, it must be mentioned that we had to interpret the topics generated by the LDA analysis, since the algorithm used does not label the topics. Therefore, we used a qualitative approach to code the topics. Using grounded theory to interpret the topics generated by the LDA analysis allows for the identification of relevant mechanisms and their interactions with each other, as it aggregates the topics into higher order dimensions, allowing for an understanding of the essential components of the underlying data. However, this may result in self-biased conclusions. Furthermore, our research primarily aims to explain an initial approach to the topic framework of IT freelancers on digital labor platforms. Therefore, future research should leverage the topics we have identified and presented to further test them empirically, either quantitatively or qualitatively.

6 Understanding the Careers of IT Freelancers on Digital Labor Platforms (P3)

Title	Understanding the Careers of IT Freelancers on Digital Labor Platforms
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Publication	30th European Conference on Information Systems (ECIS 2022)
Status	Published
Contribution of first author	The first author participated in the problem definition, research design, data collection and analysis, interpretation as well as in the conceptual development and reporting. She further significantly contributed to the creation of the manuscript.

Table 20. Fact Sheet Publication P3

Abstract. Online freelancing as an alternative way to work, where independent workers offer services on digital labor platforms, increasingly gains prominence in research and practice. While the general understanding of this form of work increases, IT work performed in this form is not fully understood. Especially the collaborative nature of IT work and the high, rapidly changing skill level required, affects the career development of IT freelancers. Therefore, this study aims to understand how the careers of IT freelancers evolve. To answer our research question, we conduct an exploratory analysis of twelve IT freelancers on a digital labor platform. We develop an IT freelancing career process model, outline advancement and decline mechanisms, and different exit options from the digital labor platform. We also illustrate the role of IT freelancer teams. Our findings thus contribute to the body of knowledge on IT work and alternative work forms on digital labor platforms.

6.1 Introduction

The online outsourcing industry is growing rapidly. Such work involves outsourcing of tasks to third parties via the Internet. The number of projects and tasks on digital labor platforms is increasing, and alternative forms of work are becoming increasingly popular (Jabagi et al. 2019; Kässi and Lehdonvirta 2018). In 2020, about 36% of the U.S. labor force (that's 59 million people) worked as freelancers (Upwork 2020). In Europe, the self-employed, including freelancers, temporary workers, and gig economy workers, already accounted for around 20 to 30 percent of all jobs in 2016 (McKinsey & Company 2016). While crowdsourcing has been much researched as one area of this industry, academic research on freelancing is not yet mature (Lacity et al. 2017). Especially the field of IT freelancing is not fully understood. Few papers have examined the practices and characteristics of freelancers in online software development (Sison and Lavilles 2018; Watson Manheim and Ahuja 2019). Focus has mostly been on IT crowdsourcing (Gol et al. 2018; Stol and Fitzgerald 2014; Taylor and Joshi 2019) or knowledge work in general (Wagner et al. 2021; Wagner and Prester 2019).

IT specialists are increasingly indispensable in almost all industries due to the rapidly progressing digitization and increasing use of technologies in companies (Dinger et al. 2015). This leads to a high demand for IT specialists in various fields (Goles et al. 2009), which confronts the chronic shortage of skilled workers and a growing talent problem. For this reason, the demand for IT professionals is higher than the supply. In this regard, digital labor platforms offer new opportunities as a new source of skilled digital workers for IT jobs (Fuller et al. 2020).

In terms of careers, globalization, constant and rapid technological change, and economic uncertainties, not least due to the Covid-19 pandemic, have led to a restructuring of labor and employment relationships that affects the structure of labor markets. As a result, people's career expectations have also changed (Arthur and Rousseau 1996; Padavic 2005; Sweet and Meiksins 2013). In IT, this is also intensified by increasing competition among workers, which is why technology companies are providing fewer and fewer lifetime employment opportunities for IT professionals (Ang and Slaughter 2000). As a result, the IT profession is becoming more diverse and shows signs of becoming a so-called boundaryless profession. This means that careers involve multiple moves between organizations and occupations (Slaughter 2001).

IT freelancers differ from other freelancing fields because of several characteristics. In particular, the collaborative nature of IT work (Kudaravalli et al. 2017; Levina 2005) and the high level of skills required, which is constantly evolving (Ang et al. 2015; Zhang et al. 2012), affect

the career development of IT freelancers. However, these special features have not been addressed in previous research. Therefore, this research seeks to answer the research question: *What are the characteristics of IT professionals' careers as freelancers on digital labor platforms?*

In this paper, we conduct an exploratory analysis of twelve IT freelancer careers to answer this research question. Based on semi-structured interviews, we develop a career model with different stages and roles, outline advancement and decline mechanisms as well as different exit options from the digital labor platform. We also illustrate the role of teams and the particular risk of skill obsolescence for IT freelancers. From the diverse information provided by IT freelancers, potentially interesting new insights can be gained into the career management of IT professionals on digital labor platforms.

The rest of the paper is organized as follows. First, the theoretical background and state of the literature on IT freelancers and career research are described. Then, the methodology is presented, and the data collection, sample, and data analysis are explained. Finally, the results are described, and the main findings are discussed as well as concluding remarks are made.

6.2 Background

6.2.1 IT Freelancing

In the following, the concept of IT freelancing will be explained in more detail. Figure 12 provides an overview of the composition of the concept of IT freelancing based on the characteristics of both associated sides: freelancing work and IT work.

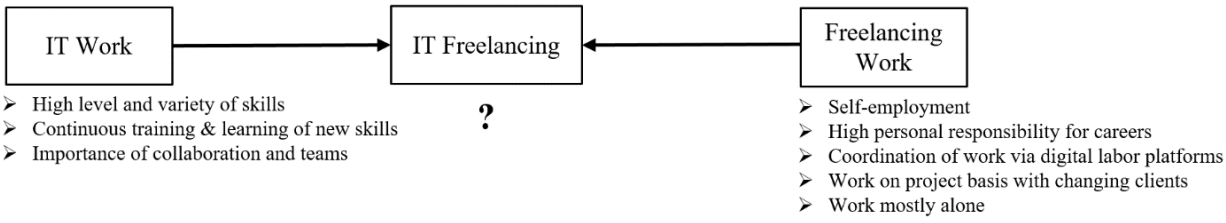

Figure 12. Implications of the Characteristics of IT Work and Freelancing for IT Freelancing

Freelancers (right side in Figure 12) can be classified as independent, self-employed contractors. They are not employed in classic "jobs" with permanent employment and a constant commitment to a company but work mostly alone as "self-employed" within the framework of flexible agreements. They are loosely employed only for a specific task or for a specific period of

time. This leads to a high level of personal responsibility for their careers due to a lack of a permanent employer (Ashford et al. 2018; Friedman 2014). Another characteristic is the coordination and completion of work online via digital labor platforms (Agrawal et al. 2015; Popiel 2017). These platforms provide the digital infrastructure for all necessary mechanisms such as payment, communication, feedback, and ranking systems, and mediate the interaction between employers and employees (Rai et al. 2019). Last, the fulfilment of different tasks requires freelancers to constantly apply their skills and expertise to new projects and contexts (Damarin 2006).

IT work (left side in Figure 12) is critical for most organizations (Guzman et al. 2008). IT professionals are an important part of sociotechnical systems that integrate information, work processes, and data processing (Niederman et al. 2016). They develop and manage IT resources such as hardware, software, or data. In doing so, IT professionals perform a wide range of IT activities and, therefore, must have a high level and variety of skills (Ang et al. 2015; Zhang et al. 2012). Unique IT-related skills and technical skills are important, but soft and interpersonal skills such as communication skills are also significant (Guzman et al. 2008). In addition, the concept of obsolescence is important in IT. It describes the idea that obsolete skills are less valuable and the person in question is less capable than a person with newer skills. This can be particularly problematic for IT professionals because the technologies they work with, and thus the skills required, change and evolve particularly frequently (Fu 2011; Joseph and Ang 2001; Lee et al. 1995). In terms of professional skills for IT workers, this means that the skills once valued are no longer in demand because they no longer fit the requirements of the job and therefore lose value as well as contribute less to their performance (Blanton et al. 1998; Joseph and Ang 2001; Rong and Grover 2009). Therefore, the constant threat of obsolescence and the natural evolution of IT jobs force IT professionals to constantly adapt and develop their skills (Zhang et al. 2012). Finally, IT work often requires collaborative efforts in designing the architecture and integrating components (Levina 2005; Majchrzak et al. 2005), as well as teamwork (Ang and Slaughter 2001; Kudaravalli et al. 2017).

IT freelancing (in the middle of Figure 12) consequently results from the aspects described. The described characteristics of both sides meet here and result in new open questions about their interaction and the effects of these characteristics. More and more IT professionals are working as freelancers. The current work environment, where developers are involved in multiple, simultaneous projects on a variety of digital labor platforms, creates a new, complex, and fragmented work environment (Watson Manheim and Ahuja 2019). The field of IT freelancing

should therefore be distinguished from typical freelancing. First, because a broad range of skills is particularly important for IT freelancers, as IT work itself requires many skills, and these are even more important on digital labor platforms where workers need to differentiate themselves from competitors (Gandini 2016; Jarrahi et al. 2020; Sison and Lavilles 2018). Moreover, as described, IT workers often work collaboratively and in teams, which is not common in normal freelancing (Ashford et al. 2018; Friedman 2014).

6.2.2 Nontraditional Careers

According to Super (1957), a career can be defined as a combination or sequence of occupational positions held over a lifetime. The traditional career model assumes that careers are orderly and within one occupation and a single organization (Levinson 1978; Super 1957). However, research has questioned the applicability of this traditional career model when considering a work environment in which careers are increasingly shaped by multiple, diverse employers (Arthur and Rousseau 1996; Sullivan 1999). In this regard, research refers to nontraditional careers as "boundaryless careers" (Arthur 1994). Boundaryless careers are not limited to a single company or organization but extend across a variety of temporary projects across the boundaries of different employers or professions (Arthur and Rousseau 1996; Greenhaus et al. 2008). Career paths can further be defined as models or prototypes that characterize the career sequences of a group of individuals (Joseph et al. 2012).

As IT careers have changed, typical career patterns have also changed (Prommegger et al. 2020a). IT careers, characterized by frequent turnover within the profession (Joseph et al. 2015), have typical characteristics of boundaryless careers (Ituma and Simpson 2009; Slaughter 2001).

Recent research has begun to examine the careers of workers on digital labor platforms (Ashford et al. 2018; Seifried et al. 2020; Van den Born and Van Witteloostuijn 2013). Studies have also been conducted on the changing careers of employed IT professionals (Joseph et al. 2012; Prommegger et al. 2020a). However, research on the careers of IT freelancers is very rare. Taylor and Joshi (2019) examine only the career anchors of IT workers in crowdsourcing, or Sison and Lavilles (2018) look at the practices of freelancers in software development in the Philippines.

6.3 Research Method

The motivation of this study is to better understand the career development of IT freelancers on digital labor platforms. To this end, we adopted an exploratory research strategy (Strauss and Corbin 1990). We felt that an exploratory design was appropriate because it allowed us to answer "how" questions and collect process data (Langley 1999). In order to do this, we collected semi-structured interview data in twelve cases and used grounded theory techniques to structure and analyze our data (Urquhart 2013). More specifically, we coded the interview data to understand what stages exist in the careers of IT freelancers, how IT freelancers move between stages and exit options from the digital labor platform. We also wanted to understand how teams form in this context.

6.3.1 Sample and Data Collection

Our empirical setting is the digital labor platform Upwork. This platform was chosen as the empirical context because it is the largest freelancing website in the world (Claussen et al. 2018; Seifried et al. 2020). This allows for a wide variety of jobs from the IT context in terms of diversity of tasks, duration of employment, and skill level. Therefore, there is a wide range of workers on the platform with varying levels of success, and these freelancers are also in different career stages.

We interviewed 12 IT freelancers who differed according to a wide variety of characteristics. Table 21 provides an overview of the sample. It was important to us in the interviewee selection that the IT freelancers were at different stages of their careers and that they differed in terms of experience, success, and background. Background means gender, cultural background, and professional area or task field. Thus, different perspectives on career development are possible and different experiences can be studied. All data refers to freelance work and comes from the interviews and from the profiles on the digital labor platform. In Table 21, "Earnings" include the sum of the freelancer's earned income on the platform.

#	Professional area or task field	Experience	Gender	Country	Earnings	FT/PT
1	eLearning/LMS Administrator	since 2017, 172 Jobs	female	Pakistan	very high	full-time
2	IT and Services (SAP, ERP)	since 2016, 3 Jobs	female	Croatia	medium	full-time
3	Networks/Cyber Security	since 2016, 0 Jobs	male	Kenya	low	part-time
4	Data Extraction/DevOps	since 2013, 230 Jobs	male	Germany	very high	part-time
5	Engineer Geologist/Programmer	since 2017, 59 Jobs	female	Hungary	high	part-time
6	DevOps/Cloud Engineer	since 2014, 10 Jobs	male	France	medium	part-time
7	Software & Web Developer	since 2005, 36 Jobs	male	Philippines	high	part-time
8	DevOps Engineer	since 2019, 6 Jobs	male	Pakistan	medium	part-time
9	Environment Manager	since 2017, 0 Jobs	male	India	low	part-time
10	Data Scientist/Digital Analytics	since 2020, 15 Jobs	female	Germany	high	part-time
11	Network/System Administrator	since 2020, 15 Jobs	male	Pakistan	medium	full-time
12	Data Analyst/Data Visualization	since 2020, 9 Jobs	male	India	low	part-time

Table 21. Overview of the Sample

In the interviews, we focused primarily on the starting process of the career as an IT freelancer and the career development over time. We also focused on the relevant skills and abilities as well as the importance of teams for IT freelancers. Finally, we took a closer look at possible career paths outside the platform. We sought to understand the dynamics of individual situations to develop rich descriptions of the career process on the digital labor platform.

6.3.2 Data Analysis

In our analysis, the overarching goal was to better understand the career development of IT freelancers. To do so, as already discussed, we followed the procedures of grounded theory methodology for data collection and analysis (Urquhart 2013). We performed several steps of

coding the interview data. In doing so, we used comparison with both existing literature and previously collected interview data to ensure that we were working with an "open mind" but not an "empty head" (Dey 2008). While the data collection steps and analysis are described here in a linear order, this process took place in jumps between data collection and analysis (Dey 2008).

For the data analysis, we applied open, selective, and theoretical coding to develop our career model (see Table 22 for an overview of the coding process using illustrative quotes from the transcripts). In open coding, interview passages were marked with open codes, i.e., short descriptive statements that summarize the key idea of the text passage (Wiesche et al. 2017). We used selective codes to identify aggregate dimensions of IT freelancers' careers. This revealed four career stages and associated roles, career advancement and decline, the importance of teams and some collaboration between IT freelancers, and various exit options away from the digital labor platform. In the theoretical coding, we sought to further develop and combine the identified dimensions by comparing them with the existing literature on IT freelancing and careers.

Illustrative quotes from the data	2nd Order Themes	Aggregate Dimensions
"It's only a few weeks [on the platform], and with most of my proposals i've actually not gone to the stage of actually getting paid work."	Beginner	Career Stages and Roles
"The second phase is, you already have your first job. Here it is really important to be a real slave. You do everything your customers say because you don't work for money here in this phase. You work for the ratings, for those 5 stars and you always have to do more than required.... Yes, it is really important to have all your customers satisfied."	Slave	
"I don't remember when I earned the top-rated reputation first, [...] in nine months or something like this. Then my job success score hasn't gone below I think 98% since then."	Establisher	
"Then 4th phase is actually you are already more or less famous on [the platform] and you have your regular customers [...] and then you already have a wide selection. Every day I have two to four interview requests. You can choose it and decide what you want to do."	Celebrity	
"Being a developer is like being a samurai: It's a path, not a finish line." "I keep one day in my whole week for learning new things."	Learning & updating skills	

“As an IT you obviously know skills are something very changing day by day or year by year […]. This is a perspective of single ones if they want to be a successful freelancer. Then, obviously, you will have to adopt new skills, you will have to adapt to the market, how the market is going or basically for what of skills, there are lots and lots of jobs.”	React to market demand	Career Advancement
“I like to build new connections so that they can count on me for new projects and it's happening actually. I have done two projects for a single person. Because he was satisfied in the first project, then he assigned me the next one, so now he's going to give me the third one also.”	Build a network	
"I was able to get the top-rated mark, an award on [the platform] and that was actually really helpful. I was finally able to get more interviews and even sometimes choose who I would rather work with."	Profile markers	
“If I’ll have a feedback, I will know how I'm working and what things I have to improve. And then also other clients can see that this is the freelancer with this feedback. And this is… It’s very helpful.”	Reviews or feedback	
"The kind of work has changed over time. The demand was more on system programming. But now it has changed."	Skill obsolescence	Career Decline
"I'm expecting my third child and I just wanted to know from [the platform], how can I go on maternity leave without losing any reputation. I was a little bit afraid that maybe after I can come back I have to not restart again everything but just like starting from a lower level."	Platform absence	
"If you have a project with someone and it doesn't work so well, then you get a bad review, and then the rating is bad and you have to explain to all the other clients why it's so bad."	Negative feedback	
“I tried working on [platform A]. I wasn't various skilled back then and that didn't go well. I mean in terms of getting projects. […] Then I switched to [platform B].”	Platform switching	Platform Exit
“I have looked at other platforms in the past but disregarded them because I did not consider them worth the effort. […] And I've had occasion to look at it [another platform] again in the last few months part, and I still wasn't impressed with the opportunities available on it.”	Exit after cost-benefit-analysis	
"What I'm doing is, I keep my relationship with previous projects, so if we have new projects, they will just contact me, without going to [the platform]."	Interception of clients	
“I also had customers before that became my project partners […]. To me basically, that's my main goal. I have a lot of project ideas in mind, but I don't have the resources or	Exit with clients as partners	

the money to fund the projects. […] There are other ways. You can go to a venture capitalist […]. But I'm never attracted to them. I'm more inclined to work with people that I have worked with before. I mean if the trust is good, confidence is good, synergies are good, maybe you can work on creating bigger projects like making a new company or doing a startup."		
"Well I have a company and I run my own business, it's a limited company. So I also work outside of [the platform]. I have clients outside of [the platform]."	Exit into an own business	
"I would say to me that this is very important to meet new friends […]. If you're just doing a day job you will be constructed to that environment […]. So if you are a company with 20 people, you're dealing with 20 people in the same area as you […]. You don't really learn anything, or you don't really learn that much. If you compare it to working with people from Yugoslavia, from Rome… different cultures […]. I have customers that I met really, they came to the Philippines, we drank beer and shared stories, it's kind of good."	Social connections with clients or other freelancers	Teams and Collaboration
"It's better to transform myself to a client and then try to find the freelancers, a so-called team. For example, if I can't do something so well, but my client needs it, then I can just find other freelancers as a client."	Orchestration of freelancers (online)	
"I just gathered some friends and then, if I get more work I supervise the work. I direct it to the team and they finish the work. I just check it and then upload it. And I talk to my client as well, that I need the team because it's LMS [learning management system] migrations, that it took for a team to transfer all the content and if they agree on this, then we can work with it on the team."	Orchestration of friends (offline)	
"And each of them [team member] is good in their field of ERP. One is web development and one is technical and server administration and one is pure python programmer. We can combine all this and offer a complete set of services."	Expertise distribution within team	

Table 22. Illustration of the Coding Process

6.4 Results – The IT Freelancer Career

In the following section, the results are presented. We developed an IT freelancing career process model, which is displayed in Figure 13. This is divided into three parts (i)-(iii). In addition, different team configurations and types of IT freelancer collaboration are explained in the results (iv).

(i) Four career stages and corresponding roles that IT freelancers move through, represented by the staircase in Figure 13 (see section 6.4.1).

(ii) The mechanisms of advancement and decline between the career stages, which are divided into a professional and a platform-specific dimension and can be identified by the up and down arrows in the career process model (see section 6.4.2).

(iii) The five different exit strategies from the digital labor platform of different career stages, which can be seen in the upper part of Figure 13 in the form of round boxes (see section 6.4.3).

(iv) Different team configurations or types of collaboration that IT freelancers form and use, e.g., to advance their careers through support (see section 6.4.4).

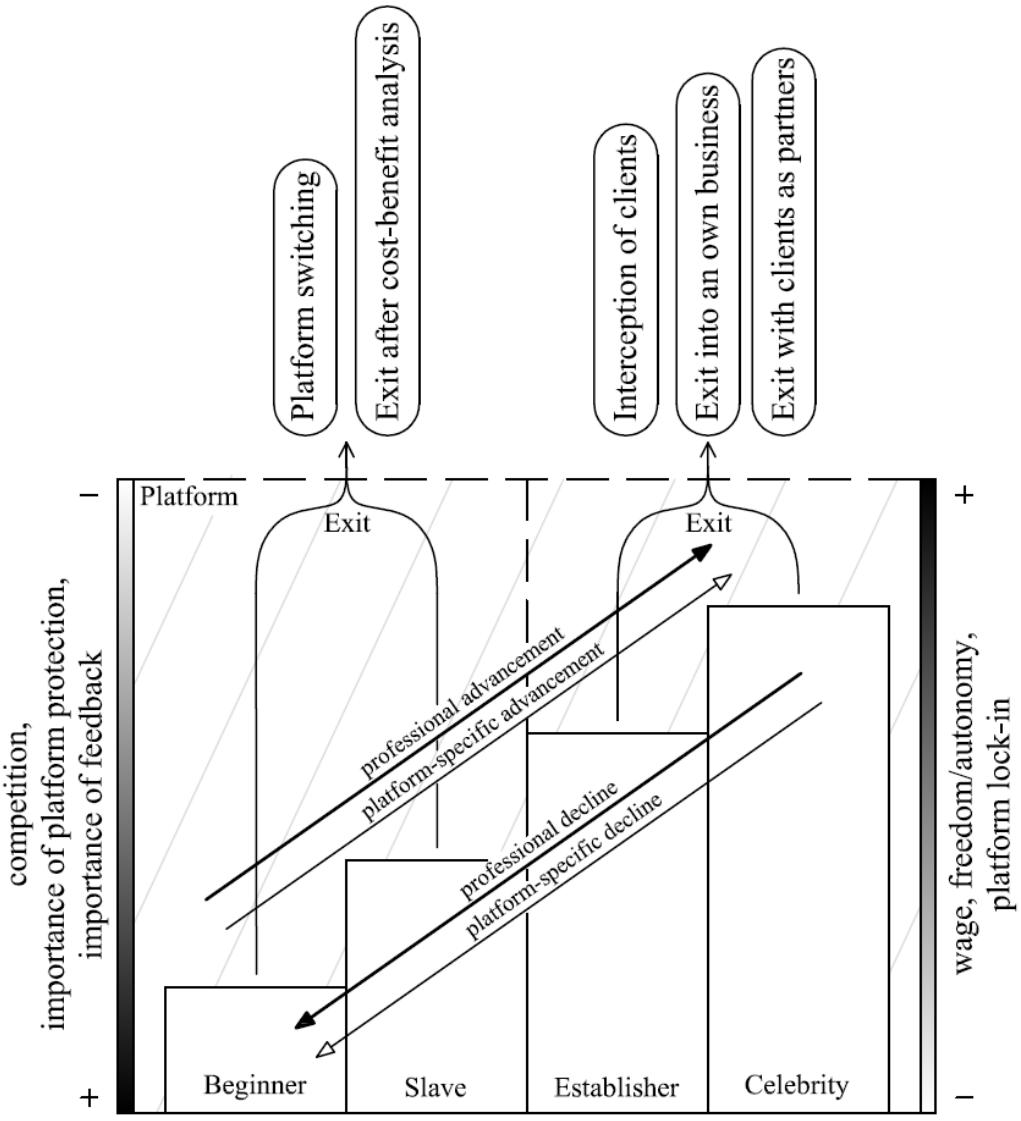

Figure 13. IT Freelancing Career Process Model

6.4.1 Career Stages and Roles

We found four stages in the career of IT freelancers on digital labor platforms (see the staircase in Figure 13). The first stage describes the entry into the digital labor platform as a **“beginner”**. The most important thing in this stage is getting the first job. The competition with other freelancers is very high in this stage, which is why initial feedback and review are necessary to build a certain trust with the client. Only a low salary or price can be set in the beginning, and many job applications are necessary until the freelancer gets the first contract. It may also be necessary to take a job from a field that does not correspond to the freelancer's main field of activity. A broad skill spectrum is therefore helpful for the platform start.

> *“I got my first job after three or four months. That was something completely different. So I was a beginner Python developer and I wanted to find any jobs related to Python but actually, I had no possibility. And because I speak a little bit better in English than in German [...] I could just take the copywriting jobs, they are easier. [...] And that was actually my start.” (#4)*

At the second stage, IT freelancers act in the role of a **"slave"**. It is necessary to do everything that the client asks for. It is necessary to build a certain trust with the clients, and all clients should be satisfied in order to expand the job history on the platform profile. At this stage, work is not yet done primarily for monetary reasons, but for the (star) rating. In terms of skills, freelancers should educate and train themselves, react to market demand and choose a field where the competition may not be too high.

> *“I don't very focus on the money involved in the project. I basically focus on If I'm delivering something what is expected. […] So I don't take any projects, which is just a high dollar project, and I am not able to do that.” (#12)*

Within the third stage, IT freelancers as **“establisher”** should improve their image and market themselves on the platform to stand out even more from the competition. It is important to get markers or awards for the profile that prove the freelancer's competence and ability for the clients. The salary or the price for the projects can be raised further, and a network of customers is built up. Finally, soft skills are becoming increasingly relevant at this stage, such as good communication with customers.

> *“I guess the strategy was initially when I started… I started with a very, very low price. And then, as I build my skills and I build my profile I started to increase my budget as well.” (#1)*

At the fourth and highest stage, IT freelancers take on the role of a **“celebrity”** and are more or less famous on the platform. There is more freedom and the IT freelancers at this level can select projects and customers. In addition, many freelancers no longer have to actively search for projects but are requested by (regular) customers. Likewise, it is important to advise customers and act as a specialist in his skills. As an expert, the freelancer can now also express his opinion on tasks.

> *“I don't really feel the competition anymore, because the clients reach out to me.” (#5)*

6.4.2 Career Advancement and Decline

IT freelancers move dynamically between different career stages during their careers. These advancement and decline mechanisms have a professional and a platform-sepecific dimension (see up and down arrows in Figure 13). The professional dimension means the content perspective of the work activity in terms of different skills. The platform-specific dimension refers to all special mechanisms within the digital labor platform.

In **professional advancement**, freelancers need to learn new skills and update old skills. Since obsolescence, as described, particularly affects IT professionals, it is especially important for IT freelancers to always be up to date with their skills. For example, this is less relevant for design freelancers, as the technologies and tasks are not as complex as in the IT field. It is furthermore important for IT freelancers to react to the changing market demand and adapt their skills accordingly. Depending on which skills are currently in demand in their fields of activity, appropriate skills should be learned or further trained in order to stand out from the competition and become more successful. In this case, the digital labor platform helps IT freelancers by making job offers visible to freelancers, as well as the associated skills required in the various areas on the digital labor platform.

> *"Being a developer is like being a samurai: "It's a path, not a finish line." So because of that, it [be up to date] has nothing to do with freelancing. A freelancer can be a designer, for example, and then you don't need anything, just your fantasy. […] As a developer […] one has to check every day what new library versions have come out, what security vulnerabilities have been figured out. As a developer, you have to evolve*

> *every day and read the news and look at those feeds all the time, because something happens every hour." (#4)*

When it comes to **platform-specific advancement**, profile updating and profile maintenance play a particularly important role. The information in the profile should be as complete as possible and the further development of the job history, as well as the acquisition of profile markers, help with career advancement in order to convince customers that the freelancer is better than the competition. For this purpose, good accessibility of freelancers is important as well as collecting reviews and feedback comments for the job history. To this end, IT freelancers should actively seek feedback and ask clients for a review after completing projects. In addition, as described, building a network with clients is necessary so that freelancers can work their way up the platform and stand out from the competition. Finally, portfolios of work samples provided to the client as well as the documentation of already successfully completed projects in the relevant field can have a positive effect on career advancement.

> *"It depends on you, which then means that you really need to take care and create a good profile and good portfolio which will help you to get the proposals and get the interviews faster. […] If it's [the profile] fully completed, then you will get more invitations." (#2)*

But a career decline is also possible. On the one hand, a **professional decline** can occur due to a change in market demand on the digital labor platform. As described, skill obsolescence is particularly dangerous for IT freelancers. If some skills become obsolete and are no longer in demand on the platform, this can have a negative impact on the career. The IT freelancer thus has fewer potential jobs and, accordingly, fewer chances to gain new experience and skills in projects.

> *"At first, I focused more on system programming, basically it was more on doing back-end applications or tools, more on C and C++ and some scripting […] that was for the first maybe three years and then I realized that the trend has changed. The main trend that I see is there's a spike in security projects, because securities is a big thing, right." (#7)*

On the other hand, a **platform-specific decline** to a lower career stage can occur if the IT freelancer is not active on the platform for a period of time and thus has no current projects or constant availability during this period. An absence can have various reasons, such as parental

leave, illness, or vacation. Likewise, negative evaluations of projects can lead to a decline in the reputation of the IT freelancer, which means that he will receive fewer projects in the future.

6.4.3 Platform Exit Strategies

In different career stages, various exit strategies from the digital labor platform are possible (see the upper part of Figure 13). In the course of their careers, IT freelancers become increasingly tied to the platform compared to other platforms (platform lock-in). The switching costs to other platforms are extremely increased as the IT freelancers build up their profile on one platform more and more over time, receive platform-specific markers, and have built their image on the one platform. Thus, a change of platform becomes more and more difficult as the career progresses because a new profile on the other platform would have to be created and started again from stage 1. In addition, ratings and job history are not portable and can therefore not be transferred to the new platform.

> *"On the new platform without any reputation, I should do everything from the beginning, so taking jobs at a very low price… I don't really think that I will do that. So I would have definitely problems with switching the platform." (#5)*

For these reasons, the platform should only be switched in the first phases of the career. In the beginning, however, it is often even necessary to **switch a platform** again if it is determined that the competition is too strong, the compatibility of the platform is not satisfactory or the job offers do not meet the IT freelancer's expectations. Furthermore, after starting a career as an IT freelancer, it may become clear after a certain period of time that this type of work does not fit the employee's ideas of a successful career. In this case, after a **cost-benefit analysis**, it may be that the platform or even the type of work is abandoned.

> *"I didn't get any projects on [platform A] so I just dropped that one. I just joined [platform B]. […] I just forgot everything of my every experience with the [platform A]. I just thought this is a new platform I shouldn't be worried about my last one let's just go and try my best and let's see what happens."(#12)*

In later and more advanced career stages, the platform career can be used as a kind of stepping stone when a new path for the career has been worked out with the platform. The more successful IT freelancers become, the more likely they are to exit the platform. As described in section 6.4.1, IT freelancers build up a network and customer base on the platform over time. By building trust with clients and often doing multiple joint projects on the platform, the role

of the platform is less important than it was early in their career. The protection of the platform as a third party between the client-freelancer relationship is no longer necessary. To save financial costs (because the platforms receive a portion of the project volume), IT freelancers pull clients away from the platform and complete projects outside of the platform environment. This **interception of clients** can therefore be an exit strategy.

> *"We [the client and the freelancer] started [on the platform]. Then, we became friends so the trust is there. We can move outside of [the platform]. […] In [the platform] you have a cut from your earning. Of course, they provide the environment and protection to freelancers and also project owners, so you basically have to pay them and that's right. But as the time goes by, when you became comfortable with your customers or the customer is confident with you […]. You basically go outside of [the platform] or the freelance environment. For example, me and my clients usually deal directly. […] We didn't pay [the platform]. I have these clients, maybe around 10 of them now." (#7)*

Another alternative to leaving the platform at advanced career stages is to **start an own business**. In this case, the skills, experience, and relationships with customers developed during the platform career can be used to go into "real" self-employment outside of a digital labor platform and leave the platform completely.

> *"I could invest the time I spend on [the platform] now in my own business and I think I could make more money with it. Now I already have a few websites that I develop for myself as a business." (#4)*

The last alternative to leave the platform is the **exit with clients as partners**. When trust has been developed in the client and IT freelancer relationship, another option is for the two parties to collaborate outside the platform as partners. With these new contacts, for example, a start-up or a new company can be founded. Both parties can support each other financially and implement project ideas together that would otherwise not be feasible on their own.

6.4.4 Team Configurations and Collaboration

Another IT-specific aspect is the importance of teams and collaboration on the digital labor platform. Different team configurations can help freelancers regarding their careers. One way is to form **social connections with clients or other freelancers**. These groups or friendships can support IT freelancers in their careers, both in terms of content and interpersonal aspects. Likewise, such social relationships can take place purely online on the digital labor platform.

In online groups, IT freelancers can exchange ideas, discuss problems and help each other with projects.

> *"There is only one friend that is from [my home country] and he approached me and he said, "Let's meet, it's nice working with you". And then we met, but most of the clients are from abroad, and I chat with them." (#8)*

Teams for joint project management can also be formed on the other side. These teams can be formed at different stages of the career and can be created either online (with other freelancers) or offline (with people from the personal environment). An IT Freelancer (mostly at more advanced career stages) takes on an orchestrator role within these teams and acts as a team leader. Tasks can be distributed in the team and thus it is possible to accept more projects and larger contracts. For **online teams**, an experienced IT freelancer books other freelancers on the digital labor platform and becomes a customer on the platform in order to secure support for projects. Alternatively, several freelancers join together to form a work team.

> *"Usually, I just collect projects, I also have three people that work with me. I don't like the word "for" me. And we mainly take on larger projects. It doesn't exclude smaller projects, but we prefer because, as we are many we like larger-scale projects and we organize our activities through Jira and through Confluence." (#2)*

Concerning **offline teams**, IT freelancers join with one or more people from their personal environment. These can be people from education, a permanent position, the family, or the circle of friends, usually from the same industry.

> *"We need colleagues or friends when we are upgrading our sales in terms of time and getting more and more projects. I am also doing that. I also started to take some of my friends… not in professional binding but I just having a conversation like that "I may need you for a project". So that if I get any chance, if I get more projects I can count on them. […] I'm trying to build my team. Slowly, slowly." (#12)*

Finally, another advantage of online or offline teams is the possibility of **expertise distribution**. The IT freelancers can complement each other's skills in the team and take on a wider range of jobs.

6.5 Discussion

This study aimed to understand how the careers of IT professionals on digital labor platforms, i.e. IT freelancers, evolve. We examined the cases of twelve IT freelancers, developed an IT freelancing career process model and defined different team configurations within the career. This study contributes to the body of knowledge in the field of IT and platform work by (1) highlighting and structuring an IT freelancing career process model and thus important characteristics of IT freelancer careers and (2) illustrating and describing the role of the digital labor platform in these careers. Below, we outline the implications of our findings for theory and practice and discuss limitations and future research.

6.5.1 Theoretical and Practical Contributions

As a result of our explorative analysis, a career process model was developed that shows how the careers of IT freelancers evolve (Figure 13). Four stages and corresponding roles with different specifications were defined. We also highlighted how a career develops over time with the professional and platform-specific advancement and decline mechanisms. This resulted in five exit options for leaving the digital labor platform at different career stages. Finally, the results show different team configurations that additionally influence the IT freelancer career (section 6.4.4).

In summary, the results show the complexity of a new platform- and IT-specific career alternative. Thus, we complement previous research with detailed information on IT freelancing as a new way of working in the IT field (Ang and Slaughter 2001). Through these described results, new aspects for the career success of IT professionals on digital labor platforms become clear. Guzman et al. (2008) found that IT personnel have established their own professional culture within organizations, characterized by different characteristics. We additionally investigated the formation of IT teams beyond the boundaries of a fixed organization, whether online via the digital labor platform or offline from the personal environment. Furthermore, we show the importance of collaboration and teams, which can give a kind of push to the career of IT freelancers and help with advancement. Here, the professional and social team dimensions are significant. On the one hand, team members can help each other in terms of content by having different expertise. On the other hand, the social component is just as important, for example by forming friendships. We thus contribute to research that deals with the mechanisms of cooperation and coordination of software development teams (Kudaravalli et al. 2017; Levina 2005; Majchrzak et al. 2005).

We also describe the necessary response of IT freelancers to skill obsolescence and illustrate the importance of concrete measures, such as regularly checking demand on the platform. This phenomenon has been widely researched in the IT literature (Fu 2011; Rong and Grover 2009; Zhang et al. 2012). However, our results show the increased importance of the problem in the context of digital labor platforms due to the described high personal responsibility of freelancers. They do not receive support from an organization or permanent employer regarding training or updating obsolete skills. Thus, we add to the research on platform work the importance of the IT-specific problem of skill obsolescence (Claussen et al. 2018; Popiel 2017; Sison and Lavilles 2018).

Furthermore, the special role of the digital platform in IT freelancer careers becomes clear through the findings of this study. The digital platform can be a drawback in the career development of IT freelancers. The literature has already established that data portability, platform switching costs, and lock-in effects exist on platforms (Farrell and Klemperer 2007; Wohlfarth 2019). However, little research has addressed the effects of mechanisms on digital labor platforms. When digital platforms use reputation mechanisms, freelancers are prevented from transferring their reviews to other platforms, leading to lock-in effects and high platform switching costs, making them vulnerable to platform exploitation (Ciotti et al. 2021). On the one hand, we contribute to this research stream by describing that switching costs and platform lock-in increase with career development. The IT freelancers become more and more dependent on the platform because, in the case of a platform change, neither the reputation and reviews that have been built up and fought for over time nor the designed profile can be transferred to another platform, which would set the IT freelancers back in their career in the case of a change.

On the other hand, we illustrate with the later exit options an attractive alternative to switching platforms and, therefore, a kind of solution to the problem described. IT freelancers can exit the platform at higher career stages and continue their careers outside of a platform, as the customer network formed with the help of the platform and the social contacts and team structures remain in place beyond the platform boundaries. First, the platform helps IT freelancers in the early career stages to build networks and trust with clients through protective mechanisms as a third instance between freelancers and clients. Second, the digital global networking and matching of the platform enable the establishment of social contacts and team structures, which also remain outside the platform.

In addition, some other platform mechanisms can help IT professionals to advance their careers. The described global networking through the digital platform marketplace can help IT professionals to "escape" their less attractive local job market. Especially in less developed countries, where the labor supply or wage structures do not meet the expectations of IT professionals, IT freelancing is a new career opportunity. Likewise, networking can counteract a possibly existing IT talent shortage, as digital labor platforms can serve as a new source of skilled IT professionals (Fuller et al. 2020). Finally, the digital labor platform can help IT professionals to overcome the previously described IT-specific problem of skill obsolescence, as a comprehensive market overview is possible on the platform and the demand for skills and jobs in various professional areas is very transparently visible. This comprehensive view of the market and especially of the competition is often not possible in offline labor markets. But IT freelancers can use this knowledge about skills and trends in demand and educate themselves accordingly to stand out from the competition and advance in their careers.

Some contributions to practice can also be derived from the results of this study. It becomes clear that IT freelancers must react to the defined mechanisms and problems within their careers with different strategies in order to be successful. For example, they should respond to skill obsolescence or use different platform features to advance in their career. Thus, different actions are required at different career stages. Furthermore, the developed IT freelancing career process model can provide valuable information that IT freelancers should understand for their development. Moreover, the exit options identified can be perceived as alternative career paths at different career stages by the IT freelancers. Especially in later career stages, they can be perceived as an alternative to platform work. Finally, the results illustrate the potential of different team configurations during the IT freelancer career. Thus, platform work can be an attractive alternative to the traditional career for IT professionals.

6.5.2 Limitations and Future Research

We acknowledge several limitations of this study. Given the exploratory nature of this study (Urquhart 2013) and the interest in the careers and mechanisms of IT freelancers' work, this research represents a first step toward understanding the careers of IT professionals on digital labor platforms. However, our analysis was based on 12 exploratory interviews with IT freelancers, which limits the generalizability of our findings. Therefore, for example, a large-scale survey could be conducted in the future to test the generalizability of our career process model. Future research should also examine our developed model of the IT freelancer career process

in other contexts and settings. Although we studied very different IT freelancers in terms of experience, career stage, and background, analyzing IT freelancers on other platforms may reveal additional mechanisms for how the IT career process unfolds on digital labor platforms. Furthermore, we hypothesize that career stages, advancement and decline mechanisms, and platform exit opportunities may differ across individuals. We, therefore, call for further empirical research on how other aspects might additionally influence the careers of IT freelancers. Finally, future studies could also investigate whether the team configurations developed in this paper shape a career in a fundamentally different way. Perhaps different career mechanisms apply at the lone-worker level than at the team level.

7 Understanding the Careers of Freelancers in Digital Labor Marketplaces: The Case of IT Work (P4)

Title	Understanding the Careers of Freelancers in Digital Labor Marketplaces: The Case of IT Work
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Contribution of first author	The first author participated in the problem definition, research design, data collection and analysis, interpretation as well as in the conceptual development and reporting. She further significantly contributed to the creation of the manuscript.

Table 23. Fact Sheet Publication P4

Abstract. Online freelancing, an alternative form of work where independent workers offer services on digital labor platforms, gains increasing importance in IS research. While the general under-standing of this form of work is growing, research lacks understanding careers in digital labor marketplaces. However, these differ from careers in offline labor markets due to volatility, global matching and platform mediation, the digital and temporary nature of work, and algorithmic management as particular platform working conditions. Therefore, to understand how working conditions in digital labor marketplaces influence the dynamic career paths of freelancers and what effects result from this interaction over the long-term career, we conduct an exploratory analysis using 35 interviews with freelancers and clients on digital labor platforms. We thus contribute to the body of knowledge on alternative forms of work in digital labor marketplaces by developing a career model and outlining the dynamics of advancement, decline, and exit within platform careers. We also illustrate long-term career dynamics in terms of changes in platform benefit for freelancers, their dependency on the platform, and lock-in effects as well as exit probabilities.

7.1 Introduction

Globalization, rapid technological change in the form of digital platforms, algorithms and artificial intelligence are increasingly accelerating the labor markets. In addition, economic uncertainties, not least due to the Covid 19 pandemic, have led to a restructuring of work and employment relationships. Especially post-Covid, the normality of remote work has reinforced the benefits of the freelancing economy (Mottola 2023). As a result, people's career expectations have also changed (Alpar and Osterbrink 2020; Guan et al. 2020; Sweet and Meiksins 2013). The concept of career has been studied primarily in an organizational setting structured in offline labor markets. However, the importance of working in digital labor marketplaces (DLM), where a global matching between freelancers (supply of work) and clients (demand for work) takes place via digital labor platforms (Bunjak et al. 2021; Gu and Zhu 2021), is increasing (Kässi and Lehdonvirta 2018). Previous studies only examine the conditions and challenges of this form of work, but not the entire career (Deng et al. 2016b; Durward et al. 2020; Kittur et al. 2013). But a growing number of workers are pursuing careers outside of traditional employment and embrace working in DLMs as a full-time job (Idowu and Elbanna 2022). This is reflected in the rising amount of projects and tasks on digital labor platforms such as Upwork or Fiverr (Jabagi et al. 2019; Kässi and Lehdonvirta 2018). In 2020, about 36% of the U.S. labor force (59 million people) worked as freelancers (Upwork 2020). The platform Upwork in particular has seen an increase in qualified freelancers, e.g. in the fields of computer programming and IT (Upwork 2021b).

Some working conditions make the career dynamics in DLMs particular. First, we focus on the research context of freelancers from the IT field who are self-employed and work outside of an organizational environment, which makes the work highly volatile and uncertain compared to traditional work (Deng et al. 2016b; Durward et al. 2020; Kittur et al. 2013). Second, due to global matching on digital labor platforms, there is high competition and broad heterogeneity of clients and jobs (Bellesia et al. 2019; Bunjak et al. 2021; Deng and Joshi 2016; Seifried et al. 2020). Third, freelancing work is temporary and purely digital (Ashford et al. 2018; Bucher et al. 2019; Deng et al. 2016b; Durward et al. 2020). Fourth, work in DLMs is not managed by a traditional supervisor, but by algorithms that thereby significantly influence freelancers' careers (Duggan et al. 2020; Tóth et al. 2022; Wood et al. 2019).

Given these working conditions of DLMs, it is unclear how the particular careers of freelancers unfold over time. The literature reveals an initial understanding of the different career aspects

in DLMs at a holistic level and examines single aspects (Frenzel-Piasentin et al. 2022; Idowu and Elbanna 2022; Sison and Lavilles 2018). But despite the diminishing relevance of the traditional career path with its promotions and salary increases, and despite recent calls to examine whether we need to update career theories in a changing work environment (Ashford et al. 2018; Barley et al. 2017; Rahman et al. 2016; Seifried et al. 2020), the dynamic development of careers in DLMs is not yet fully understood. However, to understand this new type of work, it is important for several reasons to consider the dynamic perspective of career paths in DLMs and to examine how freelance work evolves over the long term.

First, the static view of careers in DLMs may not be accurate because it only considers the status of freelancers at a particular point in time and does not take into account the trajectory of their work and development (Idowu and Elbanna 2022). But since the labor market in DLMs is not stable, there is ambiguity and impermanence of career paths (Ashford et al. 2018). We therefore need to explore more closely the career path, which can move dynamically forward or backward, because freelancers' needs and contextual requirements are also dynamic and can change over the course of their careers (Idowu and Elbanna 2022). Due to deep changes in employment relationships and organizational structures, more and more workers are experiencing a shift from stable and linear careers to dynamic careers. Thereby, these dynamic careers become even more challenging as freelancers have to plan their career development themselves due to the absence of organizations and fixed communities and they have to execute their careers by themselves under great uncertainty (Ashford et al. 2007; Ashford et al. 2018; Lo Presti et al. 2018). In this context, theoretical assumptions about traditional and static careers need to be reconsidered because, unlike permanent positions in the offline environment, self-organized advancement and unprotected career decline may be a part of career development in DLMs.

Second, theory to date has largely assumed that people design their freelancing work primarily for the short term. Therefore, we are only beginning to understand how an entire career can be designed in this new way (Kalleberg 2000, 2009). Previous theoretical assumptions need to be reconsidered, because freelancing work may not only have a short-term character. In this regard, it is important for freelancers and for digital labor platforms to understand possible long-term dynamics and career paths, as this knowledge can help them make informed decisions regarding skill development, client acquisition, marketing strategies, and long-term planning (Ashford et al. 2018). In the new complex work environment of DLMs, workers are being asked to do more than what was previously required to succeed in many companies because there are less familiar career paths or patterns for lifelong careers in DLMs. Therefore, it is important to highlight

whether the benefits of a successful platform career, such as an individualized, multi-faceted, and exciting career, are worth the effort required in the long run (Ashford et al. 2018; Petriglieri et al. 2018). Based on this line of reasoning, this research seeks to answer the research question: *How can long-term, dynamic career paths of freelancers be designed on digital labor platforms?*

In this paper, we conduct an exploratory analysis of freelancer careers to answer the research question. Based on 35 semi-structured interviews with freelancer from the IT field, we develop a freelancer career model and systematize the career advancement, career decline and exit dynamics. The detailed information provided by freelancers yields interesting new insights into the long-term career dynamics of IT professionals as freelancers on digital labor platforms.

7.2 Background

Based on the current state of research, we describe below what has not yet been adequately researched. It will be explained in detail which specific differences exist in contrast to previous related literature. To this end, we first describe the conditions of work in DLMs in four clusters and thus draw a distinction between freelancing careers in DLMs and (i) traditional careers in organizations as well as (ii) offline freelancing careers. We then use the previous understanding of career phases on DLMs to structure a preliminary theoretical model from the challenges in DLMs.

In general, non-traditional work can be location-independent (online) or location-dependent (offline) (Duggan et al. 2020; Huang et al. 2020). Location-independent work is also called crowdwork, and is defined as work that is paid and whose execution is mediated through digital platforms (Howcroft and Bergvall-Kåreborn 2019; Idowu and Elbanna 2022). Crowdwork consists of micro and macro tasks (Kalleberg and Dunn 2016). Microtasks (e.g., on Amazon Mechanical Turk) are small, trivial, and largely repetitive tasks that can be completed in a short period of time (Heer and Bostock 2010; Holthaus and Stock 2017). In contrast, macro tasks involve considerable creative and knowledge work that typically requires a longer time to complete (Idowu and Elbanna 2022; Majchrzak and Malhotra 2013; Wagner et al. 2021). Moreover, a subtype of macro-crowdwork are competition-based platforms (e.g., Topcoder) where workers can participate in competitions or "contests" (Jian et al. 2019).

In contrast to contest-based crowdwork, this paper focuses on macro-crowdwork in digital labor marketplaces (also called online labor markets) such as Upwork, Fiverr, or Freelancer.com, and

specifically on IT professionals (e.g., software development) as freelancers. These enable online transactions and matching between freelancers offering their services and clients buying those services through digital labor platforms (Rai et al. 2019). They deal with single, knowledge-intensive tasks (like IT tasks) and do not rely on collaboration and crowd intelligence in the form of contests (Holthaus and Stock 2017). Figure 14 delineates the various non-traditional forms of work described. We examine highly skilled freelance work (knowledge work). In this context, digital platforms offer project categories such as app and website development, graphic design, translation, digital marketing, and data analytics (Idowu and Elbanna 2022; Kittur et al. 2013; Wagner et al. 2021).

More specifically, we examine the case of IT work, which includes technology and software development (app development, website design, and software testing) (Gussek and Wiesche 2023; Idowu and Elbanna 2022). The career dynamics of highly skilled freelance work (hereafter just termed freelancing) are of particular interest here, as they are more complex than those of location-based gig work or micro tasking. To study the careers, freelancing platforms also offer broad project heterogeneity and low barriers to start a career. However, from a theoretical perspective, the careers all have similar challenges (Ashford et al. 2018).

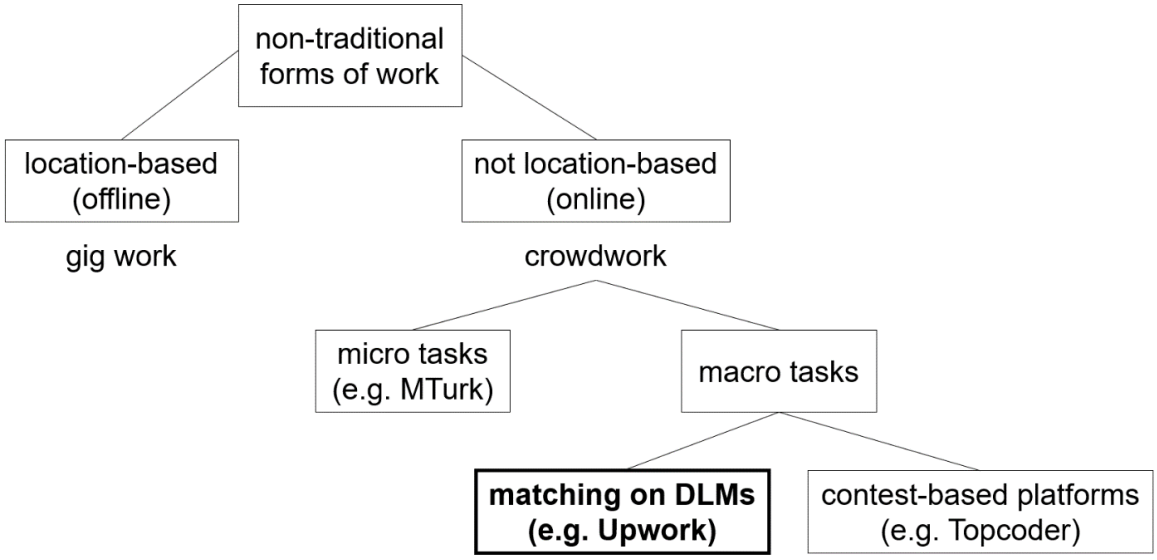

Figure 14. Non-traditional Forms of Work

7.2.1 Working Conditions of Individuals engaging in Digital Labor Marketplaces

Specific work conditions in DLMs have been studied in the literature. We provide an overview of this research below and organize it into four clusters to illustrate why careers in DLMs are special and need further research. Table 24 provides an overview of the clusters, associated

working conditions, and corresponding illustrative references from previous research. The clusters illustrate the special conditions of careers in DLMs compared to traditional careers in organizations and careers of offline freelancers who are self-employed but do not organize and perform their work via digital platforms.

Cluster	Working Conditions	Illustrative References
false self-employment and volatility	work independently	Caza et al. 2022; Kost et al. 2020; Mayer et al. 2020
	work outside of an organizational environment	Ihl et al. 2020; Kittur et al. 2013; Petriglieri et al. 2019
	autonomy	Deng et al. 2016b; Deng and Joshi 2016; Durward et al. 2020
	flexibility	Bellesia et al. 2019; Huang et al. 2020; Wood et al. 2019
	high cost and time expenditure	Wood et al. 2019; Zheng et al. 2015
	precarity and financial instability	Ashford et al. 2018; Durward et al. 2016a, 2020
global matching and platform mediation	matching of clients and workers through digital platforms	Bellesia et al. 2019; Bunjak et al. 2021; Gu and Zhu 2021
	global competition	Bucher et al. 2019; Kanat et al. 2018; Strunk et al. 2022
	wide range and heterogeneity of clients and jobs	Deng and Joshi 2016; Mayer et al. 2020; Seifried et al. 2020
	market transparency	Claussen et al. 2018; Seifried et al. 2020
digital and temporary work	digitally mediated work	Deng et al. 2016b; Gol et al. 2019b; Irani and Silberman 2013
	temporary contract work	Brawley and Pury 2016; Friedman 2014; Gol et al. 2019b
	transience of work	Ashford et al. 2018; Bucher et al. 2019; Strunk et al. 2022
	social isolation and emotional tensions	Petriglieri et al. 2019; Silberman et al. 2010; Wood et al. 2019
	different motivations and rewards	Chandler and Kapelner 2013; Paolacci and Chandler 2014; Rogstadius et al. 2011
algorithmic management	algorithmic control	Duggan et al. 2020; Rahman 2021; Wood et al. 2019
	reputation system	Idowu and Elbanna 2022; Tóth et al. 2022; Yoganarasimhan 2013

Table 24. Overview of the Working Conditions of Individuals Engaging on DLMs

Generally, the literature suggests that careers in DLMs are different from traditional careers within an organization (Blaising et al. 2021; Caza et al. 2022). DLMs lack clear, available, and

relevant career pathways (Ashford et al. 2018). Workers often inhabit "in-between spaces", between work roles, organizations, and career paths (Ibarra and Obodaru 2016). Research also refers to fragmented careers (Blaising et al. 2021) and high career path uncertainty (Caza et al. 2022). In addition, DLM careers are unpredictable, risky, and built slowly across multiple projects, relationships, and environments (Caza et al. 2022). Moreover, workers in DLMs are responsible for their own career development (Kost et al. 2020). Overall, it is unclear how careers in DLMs might unfold (Seifried et al. 2020).

First, the cluster of the false self-employment and volatility illustrates the special conditions of work in DLMs compared to careers in organizations. Workers in DLMs work independently outside organizational structures through digital platforms (Burke and Cowling 2020; Caza et al. 2022; Kost et al. 2020). Therefore, they do not receive organizational (social) support (Idowu and Elbanna 2022; Ihl et al. 2020; Kost et al. 2020), are not supported by a holding environment (Petriglieri et al. 2019), and do not benefit from managerial supervision and direct rewards or punishments for their work performance (Kittur et al. 2013) as in traditional organizations. Moreover, organizations fundamentally play an important role in shaping careers in the traditional workplace, as they are responsible for promotion, training, and setting criteria for career development (Rande et al. 2015).

Moreover, on the one hand, working in DLMs is characterized by higher autonomy (Deng et al. 2016a; Deng et al. 2016b; Durward et al. 2016b, 2020). and flexibility (Bellesia et al. 2019; Huang et al. 2020) than working in traditional organizations. This also impacts workers' careers, as they thus have greater personal responsibility and freedom to shape their careers. On the other hand, working in DLMs often comes at a high cost and time expenditure (Zheng et al. 2015) and individuals often work unsocial and irregular hours, which can lead to sleep deviation and exhaustion (Wood et al. 2019). In addition, DLM careers are characterized by precarity and financial instability (Ashford et al. 2018; Durward et al. 2016b, 2020; Petriglieri et al. 2019). There exists no job security and often low wages (Kittur et al. 2013; Wood et al. 2019).

Second, DLM careers are special because digital platforms enable the global matching of clients and freelancers by mediating the work online (Bunjak et al. 2021; Gu and Zhu 2021). Digital platforms act as providers of technological functions and online environments (Bellesia et al. 2019). In addition, there is huge competition among workers for jobs due to global connections on digital platforms (Kanat et al. 2018; Kittur et al. 2013; Strunk et al. 2022). DLMs bring together a large number of diverse individuals worldwide (Acar 2019; Bucher et al. 2019). Moreover, there is a great breadth or choice and heterogeneity of clients and jobs (Deng and

Joshi 2016; Kokkodis and Ipeirotis 2016; Wood et al. 2019). Workers face an almost infinite pool of employment opportunities, offering many different ways to shape their careers (Seifried et al. 2020). Finally, there is enormous market transparency in DLMs. Since freelancers' profiles are freely available on the platform, freelancers can obtain detailed information about the career paths of other freelancers. Likewise, all job descriptions and prices can be viewed so that workers can easily assess qualification requirements (Seifried et al. 2020).

Third, the work in DLMs itself is special compared to offline freelancing work because it is purely digital and temporary. The work on digital platforms is digitally mediated (Gol et al. 2018; Irani and Silberman 2013) and significant parts of the value creation take place via IT-facilitated platforms that enable exchange between workers and clients (Deng and Joshi 2016; Durward et al. 2016b, 2020). Moreover, work is not only digital, but can be defined as temporary contract work (Brawley and Pury 2016; Gol et al. 2019b). Thus, there are no long-time connections but jobs over a defined period of time as flexible agreements (Friedman 2014). Because of this granularity and decontextualization of tasks, workers are removed from the end product of their work (Bucher et al. 2019; Strunk et al. 2022). The transient nature of work in DLMs is therefore challenging for career development (Ashford et al. 2018). The digital nature of work also makes workers feel socially isolated (Wood et al. 2019) and they face emotional tensions (Ashford et al. 2018; Petriglieri et al. 2019). Moreover, there is a certain anonymity in the working relationship in DLMs (Silberman et al. 2010). Last, workers are motivated to participate in DLMs and develop their careers for divergent reasons, and the reward structure is often not only monetary (Seifried et al. 2020). For example, factors that increase the intrinsic motivation of a task, such as framing the task in a way that helps others (Rogstadius et al. 2011) or increasing the meaningfulness of the task (Chandler and Kapelner 2013), can improve the quality of the outcome. Extrinsic motivators, on the other hand, such as higher pay, may not do so directly (Paolacci and Chandler 2014) or only if part of the pay is designed as an unexpected gift by offering an unconditional pay increase (Gilchrist et al. 2016).

Fourth, the work in DLMs is governed and controlled by algorithmic management, which is not the case in offline freelancing (Duggan et al. 2020; Wood et al. 2019). In this regard, algorithms create power asymmetries and thus constrain freelancers' actions (Kinder et al. 2019; Wood et al. 2019). Previous research also shows that algorithms affect how and why freelancers find work in DLMs (Jarrahi et al. 2020; Jarrahi et al. 2021). Freelancers experience algorithmic rating systems as a form of control where the criteria for success and changes of those criteria are not always easy for freelancers to predict or to influence (Jarrahi and Sutherland 2019;

Rahman 2021). In addition, unlike in offline freelancer careers, the successful careers of workers in DLMs are highly dependent on their reputation and the reviews of clients on the platform (Cram et al. 2020; Hong and Pavlou 2017; Idowu and Elbanna 2022; Lin et al. 2018; Möhlmann et al. 2021; Tóth et al. 2022; Yoganarasimhan 2013). Freelancers cannot directly influence these reviews, but the quality of these evaluations is very important as it serves as a status indicator and influences future job acquisition (Gussek and Wiesche 2023; Rahman 2021).

7.2.2 Careers in Digital Labor Marketplaces

Based on the research presented so far on the working conditions in DLMs that make careers in such markets special compared to careers in organizations or offline freelancing, the following section develops a preliminary theoretical model based on the literature that structures the career challenges in DLMs.

The literature reveals an initial understanding of the different career phases in DLMs at a holistic level and examines single aspects (Frenzel-Piasentin et al. 2022; Idowu and Elbanna 2022; Sison and Lavilles 2018). Table 25 shows that the core literature on career challenges in DLMs can be roughly clustered into four different phases.

Phase	Our Label	Phase Characteristic	Illustrative References
1	Beginner	difficult platform start with a lot of competition	Blaising and Dabbish 2022; Claussen et al. 2018; Frenzel-Piasentin et al. 2022; Strunk et al. 2022
		no reputation on the platform yet	Rahman 2021; Stanton and Thomas 2016; Tóth et al. 2022
		many unsuccessful applications for jobs	Frenzel-Piasentin et al. 2022; Tóth et al. 2022
2	Slave	reputation must be built	Ashford et al. 2018; Blaising et al. 2021; Claussen et al. 2018
		only a small price can be charged for the work	Graham et al. 2017; Idowu and Elbanna 2022; Tóth et al. 2022
		the profile on the platform must contain a lot of information	Holthaus and Stock 2018; Ludwig et al. 2022; Sison and Lavilles 2018
3	Establisher	a good rating must be developed and maintained	Durward et al. 2016b; Rahman 2021
		the profile is now used and the client relationships must be established	Blaising et al. 2021; Frenzel-Piasentin et al. 2022; Kost et al. 2020
		the price for the work can be raised	Bellesia et al. 2019; Idowu and Elbanna 2022; Ke and Zhu 2021
4	Celebrity	trust between clients and workers is given and a network can be built up	Bellesia et al. 2019; Gu and Zhu 2021; Gussek and Wiesche 2023; Lo Presti et al. 2018
		competition is no longer as strong as it was in the beginning	Frenzel-Piasentin et al. 2022; Idowu and Elbanna 2022; Rahman 2021

Table 25. Clusters of Career Challenges in Digital Labor Marketplaces across Phases

The first phase describes the difficult entry into the digital labor platform (Blaising and Dabbish 2022; Claussen et al. 2018; Frenzel-Piasentin et al. 2022). We refer to this phase as "**beginner**". Competition with other freelancers is very high (Bellesia et al. 2019; Strunk et al. 2022). Most workers also have little knowledge of digital labor platforms at the beginning, and especially of the dynamics of performance management, evaluation, and reputation systems (Idowu and Elbanna 2022). Workers depend on reputation systems in the form of ratings and reviews, which they do not have at the beginning of their careers (Tóth et al. 2022). When they enter DLMs, they have no feedback or other verified performance data (Rahman 2021; Stanton and Thomas 2016). Therefore, it also takes many applications before the freelancer gets the first job (Frenzel-Piasentin et al. 2022; Tóth et al. 2022).

We term the second phase "**slave**", as workers must do everything they can to build their reputation (Tóth et al. 2022). Due to the still high competition in this phase, the number of ratings must be increased quickly (Blaising et al. 2021; Idowu and Elbanna 2022). Overinvestment in reputation is made to advance the career (Claussen et al. 2018). Moreover, at this phase, work is not yet done primarily for monetary reasons, but for the rating (Idowu and Elbanna 2022). Due to high competitiveness, only very low prices can be charged for the work (Graham et al. 2017; Tóth et al. 2022). Finally, worker profiles need to obtain a lot of information to compensate for the still low reputation (Holthaus and Stock 2018; Sison and Lavilles 2018). In this context, more personal information can increase the chances of success (Ludwig et al. 2022).

The third phase is characterized by the fact that the workers as "**establishers**" must develop a good rating and, above all, maintain it in this phase. The rating score, which acts as a flagship for the workers, only increases after a certain period of time on the platform (Rahman 2021). Finally, when the first projects in phase two are completed and the workers have received several positive ratings, it is easier to acquire more projects in the third phase as long as a high average rating has been maintained (Tóth et al. 2022). The profile enriched with information in phase two can now be used in the third phase to build relationships with clients (Kost et al. 2020). Workers in DLMs rely solely on virtual tools to present themselves and build relationships with customers (Frenzel-Piasentin et al. 2022). Last, in the third career phase, the price of labor can be slowly increased (Ke and Zhu 2021). Workers are recommended to customers by the algorithm of the digital platform and thus have the opportunity to increase their fees (Idowu and Elbanna 2022).

At the fourth and highest phase, workers take on the role of a "**celebrity**". This phase is characterized by a high level of trust between clients and workers (Gu and Zhu 2021). A long history of reviews and good ratings enables the building of collaborations (Tóth et al. 2022). Thus, long-term client relationships and the development of networks become possible (Bellesia et al. 2019; Frenzel-Piasentin et al. 2022; Lo Presti et al. 2018). In addition, competition in this phase is much less than in previous phases, or even completely absent, as few workers reach this career phase (Idowu and Elbanna 2022; Rahman 2021). Consequently, this phase is also characterized by the fact that a large number of job applications is no longer needed and workers can even secure a stable income with which they can plan (Frenzel-Piasentin et al. 2022).

There are also initial research findings on the power dynamics between freelancers and digital labor platforms. However, these cannot be assigned to specific phases based on existing literature. Due to the platforms' monopoly power, they can limit workers' choices, mobility, and career development, making them more vulnerable to exploitation (Dube et al. 2020). As described earlier, algorithms and evaluation systems create power asymmetries, limiting freelancers' actions (Curchod et al. 2020; Kinder et al. 2019; Wood et al. 2019). However, a developed reputation on the platform can also increase freelancers' bargaining power and shift the distribution of power in their favor (Durward et al. 2016b). In addition, the described use of power by platforms can promote the formation of alliances between freelancers who build their own network on the platform (Kinder et al. 2019).

Previous literature can be roughly clustered in these four career phases. So far, however, it is unclear how the described working conditions and challenges of careers in DLMs interact and lead to career advancement, career decline and platform exits. Since, to the best of our knowledge, no research has examined this before, in this paper we will examine career dynamics to highlight how workers' careers in DLMs develop over time along the phases and how workers can influence these developments. Furthermore, we illustrate the effects of the interaction of platform working conditions and career dynamics and how the role of the platform changes over the course of the long-term career.

7.3 Research Method

Given the shortage of knowledge and studies that capture the specific career dynamics of freelancers in DLMs, we use an exploratory research design that allows us to develop theoretical depth and detailed understanding of under-researched phenomena. Thus, in this work, we use an abductive approach that follows the grounded theory approach described by Strauss & Corbin (1990).

This approach is particularly suited to explore poorly understood phenomena based on previous theory and explore new data. We can thus broaden our understanding of phenomena and deepen knowledge, as well as extend and complement existing theories. Grounded theory does not mean that researchers work completely independently of existing theories (Wiesche et al. 2017). The method is based on an iterative process in which data and theory building are constantly interrelated. We therefore also draw on insights from existing theories and the literature and relate our exploratory data to them. With the help of the grounded theory method, we therefore not only extend existing theories, but also contribute to filling the described shortcomings in

existing theory building and to developing new theoretical perspectives. By applying grounded theory, we can thereby identify unexpected phenomena or relationships not contained in existing theories (Levina 2021; Walsh et al. 2015). Compared to relatively stable phenomena studied in some fields, a crucial aspect of information systems phenomena is that they are inherently emergent, i.e., they dynamically evolve and change. Technologies are changing at a fast pace and in unpredictable ways, and so are their impacts. Technologies, such as digital labor platforms and their particular working conditions, affect many aspects simultaneously. Consequently, today's new technologies have the potential to fundamentally change many previously known contexts, such as the career development of individuals. This ever-increasing role of technology must therefore be incorporated into theories of important organizational processes and phenomena (Bailey et al. 2022). To keep up with such evolving phenomena, qualitative methods help by allowing us to identify insightful cases, develop grounded theories, and shape new concepts to describe emerging phenomena such as, in our case, dynamic careers in DLMs (Monteiro et al. 2022).

The working conditions of individuals working in DLMs presented in the theoretical background that make careers in such markets unique, as well as the classification of previous literature into the four career phases, make it clear that it is so far unexplored how the described conditions and challenges of careers in DLMs interact and lead to career advancement, career decline, and platform exit. These career dynamics are therefore unexplored in the context of DLMs and differ from traditional careers in fixed organizations due to the particular working conditions, false self-employment and volatility, global matching and platform mediation, digital and temporary work, and algorithmic management, thus requiring an extension of existing theory in this research field.

To this end, we collected semi-structured interview data across 35 cases and used grounded theory techniques to structure and analyze our data (Sarker et al. 2013; Urquhart 2013; Wiesche et al. 2017).

7.3.1 Sample and Data Collection

Regarding the research context, we chose IT professionals (e.g., software development) in DLMs (IT freelancers) as the sample for our research for two reasons. First, IT work is increasingly being performed by freelancers via digital platforms (Upwork 2021b; Younger 2020). The effects of this change are not yet precisely known and may have significant individual as

well as general economic consequences. Second, IT freelancers differ from other online freelancers in two main ways, which additionally makes their careers special: IT work, which is constantly evolving, requires a high level of skill (Ang et al. 2015; Zhang et al. 2012), and IT projects often require a certain level of collaboration to complete them successfully (Kudaravalli et al. 2017; Levina 2005). This is not the case for other freelance activities such as simple design tasks, translations, or image editing. In IT, this is exacerbated by increasing competition among workers, which is why technology companies are offering fewer and fewer lifetime employment opportunities for IT professionals (Ang and Slaughter 2000). As a result, the IT profession is becoming more diverse and careers involve multiple moves between organizations and occupations (Slaughter 2001).

We studied a heterogeneous sample of freelancers on different digital labor platforms. On these platforms, there are a wide variety of jobs from the IT context in terms of diversity of tasks, duration of employment, and skill level. Therefore, there is a wide range of workers on the platforms with varying levels of success, and these freelancers are also in different career phases. We rely on 33 semi-structured interviews with IT freelancers, 2 semi-structured interviews with clients, the personal online profiles of our informants and archival documents downloaded from the platform to support our theory building process. For triangulation purposes and to strengthen the generalizability of our results, we conducted two additional interviews with clients in order to be able to include a second perspective in the results. In total, we collected 1397 minutes of interview material. The interviews lasted an average of 40 minutes, all of which we transcribed, resulting in 422 pages of qualitative data.

We conducted, recorded and transcribed 35 semi-structures interviews. The participants differ according to several characteristics. Table 26 provides an overview of the sample.

Platform affiliation (35 in total)	
Main platform is Upwork	24
Main platform is Fiverr	3
Use more than one platform	8
Gender (35 in total)	
Male	29
Female	6
Location of freelancers (35 in total)	
Europe	15
Asia	10
North America	4
South America	1
Australia	1
Africa	4
Assignment of the 33 freelancers to career phase	
Beginner (phase 1)	2
Slave (phase 2)	7
Establisher (phase 3)	11
Celebrity (phase 4)	13

Table 26. Overview of the Sample

We used theoretical sampling to ensure that the freelancers were at different phases of their careers and that they differed in terms of experience, success, and background. Background means gender, cultural background and professional area or task field. Thus, different perspectives on career development are possible and different experiences can be studied. We randomly contacted a set of freelancers in the IT specific platform categories and then conducted the interviews via online communication media outside the platform. After the initial interviews, we more consciously selected the freelancers based on their career advancement. A similar approach has been used in other studies that conducted online surveys on digital labor platforms (e.g., Deng et al. 2016b).

The interviews were also structured using a basic interview guide. In the interviews, we first asked the informants general questions about their careers and motivations for joining the platform. We then moved on to more detailed questions about the organization of the work and the start of the platform career. Examples of questions include: Could you tell me about your entry into the platform? What problems did you encounter in the starting process? We then asked questions about career development on the platform such as: Please describe what helped you climb the ladder on the platform? Do you follow certain strategies to be successful on the platform? We also focused on the relevant skills as well as teams of freelancers. We sought to

understand the dynamics of individual situations to develop detailed descriptions of the career dynamics on the platform. After the first twelve interviews, we found that informants frequently talked about the changes in their job choice within career development and the role of the platform owner within the career. Given the centrality of these topics to career dynamics, we modified our interview guide to examine such issues in all subsequent interviews. Our interviews continued until we found that new data no longer provided new information and did not help us further refine or develop our model, i.e. theoretical saturation (Glaser and Strauss 1967).

We also analyzed the freelancers' public online profiles to obtain additional information about their work experience and development on the platform (based on their work history) and what status symbols they have on the platform (e.g. platform badges or job success scores). We started this investigation before the interviews so that we could ask specific questions about the information in their profiles.

Finally, we reviewed some articles and reports published on the platform's blog to develop a better understanding of the context. These documents mainly contained information about the platform itself and offered tips for freelancers.

7.3.2 Data Analysis

We built an integrated database of interviews, profiles, and documents. The data analysis followed the framework proposed by Strauss and Corbin (1990) for the development of grounded theory development and the three-step coding process described by (Gioia et al. 2013). Following these frameworks, data analysis went hand-in-hand with the data collection phase (Strauss and Corbin 1990). We adopted an iterative approach of constant comparison between the literature and data. We first open-coded to search for recurrent first-order concepts. In open coding, interview passages were marked with open codes (we identified about 100 codes), i.e., short descriptive statements that summarize the key idea of the text passage (Wiesche et al. 2017). Then we grouped them into nine code groups to form categories (second-order themes), and finally we aggregated three theoretical dimensions. In the last step of this procedure, we identified the relationships between the categories to build a career model. Thus, data were mapped to theorize the relationships between contexts, mechanisms, and outcomes. To ensure reliability of our analysis, 20% of the interviews were coded by a research assistant who was not involve in the project. This resulted in an average inter-coder reliability of 81%.

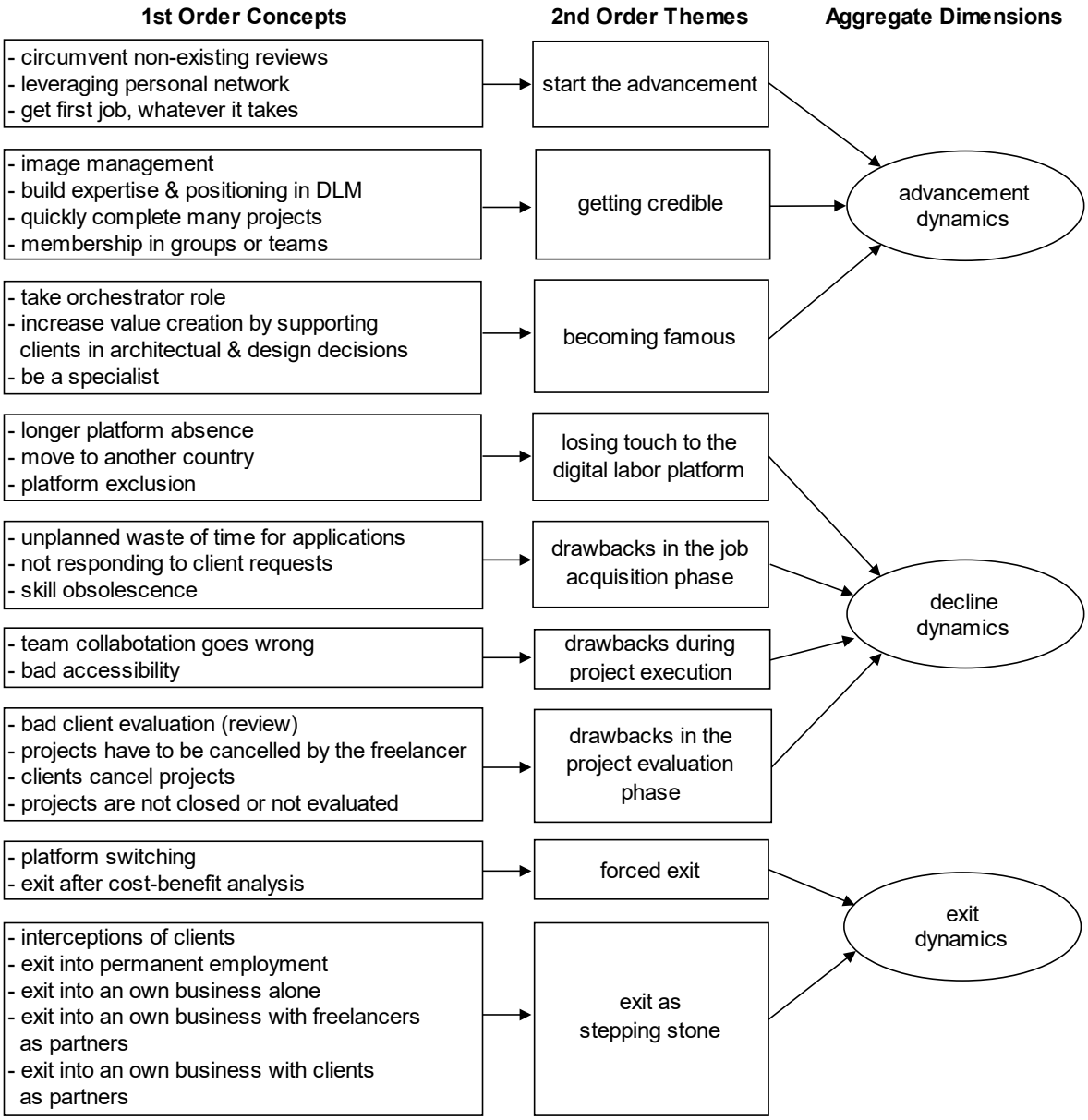

Table 27. Data Structure

In a first step, we looked for regularities and patterns in the data and found that freelancers could be classified into the proposed career phases. Further, freelancers reported on their current career status and on earlier phases of their careers. Then, as we went back and forth between theory and data, we were able to link the phases together and recognized specific attributes that lead to career advancement as well as different strategies to achieve these attributes. We also interpreted different aspects that led to a decline within the career. By having the freelancers report how the career unfolded up to the point of the interview and what they would like to achieve in the future, it became clear to us how the dynamics of the career are represented. Finally, we further examined our data to determine what exit dynamics occurred within the freelancer careers or which ones the freelancers planned. The end result of the process was the

data structure in Table 26. A more detailed presentation along the data can be found in the appendix (B). We then synthesized the described data structure into a freelancing career model (Figure 15) by mapping the relationships between advancement, decline, and exit dynamics. By doing this, additional abductive clustering of the first-order concepts revealed four additional underlying drivers that lead to long-term career dynamics over time, independent of the specific career phases. In a final step, we derived these drivers from the empirical data in comparison with existing literature (Gioia et al. 2013).

7.4 Results

In the following section, the results are presented. We developed a freelancing career model, divided into four career phases that freelancers dynamically move through, represented by the staircase in Figure 15. The advancement and decline dynamics can be identified by the up and down arrows in the career model. Finally, the exit dynamics are visible in the upper part of the Figure 15. We found many dynamic career mechanisms (first-order concepts) in the advancement, decline and exit dynamics, which are influenced by the working conditions of the platform as a context. Throughout explaining these results, we highlight the IT specifics along the career dynamics as we examine the case of IT work on platforms. Finally, we present long-term career dynamics that evolve from the interaction of the platform and individual career development over time.

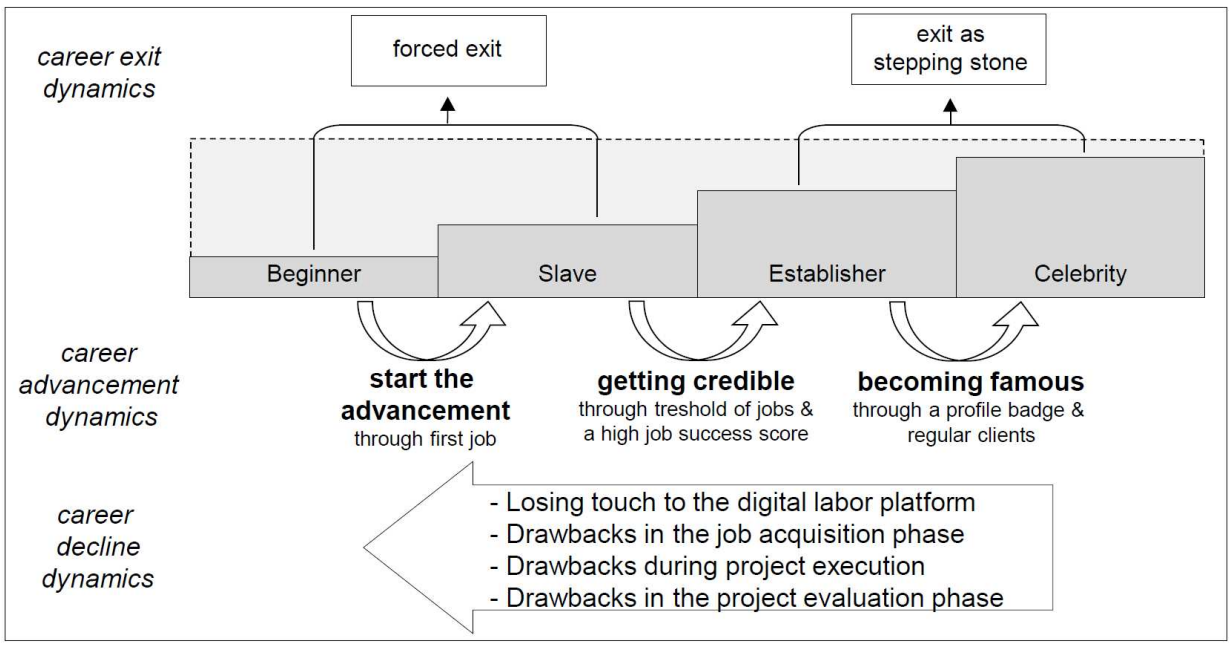

Figure 15. Freelancing Career Model

7.4.1 Career Advancement Dynamics

Our analysis identified three different career advancement situations for freelancers on digital labor platforms, influenced by the platform working conditions. Within each advancement situation, certain attributes must be achieved through strategies to advance to the next career phase. We present the three advancement dynamics below.

Start the Advancement

To advance from “Beginner” to “Slave” phase, the **first job** on the platform must be won as an entry barrier to start the advancement. To get this first job, freelancers use three different strategies: they circumvent non-existing reviews, leverage their personal network and get the first job, whatever it takes.

Due to the algorithmic management and reputation systems on platforms, starting a career is particularly difficult because freelancers do not have reviews of completed projects on the platform at the beginning. Freelancers **circumvent these non-existent reviews** by completing certificates or tests as a substitute for client reviews. This clearly demonstrates the quality of the freelancer to potential clients. In addition, external profiles of social media platforms (e.g. Facebook or Linked-In) or other freelancing platforms are often linked if for example reviews are already available there. Finally, fake reviews are sometimes used by completing fake jobs to replace the non-existing real reviews.

> *It is difficult nowadays for a new freelancer to join this world, to build this profile. […] People are actually posting fake jobs in order for them to get reviews and to get noticed. […] So: “You are my friend, you are posting this job for five dollars, you hire me for the job and then you give me a review”, then close the job. (#20)*

The working conditions on platforms are characterized by the fact that freelancers usually work independently outside an organizational environment. By **leveraging the personal network**, freelancers nevertheless receive help in getting a job. Likewise, they receive information through the experiences of other freelancers from their private environment or on the platform.

> *I actually started on [the platform] and then I was having people who are my friends, so they are on the same team as well. I taught them how to get the projects and etcetera and help them to be successful with first two projects. (#7)*

In addition, it is necessary that the freelancers **get the first job, whatever it takes**, to start in the reputation system of the platform. In this first phase as a "beginner" it is not important how

much money the freelancer earns. Many freelancers even report to do the first job for free, just to get the first rating. Additionally, any job at this phase will be accepted, regardless of whether it is in the desired field of activity for further career advancement. Lastly, freelancers present half of the solution for projects already in the proposal within the job application and may spend wasted time on it just to get the job. Some freelancers even reported that they complete the entire job before the client accepts the proposal (based only on the job description which is free available on the platform), so that clients who are in a hurry can accept the solution directly and the freelancer get a quick review.

> *For desperate people who needed something fast, I did a Python program and I said 'Hey, I already have it done, do you want to hire me?'. And because [the client was] so good about putting the requirements in the job description I said, 'Oh yeah, that's done... okay we'll code it up.' And then I told him later […] that I already have it for him and he was thrilled so, that's what it was like in the beginning. (#19)*

Getting Credible

To advance from "Slave" to "Establisher" phase, a **threshold of jobs and a high job success score** (percentage of successfully closed jobs) is necessary to get credible. To get this threshold and high success score, freelancers use four different strategies: they manage their image, build expertise and position themselves in the DLM, quickly complete many projects and become a member in groups or teams.

To stand out against the global competition and successfully complete more and more jobs, active **image management** help freelancers to deal with global matching and platform mediation. They do everything the client asks for and often give more than 100% and therefore more than is paid. Additionally, they actively seek feedback and ask clients for a review after completing projects. Finally, portfolios of work samples provided to the client help for image building. But this presentation of work samples is particularly difficult for IT freelancers. The project content and data are often confidential or licensed in IT projects and sometimes IT freelancers have to sign a non-disclosure agreement (NDA). Likewise, IT is often intangible and difficult to map and, therefore difficult to show to clients. Finally, code data in the samples can be copied and used by competing freelancers. However, it is especially important for IT freelancers to market themselves in order to stand out against the competition and to acquire jobs. The clients have to be convinced of the qualities and skills of the IT freelancer in other ways.

> *This one [project] is like their website that I work on… is like a little [platform] for teachers […]. And I have access to all the information of these people and I think a lot*

> *of freelancers could use these for bad purpose […]. And this one is real data… real people. […] Just for software it's like a freelancer has to I mean… he has to have this quality of like secretive. For example, if one client told me "Have you ever developed a website with over 1000 users?", I can not show him the screen […] (#16)*

The second strategy for advancing to the establisher career phase is to **build expertise and positioning in the DLM,** which is influenced by the wide range and heterogeneity of clients and jobs. Skills are constantly being developed and improved by freelancers. Especially in the IT field, technologies change quickly, which is why the phenomenon of obsolescence of skills helps IT freelancers for positioning in the DLM. They react to the changing market demand on the platform. Depending on which skills are currently in demand in their fields of activity, appropriate skills should be learned in order to stand out from the competition and to advance in the career. In this case, the digital labor platform helps freelancers by making job offers visible to freelancers. In addition, it can be helpful for freelancers to have a fixed amount of time each week reserved for learning new skills. Material on the internet, textbooks, videos on other platforms like YouTube, classes at universities, paid courses, training on the traditional job or blogs and news can help to update, train and learn new skills.

> *I spent one to two hours daily, just searching about what new tasks are needed on the platform, […] even if I have a job. Currently I am working as a full time, at [the platform]. So, I can have a good idea what skills I need to enhance, what new skills I should acquire, what are the trends on the future, on the tasks that will be on the platforms. So, I can be prepared […]. (#15)*

In order to **quickly complete many projects** and therefore maintain the threshold of jobs to advance a career phase, mainly short and simple jobs are accepted. Especially in the IT field, the type of work can help. Work results can be used multiple times for different clients. For example, IT freelancers use a developed code snippet several times for different projects to earn money twice without investing time in a new solution a second time. This is possible especially in the IT field, when developed software solutions fit several similar projects. In addition, freelancers usually apply specifically for projects where there is little competition or where there are few competitors. Finally, freelancers always apply at a specific time on the day when most jobs are posted online. For example, to be the first freelancer on a job, they apply at the time it is morning in the US, as that is where many new projects come from.

> *A lot of people even reuse the code from part to part. Or even resells the software, you know. There are a lot of implications in software development because, for example, [...] a project of these one I have it ready on my computer. (#16)*

Due to the working condition that freelancers work independently and often in social isolation, the final strategy for advancement to the establisher phase is a **membership in groups or teams**. The freelancers form online (with other freelancers) or offline (with people from the personal environment) teams for joint project management. Tasks are distributed in the team and thus it is possible to accept more projects and larger contracts. In addition, online or offline teams distribute expertise in these teams. The freelancers complement each other's skills in the team and take on a wider range of jobs.

> *We need colleagues or friends, when we are upgrading our sales in terms of time and getting more and more projects. I am also doing that. I also started taking some of my friends… not in [a professional way] but I just having a conversation like that "I may need you for a project". So that if I get any chance, if I get more projects I can count on them. […] I'm trying to build my team. Slowly, slowly. (#12)*

Becoming Famous

To advance from "Establisher" to "Celebrity" phase, a **profile badge and regular clients are** necessary to **becoming famous** on the platform. The profile badge helps the freelancers with their career advancement further, as it is also noticed by clients who are new to the platform or do not have a background in the field of activity, as it is directly visible on the profile and is assigned by the digital labor platform. In addition, it is valid across job categories. To get a badge and regular clients, freelancers use three different strategies: they take on an orchestrator role, increase value creation by supporting clients in architectural and design decisions and they become a specialist.

Unlike as in the slave career phase, the freelancers **take the role of an orchestrator** instead of a team member to advance to the celebrity career phase. If the freelancers are already credible and have completed a threshold of jobs, they can become team leaders and hire other freelancers on the digital labor platform or from their offline environment as job orchestrators to distribute work and become even more famous.

> *I did hire a small team for some projects. […] So there was this website I need to complete, but I did not have time on my hands. Then I outsourced it, send it to (the team) to*

complete it and I got it done in time. […] They are not on the platform, I am the only one on the platform and I give them some money I earn on the project. (#21)

Furthermore, freelancers **increase value creation by supporting clients in architectural and design decisions.** Many clients, especially in the IT field, often do not know what exactly they expect for a project success due to a lack of technical understanding. Therefore, freelancers need to support and advise the client before the project starts in defining requirements and goals in order to satisfy them and thus convince them for further projects. This requires close collaboration and regular feedback loops with clients. After the project, freelancers keep in touch with the clients to stay present for future jobs.

I usually keep in touch with the old clients, not actually with up for contract, but just for fun or just to being around. So, [the client] contacted me for some tasks, and I just gave him some solution architecture for just keep relations with old clients as well so I gave my contact details usually. (#26)

In order to become famous on the platform, freelancers **specialize on the platform**. Whereas in earlier career phases, it was somewhat helpful for advancement not to focus on the skill type, since only the number of jobs and the review quality counted, freelancers specialize in an area of work in order to advance to the highest career phase. This is mainly influenced by the high market transparency and wide range and heterogeneity of clients and jobs on platforms.

I chose this job with this technology and another job with another technology. It was not very optimized because when you are working with different technologies in development you waste time reading documentation. [...] Now my strategy is [to take] only jobs with this technology, it's just a specialization. (#16)

7.4.2 Career Decline Dynamics

In addition to career advancement, there is also the possibility that freelancers decline in the phases for various reasons, caused by the working conditions on platforms. Different situations or dangers lead to the fact that either the career advancement is slowed down or prevented or that the freelancer declines one or more phases in the career. The decline dynamics can be clustered into four dimensions, which are presented in the following.

Losing touch to the Digital Labor Platform

A **longer platform absence** causes the freelancer to lose profile badges and thus decline by one career phase, because of the algorithmic management in form of the reputation system. During the period of absence, projects cannot be completed, freelancers lose clients and do not generate income. Reasons for an absence are parental leave, vacation, illness, or focusing on a permanent position at a company. After returning to the platform, it is more difficult to win jobs. In any case, the absence should be communicated to clients and the profile should be set to private for the time to minimize the career decline.

> *I had a few time-related problems in my private life and was no longer able to work, I became a father. [...] I then just started again at 0, not directly at 0, maybe at 20%. You always see how many people have looked at your profile and the scale has really gone down to 0, maybe 1 or 2. Has not been so nice, you had to build it all up again and invest a bit of time. (#18)*

In addition, if the freelancer **moves to another country**, there may be a career decline by one phase. After a move, the country of origin changes in the freelancer's profile. Client preferences vary depending on the freelancer's country of origin, and clients also pay attention to the average hourly wage from a country, so the amount of hourly pay may need to be adjusted as a result of a move. In addition, communication and time issues may arise if the client's time zone differs from the freelancer's time zone after a move.

Lastly, over the course of their career, freelancers become more dependent on the platform compared to other platforms. The cost of switching to other platforms increases as freelancers mostly build their profile and career on only one platform over time. Thus, **platform exclusion** becomes a threat as the career progresses, since the career would have to be completely restarted in case of platform exclusion. Thus, a platform exclusion leads to a career decline down to the first career phase as a beginner. Ratings and job history are not transferable due to the platform-specific reputation system and cannot be transferred to a new platform. In addition, freelancers no longer have access to their reputation in the case of exclusion. Reasons for exclusion include disregarding platform rules, for example, when communicating with clients outside the platform or making payments outside the platform system. This threat can be mitigated by team mergers on the platform, as the other team members remain on the platform even if a freelancer is excluded.

> *Freelancing has many risks. [...] Your account may be shut. You can work all night for 4 years and one problem with one client, your account may be suspended. (#30)*

Drawbacks in the Job Acquisition Phase

During job acquisition, there is an **unplanned waste of time and connects for job applications**. Connects are needed for job applications and there are only a limited number available on the platform for freelancers for free. Many of the freelancers have reported "dummy projects" or "bot generated projects" which do not really exist and are only created to increase the platform's attractiveness and pull more freelancers to the platform. When applying for such projects, the connects are wasted, which can lead to a career decline, as the connects are missing accordingly for applying for real jobs.

> *I think some of the projects are dummy projects […]. I would say probably 40% of the projects maybe 30% are dummy projects, like they don't really exist. They're just posted there to attract people to come in and look at the projects. No, they don't already exist, if you make a bid, nothing will happen. (#7)*

Furthermore, freelancers may **not respond to client requests**. This leads to a career decline especially in the last two career phases where the freelancers receive such requests from the clients, if the invitations from clients are not answered and thus the performance measures of the freelancer deteriorate. The main reason for these developments is the platform reputation system and the algorithmic management.

> *I have already worked with a client and I was getting three or four invitations a day and if I don't respond to those invitations my profile level goes down, so I made [the profile] to private that I stop receiving invites and I don't have to respond to those things. (#26)*

Finally, especially in the IT sector, constant technological change is a key driver of **skill obsolescence**, which can lead to a career decline. If certain skills become obsolete, the freelancer can receive fewer jobs and accordingly has fewer opportunities to gain new experience and skills in projects. Therefore, freelancers need to update and develop old skills in their field of expertise. This is especially challenging because freelancers usually work independently without organizational support that could assist with training and learning. Since obsolescence affects IT professionals in particular, it is essential for IT freelancers to stay up-to-date with their skills. An IT freelancer draws a comparison to other fields:

> *Being a developer is like being a samurai: 'It's a path, not a finish line.' So because of that, it [be up to date] has nothing to do with freelancing. A freelancer can be a designer, for example, and then you don't need anything, just your fantasy. […] As a developer […] one has to check every day what new library versions have come out, what security vulnerabilities have been figured out. As a developer, you have to evolve every*

day and read the news and look at those feeds all the time, because something happens every hour. (#4)

Drawbacks during Project Execution

During the project, problems can occur that ultimately affect the freelancer's reputation and lead to a career decline. This is influenced by the working conditions on platforms that the job allocation and coordination is done by algorithms and a reputation system and that the work is done completely digital. First of all, **team collaboration can go wrong**. If the freelancer acts as an orchestrator, especially in the establisher or celebrity phase, they are responsible for the success and depend on the hired freelancers. Furthermore, communication problems can occur due to the purely digital job completion.

Team means that everyone expects trust and with trust comes disappointment, always. For example, you just give your best client [to the team] and say, "Please help me with this. But I need it today or tomorrow". "Yes I'll do it". And then the guy says "I couldn't, I was busy". And then you have the responsibility for it and you kind of have to explain yourself to your client. (#4)

Moreover, **bad accessibility** during the project can lead to a career decline. The client expects a response from the freelancers at any time, which is often difficult to realize, especially due to time changes or private problems. Especially when problems arise, demanding clients require quick solutions. If these cannot be delivered fast by the freelancers, bad reviews are threatening.

Freelancers need to be active 24/7. So if they are not active, their profile goes down. For example if I am not working on weekend it will definitely affect my rankings and score. (#10)

Drawbacks in the Project Evaluation Phase

After the project, clients have an immense position of power, as they significantly influence the reputation of freelancers through their evaluation of projects. Therefore, **bad client evaluations** (negative reviews of projects) can lead to a career decline, as often, even one negative feedback is enough to damage the reputation of freelancers. This means that they will consequently get fewer jobs on the platform in the future, because of the reputation system. Many freelancers have given reasons for negative reviews such as poor internet connection during the project, language barriers, clients expected different results due to misunderstandings or the freelancer was not honest and could not do what he promised in skills to get the job.

> *If there was bad blood between you and your client and he might leave a negative review... that bombs your success rate or your rating and when that happens, you lose visibility. (#29)*

What also leads to a career decline are **projects that have to be cancelled** at an early time, as this has a negative impact on the job success score, which is important in slave and establisher phase. On the one hand, this cancellation can be caused by the freelancers, for example, when clients book the wrong freelancer, when clients are "scope creeps" and demand more and more from the freelancers without remuneration, which was not previously agreed. On the other hand, clients close projects early when the client can no longer afford the freelancer, for example due to the drop in sales during the Covid pandemic.

> *We've had the case where clients have booked the wrong gig. Then we had to cancel that and then, of course, our cancellation rate dropped. (#35)*

Finally, it often happens that successfully completed **projects are not closed by the client or remain without evaluation**. Both have a negative impact on the image of the freelancer and can lead to a phase decline if the freelancer loses their profile badge due to missing ratings.

> *Sometimes [the client] forgot to put up the feedback and to close the project. If you have this unclosed list of projects, then if you get a new project, they will see that: "oh, they are working on so many projects, they won't be able to help us. They won't have time". (#1)*

7.4.3 Career Exit Dynamics

The careers of freelancers do not necessarily unfold exclusively on a digital labor platform. Freelancers leave the platform through exits in various career phases. On the one hand, an exit can be forced if the freelancer fails and has to end the career on the digital labor platform. On the other hand, an exit can also be positive and used as a stepping stone for the career, which is why a successful career does not only imply an advancement within the platform. Both exit types and the impact of platform working conditions on these exits are presented in the following.

Forced Exit

First, the interviews indicate that the freelancer should consider several platforms at the beginning of the career in order to select the most suitable one and **switch the platform** if the competition is too strong, the compatibility of the platform is not satisfactory or the job offers do

not meet the freelancer's expectations. Therefore, exits due to platform switching mainly occur at the beginning of the platform career. One reason that switching only takes place at the beginning of the career is primarily the switching costs to other platforms, which increase as freelancers build up their profile on one platform over time, receive platform-specific badges, and have built up their image and reputation on one platform. Thus, switching as exit becomes increasingly difficult as the career progresses, since a new profile would have to be created on the other platform and started again at the beginner phase.

> *In the beginning, I had other accounts but so far, my profile grew the fastest [on one platform], so I use [this platform], exclusively. (#19)*

In the first two career phases, a forced exit is also possible because the freelancers fail. When the **costs of building a successful career exceed the benefits**, freelancers leave the platform or even the form of work as a freelancer. In this case, the freelancers perceive the time or monetary effort as too high, so that they do not continue their platform career. This is intensified by the working conditions on platforms, as there are high costs and time expenditures and financial instability due to self-employment and high uncertainty.

Exit as Stepping Stone

In later and more advanced career phases, the platform career can be used as a kind of stepping stone when a new path for the career outside the platform becomes possible. The more successful freelancers become, the more likely they are to leave the platform. This development is supported by the positive working conditions on platforms in the form of high autonomy and flexibility and the numerous development opportunities and global job offers. Freelancers develop a network and client base on the platform over time. By building trust with their clients and often doing multiple joint projects on the platform, the role of the platform is less important in later phases than it was at the beginning of their career. The protection of the platform as a third party within the relationship between client and freelancer is no longer necessary. To save financial costs (as platforms receive a portion of the project volume), freelancers pull clients from the platform and execute projects outside the platform environment. This **interception of clients** can therefore be an exit strategy.

> *We [the client and the freelancer] started [on the platform]. Then, we became friends so the trust is there. We can move outside of [the platform]. […] In [the platform] you have a cut from your earning. Of course, they provide the environment and protection to freelancers […]. But as the time goes by, when you became comfortable with your customers […]. You basically go outside of [the platform] or the freelance environment.*

> *For example, me and my clients usually deal directly. […] We didn't pay [the platform]. I have these clients, maybe around 10 of them now. (#7)*

Another exit strategy is to **continue the career outside the platform in a permanent position** in a company. The acquired platform expertise and experience increase the freelancer's chances of finding a good job in the traditional labor market. Thus, the projects that were successfully completed during the platform career can also be used for the resume in the offline job market.

In addition, **starting their own business** is also an alternative to exiting the platform in advanced career phases. In this case, the skills, experience and client relationships developed during the platform career can be used to take up "real" self-employment outside a digital labor platform and leave the platform completely. In this case, freelancers often first start their own business in parallel with the platform career and use the platform to acquire clients, and finally leave the platform completely and focus on their own business.

> *It's a smoother transition from employment [to self-employment] than if I had to go from zero to a hundred clients myself and build up my business completely alone. So I can first go to [the platform], get jobs from it, until I have a client base that's big enough that I can do it without [the platform]. (#24)*

Freelancers also have the opportunity to **work with other freelancers they have met on the platform as partners outside the platform**. Thus, for example, a start-up or a new company can be founded. This becomes relevant in the career phase as an establisher or celebrity, when the freelancer comes into contact with other freelancers as a team member or as an orchestrator of teams.

The last option to leave the platform is to **exit with clients as partners**. In the establisher and celebrity career phases, a client network is built up and regular clients are acquired. If, consequently, the relationship between client and freelancer becomes trusting, another option is for the two parties to work together as partners outside the platform and found a company together. Both parties can support each other financially and jointly implement project ideas that would not be feasible on their own.

> *I also had customers before that became my project partners […]. To me basically, that's my main goal. I have a lot of project ideas in mind, but I don't have the resources or the money to fund the projects. […] There are other ways. You can go to a venture capitalist […]. But I'm never attracted to them. I'm more inclined to work with people that I have worked with before. I mean if the trust is good, confidence is good, synergies*

are good, maybe you can work on creating bigger projects like making a new company or doing a startup. (#7)

7.4.4 Long-Term Career Dynamics in Digital Labor Marketplaces

In the following, we synthesize the results described in sections 7.4.1 to 7.4.3 and explain underlying drivers and developments. In our analysis of the advancement, decline, and exit dynamics, we found underlying patterns how the freelancers' relationship with the platform in combination with the individual career development change over time and how this interaction changes the exit probability as well as the dependency and the benefit of the platform. We illustrate these influences regarding the long-term career dynamics of freelancers in Figure 16.

Regardless of career phases, we cluster the first-order concepts within the career dynamics into four underlying drivers: reputation, relationships, expertise and platform power. In all underlying drivers, we see developments over the career (see the two dotted straight lines in Figure 16). The reputation, relationships and expertise (regarding the individual career development) increase with growing success over time, whereas the power of the platform steadily decreases (with it the competition between freelancers). The opposite developments of the straight dotted lines as the interaction between the relationship with the platform and the individual career development over time lead to a dynamic change in platform benefit and dependency (see the inverted U-shape curve in Figure 16) as well as to a dynamic change in platform exit probability (see the U-shape curve in Figure 16). These two developments result from the four drivers (reputation, relationships, expertise, and platform power) as described.

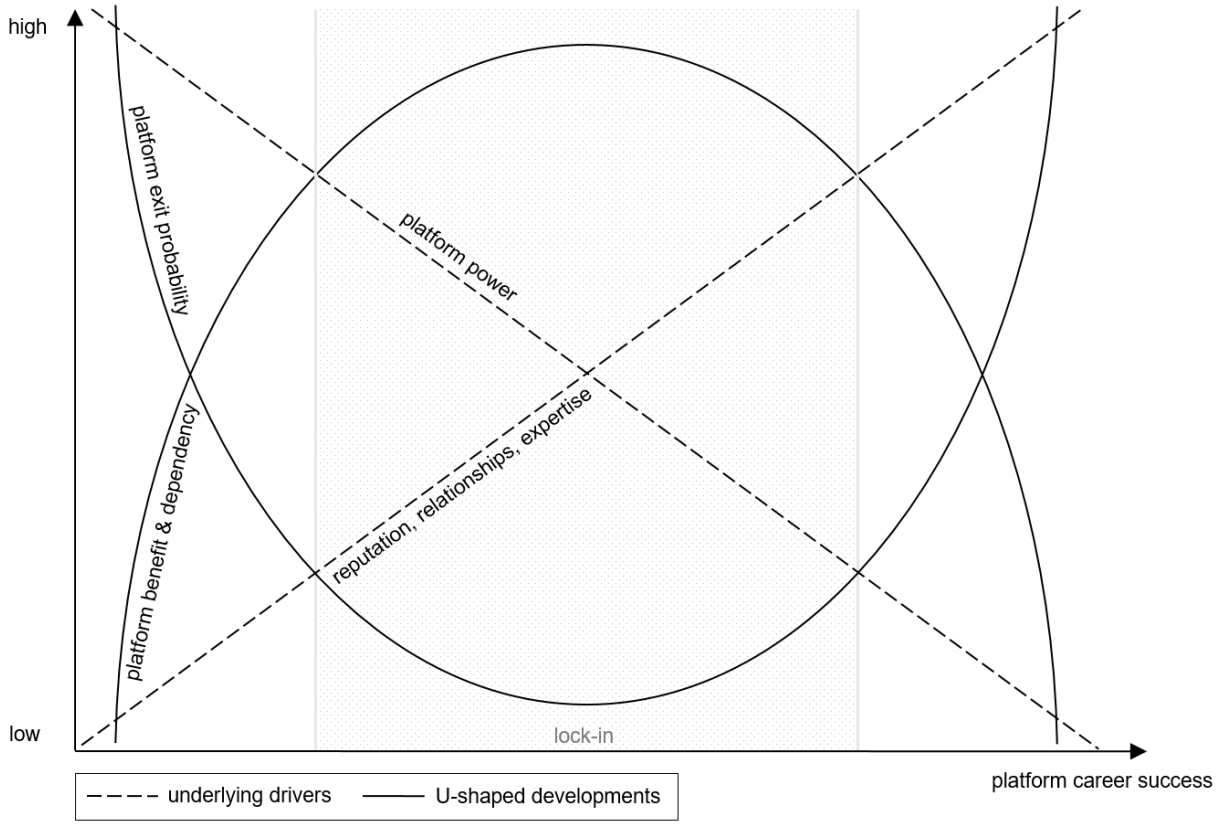

Figure 16. Graphical Illustration of the Long-term Career Dynamics

In the following, we present these drivers individually and give examples of the clustering of our first-order concepts in each case in brackets.

First, the career success of freelancers is strongly based on their **reputation**, i.e. positive evaluations by clients. This driver can make it difficult to start on the platform if a freelancer lacks a reputation yet (circumvent non-existing reviews). Still, it can also help with advancement by building up a reputation in the form of successful completed projects (quickly complete many projects). In addition, reputation is also a reason for decline if it decreases (bad client evaluation) or leads to an early exit if it cannot be built up (exit after cost-benefit analysis). Overall, reputation is increasing over careers in DLMs.

Second, **relationships** with other freelancers or clients in the form of teams or a network change client interaction and freelancing work over time. Well developed relationships help with advancement (membership in groups or teams, take orchestrator role, leverage personal network), but can also trigger decline if they fail (team collaboration goes wrong), or enable exit as a stepping stone by maintaining relationships outside the platform (exit into an own business with freelancers or clients). In summary, more and stronger relationships are built over the career in DLMs.

Third, **expertise** is a driver of change in freelancer careers. By building expertise and taking responsibility for continuing education, this driver can trigger some dynamics. Built expertise leads to advancement (build expertise & positioning in DLM, be a specialist), but can also lead to decline if it is not developed fast enough (skill obsolescence). It can also enable an exit as a stepping stone if developed knowledge continues to be used outside the platform (exit into an own business alone). Overall, more and more professional expertise is established and developed over the career.

Fourth, the **platform power** and the freelancer's relationship with the platform change over time. As reputation, relationships, and expertise increase, the power of the platform and global competition decrease, especially as this leads to an increase in the freelancer's bargaining power. However, when success is low, the power of the platform is very high, which the platform can exploit to the disadvantage of the freelancer (platform exclusion). Moreover, this high power can lead to a voluntary exit from the platform (platform switching). However, competition decreases as freelancers evolve because they can better differentiate themselves from their competitors as their reputation on the platform increases. The more expertise and relationships the freelancers build, the more important and powerful they become on the platform market, which is why the platform's power position is weakened. The more successful the freelancers are, the more they can also disregard the rules of the platform (interception of clients).

The opposite developments of the four described drivers (see the two dotted straight lines in Figure 16) over time result in a dynamic change of the **platform benefit and dependency** of the freelancer on the platform as well as in a dynamic change of the **platform exit probability**. In the following, the three critical areas of the curves are briefly explained.

With low career success, the probability of an exit is very high and the benefit of the platform as well as the dependency is yet very low, as the power of the platform as well as the competition are very strong and there is no reputation, relationships or expertise to compensate for this. It is particularly difficult to build a reputation and with little success, the investment in the platform is often prohibitively high. As a result, the benefit of the platform for freelancers is low and a lot needs to be done to successfully start on the platform, especially because of the uncertainty and independence outside of a fixed organization. Strict rules and the threat of sanctions by the platform further reinforce the power imbalance.

With medium career success, the development of reputation, relationships, and expertise slowly leads to a decrease in platform power and the benefit of the platform to freelancers increases,

which in turn leads to a platform lock-in effect by increasing dependency on the platform. Freelancers rely on the platform as a third party between them and their clients, and freelancers enjoy its protection during and after job execution. They also benefit from global accessibility to jobs and clients. This in turn increases the dependency on the platform, because the reputation system is platform-specific, which is why the reputation built up cannot be transferred to other platforms in the case of a platform exit. For these reasons, the probability of exit decreases.

With high career success, freelancers enjoy higher power over the platform, as they are no longer dependent on the platform due to their built reputation, relationships and expertise. They now offer high added value to the platform and thus increase their bargaining power. The probability of exit is therefore again very high because the costs of the platform significantly exceed its benefits. Freelancers therefore circumvent the rules of the platform and work with clients outside the platform or leave it completely. The lock-in effect and the dependency on the platform can consequently be overcome by high career success and a platform exit as a career stepping stone becomes possible.

7.5 Discussion

The aim of this study was to understand how freelancers' careers develop on digital labor platforms. We examined careers of 33 freelancers and developed a freelancing career model (Figure 15) and visualized long-term career dynamics (Figure 16). We contribute to the body of knowledge in the field of DLMs and IT work by (1) highlighting and structuring a long-term freelancing career model and thus important advancement, decline and exit dynamics over time and (2) clarifying IT specifics of working in DLMs. Below, we outline the implications of our findings for theory and practice and discuss limitations and future research.

7.5.1 Theoretical Contributions

First, we develop and structure a freelancing career model and thus illustrate how the working conditions in DLMs influence the **dynamic career paths of freelancers**. Therefore, we visualize how different **underlying drivers** lead to a change in **platform benefit** for freelancers and freelancers' **dependency** on platforms, as well as a change in **platform exit probability** over time.

Especially our results regarding exit dynamics change the perspective on career advancement only within a digital labor platform. Through this new perspective, freelancers' careers are not limited to the platform. Thus, we make a theoretical contribution to different literature streams.

We explain how freelancers move through their careers and how careers evolve over time with the advancement, decline, and exit dynamics. It becomes clear that freelancers' careers do not fit the classic career theories (Super 1957) nor the idea of boundaryless careers (Arthur 1994; Arthur and Rousseau 1996; Kost et al. 2020; Lo Presti et al. 2018). Careers on a digital labor platform should therefore be given special consideration.

First, our results illustrate that a platform career does not only consist of continuous phases (Super 1957), but that freelancers can also experience career declines and that there is not only a steady career advancement. The platform working conditions and career mechanisms push freelancers again and again in different directions and keep them to a certain extent in a kind of quicksand, which is always in motion and which freelancers have to follow with appropriate strategies.

Second, we show that the boundaries within these platform careers are multidimensional. On the one hand, technical boundaries are still easy to overcome. Freelancers have new jobs all the time and can also easily switch between different jobs. On the other hand, the platform can be seen as an organizational boundary that cannot be easily overcome. Due to algorithmic management on the platform, reputation systems are crucial for career dynamics (Cram et al. 2020; Möhlmann et al. 2021; Straub et al. 2015). Switching between platforms is made much more difficult by lock-in effects and a certain dependence of freelancers on the platform. They are prevented from transferring their reviews to other platforms, leading to lock-in effects and high platform switching costs, making them vulnerable to platform exploitation (Ciotti et al. 2021; Farrell and Klemperer 2007; Kost et al. 2020; Wohlfarth 2019).

We contribute to this line of research by describing that platform dependency and lock-in change over career development. Freelancers become increasingly dependent on the platform, as neither the reputation and reviews built and earned over time nor the designed profile can be transferred to another platform in case of a platform switch, which would set freelancers back in their career in case of a platform switch. As a result, actual boundary objects such as reviews or platform badges, which can facilitate entry and career advancement in early career phases, become artifacts that bond freelancers to the platform over time. The role of the platform thus changes over the course of a career from a difficult environment for a career start, to a supportive and protective third party between clients and freelancers, to an environment on which freelancers are simultaneously dependent.

Moreover, our results regarding the different exit dynamics over time contribute to turnover literature. Information systems research has studied IT professional turnover, the voluntary leaving of an IT job for another job with another employer, since the beginning of the discipline (Joseph et al. 2007; Maier et al. 2015; Zylka and Fischbach 2017). We show that turnover on a digital labor platform (exit) differs from traditional turnover because of the lock-in mechanisms described above. The classical turnover model of March and Simon (1958), which illustrates the desire to move and the ease of movement as antecedents of turnover intention, needs to be extended by the aspect of platform lock-in. This platform lock-in, as a new temporal perceived organizational factor, increases the desire to move and reduces the ease of movement. The desire to move increases with career advancement as freelancers become more successful within the platform and can leverage their skills and network, even without the platform as a protection and matching environment. However, it becomes increasingly difficult to leave the platform as more reputation is built on the platform. Due to the high platform dependency and the difficult transferability of reputation to other platforms, switching to another digital labor platform means a complete restart as compared to switching employers in the offline labor market.

In summary, we proposed a u-shaped relationship between career success and platform exit probability, and an affiliated inverted u-shaped relationship between career success and platform benefit and dependency. The barrier to exit the platform career is low with low career success. Most importantly, failure is a major reason to leave the platform. With increasing success, freelancers build a career on the platform and dependency and platform lock-in increase. Freelancers build their reputation, relationships and expertise on the platform and invest time and money to build their career (Ciotti et al. 2021; Farrell and Klemperer 2007; Wohlfarth 2019). The platform receives a share of the revenue from each job (Parker and van Alstyne 2005; Rochet and Tirole 2003). However, when freelancers have achieved a high level of career success, they want to give less money to the platform because they have established themselves in the platform market, their power has increased, and the benefit of the platform is low. Thus, the platform can be used as a kind of stepping stone for further career independent of this digital labor platform. Consequently, the dependence on the platform and the platform lock-in decreases again with high career success. Thus, our results show that the digital platform can be an inhibitor or facilitator for freelancers' dynamic career development, depending on the career development and how platform working conditions impact career dynamics.

Second, we contribute to the IT literature by highlighting **specifics of IT work in DLMs**. Thereby, the analysis of career dynamics has highlighted two distinctive features: (i) skill obsolescence in DLMs and (ii) team collaboration of freelancers in DLMs. Therefore, we highlight the complexity of a new IT-specific career alternative and explore online IT freelancing as a new way to work in IT (Joseph et al. 2012).

On the one hand, we contribute to the literature that addresses skill obsolescence as a key challenge for IT professionals in the offline labor market (Ang and Slaughter 2000; Fu 2011; Rong and Grover 2009; Tsai et al. 2007; Zhang et al. 2012). This paper illustrates that in DLMs, the importance of skill obsolescence also plays a possibly even more significant role in career advancement and decline and changes over time. In early career phases, obsolescence can be used to position on the digital labor platform to advance quickly due to high competition. In DLMs, freelancers gain high visibility into the skills needed in the global platform market. Skill requirements become more transparent than in traditional labor markets as all job postings can be viewed online on the platform. Therefore, the phenomenon of skill obsolescence can be used for career advancement. However, in later career phases, skill obsolescence becomes a challenge because there are always new and up-to-date requirements that freelancers have to meet in order to remain specialists and not decline to lower career phases again. Thus, we add to the research on platform work the importance of the IT-specific problem of skill obsolescence (Claussen et al. 2018; Popiel 2017; Sison and Lavilles 2018).

On the other hand, we demonstrated that the importance of team collaboration plays a role in career advancement and career exit in DLMs and changes over time. In early career phases, freelancers can take on more jobs especially as part of a team, which can help them in career advancement. The variety of tasks and execution of large projects is difficult to organize alone, especially early in a career phase. That's why we highlight the importance of teamwork, which can boost IT freelancers' careers and help them advance. In later career phases, freelancers then tend to take on the role of an orchestrator and lead or manage freelancer teams to become even more famous and handle the wide range of jobs. In summary, team building is not actually common in DLMs, or is more difficult to address due to the purely digital and mostly anonymous interactions between platform participants. However, the IT-specific work characteristics require teamwork or some degree of collaboration. Thus, we contribute to research investigating the mechanisms of cooperation and coordination between IT teams (Kudaravalli et al. 2017; Levina 2005; Majchrzak et al. 2005).

7.5.2 Practical Contributions

Some contributions to practice can also be derived from the results of this study for freelancers (job seekers), clients (job posters), and the platform owner.

It becomes clear that freelancers must react to the defined advancement and decline dynamics within their careers in order to be successful. For example, they should respond to skill obsolescence or use different platform features to advance in their career. Thus, different actions are required at different career phases. It should be added at this point that workers sometimes need to use actions that may be difficult and partly not allowed by the current state of the platforms, as DLMs are still very precarious and challenging for workers and difficult circumstances arise. Furthermore, the developed freelancing career model can provide valuable information that freelancers should understand for their long-term career development. Thus, platform work can be an attractive alternative to the traditional career. The various possibilities and freedom of task completion, the speed and implementation of career development, as well as the promising possibilities of platform exit in advanced stages illustrate this attractiveness of platform careers.

For clients on digital labor platforms, our results and the developed career model can also be helpful. It especially shows the difficult platform start of freelancers and can motivate clients to also give new freelancers a chance. In addition, we have clarified the importance of feedback and reviews for the career on platforms, which encourages clients to give fair assessments. In addition, we present digital labor platforms and the prevailing dynamics in detail, which can alleviate clients' uncertainties and make offering valuable jobs more likely. Lastly, through our findings, we shed light on many problems in the relationship between freelancer and client from both sides, which can settle potential conflicts between both parties and lead to better business collaborations.

The results of our study may also be relevant for digital labor platform owners. In order to improve their platforms and especially to better adapt them to the careers of freelancers, platform owners should understand the developed dynamics and career phases. To increase the attractiveness of the platforms and thus generate more value, appropriate strategies can be developed to address the IT-specific problems of IT freelancers as complementors on the platforms. Furthermore, platform owners may be able to prevent freelancers from leaving their platform or migrating to competing platforms if they can understand and quantify the motivations for their exits. Especially in the case of forced exits, platform owners could support freelancers early in their careers to retain potentially valuable workers on their platform.

7.5.3 Limitations and Future Research

We acknowledge several limitations of this study. Given the exploratory nature of this study (Urquhart, 2013) and the interest in the careers of freelancers, this research represents a first step toward understanding the career dynamics of freelancers on digital labor platforms. However, our analysis was based on 33 exploratory interviews with IT freelancers and 2 with clients, which limits the generalizability of our findings. Therefore, for example, a large-scale survey with freelancers or, as a follow-up, with platform clients could be conducted in the future to test the generalizability of our career model. Future research should also examine the career model we developed for freelancers in other contexts and settings. Although we studied very different freelancers in terms of experience, career phase, and background, analyzing workers on other platform types, such as competition-based platforms (Top-coder) or micro-labor platforms (MechanicalTurk), could provide additional insights into how freelancing careers evolve. Moreover, a longitudinal study and observation of different freelancers could provide even more insight into the career dynamics. Furthermore, we hypothesize that career phases and dynamics may differ across individuals. We therefore call for further empirical research on how other aspects might additionally influence the careers of online freelancers (such as prior education, age, or individual motivation) and whether our career model is applicable in other contexts beyond IT (such as design or translation tasks). Future research could also shed more light on individual aspects of our career model, such as exit scenarios. Interviewing former freelancers who have already successfully mastered an exit could reveal further valuable insights into the career dynamics. Finally, it would also be worth exploring whether there are different paths and types of freelancers within the career model we have developed, who may go through different sub-phases of the four main phases we have identified within their careers.

8 IT Professionals in the Gig Economy: The Success of IT Freelancers on Digital Labor Platforms (P5)

Title	IT Professionals in the Gig Economy: The Success of IT Freelancers on Digital Labor Platforms
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Table 28. Fact Sheet Publication P5

Abstract. When IT work is performed through digital labor markets, IT professionals have a high degree of personal responsibility for their careers and must use appropriate strategies to be successful. This paper investigates the success of IT freelancers on digital labor platforms. Drawing on signaling theory, a dataset of 7,166 IT freelancers is used to examine how activating, pointing, and supporting signals lead to success. Analysis was carried out using negative binomial regression. The results indicate that the three signaling types positively influence the objective career success of IT freelancers. This paper contributes to the literature by testing signaling theory in the new context of digital labor platforms, investigating IT specifics, and proposing support as a new type of signal for IT professionals on digital labor platforms. In practice, the results provide guidelines for IT freelancers to improve their success within their careers.

8.1 Introduction

As an additional, fast-growing labor market, the gig economy has changed the way people work and is attracting increasing numbers of academic investigations (Jabagi et al. 2019; Kuhn 2016). In 2020, about 36% of the U.S. labor force (59 million people) worked as freelancers (Upwork 2020). Online freelancing plays an important role, especially in professions such as software engineering, digital marketing, design, image editing, writing and translating (Blaising et al. 2021). Moreover, the number of qualified freelancers is increasing, e.g. in the field of computer programming and IT (Upwork 2021a).

Particularly for IT work, digital labor markets offer new opportunities to tackle the increasing need, the chronic skills shortage, high turnover rates and the growing talent gap in IT (Apfel et al. 2020; Fuller et al. 2020; Wiesche et al. 2019). IT freelancers perform software development work online as independent contractors rather than as employees of a permanent company (Sison and Lavilles 2018). The field of IT freelancing must be distinguished from other freelancing areas because IT work itself exhibits specific characteristics that demand further investigation in the context of digital labor markets. IT freelancers differ from other online freelancers in two main aspects.

First, the breadth of knowledge and skills required, the constant change and development, and the need to learn and adapt knowledge in an intellectually demanding work context are characteristics that distinguish the IT profession from other professions (Riemenschneider and Armstrong 2021). IT freelancers must particularly respond to the threat of skill obsolescence, especially in the context of digital labor platforms, as they face a high level of personal responsibility for continuous training, updating, and learning (Graham et al. 2017; Kost et al. 2020; Spreitzer et al. 2017). On digital labor platforms, these characteristics additionally pose a particular challenge to the success of IT freelancers, as they must further differentiate themselves from the global competition by meeting high skill requirements (Gandini 2016; Jarrahi et al. 2020). Compared to other freelancing fields, IT tasks are more complex, interdependent and constantly evolving (Stol and Fitzgerald 2014). In particular, the aspect of skill obsolescence is less relevant for freelancers in, for example, the areas of design or translation (Gussek and Wiesche 2022b).

Second, IT work often requires collaborative efforts in designing architectures and integrating components as well as teamwork (Ang and Slaughter 2001; Kudaravalli et al. 2017; Levina 2005; Majchrzak et al. 2005). On digital labor platforms, meanwhile, freelancers usually work

alone and teamwork is not common, e.g., for image editing, translation, or simple design tasks (Ashford et al. 2018). But for IT freelancers, some collaboration or teamwork can boost careers and help with advancement (Gussek and Wiesche 2022b).

On the one hand, collaboration within organizations is becoming more intense (Maruping and Matook 2020), but IT workers also value freedom and self-determination in their careers (Gol et al. 2018). In comparison, the traditional understanding of career success refers to the perceived or actual achievements of individuals (e.g., Judge et al. 1999). To succeed in digital labor markets despite the described characteristics of IT work, however, IT freelancers must independently apply suitable strategies. Due to the digital organization of work, the geographical distribution of freelancers and clients, and the resulting strong competition, IT freelancers need to convince potential new clients through their profiles on a platform to acquire projects (Agrawal et al. 2015). To improve trust and reduce uncertainty among potential clients, IT freelances can display signals about their achievements and skills (Connelly et al. 2011; Hukal et al. 2020; Kathuria et al. 2021).

Previous studies on careers in the gig economy suggest that a high level of expertise as well as a wide range of skills and resources and self-expression are necessary for workers to be successful (Ashford et al. 2018; Damarin 2006; Petriglieri et al. 2019; Van den Born and Van Witteloostuijn 2013). Some studies have already investigated the sending of signals on online labor markets. Durward et al. (2016b) present signaling behavior as a mechanism that influences bargaining power and thus success in crowdsourcing. Yoganarasimhan (2013) finds that buyers are predictive, that they place significant weight on seller reputation, and that failure to account for momentum and choice can bias estimates of reputation. Horton (2019) examines the introduction of a new signaling feature into the context of a market design platform. In addition, Kathuria et al. (2021) investigate the effectiveness of skill and achievement signals. Moreover, only a few studies have focused on IT work in the gig economy and examined, for example, IT crowdsourcing (Stol and Fitzgerald 2014; Taylor and Joshi 2019) or the characteristics of online software development freelancers (Sison and Lavilles 2018; Watson Manheim and Ahuja 2019). In combination, however, it remains unclear how signaling differs for freelancing in the IT field and in online labor markets given the specific characteristics of IT work and digital labor platforms described earlier. This makes the signaling of IT freelancers on digital labor platforms not well comparable to signaling in other fields.

We test signaling theory in the new context of digital labor platforms, investigating IT specifics, and proposing a new typology of signals. Therefore, this research seeks to answer the research question: *How do different signals on digital labor platforms affect the career success of IT freelancers?* Using a quantitative analysis of 7,166 IT freelancer profiles from the freelance platform Upwork, we investigate the relationship between the use of signals and the career success of IT freelancers. Specifically, we study how three types of signals influence the career success of IT freelancers: activating signals, pointing signals, and supporting signals. The activating signals are related directly to the person and illustrate their skills, characteristics and human capital independent of the digital labor platform (e.g., education or programming skills). The pointing signals describe some kind of behavior and are therefore not directly related to the person; they are specific to the platform market and refer to the presentation of a certain image to convince clients and stand out from the competition on the platform (e.g., ratings of platform clients or a profile badge). Finally, the supporting signals are related to beyond the person and therefore indicate a certain form of team or group support (e.g., agency support on the platform).

The rest of the paper is organized as follows. First, the theoretical background and the state of the literature are explained, which leads to the development of the hypotheses. We then describe the data, the sample and the methodology. Finally, we report the results, discuss the main findings, and conclude.

8.2 Theoretical Background

8.2.1 IT Freelancing

This research focuses on freelancers who work in the gig economy and are classified as independent contractors who complete and coordinate their work online through digital labor platforms (Popiel 2017). These online labor markets are defined as digital matching platforms that facilitate work allocation in the global economy (Agrawal et al. 2015). These markets provide the digital infrastructure for payment, communication, search, feedback and ranking and they mediate the interaction between employers and employees (Rai et al. 2019). IT freelancers perform software development work through such platforms as independent contractors rather than as employees of a permanent company (Sison and Lavilles 2018). This work environment, where developers are involved in multiple, concurrent projects on various digital labor platforms, creates a complex and fragmented work environment (Watson Manheim and Ahuja 2019). IT freelancing requires special considerations due to the specific characteristics of both IT work and classic freelancing. In general, the characteristics of classic freelancers also apply

to IT freelancers. However, some characteristics of IT work reinforce these special features (see Table 29).

IT professionals require a high skill level (Zhang et al. 2012), as well as a certain breadth of knowledge, skills and abilities. Unique IT related skills, both technical skills as well as soft and interpersonal skills such as communication skills, are important (Guzman et al. 2008). Moreover, these skills must always be kept up-to-date. IT work is driven by fast technological change, resulting in rapid knowledge obsolescence and a constant need for training and updating (Gussek et al. 2021; Matook and Blasiak 2020; Zhang et al. 2012). Furthermore, IT work requires collaborative efforts to integrate components and design architecture (Levina 2005), as well as teamwork (Ang and Slaughter 2001).

Category	Characteristics	Source
IT Work	high skill level	Niederman et al. 2016; Zhang et al. 2012
	skill diversity	Guzman et al. 2008; Niederman et al. 2016
	constant skill change	Niederman et al. 2016; Zhang et al. 2012
	high collaboration, teamwork and communication	Ang and Slaughter 2001; Kudaravalli et al. 2017; Levina 2005; Meyer et al. 2021
Classic Freelancing	high degree of individual responsibility for career management	Graham et al. 2017, 2017; Kost et al. 2020; Spreitzer et al. 2017
	high competition and required image presentation on the digital labor platform	Ashford et al. 2018; Roberts 2005; Hennekam and Bennett 2016; Vallas and Christin 2018

Table 29. IT Work and Classic Freelancing Characteristics

In terms of freelancing, there is no long-term connection between employee and employer (Friedman 2014; Gussek and Wiesche 2022a). Furthermore, unlike traditional workers, who are covered by relevant employment laws, freelancers are effectively self-employed and are thus responsible for their own career planning (Graham et al. 2017; Kost et al. 2020; Spreitzer et al. 2017). In addition, it is important for freelancers to present their skills on the digital platform, as they will be evaluated as individuals in the selection process based on the information available on the platform (Ashford et al. 2018; Roberts 2005). Thus, the success of gig workers depends on how successfully they develop a positive brand image (Hennekam and Bennett 2016; Vallas and Christin 2018).

The IT freelance sector should be distinguished from traditional freelancing in the sense that a broad range of skills and high-level skills are particularly important for IT gig workers. IT work

itself requires highly advanced skills, which are even more important on digital labor platforms, where workers need to stand out from the competition (Gandini 2016; Heimburg and Wiesche 2022; Jarrahi et al. 2020). Furthermore, IT freelancers do not work exclusively on repetitive, small tasks that require low skill levels but also perform more complex tasks with higher skill requirements. In this context, software development tasks are more complex and interdependent compared to classic freelancing work (Stol and Fitzgerald 2014). Moreover, IT freelancers work collaboratively and often in teams, which is uncommon in classic freelancing (Ashford et al. 2018; Friedman 2014).

Few studies have focused on IT work in the gig economy. Such studies have, for example, examined IT crowdsourcing (Stol and Fitzgerald 2014; Taylor and Joshi 2019) or the practices and characteristics of online software development freelancers (Sison and Lavilles 2018; Watson Manheim and Ahuja 2019). In addition, Frenzel-Piasentin et al. (2022) examine the importance of improving non-technical skills for the development of information systems in the gig economy. Lastly, Kanat et al. (2018) address survival in global online labor markets for IT services.

8.2.2 Signaling Theory

Signaling theory describes the process by which one party (referred to as the agent) uses signals to credibly convey various information about themselves to another party (the principal) (Matsubara and Kagifuku 2016). A signal can be defined as a visible characteristic of an object, person, or organization (Spence 1973). These signals, in turn, reduce the information asymmetry between the parties and are considered beneficial for the formation of contracts. Accordingly, signaling theory has been explored in different contexts, such as in e-commerce (Mavlanova et al. 2016; Wells et al. 2011), marketing (Kirmani and Rao 2000; Robbins and Schatzberg 1986) and the labor market (Spence 1973). In traditional labor markets, there are many possible signals, such as different personal characteristics, education, job experience, race (Spence 1973), or cognitive and social skills (Piopiunik et al. 2020).

Previous research has mainly focused on signals that can be distinguished according to their associated costs and thus credibility, called assessment and conventional signals (Donath 2007; Holthaus and Stock 2018), or according to whether they are self-reported or from a third party, called internal and external signals (Mavlanova et al. 2016; Spence 1973). In addition, prior research lacks a consensus on signal effectiveness in online freelance job markets (Durward et

al. 2016b; Gefen and Carmel 2008; Hukal et al. 2020). However, these two signal distinctions may not be sufficient for the context of IT work on digital labor platforms.

8.2.3 A Typology of Signals on Digital Labor Platforms

In the particular environment of digital labor platforms, significant information asymmetries prevail, as the low entry costs and purely digital interactions in online markets create additional uncertainties. Potential clients only have the profile information of online freelancers to assess their quality (Agrawal et al. 2015; Claussen et al. 2018). Freelancers on digital labor platforms can use signals to reduce the lack of trust and uncertainties of potential clients and obtain jobs, consequently increasing their earnings and success (Durward et al. 2016b; Gefen and Carmel 2008; Hukal et al. 2020). For these reasons, we propose to structure the signals on digital labor platforms into activating signals, pointing signals, and supporting signals. We define the three types of signals as follows.

Activating signals relate directly to the person and illustrate the person's skills, attributes, and human capital independent of the digital labor platform (e.g., education or programming skills). **Pointing signals** describe a type of behavior and are therefore not directly related to the person. They are specific to the platform market and refer to the presentation of a certain image to convince clients and stand out from the competition on the platform (e.g., reviews from platform clients or a profile badge). **Supporting signals** refer beyond the individual and indicate a specific form of team or group support (e.g., agency support on the platform). This typology is consistent with other research on signals (Bianchi et al. 2019; Connelly et al. 2011; Durward et al. 2016b; Schulz et al. 2015).

Activating signals are related to the person individually and illustrate the skills, attributes and human capital the person possesses. In this context, they signal characteristics of the person that distinguish the signaler from the competition and that is also essential for activating or performing the signaler’s quality (Hasson 1997). These signals are inherently related to the quality of the individual freelancer and also exist outside the platform (Bianchi et al. 2019; Durward et al. 2016b; Schulz et al. 2015). For example, the communication of skills or education could be considered as an activating signal.

However, given the high number of competitors in a global, anonymous market, it is insufficient to send these activating signals alone. **Pointing signals** refer not to the personal characteristics or skills themselves, but to a corresponding image presentation or behavior of the IT freelancer

on the platform (Bianchi et al. 2019; Connelly et al. 2011). For online freelancers, these additional pointing signals are very important to differentiate from the global competition present on the platforms. For example, a platform-specific profile badge or ratings already received on the platform can be classified as pointing signals. While this information relates to the freelancer, it denotes his or her behavior on the platform (e.g., providing information on the profile) rather than a direct characteristic, such as education or skills (Durward et al. 2016b). The need to distinguish these types of signals becomes especially clear when considering the difficult situation of starting a freelancing career on platforms (Claussen et al. 2018; Frenzel-Piasentin et al. 2022). At the beginning, freelancers can only demonstrate activating signals, as they already possess the platform-independent personal characteristics and skills, but they cannot yet demonstrate the platform-specific pointing signals such as good ratings (Rahman 2021; Stanton and Thomas 2016; Tóth et al. 2022). In this context, it is particularly difficult for these freelancers to be seen by clients on the platform and to gain their trust without being able to "point" to their existing skills. Since algorithmic ranking systems are supposed to facilitate matching of clients and freelancers in online labor markets, IT freelancers need to aim for a higher listing to be seen by the clients, which may be only possible through the use of pointing signals (Durward et al. 2016b; Möhlmann et al. 2021).

In order to capture specifics of IT work on digital labor platforms, we add a new third type of signal that is relevant for IT freelancers: **Supporting signals**. These extend beyond the individual and signal some support from groups or teams. This signal is not related to the person, so does not describe any direct characteristics, or related to beyond the person, so does not describe any behavior related to the platform. Such supporting signals apply particularly to IT freelancers. Freelancers in other areas usually work alone on the digital labor platform (Ashford et al. 2018); for IT freelancers, however, some collaboration or teamwork can boost careers and help with advancement (Gussek and Wiesche 2022b). The detailed motivation of this new type of signaling follows in the hypothesis development.

Table 30 summarizes the current body of knowledge on the use of signaling theory in online labor markets (a complete overview can be found in Table 40 in the appendix C). In Table 30, we structure the current state of knowledge regarding both signals and signal outcomes based on our typology of signals. It is clear that, when the sources are assigned to our signaling types, the pointing signals dominate. Few papers integrate multiple signal types in their research and supporting signals were only studied in one source. In addition, few papers use samples from the IT field. Consequently, no study has yet investigated all three types of signals, considered

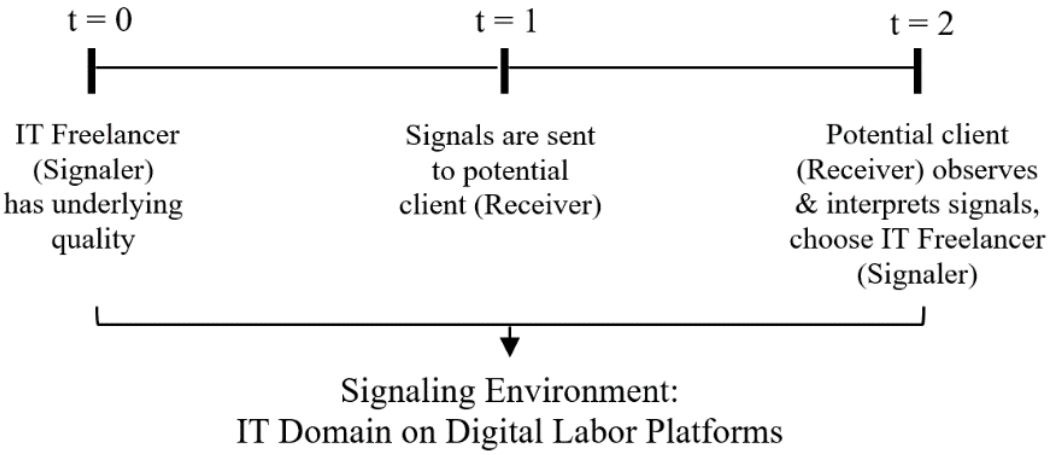
supporting signals as a new signal type, and explored the characteristics of IT workers on digital labor platforms as IT freelancers.

Assignment to Signaling Types	Reference	Signal	Signal Outcome
activating signals	Seifried 2021Seifried 2021	skill value & portfolio, offline skills	skill distance
	Pallais 2014	personal information	hiring probability
	Kässi and Lehdonvirta 2018	certification	earnings
	Kokkodis and Ipeirotis 2016	skills	
pointing signals	Hong and Pavlou 2017	reputation	buyer selection
	Yoganarasimhan 2013	price, reputation	
	Hong and Pavlou 2012	average ratings, project experience	provider pricing
	Assemi and Schlagwein 2016	reviews, average rating, comments	customer decision
	Horton 2019	capacity of workers	hiring probability
	Benson et al. 2020	reputation	jobs, rejection rate, time to payment
	Lin et al. 2018	reputation, portfolio items	
	Moreno and Terwiesch 2014	reputation	selection probability
	Rahman 2018	ratings	reputation
pointing & activating signals	Durward et al. 2016b	pointing and activating signals	bargaining power
	Kathuria et al. 2021	skill and achievement signals	supplier quality
	Holthaus and Stock 2017	character traits, conventional and assessment signals	earnings
	Holthaus and Stock 2018	tests, portfolio items, rating, self-promotion, price	
	Claussen et al. 2018	skills, self-description, project experience	
	Banker and Hwang 2008	performance, achievements, skill certifications, badge	sales performance
	Lehdonvirta et al. 2019	platform-generated, platform-verified and unverified signals	pay rate
supporting & pointing signal	Stanton and Thomas 2016	outsourcing agency affiliation, feedback score	hiring probability, wages

Table 30. Overview of Literature on Signaling in Online Labor Markets

Figure 17 illustrates our research construct regarding the signaling timeline. As described earlier, the central actors within the signaling theory are the signaler (in our case the IT

freelancer), and the receiver (the potential client), as well as the signals themselves (the three signal types: activating, pointing, and supporting signals) (Connelly et al. 2011).



Note: t = time

Figure 17. Signaling Timeline

The IT freelancers send certain signals to indicate their quality. The potential clients evaluate the validity of the quality of the signalers based on these signals and decide to book the IT freelancer for a project or not, which has a direct impact on the IT freelancer's subsequent earnings and success (Pavlou et al. 2007). The three types of signals presented must be considered in the environment in which they are used. Therefore, this study also examines the signals' applicability in the digital labor platform environment and the IT domain. The signaling environment is overall an under-researched aspect of signaling theory (Connelly et al. 2011) and only a few research papers have investigated the signaling context so far (Kathuria et al. 2021).

8.3 Hypotheses

Based on the presented theoretical background, this study investigates how the three proposed signaling types affect the success of freelancers in the IT domain on digital labor platforms. In particular, we present the specifics of the aspects for IT professionals.

In the psychological literature, career success is defined as the perceived or actual achievements an individual has made in their career (e.g., Judge et al. 1999). A distinction can be made between subjective and objective career success (Hughes 1937; Judge et al. 1995; Wang and Wanberg 2017). In this context, Hughes (1937) defines objective success as directly observable, measurable, and verifiable by third parties, whereas subjective success means the individual's reactions to their career experiences.

8.3.1 Activating Signals – Human Capital

As described, signals can reduce the information asymmetry between parties on digital labor platforms, thus leading to online freelancers generating more projects and therefore higher earnings (Matsubara and Kagifuku 2016). First, this increased success can be enabled by activating signals that affect the skills and human capital of signal senders (Connelly et al. 2011). These skill signals can help signal senders provide better quality solutions to meet buyers' needs (Kathuria et al. 2021; Lee et al. 2004). In this regard, human capital can be defined as a signal, as it indicates that potential workers possess personal characteristics desired by potential clients, such as intelligence, effort, and self-motivation (Howard 1986; Strober 1990; Swenson-Lepper 2005).

In digital labor markets, a long-term, pre-planned career in a single organization is not guaranteed. There is a high degree of uncertainty about future work due to the highly transient nature of work, which results from mostly short-term projects (Ashford et al. 2018; Ibarra and Obodaru 2016). This requires building core competencies, such as communication skills and up-to-date skills. These competencies make freelancers more qualified to perform different types of work roles, constantly able to apply their expertise to new tasks, thus making them more attractive to clients (Damarin 2006).

Since, as described, the constant changes and complexity of tasks in IT place extreme and unusual demands on the profession, a high level of qualification is particularly important for IT professionals (Guzman et al. 2008). For IT freelancers, the importance of sending activating signals concerning human capital becomes even more important. On the one hand, a relatively high skill level is required to participate in IT freelancing (Taylor and Joshi 2019). On the other hand, there is a constant change in the required skills, which is amplified especially on digital labor platforms by a frequently changing market and variable work requirements (Ashford et al. 2018; Niederman et al. 2016).

Related research suggests possible relationships between skill development and performance among online freelancers (e.g., Anderson 2017; Huang et al. 2019). For example, Anderson (2017) and Huang et al. (2019) found correlations between performance, earnings, and different skillset combinations in two large-scale case studies on Fiverr and Upwork. Anderson (2017) also found that workers with various skillsets earn higher wages than those with more specialized skills. Freelancers need to self-initiate the development of skills that will enable them to adapt to a frequently changing market and variable work demands (Ashford et al. 2018).

We therefore posit that activating signals positively influence the objective career success of IT freelancers. Firstly, the amount of skills indicated on the profiles serves as a quality indicator and is related to the acquisition of new contracts (Kathuria et al. 2021). Offering a variety of skills is very advantageous for interactions with clients (Durward et al. 2016b). Based on these assertions, the following hypothesis is proposed:

H1a: The amount of IT freelancer skills is positively related to objective career success.

Since we focus on IT freelancers, IT specific skills may play a particular role for success. IT freelancers deliberately use their skills to present themselves as experts in a specific field. For this reason, we further propose that the number of top IT skills an IT freelancer masters likewise has a positive impact on the success (Durward et al. 2016b; Taylor and Joshi 2019). For these reasons, we propose the following:

H1b: The number of IT top skills of an IT freelancer is positively related to objective career success.

Furthermore, since communication with clients is essential due to frequent interaction between IT freelancers and their clients, we suggest that the better the IT freelancer's command of the English language, the more successful they will be. Since English is an international language, the IT freelancer may receive more orders and the quality of their work may increase due to better communication (Popiel 2017; Taylor and Joshi 2019). Thus, we hypothesize the following:

H1c: Higher English skills of an IT freelancer are positively related to objective career success.

Lastly, the education of IT freelancers could be a strong activating signal to reduce the lack of information regarding the quality of IT freelancers. Consequently, the educational background could be used to demonstrate expertise. The academic degrees achieved enable IT freelancers to perform better compared to competitors on the digital labor platform and thus potentially lead to more success (Durward et al. 2016b). Hence, we posit:

H1d: A higher level of education of an IT freelancer is positively related to objective career success.

At this point, we also introduce an IT specific variable and consider that education in an IT related field sets IT freelancers even more apart from the competition and signals special skills in their field of activity. For example, Setor and Joseph (2016) find evidence that formal IT

education provides an advantage over non-IT education in terms of wages in early IT careers. Therefore, we propose the following hypothesis:

H1e: An IT education of an IT freelancer is positively related to objective career success.

8.3.2 Pointing Signals – Image Presentation specific to Digital Platforms

Greater success of IT freelancers through more projects, achieved by reducing information asymmetries, can also be realized through platform-specific pointing signals. These do not refer to the person but clarify the image the IT Freelancer has built on the platform to stand out from competition (Connelly et al. 2011; Matsubara and Kagifuku 2016). In online labor markets, algorithmic ranking systems facilitate the matching of clients and freelancers (Durward et al. 2016b; Möhlmann et al. 2021). Therefore, to be more visible and get more projects, IT freelancers need to improve their image on the platform and aim for higher listings on digital labor platforms, which is possible through pointing signals. However, IT freelancers have no direct influence on these pointing signals; they can only influence them indirectly (Durward et al. 2016b; Möhlmann et al. 2021).

IT professionals typically do not have to compete for jobs because the market demand for skilled IT professionals is very high and employers compete aggressively for workers to meet the demand for IT services (Taylor and Joshi 2019). Other reasons for this IT workforce shortage include declining numbers of students studying technology-related majors and poor career development, which is exacerbated by pending retirements in the existing IT workforce (Bitkom 2022; Bosworth et al. 2013; Prommegger et al. 2020c; Setor and Joseph 2021). In contrast, workers in the gig economy, including IT freelancers, must compete on digital labor platforms to get jobs. This situation is new for IT professionals, which is why it is particularly interesting to examine the second signaling type, pointing signals. On digital labor platforms, IT freelancers' success depends on how successfully they develop a positive brand image on the platform (Hennekam and Bennett 2016; Vallas and Christin 2018).

We therefore propose that pointing signals positively influence the objective career success of IT freelancers. Firstly, we posit that the number of jobs on the IT freelancer's profile (portfolio items) as a pointing signal is crucial for career success (Holthaus and Stock 2018; Lin et al. 2018). Such references can signal a record of efficient client relationships. Moreover, they serve as figureheads or advertisements to promote the IT freelancer's skills and to help them stand

out from the competition on the platform (Durward et al. 2016b). In the light of this, we hypothesize that:

H2a: A higher number of jobs of an IT freelancer is positively related to objective career success.

In addition, the review quality of these completed jobs is also considered as a pointing signal. On digital labor platforms, a certain number of stars are given as ratings to each of the IT freelancers' projects (Ashford et al. 2018; Jarrahi et al. 2020). The IT freelancers cannot directly influence these ratings, as the clients give the feedback. However, feedback can be positively influenced indirectly by successful project completion (Moreno and Terwiesch 2014). This individual success record serves as a status indicator and affects future project acquisition. Therefore, the quality of these evaluations is precious for IT freelancers and a good rating must be developed and maintained (Durward et al. 2016b; Rahman 2021). Thus, we hypothesize the following:

H2b: A higher review quality of an IT freelancer is positively related to objective career success.

Furthermore, IT freelancers can build up their image by providing as much information as possible on their profiles on the digital labor platform. By the pointing signal of a complete profile, freelancers can reduce many client uncertainties (Holthaus and Stock 2018; Ludwig et al. 2022; Sison and Lavilles 2018). Based on these assertions, the following hypothesis is proposed:

H2c: A higher profile completeness of an IT freelancer is positively related to objective career success.

Finally, a profile marker through a badge can help the IT freelancers to improve their image and thus improve their success by signaling high quality. These badges are displayed to potential clients directly on top of the profiles and signal a special status of the IT freelancer compared to the competition (Assemi and Schlagwein 2016). For these reasons, we propose the following hypothesis:

H2d: A profile badge of an IT freelancer is positively related to objective career success.

8.3.3 Supporting Signal

Since we focus on IT professionals as freelancers on digital labor platforms, we additionally consider the impact of supporting signals, related to group or team support of the IT freelancer. We consider this type separately because it is a signal that is valid beyond the person, the support from outside. What is important here is not the person itself, but the team or the people who stand behind them. Through this signal, therefore, the deviant organizational form of the work is embodied. Therefore, it is neither about the skills or the human capital of the IT freelancer (activating signals) nor the behavior on the platform (pointing signals) (Stanton and Thomas 2016).

Collaboration, communication and teamwork are of great importance in IT work (Kudaravalli et al. 2017; Meyer et al. 2021). IT freelancers are often interdependent due to the collaborative nature of work. This fact is made difficult on digital labor platforms and in the context of freelancing scenarios, which is why IT freelancers need to put more effort into building a functioning community and some support. In the area of agile methods, for example, pair programming leads to intensive collaboration and communication among IT professionals (Kude et al. 2019; Matook et al. 2016). Also, in software development teams, there are different members (project managers, developers and testers) who have different roles and perceptions and are dependent on each other (Ghobadi and Mathiassen 2016). Following this line of reasoning, we suggest that a lot of coordination and a collaborative way of working is also important for IT freelancers.

In classic freelancing, however, work is performed alone, which makes the necessary collaboration and cooperation between IT freelancers difficult. Freelancers are physically separated from each other and their clients on digital labor platforms. They lack relationships with work colleagues with whom they can exchange ideas or whom they can use as sources of support (Ashford et al. 2018; Kunda et al. 2002). This separation can further challenge IT freelancers, as they lack role models or career mentors and therefore have few practical opportunities to develop themselves and be successful (Grugulis and Stoyanova 2011). As described, the online nature of the digital platform makes IT freelancing more difficult due to the classic freelancing barriers to collaboration and communication. For these reasons, we propose that dedicated support is especially important for IT freelancers.

Such support can come for IT freelancers in two forms. In the first, several freelancers on the platform can associate to create groups, teams or collaborative communities. In the second, support can come from an agency to which the IT freelancers belongs (Kost et al. 2020). Agency

support for freelancers is similar to sponsorship by organizations. For freelancers, support from agencies is essential (Barley and Kunda 2011). In the process, many of the workers develop close relationships with external agencies, which are important partners for them in their search for new jobs. Thus, these relationships positively influence IT freelancers' success (Van den Born and Van Witteloostuijn 2013). On the basis of these assertions, the following hypothesis is proposed:

H3: Support from agencies or groups of an IT freelancer is positively related to objective career success.

Based on the background and hypotheses section, our research model is illustrated in Figure 18.

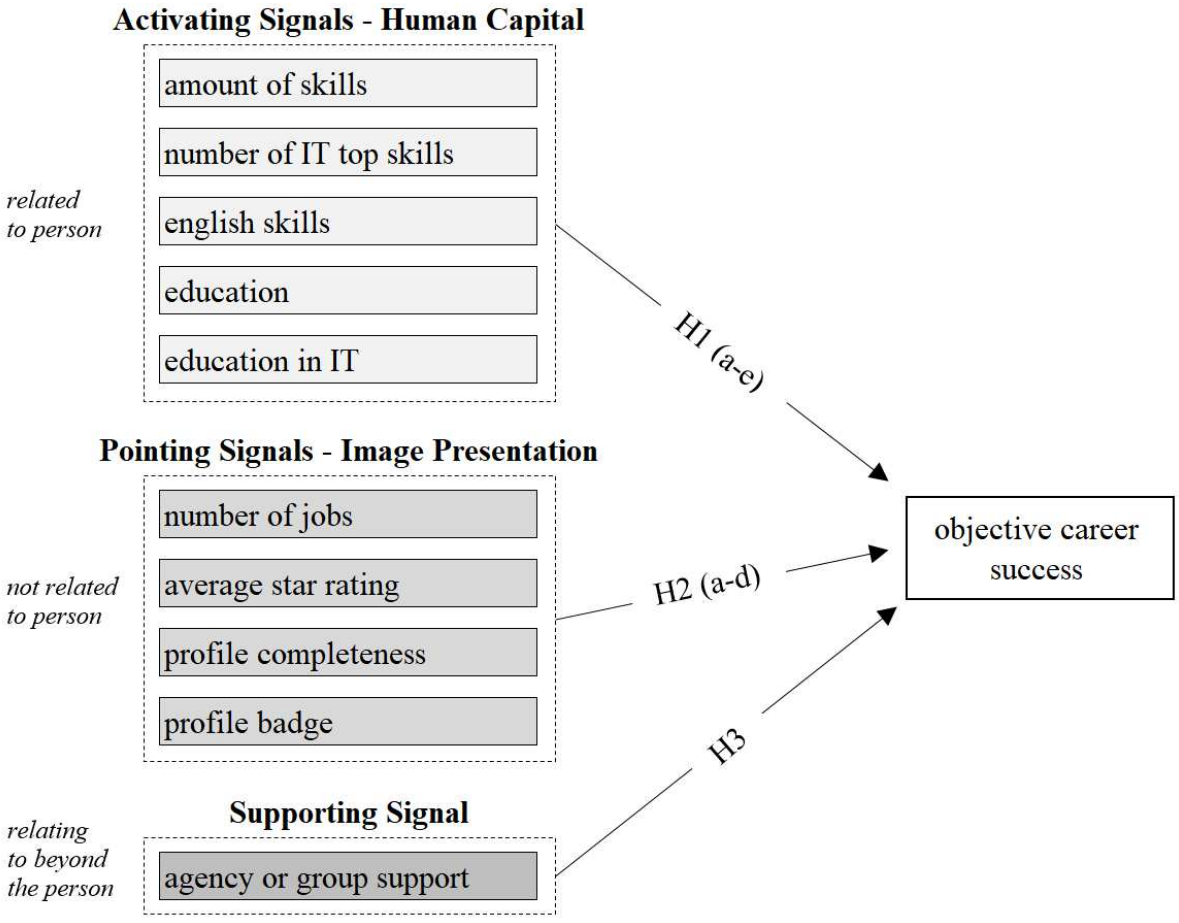


Figure 18. Research Model

8.4 Method

8.4.1 Data and Sample

We use digital trace data on IT freelancers to answer our research question (Howison et al. 2011). Digital trace data are records of activities (traces) performed through an online information system (digital). They have two important properties. First, they are existing data, not data produced for research. Second, they are event-based rather than summarized data (Howison et al. 2011). Because digital trace datasets are not collected primarily for research purposes, researcher-induced bias is eliminated (Lindberg 2020). In analyzing the secondary data, we follow the methodological approach of working with digital trace data (Holthaus and Stock 2017; Howison et al. 2011; Vial 2019). First, we (i) saved each freelancer's publicly available information in a local database. Then, we (ii) removed all personal information from the data set and anonymized it by assigning random numbers to the freelancers. Finally, we (iii) analyzed the data points in aggregated form to avoid possible conclusions about individual freelancer profiles.

For each profile, we use the description, job history and career progress of IT freelancers on the digital labor platform Upwork to test the hypotheses developed above. This freelancing platform was chosen as the empirical context because it is the largest freelancing website in the world (Claussen et al. 2018; Seifried et al. 2020). This allows for a variety of jobs from the IT context in terms of diversity in task, duration, and freelancer skill level. This guarantees a heterogeneous dataset that includes differently successful workers. The data was collected for the first time in February 2021 and for the second time in February 2022 to examine the career development of IT freelancers over one year. The dataset contains data from 36,661 freelancers working in the IT industry. More precisely, we used profile data of freelancers who work in categories *IT & Networking, Data science & analytics, Web, mobile & software development* as well as *Project Management (Admin support)* and *Tech support (Customer service).* After including those profiles that match with the variables of interest and that were active within the observation period of one year, our final sample consists of 7,166 IT freelancer profiles. We have additionally illustrated the data structure in Figure 20 (appendix D).

8.4.2 Measures

Dependent Variable

Earnings or salary are commonly used criteria of objective career success (Judge et al. 1995; Judge et al. 1999). Measuring earnings as an indicator of career success has significant advantages compared to other measures of success. For one, earnings are measured in a natural unit that is easy to interpret. In addition, there is less bias than with single-source or dyadic data. Lastly, it provides an approximation of many dimensions of success in a single measurement, such as client satisfaction and successful management and sales activities (Healy et al. 1992; Holthaus and Stock 2018). Therefore, we measure the variable of *objective career success* using the earnings, rounded to integer values, earned by each IT freelancer on the digital labor platform over one year between February 2021 and February 2022. Accordingly, we were able to collect objective 1-year earnings information for each IT freelancer for the year after using the different signals. Information about the earnings is automatically calculated on the profiles in dollars.

Independent Variables

All independent variables are based on the dataset at the first point of data collection in February 2021, as we want to test the impact of the different signals (see Table 31) on one-year earnings. Accordingly, our goal was to model the earnings for each freelancer for the year after the signaling information.

Signal Type	Definition	Signal	Description
Activating Signal	Related to the person's human capital that is essential to activating the person's quality, independent of digital platforms.	amount of skills	The number of self-reported skills reported on the freelancer profile.
		number of IT top skills	The number of top IT skills reported on the freelancer profile. Top 10 IT skills in 2021 (observation year): Python, Java, C, C++, JavaScript, C#, R, Go, HTML, Swift.
		English skills	The indicated language skills on the freelancer profile. There are the variants "basic", "conversational", "fluent" or "native or bilingual". Range from 0 (no English skills) and 4 (highest possible English skills).
		education	The indicated education on the freelancer profile. Range from 0 (no education specified), 1 (bachelor's degree), 2 (master's degree) or 3 (Ph.D. education).
		education in IT	Indicates whether the freelancer has academic degrees in information technology, computer science, software engineering or software development.
Pointing Signal	Related to the person's behavior and a corresponding image presentation specific to digital platforms.	number of jobs	The number of previously completed jobs displayed on the freelancer profile.
		average star rating	The calculated average overall feedback score over the entire work history with which the employer rated the project, range from 1-5 stars.
		profile completeness	The number of completed fields of the freelancer profile, range from 0-9.
		profile badge	Indicates whether the freelancer has a profile badge like "Rising Talent", "Top Rated" or "Top Rated Plus".
Supporting Signal	Related to beyond the person independent of the human capital or behavior.	agency or group support	Indicates whether the freelancer is represented by an agency or member of a group of freelancers.

Table 31. Illustration of the used Signals

We use five variables related to activating signals. The freelancer's *amount of skills* (H1a) is the number of the self-reported skills on the freelancer profile (Jarrahi et al. 2020). The *number*

of IT top skills (H1b) is the number of top IT skills reported on the freelancer profile. We focused on the top 10 programming skills in 2021 (observation year): Python, Java, C, C++, JavaScript, C#, R, Go, HTML and Swift (Cass 2021). Furthermore, Upwork offers freelancers the possibility to indicate their language skills and the respective level on their profiles. Thus, there are the variants "basic", "conversational", "fluent" or "native or bilingual". The variable *English skills* (H1c) is therefore ordinally scaled and can take on values between 0 (no English skills) and 4 (highest possible English skills), depending on the existing levels of the platform. The variable *education* (H1d) is also ordinally scaled and can take the values 0 (no education specified), 1 (bachelor's degree), 2 (master's degree) or 3 (Ph.D. education) (Seifried et al. 2020). Lastly, the variable *education in IT* (H1e) is a dummy equal to 1 if the freelancer has completed an education in an IT related field and 0 if not. For example, academic degrees in information technology, computer science, software engineering or software development were considered.

Regarding pointing signals, four variables are included in the model. The variable *number of jobs* (H2a) is the (log) number of previously completed jobs scaled logarithmically that the freelancer has undertaken (Claussen et al. 2018). Next, we measure the variable *review quality* (H2b) of an IT freelancer as the calculated average overall feedback score of their entire work history, with individual ratings provided by the employer of each project. These ratings are based on a ranking from 0 (worst) to 5 (best) stars. Here, the rating indicates how satisfied an employer was with the project outcome overall (Claussen et al. 2018). Additionally, the variable *profile completeness* (H2b) measures the number of completed fields in the IT freelancer's profile. The following nine filling options that Upwork offers are taken into account: availability information, response time, skills information, language skills, skill certificates information, education information, information about work experience outside the platform, other experiences, and testimonials from clients. Finally, the variable *profile badge* (H2d) is a dummy variable equal to 1 if the IT freelancer has a profile badge, and equals to 0 if not. The markers "Rising Talent", "Top Rated" or "Top Rated Plus" can appear at the top of the IT Freelancer profile.

Finally, we measure the support system using the variable *agency or group support* (H3), which is a dummy equal to 1 if the freelancer is represented by an agency or member of a group of freelancers and equal to 0 if not (Claussen et al. 2018; Stanton and Thomas 2016; Van den Born and Van Witteloostuijn 2013). This information is reported on the profile.

Control Variables

We first control for the job categories in which an IT freelancer works. We use four dummy variables, which are equal to 1 if the IT freelancer mainly does jobs in that category and equal to 0 if not. More specifically, we include the variables (1) *IT & Networking,* (2) *Web, mobile & software development,* (3) *Project Management,* and (4) *Technical Support*. The Data Science & Analytics category serves as the reference category.

Second, we control for the geographical origin of the IT freelancer (Claussen et al. 2018; Holthaus and Stock 2018; Seifried et al. 2020). We use four dummy variables, which are equal to 1 if the freelancer is from the specific area and equal to 0 if not. More precisely, we use the variables *Subcontinent India* (India, Pakistan, Bangladesh, etc.)*, Asia* (Philippines, Indonesia, etc.)*, Developed countries* (Western Europe, Australia, USA) and *East Europe* (Russia, Ukraine, Poland, Baltic States, etc.). Other regions serve as a reference category (Egypt, Nigeria, Serbia, Brazil, etc.).

8.4.3 Data Analysis

Our dependent variable of interest, objective career success measured by the earnings each IT freelancer earns within one year (rounded to integer values), is a non-negative integer with a limited range and therefore represents count data. Our dependent variable is therefore not normally distributed. We confirm this via three checks. This is evident firstly from the histogram of the dependent variable. Second, the value for the skewness of the distribution of the dependent variable is positive. Third, we performed a Kolmogorov-Smirnov normality test, which proves, with a *p*-value less than 0.001, that there is no normal distribution of the dependent variable. These results additionally suggest a right-skewed distribution. Parametric tests, such as linear regression, are not sufficient in this case and violate the assumptions of ordinary least squares regression. Under these conditions a transformation (e.g., log transformation) of the dependent variable can be used, but the interpretation of these transformed values can be difficult and statistical power would be lost. Poisson regression models and negative binomial models better approximate a right-skewed distribution, as is the case for count outcomes, and are the most applicable econometric approaches (Coxe et al. 2009; Wooldridge 2016).

In this regard, a Poisson regression model is based on the equivalence between the mean and the variance of the dependent variable. However, we detected overdispersion in our dependent variable, which means that the employed regression approach should control for overdispersion. The standard deviation (Stdv = 13,278) was almost three times higher than the mean (mean =

4,534). Therefore, we select negative binomial regression (Gardner et al. 1995). Crucially, unlike Poisson regression, negative binomial regression corrects for overdispersion by calculating an additional parameter in the regression (Wooldridge 2016).

We performed the negative binomial regression in SPSS and calculated the Exp(b) coefficients for a better interpretation of our results. The latter represent odds ratios that can be interpreted by multiplying them by the dependent variable to approximate the effect of increasing the independent variable by one unit. Thus, any value greater than 1 represents a positive impact and any value less than 1 represents a negative impact on the outcome variable. The decision steps for the model choice are shown in Figure 7 (in section 3.2.4). The path in bold reflects our choice for data analysis.

8.5 Results

8.5.1 Descriptive Statistics

The means, standard deviations, and Pearson intercorrelations of the independent measures used in the regression analysis are shown in Table 32. The variance inflation factors (VIF) associated with the predictors range from 1.079 to 2.133, indicating that the results are not biased due to instances of multicollinearity (Hair et al. 2012). Furthermore, the correlations between the independent variables (see Table 32) are below the limit of 0.70, which reduces concerns about multicollinearity (Cohen et al. 2013).

Table 32. Variable Descriptive Statistics and Intercorrelations

	Min	Max	Mean	Stdv	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 IT & Networking	0	1	0.11	0.310																	
2 Web, mobile, software dev.	0	1	0.66	0.474	-.484**																
3 Project Management	0	1	0.04	0.194	-.070**	-.282**															
4 Technical Support	0	1	0.01	0.117	-.041**	-.165**	-.024*														
5 Subcontinent India	0	1	0.48	0.500	-.054**	.120**	-.091**	-.045**													
6 Asia	0	1	0.15	0.353	.022	-.082**	.088**	.100**	-.400**												
7 Developed countries	0	1	0.08	0.266	.043**	-.083**	.050**	-.021	-.279**	-.179**											
8 East europe	0	1	0.13	0.331	-.009	.069**	-.027*	-.038**	-.367**	-.156**	-.109**										
9 Amount of skills	0	10	8.86	1.948	-.003	.024*	.006	-.003	.056**	-.049**	-.019	-.006									
10 Number of IT top skills	0	6	0.71	0.952	-.081**	.050**	-.117**	-.072**	-.055**	-.041**	.005	.039**	.140**								
11 English skills	0	4	3.00	0.646	-.008	-.059**	.094**	.027*	.121**	-.085**	.188**	-.275**	.086**	-.043**							
12 Education	0	3	1.05	0.751	-.002	-.071**	.038**	-.025*	.099**	-.072**	.037**	-.013	.056**	-.008	.089**						
13 Education in IT	0	1	0.62	0.486	.020	.054**	-.095**	.017	.236**	-.060**	-.077**	-.126**	.046**	.113**	.049**	.229**					
14 Number of jobs (log)	0	8.41	1.75	1.429	-.033**	.116**	-.029*	-.009	.067**	-.048**	-.051**	.050**	.137**	-.035**	.078**	.091**	-.000				
15 Review quality	0	5.00	4.61	1.106	-.026*	.166**	.016	.017	.002	-.030*	-.022	.063**	.024*	.012	-.015	-.002	.025*	.265**			
16 Profile completeness	3	9	5.69	0.935	.069**	.026*	-.024*	.021	.105**	-.026*	-.046**	-.036**	.181**	-.066**	.104**	.060**	.050**	.383**	.046**		
17 Profile badge	0	1	0.30	0.457	-.020	.091**	-.025*	.025*	-.019	-.018	-.015	.076**	.112**	-.020	.040**	.056**	-.000	.394**	.114**	.292**	
18 Agency or group support	0	1	0.11	0.313	-.006	.066**	.016	.004	.093**	-.049**	-.056**	.026*	.067**	-.028*	.065**	.062**	.029*	.285**	.045**	.138**	.182**

* p < .05, ** p < .01

N = 7166

In our sample, the average 1-year earnings is $4,534. The average number of skills reported on the profiles is 8.86 and the average number of IT top skills of the IT freelancers is 0.71. Furthermore, most of the IT freelancers speak English fluently (mean = 3) and the majority has at least a bachelor's degree, as indicated by the mean value of the variable education of 1.05. Additionally, 62% of IT freelancers have a degree from the IT domain. Furthermore, IT freelancers completed an average of 18 jobs on the platform. The average review quality is 4.61 out of 5 stars. This high average score is common in marketplaces with implemented reputation systems and can be explained by the survival behavior of users in online communities. When they receive low feedback scores, they have difficulty re-engaging and often leave the platform (Kokkodis and Ipeirotis 2016). Additionally, IT freelancers completed an average of 5.69 out of 9 fields on their profiles and 30% have a profile badge. It is also notable that only 11% of IT freelancers receive support from agencies or groups.

In addition, 11% of the studied IT freelancers work in the job category IT & Networking, 66% in Web, mobile and software development, 4% in Project management, 1% in Tech support and 18% in Data science & analytics. Almost half of IT freelancers are working from the subcontinent India (48%), followed by Asia (15%), East Europe (13%) and the developed countries (8%). In addition, 16% of IT freelancers come from other regions. The top five countries are India (25%), Pakistan (16%), Ukraine (5,4%), Philippines (5%) and Bangladesh (4,9%), which aligns with previous studies (Claussen et al. 2018; Seifried et al. 2020).

8.5.2 Regression Analysis

Main Effects

Table 33 shows the negative binomial regression results for the dependent variable 1-year earnings. Model 1 is the baseline model. Model 2 additionally includes the variables concerning the activating signals and Model 3 those of the activating and pointing signals. Model 4 shows the full model. Inspection of the Log-likelihood reveals that the different signals add explanatory value compared to Model 1. We discuss below the results of the independent and the control variables in the full model (Model 4). We check the robustness of our results by using the number of stated hours on the platform that an IT freelancer could work for acquired projects within a year as an alternative measure of objective career success. The results are very similar to those obtained by using 1-year earnings as a measure of objective career success.

For activating signals regarding the human capital of IT freelancers, we found that the number of IT top skills ($p < 0.05$) and the English skills ($p < 0.01$) had a positive and significant effect

on the 1-year earnings. Therefore, H1b and H1c were supported. Accordingly, as shown by the odds ratio in Table 33, adding one IT top skill to the profile increases earnings by 10.4% and improving English skills by one level increases earnings by 30%. However, H1a, H1d and H1e concerning the amount of skills and the (IT) education could not be confirmed in our analysis.

	Model 1		Model 2		Model 3		Model 4	
Intercept	2.854,413***	(0.1477)	239,277***	(0.3380)	62,993***	(0.4477)	65,138***	(0.4464)
Control variables								
IT & Networking	1.742***	(0.1812)	1.835***	(0.1825)	1.600***	(0.1761)	1.543**	(0.1763)
Web, mobile, software dev.	1.473***	(0.1266)	1.557***	(0.1281)	1.136	(0.1248)	1.123	(0.1248)
Project Management	1.410	(0.2603)	1.335	(0.2644)	1.081	(0.2602)	1.027	(0.2607)
Technical Support	2.932***	(0.4145)	3.139***	(0.4166)	3.192***	(0.4024)	3.239***	(0.4018)
Subcontinent India	1.017	(0.1337)	0.934	(0.1369)	0.872	(0.1320)	0.830	(0.1326)
Asia	1.009	(0.1674)	1.085	(0.1680)	1.077	(0.1635)	1.089	(0.1634)
Developed countries	1.069	(0.2048)	0.845	(0.2087)	0.987	(0.2044)	0.992	(0.2046)
East europe	1.737***	(0.1762)	2.135***	(0.1802)	1.552***	(0.1727)	1.495**	(0.1728)
Independent variables								
Amount of skills			1.114***	(0.0246)	1.034	(0.0239)	1.031	(0.0239)
Number of IT top skills			1.022	(0.0532)	1.104**	(0.0498)	1.104**	(0.0497)
English skills			1.520***	(0.0806)	1.311***	(0.0769)	1.300***	(0.0768)
Education			1.138**	(0.0649)	0.985	(0.0634)	0.978	(0.0633)
Education in IT			1.063	(0.1031)	1.062	(0.0990)	1.061	(0.0988)
Number of jobs (log)					1.565***	(0.0438)	1.520***	(0.0445)
Review quality					1.078*	(0.0432)	1.081*	(0.0430)
Profile completeness					1.186***	(0.0559)	1.196***	(0.0557)
Profile badge					2.574***	(0.1105)	2.490***	(0.1105)
Agency or group support							1.609***	(0.1501)
Model performance								
Log-likelihood	-38,751		-38,722		-38,509		-38,503	
Chi2	32.270***		90.061***		516.896***		527.954***	
Number of observations	7166		7166		7166		7166	

Note: standard deviations are shown in parentheses; dependent variable = 1-year earnings; Exp(B) values are displayed.
* p < 0.1, ** p < 0.05, *** p < 0.01

Table 33. Regression Analysis Results

Concerning pointing signals regarding the image presentation, we found that all four variables had the expected significant positive effect on 1-year earnings. The results were consistent with H2a-d. The number of jobs (Exp(b) = 1.520, $p < 0.01$) and the review quality of completed projects (Exp(b) = 1.081, $p < 0.1$) showed significant positive associations with 1-year earnings. Furthermore, the additional filling of a field of the IT freelancer profile increases earnings by 19.6% ($p < 0.01$) and IT freelancers who have a profile badge earn much more than those without a badge (Exp(b) = 2.490, $p < 0.01$).

Lastly, regarding the supporting signal, the variable agency or group support showed a positive and significant effect on the 1-year earnings. Thus, H3 was supported. In detail, it becomes clear that belonging to a group or agency increases IT freelancer's earnings by 60.9% ($p < 0.01$). Table 34 shows an overview of the supported and not supported hypotheses.

	Hypotheses	Variable	Results
Activating Signals – Human Capital	H1a (+)	Amount of skills	Not Supported
	H1b (+)	Number of IT top skills	Supported
	H1c (+)	English skills	Supported
	H1d (+)	Education	Not Supported
	H1e (+)	Education in IT	Not Supported
Pointing Signals – Image Presentation specific to Digital Platforms	H2a (+)	Number of jobs	Supported
	H2b (+)	Review quality	Supported (marginal)
	H2c (+)	Profile completeness	Supported
	H2d (+)	Profile badge	Supported
Supporting Signal	H3 (+)	Agency or group support	Supported

Table 34. Results of Hypotheses Tests

Control Effects

In addition, our results regarding control effects show that the job category of freelancers and the region from which the IT freelancer comes are significant. Freelancers earned more in the category IT & Networking ($Exp(b) = 1.543$, $p < 0.05$) and in Technical support ($Exp(b) = 3.239$, $p < 0.01$) compared to the reference category Data science & analytics. Moreover, IT freelancers from East Europe ($Exp(b) = 1.495$, $p < 0.05$) earn more than IT freelancers from other regions.

8.6 Discussion

Prior research calls for studying the influence of signal types and signal environment on the effectiveness of signals (Connelly et al. 2011; Durward et al. 2016b; Kathuria et al. 2021). Our results advance this discussion by examining the impact of three signaling types in the context of digital labor platforms on the career success of IT freelancers. Our study suggests that different activating signals related to human capital, pointing signals related to image presentation specific to digital platforms and supporting signals positively predict the objective career success of IT freelancers on digital labor platforms.

This improves our understanding of the recent technological and economic changes in the employment environment. The workplace is experiencing rapid digitalization, exemplified by the digital labor platforms where new, digital forms of communication and work processes are the

norm. This digital work execution and mediation leads to uncertainties between parties, which can be reduced by IT enabled signals and thus lead to success in these new digital environments. Thus, this paper shows how technology can be built and used on digital labor platforms, especially in the form of signals. However, we also illustrate that digital labor platforms still need to be improved regarding available signals to build technology for humanity.

8.6.1 A Typology of Signals to explain Career Success of IT Freelancers on Digital Platforms

Previous research has mostly focused on signals that can be distinguished according to their associated costs (assessment and conventional signals) (Donath 2007; Holthaus and Stock 2018), or according to whether they are self-reported or from a third party (internal and external signals) (Mavlanova et al. 2016; Spence 1973). In addition, prior research lacks a consensus on signal effectiveness in online freelance job markets (Durward et al. 2016b; Gefen and Carmel 2008; Hukal et al. 2020). The previous signal distinctions, therefore, are not sufficient for the context of IT work on digital labor platforms. Furthermore, since we focus on digital labor platforms in the IT domain, we investigated the support signal as a third new signal type relevant for IT freelancers. Therefore, we focused on three signaling types: activating signals, pointing signals, and supporting signals (Bianchi et al. 2019; Connelly et al. 2011; Durward et al. 2016b; Schulz et al. 2015).

Our data show that all three signal types positively influence the success of IT freelancers. More specifically, the proof of skills in the IT field and the English skills are relevant for success. The indication of an additional currently requested IT skill on the IT freelancer profile can increase the earnings by 10.4%. In addition, the improvement of English skills by one level can even result in a 30% increase in earnings. Furthermore, the number of jobs in the work history and the resulting review quality also has a positive impact on the success of IT freelancers, as well as the completeness of the profile and the receipt of a profile badge for self-promotion. Finally, IT freelancers who receive and signal social support are more successful than those who work alone without any support ($Exp(b) = 1.609$, $p < 0.01$).

8.6.2 The Role of the Signaling Environment: the IT Domain on Digital Labor Platforms

Overall, the signaling environment is an under-researched aspect of signaling theory and only a few research papers have investigated the signaling context so far (Connelly et al. 2011; Kathuria et al. 2021). We contribute to this literature by testing signaling theory in the new context of IT work on digital labor platforms. The three types of signals presented must be considered in the environment in which they are used. Besides, it also plays a role who sends the signals. Therefore, this study also examined the applicability of signals in the digital labor platform environment and the IT domain.

Through our analysis, the interplay between the characteristics of online freelancing on digital labor platforms and the characteristics of IT work became clear. The use of signals is special in this context due to the nature of the work relationship because freelancers work independently and are thus responsible for their own career. Moreover, work coordination and execution occurs completely online via the digital platform. In addition, we were able to show that different IT characteristics affect the effectiveness of the signals.

First, the characteristics of online freelancing and IT work regarding activating signals become clear. We were able to show in this paper that IT freelancers need to build human capital themselves in order to be successful. Above all, this illustrates the diversity of skills needed. For example, we showed that general skills are important for success, like English skills (Exp(b) = 1.300, $p < 0.01$), while, simultaneously, the specific expertise for IT jobs, such as the amount of top IT skills the freelancer indicates in the considered year, is important for success (Exp(b) = 1.104, $p < 0.05$). However, we did not find that the amount of skills listed on the IT freelancer profiles significantly influences 1-year earnings. A possible explanation could lie in the associated costs for the signals. These are possibly higher for IT specific signals and thus have a stronger impact on success. Furthermore, from the results, it can be concluded that skills in the specific skill environment are essential for career success. IT work is driven by fast technological change, which leads to rapid knowledge obsolescence and a constant need for training and skill development (Zhang et al. 2012). We support these findings because signaling mastery of currently in-demand IT skills, in particular, had a positive effect on IT freelancers' earnings. Lastly, we did not find that IT freelancers' education significantly impacted earnings. A possible explanation for this result could be that IT work is constantly changing and IT freelancers do not necessarily learn the skills required for a project in their basic education. Therefore, the

qualifications that had been acquired some time ago are not necessary for success. Consequently, anyone can enter the platform and be successful if they adapt their skills to current market demands. Concrete skills in the field of activity, such as the programming skills, are therefore particularly important (Fuller et al. 2022).

Second, the characteristics of online freelancing and IT work also become clear in terms of pointing signals. In the traditional labor market, the demand for IT professionals is very high. Moreover, the constant technological change makes it difficult to find replacements for IT professionals who have left a team (Bosworth et al. 2013; Thibodeau 2012). For this reason, image presentation on the digital platform and the associated use of platform-specific pointing signals is usually not necessary for IT professionals outside of digital labor platforms. However, within the context of digital labor markets, self-promotion is mandatory due to global competition and IT freelancers are self-responsible for this promotion (Ashford et al. 2018; Hennekam and Bennett 2016; Roberts 2005; Vallas and Christin 2018). IT freelancers need to deal with algorithmic labor management for a successful image presentation because career success especially depends on the logic of the algorithms on the digital labor platforms. Here, we contribute to the literature on the use and handling of algorithms and matching (Cram et al. 2020; Möhlmann et al. 2021; Straub et al. 2015). Freelancers are highly dependent on and driven by established metrics. For example, Uber measures availability, jobs accepted, jobs completed, and customer reviews (Kalleberg and Dunn 2016). Consequently, the platform's mechanisms are important and must be used and influenced or addressed by IT freelancers. Regarding the platform-specific pointing signals concerning image presentation, we could show through our study that it is important for successful careers of IT freelancers to actively use certain mechanisms of the digital labor platform. The platform offers various possibilities, which IT freelancers should use. We observed significant effects from the number of completed jobs ($Exp(b) = 1.520$, $p < 0.01$), the quality of reviews in the work history ($Exp(b) = 1.081$, $p < 0.1$), the completeness of profile information ($Exp(b) = 1.196$, $p < 0.01$) and the achievement of a profile badge ($Exp(b) = 2.490$, $p < 0.01$). By using such signals, IT freelancers can move up the lists of available freelancers and thus be more visible to potential clients. In addition, it could be interesting to develop additional platform features for IT freelancers to support image development and more platform-specific pointing signals.

Third, the characteristics of online freelancing and IT work additionally become clear regarding supporting signals. In IT, collaboration, communication and teamwork are of great importance for the successful completion of tasks (Ghobadi and Mathiassen 2016; Kudaravalli et al. 2017;

Meyer et al. 2021). Consequently, IT freelancers are also often interdependent during their work. This reality is made difficult on digital labor platforms and in the context of freelancing scenarios, so IT freelancers must make more efforts to build an active community and some support. This is because in traditional freelancing, work is usually done alone and freelancers are separated from each other and clients (Ashford et al. 2018; Kunda et al. 2002). We contribute to this literature by showing that IT professionals can be more successful in teams or groups than alone, even on digital labor platforms. Accordingly, the signaling of support from groups or agencies has a positive impact on an IT freelancer's earnings ($Exp(b) = 1.609$, $p < 0.01$). This result provides a starting point for future research, as the investigated team or group support of IT freelancers can be used as a baseline for development of further supporting signals.

8.6.3 The Need to Improve Digital Labor Platforms for Humanity

Through our investigation, it became clear that digital platforms still need to be improved in terms of available signals to actually build "technology for humanity". Surprisingly, we found that many signals used in traditional labor markets could not be observed in our dataset, as globalized, anonymous digital labor platforms do not provide space for this type of holistic assessment of a person. In Table 35, we have listed possible signals that might be particularly relevant on digital platforms within the three signal types in addition to those we found.

Signaling Type	Potential relevant but unavailable signals on digital labor platforms	Illustrative References
Activating Signal	personality traits, character traits	Van den Born and Van Witteloostuijn 2013
	ethical sensitivity, moral, intelligence	Swenson-Lepper 2005
	motivation	Van den Born and Van Witteloostuijn 2013
	social skills	Gandini 2016
	interpersonal and verbal skills	Howard 1986
	cognitive capabilities (flexibility, agility)	Ashford et al. 2018; Strober 1990
	emotional capabilities (regulating emotions, tolerating ambivalent and conflicting emotions)	Ashford et al., 2018Ashford et al., 2018
Pointing Signal	external certifications the platform does not support	Kässi and Lehdonvirta 2018
	ratings from other platforms (which are not portable between platforms)	Wohlfarth 2019
	training, learning and updating activities	Gussek and Wiesche 2022b
Supporting Signal	networks independent of the platform	Gold and Fraser 2002
	size of the network	Van den Born and Van Witteloostuijn 2013
	offline support from friends and family	Gussek and Wiesche 2022b

Table 35. Potential Relevant but Unavailable Signals on Digital Labor Platforms

The detected and analyzed activating, pointing and supporting signals are very limited. Consequently, truly meaningful signals on digital platforms are very limited. In their current form, platforms enormously degrade the ways in which people can be evaluated. All the signals on the profiles tend to be transaction-based and signals related to individual situations and personality (e.g., Ashford et al. 2018; Van den Born and Van Witteloostuijn 2013) are not available. One possible reason could be that the inherent goal of digital platforms is to capture value (Schreieck et al. 2021). The information control of freelancers is therefore limited because they cannot communicate and signal many dimensions of their identity in any way on the digital platforms (Averill 1973). Thus, they have a very limited ability to influence or control the decisions of the people who assess them. Therefore, to build technology for humanity and be fairer, digital labor platforms would need to be improved in the future to give space to more relevant and differentiated signals.

8.6.4 Practical Contributions

This research has practical implications as well. First, our results on activating signals referring to human capital show that IT freelancers need to keep their skills up to date. The fast pace of information technology leads to rapid obsolescence of technologies and skills. Obsolescence is particularly relevant for IT professionals, which is why freelancers should invest heavily in their human capital to keep it current, especially in their professional domain. It also became clear that (IT) education has no significant impact on success. Consequently, platform work in the IT field is attractive for everyone, even if they were not educated in classic IT fields. Secondly, IT freelancers should consider and implement various factors of image presentation through platform-specific pointing signals. Our results show that it is crucial for the career success of IT freelancers to have a high review quality, many completed jobs in the work history, a profile badge and overall a complete profile. Therefore, they should actively fight for a good rating from the clients or a profile badge to stand out from the competition. Third, the results underline the importance of IT freelancers actively searching for support on the digital labor platform to receive content support for completing their tasks and an emotional network in order to be more successful. Lastly, digital labor platforms could solve the problem of high demand for IT professionals, as digital labor platforms always have many IT professionals available (Popiel 2017). Furthermore, the international use of the platform provides access to IT professionals from all over the world. Thus, the platforms are a potential new source of skilled IT workers for organizations.

8.6.5 Limitations and Future Research

Our research has some limitations that need to be considered. First, we only study IT freelancers on the platform Upwork, which means that we cannot draw a comparison between different digital labor platforms. In future work, it would be interesting to explore whether our results also apply to other online freelancing platforms, such as Fiverr. Second, we do not differentiate between different skills or the degree to which skills are mastered (depth) but only use the total amount of skills as a measure of human capital. Future research could therefore investigate whether some (IT) skills are more relevant than others for specific tasks and thus the degree to which various skills and the respective breadth and depth of a freelancer's skillset influence career success. Third, through the profile data of IT freelancers, we can only study the objective career success. Therefore, the individual's reactions to their career experiences should be considered in more detail in future work (Hughes 1937; Judge et al. 1995). Subjective success and

other enriched insights into the careers of IT freelancers can be considered through targeted surveys or interviews. Therefore, more causal inferences could be drawn regarding the results. Fourth, the final analyzed dataset (7,166 profiles) includes only a subset of the originally scraped freelancer profiles (36,661 profiles). This is mainly due to the choice of the dependent variable. In order to determine a meaningful value for objective success as a way to interpret the effect of the different signals, we use success over the one year period after the signals are sent. As a result, many profiles that left the platform market during this year or set their profiles to private for the second data collection point are not included in the analysis. In addition, there are many incomplete profiles. As with any empirical data collection of this kind, these circumstances could lead to a bias in the results due to survivorship bias. Lastly, other effects regarding IT freelancers' career success could be considered, such as the application of different business strategies, gender or age. For example, a low-cost strategy or an industry specialization strategy could contribute to the success of IT freelancers on digital labor platforms (Van den Born and Van Witteloostuijn 2013). In addition, the issue of obsolescence is significant to the success of IT freelancers. It is exciting to investigate in the future how the strategy of unlearning works to ensure the ability to innovate and remain responsive (Matook and Blasiak 2020).

Part C

9 Summary of Results

Through the five publications embedded in this thesis, we addressed the challenges and research questions that guided our research. The overall goal of this thesis was to improve the understanding of working on digital platforms by examining challenges and success factors, long-term career paths of online freelancers, and IT specifics on digital labor platforms. In the following, we summarize the findings for each research question individually before discussing their implications for theory and practice in the next sections.

RQ1: *What different aspects of the gig economy have been studied in IS and management research and how are they interconnected?*

Based on a structured literature review (P1), our first step was to frame the research topics on the gig economy and to show an overview of the research field by structuring the findings around the concept of the gig economy in relation to gig workers, gig work, and gig platforms. We examined the characteristics and motivators of gig workers. We also defined the main characteristics of gig work itself that apply to all forms of platform work as (i) self-employment, (ii) work in the form of predefined tasks, and (iii) digital organization of work. We also illustrated the challenges and responses of gig workers, the digital platforms that motivate gig workers and manage gig work, and the structure of the gig economy as a framework. Next, we classified and differentiated the forms of work in the gig economy according to person dependency and location dependency. Finally, we identified research gaps as a basis for further empirical publications of this thesis: a differentiated investigation of the forms and tasks of platform work, the characteristics of IT freelancers on digital labor platforms, long-term careers of freelancers on digital labor platforms, and career success factors and strategies of freelancers to navigate the many challenges in the gig economy.

RQ2: *What are the challenges of IT freelancers on digital labor platforms, how can they be structured and how are they interrelated?*

The subsequent first empirical study of the thesis analyzed online forum posts of IT freelancers (P2). We created a synthesis of online freelancers' challenges and extended them in many areas. We identified 14 relevant discussion topics of online IT freelancers and grouped the topics into aggregate dimensions: platform start, gig acquisition, gig execution, finances, platform and client relationship, and topics unique to freelancing in the IT profession. We then grouped the challenges and topics into an overall model of IT freelancing on digital labor platforms. The

four specific topics of IT work on digital labor platforms with associated challenges were starting in IT and support, rights and property, IT teams and collaboration, and specific IT skills. Overall, we presented online forum interaction as a promising and rich source of information and support for IT freelancers that could replace the actual lack of colleagues and social contacts on digital labor platforms. The study also formed the basis for further empirical analysis of individual challenges and solution strategies to support freelancers' success on digital labor platforms.

RQ3: *How can long-term, dynamic career paths of freelancers be designed on digital labor platforms?*

In the qualitative study of online freelancer careers (P3), we developed a first draft of a process model for freelancer careers. We identified four career stages and corresponding roles that IT freelancers move through: Beginner, Slave, Establisher, and Celebrity. We also illustrated the different advancement and decline mechanisms between career stages, divided into a professional and a platform-specific dimension. Career advancement is thus led by learning and updating skills, responding to market demand, building a network, profile markers, and reviews or feedback. Career decline, in contrast, can occur due to skill obsolescence, platform absence, or negative feedback from clients. In addition, we showed five different exit strategies from the digital labor platform at different career stages that can be categorized as switching platforms, exit after cost-benefit analysis, intercepting clients, exit with clients as partners, and exit into an own business. Finally, we identified different team configurations or types of collaboration that IT freelancers form and use such as social connections with clients or other freelancers, orchestration of freelancers (online), orchestration of friends (offline), or distribution of expertise within teams.

By expanding the base of the initial qualitative study to include additional interviews and the client perspectives (P4), we were able to highlight that online freelancing career paths on digital labor platforms are long-term and dynamic. From the literature, we identified the four particular working conditions on digital labor platforms as false self-employment and volatility, global matching and platform mediation, digital and temporary work, and algorithmic management that influence the dynamic career paths of online freelancers. We developed the career model of online freelancing and systematized career advancement in three steps: start advancement, become credible, and become famous. Career decline is possible when losing touch with the platform or when experiencing drawbacks in the job acquisition, project execution, or project

evaluation phase. We clarified the exit dynamics in terms of forced exit or exit as a stepping stone. Finally, we showed that four underlying influencing factors (reputation, relationships, expertise, and power of the platform) change freelancers' relationship with the platform in combination with individual career development over time. This interaction changes the probability of exit as well as the dependence and benefit of the platform in an inverted and normal U-shape. In addition, we were able to define and discuss two specifics of IT work on digital labor platforms: skill obsolescence and team collaboration among online freelancers.

RQ4: *How do different signals on digital labor platforms affect the career success of IT freelancers?*

In the last study on the success factors of IT freelancers (P5), we explored the relationship between the use of different signals and the career success of IT freelancers. We extended the signaling theory in the new context of IT work on digital labor platforms and developed a new signaling typology. Furthermore, we demonstrated that three types of signals positively influence the career success of IT freelancers. First, the number of IT top skills and English skills as activating signals (related to human capital) showed a positive impact on career success. Second, we showed that the number of jobs, quality of reviews, profile completeness, and profile badges as pointing signals (related to image management and presentation) also positively affected career success. Third, supporting signals such as agency or group support have a positive impact on the success of IT freelancers. Furthermore, we identified concrete IT-specific success factors through our analysis and thus investigated specifics of IT work on digital labor platforms. Moreover, we were able to clarify that many signals used in traditional labor markets could not be observed on digital labor platforms. One reason for this is that globalized, anonymous platforms do not provide space for this kind of holistic assessment of a person.

The following Table 36 gives an overview on the key findings of this thesis.

P	RQ	Key Findings
P1	RQ1	• Framework and overview on research topics on the gig economy – Characteristics of and motivators for gig workers – Three characteristics of gig work: self-employment, work in the form of predefined tasks, digital organization of work – Challenges and responses of gig workers – Digital platforms motivate gig workers and manage gig work – The structure of the gig economy as a framework • Classification and differentiation of work forms in the gig economy according to person dependency and location dependency • Identification of existing research gaps – Differentiation of the forms and tasks of platform work – Characteristics of IT freelancers on digital labor platforms – Long-term careers of freelancers on digital labor platforms – Career success factors and strategies of freelancers
P2	RQ2	• Synthesizing and expanding the challenges of online freelancers – Identify 14 relevant discussion topics of online IT freelancers – Grouping them into aggregate dimensions: platform start, gig acquisition, gig execution, finances, platform and client relationship, topics unique to freelancing in the IT profession – Bundle the challenges and topics into an aggregate model of IT freelancing on digital labor platforms • Four specifics and challenges of IT work on digital labor platforms: starting in IT and support, rights and property, IT teams and collaboration, and IT skills • Interaction in online forums is a promising source of information and help • Provide a basis for further empirical analysis of individual challenges and solution strategies
P3	RQ3	• First draft of a freelancing career process model • Four career stages and corresponding roles of freelancers: Beginner, Slave, Establisher, Celebrity • Advancement and decline mechanisms between career stages (professional dimension and platform-specific dimension) – Advancement: learning and updating skills, react to market demand, build a network, profile markers, reviews or feedback – Decline: skill obsolescence, platform absence, negative feedback • Five exit strategies from the digital labor platform: Platform switching, exit after cost-benefit analysis, interception of clients, exit with clients as partners, exit into an own business • Team configurations or collaboration types that IT freelancers form and use: social connections with clients or other freelancers, orchestration of freelancers (online), orchestration of friends (offline), expertise distribution within teams

P4	RQ3	• Online freelancer career paths are long-term and dynamic • The special working conditions that influence the dynamic career paths of online freelancers are false self-employment and volatility, global matching and platform mediation, digital and temporary work and algorithmic management • Career model of online freelancing − Systematization of career advancement in three steps: start advancement, become credible and become famous − Career decline when touch with the platform is lost, or when drawbacks occur in the job acquisition phase, project execution or project evaluation phase − Exit dynamics in the form of forced exit or exit as a stepping stone • Four underlying drivers (reputation, relationships, expertise, and platform power) change freelancers' relationship with the platform • The probability of exit as well as the dependence and benefit of the platform change in a (inverted) U-shaped way over time • Define and discuss specifics of IT work on digital labor platforms: skill obsolescence and team collaboration
P5	RQ4	• The relationship between the use of signaling and the career success of IT freelancers • Develop a new signaling typology and extend the signaling theory in the new context of IT work on digital labor platforms • Three types of signals positively influence the career success of IT freelancers − Activating signals: number of IT top skills, English skills − Pointing signals: number of jobs, review quality, profile completeness, profile badge − Supporting signals: agency or group support • Concrete IT-specific success factors • Identify potential relevant but unavailable signals on digital labor platforms

Table 36. Overview of the Key Findings

10 Discussion

Based on the summary of our findings from the five publications included in this paper, we describe discussion topics of interest concerning the state of research.

10.1 A Differentiated Examination of the Forms of Platform Work

In this thesis, we focused on non-location based online work for macro tasks done through digital labor platforms as online freelancing (Idowu and Elbanna 2022; Wagner et al. 2021). We proposed a differentiation of the various forms of work in the gig economy (P1). These need to be distinguished in research because they imply different characteristics. In this regard, we presented that a separate consideration of the forms of platform work is necessary. By defining three overarching characteristics of platform work and describing a differentiation of the forms based on previous research, we establish a foundation for future analysis.

All forms of platform work share the following three characteristics. Platform workers work independently without a fixed employment contract. They work in the form of predefined and time-limited tasks and organize their work and job procurement online via digital platforms (Ashford et al. 2018; Caza et al. 2022; Kuhn and Galloway 2019).

But across these three main attributes, characteristics vary. For example, the execution of the work is sometimes online and sometimes offline, or the tasks require a high or low skill level. Some platforms contain repetitive tasks that require low skill levels (e.g., drivers on Uber; Kaine and Josserand 2019), and some platforms contain more complex or creative tasks that require high skill levels (e.g., creative freelance work on Upwork; Claussen et al. 2018). In this thesis, we create awareness that many aspects studied differ for distinct forms of platform work.

10.2 Moving Beyond Online Freelancing as a Side Hustle to Dynamic Long-term Platform Careers

The traditional career with its promotions and salary increases is becoming steadily less important. Due to the profound change in employment relationships and organizational structures, more and more employees are experiencing a shift from stable and linear careers to digital and dynamic careers. Hence, it is necessary to examine whether we need to update traditional career theories and assumptions in a changing work environment (Ashford et al. 2018; Barley et al. 2017; Seifried et al. 2020). Therefore, in this thesis, we investigated the dynamic careers and the challenges and success factors of online freelancers.

We were able to highlight in several publications (P3 and P4) that the static view of platform careers is not appropriate. The platform labor market is not stable, and career paths are not unambiguous but impermanent (Ashford et al. 2018), moving both forward and backward. Consequently, a platform career does not only consist of continuous successive static phases (Super 1957), but freelancers may also experience career setbacks and do not necessarily rise steadily in their careers. The working conditions and career mechanisms of the platform keep pushing freelancers in different directions and, in a way, keep them in a kind of quicksand that is always in motion and that freelancers have to follow with appropriate strategies. We therefore challenge previous theories such as the life-span model (Levinson 1978; Super 1957, 1980) or the protein and boundaryless career theories (Arthur 1994; Hall and Mirvis 1995; Kost et al. 2020; Lo Presti et al. 2018; Popiel 2017) and developed an alternative theory of platform careers (P4).

Moreover, theory has largely assumed that people do their freelance work primarily as a short-term side hustle and not as a long-term career (Ashford et al. 2018; Kalleberg 2000, 2009; Kuhn 2016; Seifried et al. 2020). But we have highlighted (P3 and P4) that freelance work cannot be only short-term in nature. Thus, we provide a whole new perspective on online freelancing as a promising real long-term career option.

In terms of challenges and success factors, it becomes evident that in the new complex working environment of digital platforms, more is being demanded of workers than what was previously required for success in many fixed organizations. We add a set of challenges and success factors to the existing freelancing literature and thus also provide the basis for further research on the complexities of the alternative form of work on digital labor platforms (Blaising et al. 2021; Duggan et al. 2020; Idowu and Elbanna 2022). In particular, starting as an online freelancer, prevailing against global competition, and the power of clients and the platform itself are core challenges that must be overcome (P2). In addition, the four special working conditions on digital labor platforms (P4) pose a number of challenges to online freelancers (Bucher et al. 2019; Caza et al. 2022; Deng and Joshi 2016; Tóth et al. 2022): false self-employment and volatility (leading to financial precarity, personal responsibility, and high cost and time expenditure), global matching and platform mediation (leading to global competition), digital and temporary work (leading to transience of work, and social isolation), and algorithmic management (leading to non-transparent algorithmic control or dependence on client evaluations).

Regarding the success of online freelancers, it emerges that, above all, appropriate signals are needed to reduce the uncertainties in anonymous platform labor markets and to obtain jobs.

Previous research has already illustrated that signals matter for online freelancers (e.g., Durward et al. 2016b; Hukal et al. 2020). We add to these findings by presenting concrete signals of success within a typology of signals to explain the career success of freelancers on digital labor platforms (P5). We also contribute to the previous literature by analyzing the signaling environment as an under-researched aspect of the signaling theory (Connelly et al. 2011; Kathuria et al. 2021). Thus, we contribute to this research by testing signaling theory in the new context of IT work on digital labor platforms. However, within this analysis, the limitations of the anonymous platforms also became obvious, as many relevant signals cannot yet be sent via the digital platform in its current form or are unavailable. Thus, in relation to the previous literature we highlight the need for further improvement of digital labor platforms to make this career option even more attractive and fair.

Finally, we illustrated in this thesis (P3 and P4) that the boundaries within platform careers are multidimensional in contrast to previous research findings (Arthur 1994; Arthur and Rousseau 1996; Kost et al. 2020; Lo Presti et al. 2018). On the one hand, technical boundaries are easy to overcome because freelancers often have new jobs and can easily switch between different jobs since they have a lot of freedom and autonomy. However, on the other hand, the platform itself can be seen as an organizational boundary that is not easy to overcome. As already discussed in the literature, reputation systems are crucial for career success (Cram et al. 2020; Möhlmann et al. 2021; Straub et al. 2015). But these are platform-specific and ratings cannot be transferred to other platforms, which leads to lock-in effects and implies a certain dependency of freelancers on the digital platform (Ciotti et al. 2021; Farrell and Klemperer 2007; Kost et al. 2020; Wohlfarth 2019). We contribute to these aspects in that we described different exit scenarios of how the boundaries of digital labor platforms can be overcome and how a further career can be pursued outside the platform. In doing so, we also showed how the role of the platform, its benefits, and thus the freelancer's dependence on it as well as the probability of an exit change over time within the individual career development.

10.3 Increased Knowledge About a New Form of IT Work

In this thesis, we highlighted the complexity of a new platform- and IT-specific work and career alternative and examined online IT freelancing as a new way to work in IT (Joseph et al. 2012). In doing so, we add detailed information on IT freelancing as a new way of working in IT to previous research on IT work (Ang and Slaughter 2001; Zhang et al. 2012). By focusing this thesis on the field of IT work on digital labor platforms, we were able to improve knowledge

about this new form of IT work and clarify the specifics of IT freelancing. Thus, we add to the freelancing literature, which has already examined aspects of IT work (Frenzel-Piasentin et al. 2022; Kanat et al. 2018; Sultana et al. 2019; Taylor and Joshi 2019).

First, we developed a definition of IT freelancing based on the literature that can be used in future research on online freelancing and IT work. Second, we identified a set of characteristics, challenges, and success factors of IT freelancers, which are summarized in Table 37.

IT Freelancing Specifics		**P**
Collaboration with clients	Lack of IT expertise of the client	P2
	Client data is often private and confidential, thus rights to work results and ownership are often unclear	P2
Skills and IT projects	IT projects are often more extensive and require a high skill level, high and specific requirements	P2
	A concrete IT-specific success factor is the number of IT top skills specified on the platform profile	P5
	IT education is not important for the IT field, which is why a cross-entry into IT freelancing is possible	P5
Technological change and skill obolescence	IT freelancer's responses to skill obsolescence are necessary due to high levels of personal responsibility	P2, P3
	The importance of skill obsolescence changes over time: early in a career it can help with positioning and advancement, late in a career it is a challenge	P4
	Mastering IT skills currently in demand has a positive impact on IT freelancers' income	P5
Teams and collaboration	The project work can be divided into teams and thus more projects can be completed in the same time, required skills can be complemented and it is not necessary that an IT freelancer can do all the tasks by themselves	P2
	Teams can be formed online or offline and help with career advancement: professional and social team dimensions are important	P3
	The importance of teamwork changes over time: early in a career, IT freelancers can take on more jobs as part of a team (variety of tasks and execution of large projects becomes possible), late in a career they tend to take on the role of an orchestrator and lead or manage teams	P4
	IT professionals in teams or groups are more successful compared to working alone on digital labor platforms	P5

Table 37. Overview of the Identified IT Freelancing Specifics

In the following, we discuss the two most central points of this thesis again in detail: skill obsolescence and the team formation of IT freelancers.

First, previous IT research has highlighted several times that IT work is characterized by rapid technological change, which leads to fast skill obsolescence and a constant need for training and skill updating (Fu 2011; Rong and Grover 2009; Zhang et al. 2012). However, our results show that the problem of skill obsolescence becomes even more important in the context of digital labor platforms than in the traditional offline labor market due to the high level of freelancer personal responsibility described above (P2, P3, P4, and P5). IT freelancers do not receive support from an organization or permanent employer regarding continuing education or updating outdated skills. Thus, we add to the research on freelancing and platform work the importance of the IT-specific problem of skill obsolescence. In future research, this aspect should also be investigated in other online freelancing areas (Claussen et al. 2018; Popiel 2017; Sison and Lavilles 2018). We also describe the necessary response of IT freelancers to skill obsolescence and illustrate the relevance of concrete measures, such as regular monitoring of skill demand on the platform (P2 and P3). In addition, we show that the phenomenon of obsolescence is not necessarily exclusively challenging, but can help especially with starting on platforms and positioning in the global IT market, because new skills quickly become relevant again and again, so that one can be successful with new niche knowledge (P4).

Second, in IT, collaboration, communication, and teamwork are of great importance for successful task completion (Ghobadi and Mathiassen 2016; Kudaravalli et al. 2017; Levina 2005; Majchrzak et al. 2005; Meyer et al. 2021). Consequently, IT freelancers are also often interdependent in their work. This is complicated on digital labor platforms and in the purely online context of freelancing scenarios, requiring IT freelancers to put more effort into building an active community and some level of support. This is because work is typically done alone in other freelancing areas and freelancers are separated from each other and clients (Ashford et al. 2018; Kunda et al. 2002). We contribute to this literature and call for more research on teams in other online freelancing fields by illustrating that online freelancers in IT can be more successful in teams or groups than alone (P5). We also highlight some advantages of IT freelancing teams such as being able to complete more projects in the same amount of time, taking on larger and more diverse projects (P2 and P4), or the social support provided by friendships in teams (P3). Finally, we indicate that team affiliation can change over the course of a freelancing career. In early career phases, freelancers can especially benefit from the described advantages as part of a team, which can help them in career advancement. In later career phases, however,

freelancers tend to take on the role of an orchestrator and lead or manage freelancer teams to become even more visible and handle a wide range of jobs (P4).

11 Implications

In the following sections, we explain the implications of the findings of this thesis for theory and for practice. Based on our mixed-methods research approach, we provide rich theoretical insights that also include guidance for practice.

11.1 Implications for Theory

Digital Platform Research: Our main goal was to better understand platform work. We contribute to the research on digital labor platforms in several aspects. First, we distinguished and characterized the **forms of platform work** (P1). Thus, we contribute to platform research that has only examined single forms of platform work such as crowd work (e.g., Buettner 2015; Nevo and Kotlarsky 2020; Pedersen et al. 2013) or only look at specific aspects such as the organization and experience of gig workers (e.g., Kaine and Josserand 2019). Second, this thesis extends the literature on digital labor platforms by summarizing and structuring the **challenges** of online freelancing (e.g., Ashford et al. 2018; Caza et al. 2022). We contribute to the challenges of freelancing already identified in the literature by addressing new aspects such as increasing platform dependency, client and platform power, or privacy issues related to platform monitoring (P2) and illustrating appropriate **success factors** to respond to the challenges (P5). Third, we contribute to the body of knowledge in the field of **careers** on digital platforms (e.g., Frenzel-Piasentin et al. 2022; Idowu and Elbanna 2022; Sison and Lavilles 2018) by illustrating and structuring a long-term and dynamic freelancer career model and thus important advancement, decline, and exit dynamics over time (P3 and P4). We also contribute to the literature around the concept of the **holding environment** (Petriglieri et al. 2018, 2019) by explaining and adding online forums as support for working on digital labor platforms. Connections to people are thus also possible through the use of online forums (P2). Fourth, we contribute to platform literature that addresses particular platform mechanisms (e.g., Ciotti et al. 2021; Farrell and Klemperer 2007; Wohlfarth 2019) by clarifying changing **lock-in effects** and **switching costs** associated with platform power on digital labor platforms (P3 and P4).

Career Theories: Through the results of this thesis, it is also clear that the careers of online freelancers do not fit the **traditional career theories** (Super 1957) nor the perceptions of **boundaryless or protean careers** (Arthur 1994; Arthur and Rousseau 1996; Kost et al. 2020;

Lo Presti et al. 2018). Careers on a digital labor platform should therefore receive special attention in future research. We contribute to existing career theories by indicating from our results that a platform career does not only consist of continuous phases (Super 1957) but that freelancers can also experience career declines and that there is not only a steady career advancement. Moreover, platform careers are not boundaryless (Arthur 1994; Arthur and Rousseau 1996), but the boundaries within platform careers are multidimensional. While the technical boundaries are easy to overcome, the platform itself can be seen as an organizational boundary that is not easy to overcome, especially with increasing success and developed platform-specific reputation (P3 and P4).

Signaling Theory: This thesis contributes to the signaling theory (P5). Since there was no consensus in previous research on the effectiveness of signals in online job markets for freelancers (e.g., Durward et al. 2016b; Hukal et al. 2020), we developed a **typology of signals** to explain freelancers' career success on digital platforms. We also contribute to the research by analyzing the **signaling environment** as an under-researched aspect of signaling theory (Connelly et al. 2011; Kathuria et al. 2021). We thus contribute to this literature by testing signaling theory in the new context of IT work on digital labor platforms. In addition, we highlight how technology can be built and used on digital labor platforms, particularly in the form of signals. However, we also illustrated that digital labor platforms still need to be improved in terms of available signals in order to develop technology for humanity.

IT Work Research: The findings of this thesis also contribute to the research regarding IT work and IT professionals (P2, P3, P4, and P5). By illustrating the **characteristics**, **specific challenges**, and **success factors** in the field of IT work on digital platforms (see Table 37), we complement previous research that indirectly examined individual aspects of IT freelancing (e.g., Gol et al. 2018; Sultana et al. 2019; Taylor and Joshi 2019; Watson Manheim and Ahuja 2019). We further contribute to IT work research by highlighting the complexity of a new **IT-specific career alternative** and presented detailed information on IT freelancing as a new form of work in IT (Joseph et al. 2012). Through our findings on IT freelancing on digital labor platforms, we also contribute to research which addresses the **high demand for IT professionals** (e.g., Prommegger et al. 2020c), rapid technological change that requires continuous learning and training due to **skill obsolescence** (e.g., Fu 2011; Rong and Grover 2009; Zhang et al. 2012), or the mechanisms of **cooperation and coordination** among IT teams (e.g., Kudaravalli et al. 2017; Levina 2005; Majchrzak et al. 2005). Finally, our findings regarding the different

exit dynamics from the platform (P3 and P4) contribute to research on **IT professional turnover** (e.g., Joseph et al. 2007; Maier et al. 2015; Zylka and Fischbach 2017). We showed that turnover on digital labor platforms (exits) differs from traditional turnover due to the identified platform lock-in mechanisms. On platforms, the classic turnover model of March and Simon (1958), which presents the desire to move and the ease of movement as antecedents of the turnover intention, has to be extended by the aspect of platform lock-in (P3 and P4).

11.2 Implications for Practice

Many contributions for practice can be derived from the results of this thesis, specifically for online freelancers (job seekers), companies or private individuals as clients (job providers) and the platform owners of the digital labor platforms. Overall, we emphasize the relevance of the topic platform work, especially for the future of work and the global labor market, companies from the IT industry and other disciplines, and general society.

The focus of this thesis was to investigate the perspective of **online freelancers**. First, they have to deal with the identified challenges arising from the specific characteristics of platform work. Our findings help online freelancers to keep these challenges of platform work in mind, to be aware of them, to evaluate them and to react accordingly. Overall, it is clear that new challenges arise for workers compared to traditional employment. In the current design of platform work, the attractiveness of the work situation of freelancers on digital labor platforms is diminished by the enormous challenges. But accordingly, we have also analyzed how online freelancers can deal with these challenges and be successful. It becomes clear that freelancers need to respond to the dynamics within their careers to be successful. For example, they should respond to skill obsolescence or use different platform features to advance in their careers. Therefore, different actions are required in different career phases. Moreover, our developed career model can provide valuable information for freelancers to understand for their long-term career development. Furthermore, our results show that appropriate signals can help to be successful on digital labor platforms. Especially in the domains of human capital, image presentation on the platform and support, online freelancers should use appropriate signals to get jobs on platforms. Especially for IT freelancers, we also identify promising actions such as leveraging the help of other IT freelancers, constantly developing their skills, and addressing IT-specific challenges such as data privacy. In this way, platform work can be an attractive alternative to a traditional career in the offline labor market. The diverse opportunities and freedom of task

completion, the speed and implementation of career development, and the promising opportunities for platform exit in advanced career phases illustrate this attractiveness of platform careers despite the identified challenges.

Our findings may also be helpful to **individuals or companies as clients** on digital labor platforms. First, digital labor platforms could solve the problem of high demand for (IT) professionals in companies, as there are always many professionals available on digital labor platforms and the international use of the platform allows global access to experts from all over the world. Thus, the platforms are a potential new source of skilled specialists for companies or private clients, especially in the IT sector. In addition, we particularly highlight the difficult platform start of freelancers and motivate clients to also give new freelancers a chance. In addition, we clarified the importance of feedback and reviews for platform careers, which encourages clients to evaluate fairly. Finally, based on our findings, we shed light on many problems and challenges in the relationship between freelancers and clients on both sides, which can resolve potential conflicts between the two parties and lead to better business collaboration.

From the perspective of **platform owners**, we have clarified that they need to manage, control and monitor online freelancers in order to be successful. Platform owners should respond to the challenges and success strategies of the online freelancers with appropriate measures to keep the freelancers on their platform, support them and thus generate value. If platform owners are aware of the identified challenges, success factors, career dynamics and career phases, they can make their platforms more successful and attractive. In that case, they can make platform work in the form of freelancing overall fairer. In addition, platform owners may be able to prevent freelancers from leaving their platform or switching to competing platforms if they understand and quantify the motivations for their exit or failure. Especially in the case of forced exits, platform owners could support freelancers at the beginning and throughout their careers to keep potentially valuable workers on their platform.

12 Limitations

The findings of the publications embedded in this thesis and thus the results of the thesis as a whole are subject to several limitations. These limitations result from the methodologies we used and the cases and data sources we selected. We summarize important and overarching limitations in the following sections.

In the embedded publication P1 we conducted a **systematic literature review** based on vom Brocke et al. (2009) and Webster and Watson (2002). Although we followed these guidelines, used multiple databases, selected relevant search terms and adjusted them throughout the process, documented the search and selection process in detail, and performed a backward and forward search, the literature review may not include all relevant articles due to the choice of keywords and databases. Furthermore, although we documented the inclusion and exclusion criteria, the selection of sources is subjective despite the systematic approach and depends on the decisions of the researchers. Other researchers may have selected different articles.

In the embedded publications P2, P3 and P4, we used **qualitative methods**. Qualitative research raises the issue of possible bias and limited generalizability. Researchers interpret their observations of the phenomenon based on their own views and perspectives, which can lead to the problem of researcher bias and subjectivity (Bailar et al. 1977). The execution and analysis of *interviews* is subject to several limitations in this regard. The analysis in P3 and P4 was based on exploratory interviews with online freelancers and platform clients, which limits the generalizability of our findings. Interviews are bound to the subjectivity of the interviewees and the individual judgment of the researcher (Mayring 2023). The interviewed freelancers and clients were asked to explain their thoughts and opinions and to illustrate them with examples. We may have unconsciously steered interviewees in thematic directions we expected during the interviews, or we may have interpreted responses in that they fit our expectations.

The qualitative data must be further *coded and analyzed*, which is also subject to limitations. We attempted to limit the weakness of subjectivity in coding in P2, P3, and P4 and to ensure the reliability of our analysis by double coding parts of the data. We assessed the percentage of matching codes. First, the first author coded the empirical data a second time to determine intra-coder reliability. Second, a third person from the research team also coded the empirical data to determine inter-coder reliability. We also discussed our derived concepts and categories among the co-authors, within the research group, and at a conference (P3), thus refining our analysis results and identifying additional categories. We also conducted triangulation, that is,

we used data from multiple sources to gain a better understanding of the phenomenon (Strauss and Corbin 1990). For example, we additionally considered the client's perspective or added further secondary data (P4). Despite these methodological limitations, our results can serve as a stimulus for future work on this topic.

In the embedded publications P2 and P5, we build on **quantitative methods**. The *datasets* used impose some limitations. In P2, the dataset for topic modeling is based on forum posts from Reddit, where we chose words as IT search terms that are typically, but not necessarily exclusively, used in an IT context, which may result in other posts (not related to IT work) being included in the LDA analysis. Some of these posts fall into the excluded topic of writing and translation, while others belong to IT-related fields, such as video editing, and occur as noise across all topics. We argue that this does not bias our results because our explanations are not based on the word lists alone but take into account the underlying full posts, which we intentionally excluded for this reason. In addition, our LDA dataset includes posts from a limited time period (2019 to 2022), so we could only identify topics that were discussed during this time frame. However, this time limitation ensures a high degree of actuality of the analyzed content. In P5, we analyzed the profile data of IT freelancers and can only use this information to examine the objective career success. However, individual responses to freelancers' career experiences would also need to be considered (Hughes 1937; Judge et al. 1995). Subjective success and other in-depth insights into the careers of IT freelancers could be considered through targeted surveys or interviews. This would allow more causal inferences to be drawn from the results which we were only able to do to a limited extent. In addition, due to the choice of the dependent variable, the final analyzed dataset in P5 only includes a subset of the originally scraped freelancer profiles. In order to provide a meaningful value for objective success that could be used to interpret the impact of the various signals, we used success over the one-year period after the signals were sent. As a result, many profiles that left the platform market this year or set their profiles to private at the second survey date were not included in the analysis. In addition, there are many incomplete profiles. As with any empirical data collection of this type, these circumstances can lead to a bias in the results due to survivorship bias.

In addition, in P2 and P5, we had to limit the studies to a certain set of *investigated factors*. Regarding P2, there might be other IT-specific issues that are not discussed in the Reddit forum and therefore could not be identified by us. We cannot exclude that there are other issues and challenges of IT freelancers that are not discussed in the considered posts. In particular, we

investigated only the information discussed by freelancers sharing information outside the platform. To minimize this limitation, we used the sub-forum for IT freelancers in the official Upwork forum to cross-check our results and were able to validate the main points, but less explicitly. This can be justified by a discussion culture characterized by more monitoring and moderation compared to the Reddit discussion forum, and by the smaller size of the dataset due to fewer users and less activity. In P5, other effects related to the career success of IT freelancers, such as the use of different business strategies, gender, or age, could be also relevant. Therefore, although we relied on several statistical tests to make informed decisions, other factors that might have altered our results are conceivable.

Other overarching limitations relate to the cases and data we selected. A large part of our findings is based on only one case of a digital labor platform (see P2, P3, and P5). While we also compared our findings with other digital labor platforms (see P4), the core findings relate to a single platform. Given the scope and focus of this thesis, we prioritized an in-depth understanding of one platform over a broader, comprehensive understanding of multiple platforms.

Finally, limitations regarding the overall conception of this thesis can be identified. Given the scope, the general focus of the thesis was on the perspective of workers as online freelancers on digital labor platforms. However, other perspectives also need to be considered in future research to gain a comprehensive understanding of platform work. Primarily, the perspective of clients and also platform owners should be additionally integrated. Furthermore, the general research design of this thesis is limited by the mixed methods approach. Since we did not limit ourselves to one methodology, it is possible that the synthesized overall results of this thesis suffered from the combination and integration of the individual findings of different methodologies. Possible incongruencies in the methods could thereby affect the overall validity of the results.

In the next section, we describe avenues for future research that illustrate how scholars can use and further develop the findings of this thesis.

13 Future Research

Over the course of the five studies of work on digital platforms, a number of open questions for future research emerged that we were unable to address within the scope of the publications included in this thesis. We think that the aspects outlined below suggest worthwhile avenues for future research.

The navigation of negative reviews on digital platforms.

In this thesis, it became clear in particular in the studies P3 and P4 within the interviews with online freelancers that clients have an immense position of power after an online project, as they significantly influence the reputation of freelancers through their evaluations. Therefore, negative client reviews can lead to career breakdowns, as often a single negative review is enough to damage the reputation of freelancers on digital labor platforms. However, the detailed impact of negative feedback on digital labor platforms and how freelancers can handle it has not yet been adequately researched. Different configurations and ways to succeed and to deal with negative reviews could be investigated using methods such as qualitative comparative analysis, especially in its fuzzy set version (fsQCA; Fiss 2011; Ragin and Davey 2022). Insights from such analyses would, on the one hand, help online freelancers in practice to succeed despite (perhaps even unjustified) negative reviews and to deal with these bad client evaluations (Blaising et al. 2021; Moreno and Terwiesch 2014). On the other hand, these findings would contribute to research on the relevance of reputation on digital labor platforms, which has so far mainly focused on positive reviews (Hong and Pavlou 2017; Idowu and Elbanna 2022; Jarrahi et al. 2020; Tóth et al. 2022). Thus, in addition, not only the effect of individual signals could be studied as in P5 of this thesis, but different configurations of signals that together predict the success of online freelancers.

Digital platforms as entrepreneurship incubators.

Moreover, the different exit scenarios and the change in platform exit probability over time are important results of this thesis (P3 and P4). In this context, future research could shed more light on individual aspects of our developed career model, such as the exit scenarios. Surveying or interviewing former freelancers who have already successfully mastered an exit from a digital labor platform could provide additional valuable insights into the career dynamics in online labor markets. If the exact motivations and intended paths to success of these ex-online freelancers were analyzed, a theoretical model for entrepreneurship on digital platforms could be

developed. Digital labor platforms may act as incubators for successful entrepreneurs, which can facilitate the start of their own businesses and self-employment by helping to build up expertise and a client network. The results of this research would contribute to the entrepreneurship literature regarding the gig economy and practically illustrate a possible path to self-employment or business formation (Ahsan 2020; Burtch et al. 2018).

Emergent teams and groups on digital platforms.

Within this thesis, we have discussed the team dimensions and team dynamics of online freelancers in various publications (P2-P5). However, beyond the IT domain, it is interesting to examine the uncommon collaboration on digital labor platforms in detail. The literature has already identified that connecting to people in the gig economy can help as part of the holding environment (Petriglieri et al. 2018, 2019). Promising further questions on this topic have arisen within this thesis. First, there is the question of what types of teams exist on digital labor platforms. Second, there is the question of how teams of freelancers are managed by orchestrators who can work together to complete more and also more differentiated projects. Finally, in future research, it needs to be explored how roles change over careers as online freelancers become clients over time or take on both roles simultaneously.

Skill Obsolescence on digital labor platforms.

In the studies P2 and P5, we focused on the area of IT work on digital labor platforms and concluded that the issue of skill obsolescence is particularly challenging for the online freelancing sector. We demonstrated the necessary response of IT freelancers to skill obsolescence and illustrated the importance of concrete actions, such as regularly reviewing the demand on the platform. This phenomenon has been widely studied in the IT literature (Fu 2011; Rong and Grover 2009; Zhang et al. 2012). However, our results show that the problem is gaining importance in the context of digital labor platforms due to the high level of freelancer responsibility and should be studied in more detail (Claussen et al. 2018; Popiel 2017; Sison and Lavilles 2018). Future research could investigate whether some skills are more relevant for certain tasks than others and whether specific skills are more or less affected by skill obsolescence. To this end, it should be analyzed to what extent different skills and the respective breadth and depth of a freelancer's skills influence professional success and the risk of obsolescence.

The client perspective on freelancing jobs in digital labor markets.

The focus of this thesis is the perspective of workers on digital labor platforms and, more specifically, their characteristics (P1), challenges and success factors (P2 and P5), and careers (P3 and P4). However, clients also exist as a second user group on digital labor platforms (Kost et al. 2020). In this regard, it has become clear in P1 that much research exists on the worker perspective (e.g., Ashford et al. 2018; Caza et al. 2022; Jabagi et al. 2019). In contrast, the important perspective of clients on digital labor platforms has been little studied so far. Therefore, future research should take a closer look at the client perspective, because the specifics of online work, such as digital mediation, sometimes make client interaction difficult. It is unclear which tasks can be handled well with online freelancers and which cannot. Furthermore, the feedback behavior of clients is unexplored, as well as the most important aspects within the matching process between them and online freelancers. Finally, it could be analyzed how clients can design and tailor their contracts in a useful way in order to get as much benefit as possible from the platform work. In summary, by highlighting this second opposite perspective, the interactions of the parties on digital labor platforms could be improved.

14 Conclusion

We are experiencing a radical change in people's work and professional lives, influenced by technologies such as digital platforms. The aim of this thesis was therefore to improve the understanding of working on digital platforms, challenges and success factors as well as career paths of online freelancers. To this end, this thesis combines literature on digital labor platforms as well as qualitative and quantitative data and different methods. We first structured the literature around the concept of the gig economy, defined the forms of platform work, and identified research gaps. We then empirically investigated the challenges that constitute platform work and the particular characteristics of IT freelancers. We also explored the long-term career dynamics of online freelancers and developed a career model on digital platforms. Finally, we analyzed the specific success factors of online freelancers in the IT sector. Our findings contribute to the literature on working on digital platforms, signaling theory, several career theories, and research on IT work. The findings also help organizations, platform owners, and (IT) workers to benefit from digital labor platforms. We hope that our findings will stimulate further research on platform work.

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Appendix

Appendix A: Latent Dirichlet Allocation (P2)

The most commonly used topic model is the Latent Dirichlet Allocation (LDA) model, a hierarchical Bayesian model that describes a generative process of document generation (Blei et al. 2003). The goal of this unsupervised modeling technique is to infer topics as latent variables from the observed distribution of words in each document. In particular, a topic is defined as a multinomial distribution over a vocabulary of words, a document is a collection of words from one or more topics, and a corpus is the set of all documents. In the following, we explain how we use the LDA analysis to derive topics from the document corpus. The LDA analysis procedure is shown in Figure 19.

Before running the LDA on our collected data, we needed to do some preprocessing steps. First, in accordance with prior work, we grouped posts and comments into documents and converted the documents to word lists. Second, we transformed the data with common practices from the natural language processing area in order to prepare them for the topic modeling as previous organizational studies in the context of topic modeling have done (e.g., Hannigan et al. 2019; Kaplan and Vakili 2015). With respect to Stop-Word Elimination and Lemmatization, we employed WordNetLemmatizer in the NTLK package, a leading platform for building Python programs to work with human-language data. Furthermore, we removed low-frequency words, which only appear in less than ten documents, and high-frequency words, which appear in more than 50% of all documents.

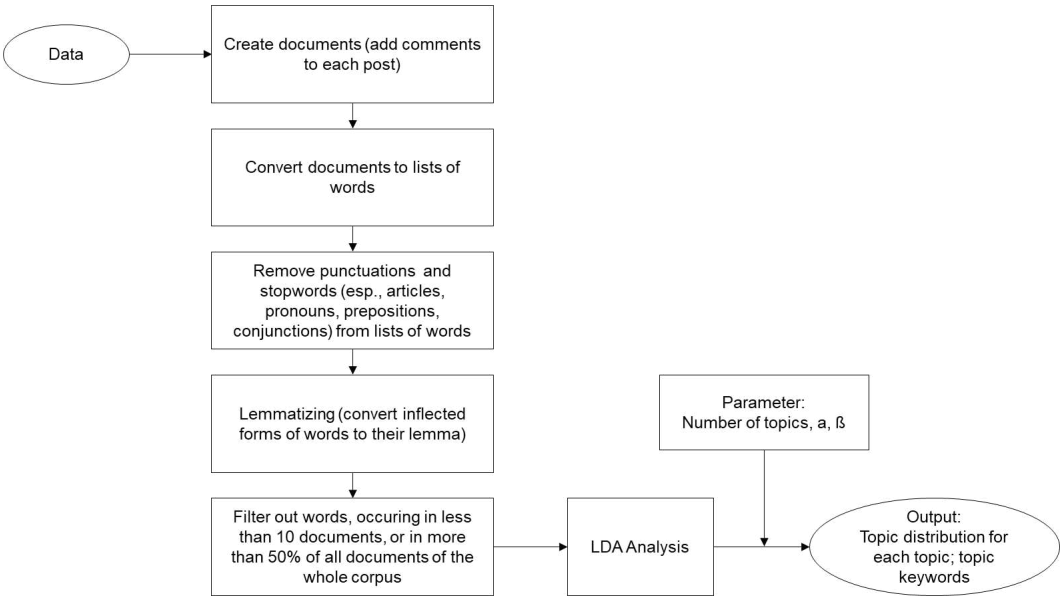

Figure 19. LDA Analysis Procedure

In the following LDA-analysis step, we employed Gensim, one of the most commonly used open-source Python topic-modeling packages, used and cited in over 500 commercial and academic applications. Thus, we worked with the Python library Gensim to build a topic model and trained an LDA model with varational Bayes (VB) sampling (Hoffman et al. 2010).

The analysis is based on the hyperparameters alpha, beta and the number of topics. Here, alpha controls the topic distribution per document and beta controls the word distribution per topic. The alpha and beta values used for this study were determined based on the recommendations of the developers of the model (Griffiths and Steyvers 2004). The alpha value is equal to 50 divided by the number of topics and the beta value is equal to 0.01.

As mentioned, LDA needs to be given, a priori, a parameter that tells it the number of topics in the corpus. Selecting a number that is too small could cause unnecessary generalizations, whereas choosing an overly large number could cause redundancy. Therefore, regarding the optimal number of topics, we used the coherence score as a measure to evaluate the results of the model. A widely used measure for evaluating topic models, originally also used by Blei et al. (2003), is perplexity. It measures how well a trained LDA model can predict a sample of documents in terms of their topic distribution. Measures such as perplexity, while useful for measuring model performance, are not able to determine the meaningfulness of the computed topics from a human perspective (Chang et al. 2009). For this reason, coherence measures have been proposed that directly evaluate the retrieved topics based on their semantic coherence. In the domain of coherence measures, the Cv measure shows the highest correlation with human topic ranking (Röder et al. 2015; Syed and Spruit 2017). It is an indicator of how interpretable a topic is to humans. In this study, interpretability is the most important factor for the output of topic modeling to derive challenges of online freelancers during the subsequent grounded theory coding process. To determine the optimal number of topics, we ran the algorithm for different topic numbers, $T = [5,10, \dots,95,100]$, and evaluated the emerged topics, whose scores are shown in Table 38. Up to the number of 15 topics, the coherence score increases to the value of 0.380. However, if the number of topics is further increased, the score slowly decreases, which means that a more adequate division of topics is not achieved. We have therefore set the topic number at 15.

Number of Topics	Coherence Value
5	0.331797
10	0.368639
15	**0.380043**
20	0.376696
25	0.375529
30	0.376842
35	0.376465
40	0.373677
45	0.368708
50	0.365096

Table 38. Coherence Values for Different Number of Topics

Appendix B: Detailed Presentation of the Data Structure (P4)

Data (Interview Quotes)	1st Order Concepts	2nd Order Themes	Aggregate Dimensions
"And I started to apply for jobs at a very low price and I always wrote honestly that actually I have some experience, but I have to learn a lot but I feel that i'm able to complete the job. And I can do it at a very low price because it's a learning process for me."	circumvent non-existing reviews	start the advancement	advancement dynamics
"So it's kinda hard for me to get new projects… first projects, but then I got to know the Upwork readiness test. It's kind of a test which helps you to have a badge actually. So this badge really help new freelancers, to show that they are really good potential freelancers, obviously, they have not any project."			
"Yeah, I also wanted to mention that I have some colleagues that I work with on Upwork. So, I have a senior electrical engineer to me, he's retired, he lives in Brazil, and you know he's the one I mentioned before, who really helped me because he can come in and teach me so much of his prior knowledge."	leveraging personal network		
"So I actually started on Upwork and then I was having people who are my friends, so they are on the same team as well. I taught them how to get the projects and etcetera			

and help them to be successful with first two projects."			
"What I did is like, I had implemented the solution in my daily job so what I did is I took the solution, half of it and submitted it in the proposal. So I think they got interested and I got the ping back so that's the trick I used actually I just gave the half solution."	get first job, whatever it takes		
"Because at that level is… it's almost like a piranha tank of people making new accounts and just scheming some money out of the platform or other…other very bad experiences that my clients have shared you know, trying to get a cheap job done. And that's where you kind of have to shoot in the beginning because you're an unknown quantity. I worked for $25 an hour, I think. My first job was for $10, and I did someone's homework, which I'm not proud to admit."			
"I always put a little more into the work than the client wanted. Then it's a little over dosed and then you have a little buffer if anything else should still be."	image management	getting credible	
"I have 5 out of 5 stars there and I also do relatively much for the fact that the clients are very satisfied with me. I am very, I say, service-oriented and then maybe go the extra mile for no money to just then have a good client relationship which maybe not everyone does."			
"I started with one learning management system. I started with "moodle". And after that… now after five years, I work with more than 30 learning management systems. And, initially, I was not able to take new e-learning authoring, it's like a different domain of experience. So also I build that because when I met like projects, I grew up with them like they demanded more and more and more, and then I built my things, according to that. So initially I only	build expertise & positioning in DLM		

knew one platform that was moodle learning management system but later… now I can do more than 30 learning management systems and all the rest of the authoring tools that are available out there. So definitely it was a really huge career development and a skill development for me."			
"And actually, my strongest skill, is not web development or full stack. It's about security. So, actually I'm not working on what I'm expert at, you know. Yeah, it's like just starting and keep going, you know. Like job after job. Probably I can get specialized this way, just start in like life, you know. Like a lot of people start working as…in the in the base of the pyramid and start like looking, 'Oh, this I'm good, this is not.' and actually you just start looking for things you can do very quick and you can get the most money of that."			
"So what you can do, so I sent more offers. Some I think I just got out of luck, because it wasn't anything complicated. And what really helped me is that, is that I work with cloud services, and for cloud services there are not so many freelancers who really want to work for very little money."	quickly complete many projects		
"You need to apply to as much as possible jobs on Upwork, but as jobs don't stand, when somebody posts a job, you need to be on the platform. So when the job just come in, be among the first persons that apply on it. So like that you have many more chance to be contacted."			
"When I am sleeping, they [the team] are awake so they can manage that and it really helps a lot. So it is like under the same umbrella there are multiple people and if one is available, he is taking over and he is doing the job."	membership in groups or teams		
"Most time when you work with the team, you break down complex issues that could be resolved by different people. And be-			

cause we are also sharing ideas from others, it makes the whole work easier for you. Sometimes you don't have to spend a lot of hours trying to figure out how to go about things when you have a good team you're working with, you could just say, I'm struggling with this, how could I go about it? And somebody say, can you try this? [...] So working with a team for me has more advantages."			
"I'm just trying to develop my business and start a company because of this I have now already taken 3 freelancers on board with whom I can also work in a team on the project, especially if the project is somewhat more extensive. That would be a bit beyond the scope for a single person at least according to the opinion of the clients."	take orchestrator role	becoming famous	
"I have an assistant actually who comes in. I just hired him, I had two assistants last year over the course of the year, one during the winter and one during summer. And yeah, I tend to hire an in-person assistant to work with me in my lab and I also pay them through Upwork. They make an Upwork profile, and I tell them 'You're an independent contractor, congratulations.'"			
"Yeah, as I said earlier you have to study the profile of the employer, to understand how big the company is, what are they doing. You should read their job post very well. After that you should search on the internet about the employer and try to study everything you can. Not even on the job, also you have to dig about the organization itself, to understand the full picture. That will help you a lot to understand what they need exactly from the job. Sometimes the person who is writing the job post is not a very technical person, that's your… I think that's your mission to discover what actually they need, not what have they written only."	increase value creation by supporting clients in architectual & design decisions		

"In fact, I always try to... so for me it's a no-go to simply work through things as they are written and then at some point deliver a product without communication. So I like to challenge, that is, if, for example, the app developers have made suggestions on how they want to implement things, I also say on the basis of my experience that I have just said is it really the most useful or can we not here and here and that and that so that is a bit better, more effective. The clients now also outside of teams, if it's just direct clients I always try to bring my know-how, my experience with bring in if I see somewhere stumbling block, if I see somewhere okay, that could not be the best solution that I think of at least then I always try to be active there also advisory."			
"You should show commitment and deliver a product that satisfies the customer and not wipe the penny on a quick wave, but approach it properly and professionally."	be a specialist		
"You have to be very good at what you want to do. If you are only good, there is a lot of competition that can do it better."			
"I had a break at Upwork, a few months. I was pregnant and I wasn't feeling so great, so I took a break from Upwork. And after that, when I started again, well, when you have a break, it's a bit difficult to start again. And then I also looked on other platforms and I was looking for projects on Upwork at the same time."	longer platform absence	losing touch to the digital labor platform	decline dynamics
"Well, maybe one because it's really like up to date, now because i'm expecting my third child and I just wanted to know from upwork that, how can I go on maternity leave. You know, without losing any reputation."			
"I moved to Germany in 2019, yes in December 2019. And I would say my freelancing business is going a bit worse here, because I had to change my address on Upwork and my hourly rate. And honestly to say I had more offers, so more job offers	move to another country		

when I was in Ukraine. I'm not sure why, actually I analyzed it, and probably the clients, they want to work more with Eastern Europeans, with Russians, Ukrainians and Belarusians. Because actually quality and cost they are best balanced compared for example with European freelancers, they want more money but work quality is mostly not as high as with Eastern Europeans."			
"Normally I need to stay up late, because I was getting jobs in the nighttime, because most of the community stays in Canada and US. That is something which was effecting me."			
"... randomness of the platform, if one is once banned or blocked. Then it is all gone from one day to the next. It was once blocked one day and then released again when a warning was checked. [...] At this point, it would be tragic if our profile was deleted. Ideally, at some point, 80% could be generated organically via our website or our company and 20% maybe via platforms, perhaps with a little diversification on 1-2 platforms, because you never know what will happen."	platform exclusion		
"I worked for a company which I decided to work with outside of Upwork and I got scamed for three months without pay with promises of better future of the company and I was not the only one. We were like 10 or 15 people. The scam was something that set me back in my career. Me agreeing to work outside of the platform and than getting scamed. That was the main issue."			
"I stopped dealing with unverified clients. If it's related to a company or a team, I request the info about the company. If I find their...them unconvincible, so I just ignore them."	unplanned waste of time for applications	drawbacks in the job acquisition phase	
"I think some of the projects, there are dummy projects right, they're just there. I don't have evidence right, but I think that			

some, I would say probably 40% of the projects maybe 30% are dummy projects like they don't really exist they're just posted there just to attract people to come in and look at the projects right. If you make a bid, nothing will happen right."			
"Because there are these millions of freelancers on the platform, and if you should not reply on the time, then the job just comes in 15 minutes and goes by."	not responding to client requests		
"You need to apply to as much as possible jobs on Upwork, but as jobs don't stand, when somebody posts a job, you need to be on the platform. So when the job just come in, be among the first persons that apply on it. So like that you have many more chances to be contacted."			
"You realize there that you'll be left behind relatively quickly if you don't develop further, and you'll always be stuck with some small, quotation marks, booger jobs, and I think that's what most people don't want in the long term."	skill obsolescence		
"So, at first, I focused more on system programming like doing back-end applications or tools utilities, and C or C++ and some scripting and then that was for the first maybe three, five years and then I realized that the trend has changed. The main trend that I see is there's a spike in security projects, because as you know securities is a big thing, right. There is that and then there's also demand on the networking. And the good thing is that's within the area of my expertise use a build design and create networking appliance, and so I always deal with networking and security like almost daily basis, so I focused more on my career in networking security, so I took certifications I had two certifications. One from network security plus, I'm not sure if you're aware of that organization, it was 30 plus I also had certification from the SEC. So, the importance of certifications because clients			

are inclined to give projects to freelancers who are certified right in these particular areas, especially when it comes to security and networking. So, I focus on networking and security and the last three years. First was more interesting programming and the middle more on security and networking and the last three years, I kind of also changed my career trajectory, so I focus more on devops so it's more on deploying services in the cloud and managing the life cycle of a project or a software. [...] I had to invest and learn new skills."			
"I've had a negative experience in that regard too I'll say, where somebody called my work a tire fire and you know, tried to basically torpedo me out of the project, because they wanted to take full rein. And you know, they saw dollars and that was… so you have to watch out for that when you're working with other freelancers and building your team, you want people who are goal minded and work minded and not sort of greedy or petty."	team collabotation goes wrong	drawbacks during project execution	
"I've often been part of teams that were built up through Upwork and the language barrier can be a real hindrance and critical to the success of the project, because you have to make fewer extra rounds for any adjustments and whatever else because you misunderstand each other four or five times. "			
"Some people feel furious: 'Why didn't you answer me, why?' But I usually reply: 'I had some family problems.' Things like that. Depends on the type of person. If he's a good guy, he will pity you. Some clients just make a bad evaluation for you, If you are late replying to them."	bad accessibility		
"They need to have time routines, sleeping timing, sleeping routines…"			

"I got at the beginning…well one very angry client. I tried to do my best and unfortunately at the end he declined the work. I respect the client perspective. And it was… it was actually it was not… a large obstacles but he refused to continue and I respect his decision. And they moved to provide the best they can do for all other clients which, thanks to God, helped me to overcome this situation. So, the feedback…that helped a lot."	bad client evaluation (review)	drawbacks in the job evaluation phase	
"A bad review will be like the hell for a freelancer because there is no contract, and the freelancer depends on reputation."			
"I actually did have one project outside of Upwork, that had to come to a halt because of COVID. It just wasn't the time and they just put a stop to it, so that they could… you know take it back up when things were better. That's about it."	projects have to be cancelled by the freelancer		
"The best strategy is to have a very strong defined clear proposal for each job because there are always clients who always change the requirements, you know. It's like okay let's start the contract and I want these, these, these in this proposal, let's start it, okay after that requirement are developed the client see the product and say 'Oh, I want this, I want this, I want this.' and sometimes some clients want like that I do it for free. And that's not right. So, the best strategy is to be very clear before the proposal you know."			
"Somebody will post a job and say, do this. And when you start working, you finish doing the work and he will end the contract and pay nothing. So, we are discovered that has started happening. So they need to secure more the website and these clients, I don't know how they are, they have been accepted on Upwork, but as a freelancer, there are verifications and all those, but	clients cancel projects		

they don't do all that for customers. So anybody can just register and that's all. So they need to start also verifying the clients."			
"He wanted it on time and I was trying to let him know I needed some time to finish all this and stuff like that. I couldn't finish the rest. He just had to cancel the contract. So he was not really patient with me in that aspect. He was not really patient."			
"Most people see my profile, they see my work history, job completed successfully, no feedback given, 'Oh, I wonder why?'. And they'll see a feedback and then… the five stars… 'Oh, he get three and a half on this one' and but they're very accommodating and I can see that it ended amenably. I tend... I've only had one contract end badly. And I took the feedback to heart, it's hard because I do try to help people be very successful. And I am a bit of a self-sacrificing person in that regard, so I do feel like…it's a personal failure when I don't… my clients don't succeed."	projects are not closed or not evaluated		
"If you have multiple projects where they haven't given you feedback or haven't given you a review, that's bad for your rating and there are a lot of clients who forget about that or don't do that. They don't have time to do it. And I didn't know that in the beginning. And I didn't ask for it, for example, yeah."			
"I didn't get any projects on Freelancer.com so I just dropped that one. I just joined Upwork. […] I just forgot everything of my every experience with the Freelancer.com. I just thought this is a new platform I shouldn't be worried about my last one let's just go and try my best and let's see what happens."	platform switching	forced exit	exit dynamics
"I did try Freelancer and Fiverr and there was another one. Small gigs or something like that. I can't recall right now but its like micro gigs is what its called. But none of them convinced me. Actually Freelancer to			

me is just a rip off for a platform. Fiverr is more of a thing for projects that I can do this for you, I can do that for you. It never convinced me. It's like a very specific thing and the other one for micro gigs you need to get like an SMS and I never got it in order to get authorized. So I fell back into Upwork."			
"The difficulty in getting the job is the competition, both in terms of skills as well as cost. What I do plan to do is fine-tune my profile so that my skill set is more relevant to the jobs that I will be applying for. As well as reduce the costs that… the amount of money that i'll be requesting in the proposal to see whether that will increase… lead to actual positive responses. If that doesn't work I may consider Upwork to not be worth the effort."	exit after cost-benefit analysis		
"I didn't have, let us say… luck on Fiverr. I didn't have maybe enough some promotion or something I did not know. I didn't even actually pay too much attention they're."			
"Once we referred to our website and said that they could also contact us through it. Thereupon we got a warning directly. [...] Some clients who were really satisfied with us approached us outside of Fiverr at some point, googled us and wrote to us directly by email. And there are now also 2-3 business relationships developed, which only run outside of Fiverr. They have then sought the way out the platform themselves."	interceptions of clients	exit as stepping stone	
"I only work on Upwork. But obviously I have other clients, local clients from word of mouth. If they were able to find me on the platform then they will find me… but obviously if they saw my profile on Upwork and then they google my name and they come directly to my website and then they email me and ask me… then that's a different story because they didn't approach to the platform right. But if they approach			

through Upwork then I will go through that. But if they approach directly, through email then I will go directly. Because in that case, you found me also through Upwork yes, but then you google my name and then my name appears then it makes sence."			
"Upwork is a big platform where you can obviously gain a lot of money with it but its never as much as when you leave the platform with the knowledge you gained […]. Its a big knowledge giver. I think people should work on sites like Upwork just to get experience but not for a lifetime, just for long term means getting knowledge. Its just a place to grow, finally you should have a comfortable life, comfortable income and comfortable thinking."	exit into permanent employment		
"You will receive some sort of knowhow on Upwork. […] So if you learn something new it increase your revenues. Like the more item in your CV the more value you have or will have."			
"I then studied at some point and thought it was very cool and actually became very fond of the IT field for me, that is, software development and everything that has to do with data in any form, long before I graduated, which is why I already started my own business to some extent during my studies. At that time not yet via Upwork, but via various other German platforms where there were mini-jobs and jobs to be done as a student. Yes, and after graduation I joined a relatively large German online comparison company as a software developer. I have developed a bit there and then at some point I said that for me an employment relationship is not that what I want in the long term and have therefore started to found. First as a freelancer and now I want to build up a business piece by piece with a company and all the trimmings."	exit into an own business alone		
"I invest the time I spend on Upwork now in my own business […]. Now I already have			

a few websites that I develop for myself as a business."			
"It's like an exit strategy because I know five freelancers, they can do their job very good, so, I think it's very good to make a company outside of Upwork and provide the services."	exit into an own business with freelancers as partners		
"As I already have lots of experience in SAP, I have lots of friends and the same sort of technical skill people I've known them from the last five years, six years or something. So, what we did is we group together, and we call that the nine degrees. So that is what our group called, and, in this group, we have different sort of technologies, different people, so we are trying to build lots of projects irrelevant of technologies and get the projects and get that particular activity done."			
"I have customers that I met really, they came to the Philippines, we drank beer, shared in stories, it's kind of good right. So that doesn't happen if you're just restricted in a type of environment, so I also have customers before that became my project partners, so we started a startup or company."	exit into an own business with clients as partners		
"I have a few contacts from the platform itself because they contacted me to hire me remotely. Not to work on the platform anymore, so to get out of the platform and we continued our job. So, I took the… let's say I took the contact from the platform, and they continued in... in another way so… It depends how you use it always, it's not said that they have to do something. It's just how you use it, the platform, it depends how you use it and what benefits to you."			

Table 39. Data Structure

Appendix C: Complete Literature Review Table (P5)

Assignment to Signaling Types	Source	Sample	Signal	Signal Outcome
activating signals	Seifried 2021	freelancers	skill value, skill portfolio, reported offline skills	skill distance
	Goes and Lin 2012	transactions	certification	willingness to seek certification
	Pallais 2014	workers in an online labor market	personal information	hiring probability
	Kokkodis and Ipeirotis 2016	transactions	category-specific quality	worker quality
	Kässi and Lehdonvirta 2018	projects of gig workers	certification	earnings
	Kokkodis and Ipeirotis 2016	transactions	skills	
pointing signals	Hong and Pavlou 2017	software development projects	reputation	buyer selection
	Yoganarasimhan 2013	freelancers	price, reputation	
	Hong and Pavlou 2012	crowdworkers	average feedback ratings, project experience	provider pricing
	Gefen and Carmel 2008	programming transactions	relative bid price, purchasing power parity, client loyalty	winning bid
	Assemi and Schlagwein 2016	crowdworkers	reviews, average weighted rating, positive ratings, positive/negative comments	customer decision
	Horton 2019	recruiting invitations	capacity of workers	hiring probability
	Mill 2011	freelancers	reputation	
	Benson et al. 2020	workers in an online labor market	reputation	jobs, rejection rate, time to payment
	Lin et al. 2018	transactions	reputation, portfolio items	
	Hesse et al. 2020	platform users	rating, text review, profile image, self-description, identity verification	platform's degree of social interaction

	Moreno and Terwiesch 2014	software development transactions	reputation	probability of being selected, price
	Rahman 2018	client-contractor interactions	ratings	reputation
	Kanat et al. 2018	IT service providers	reputation	service provider survival
pointing & activating signals	Durward et al. 2016b	crowdworkers	different pointing and activating signals	bargaining power
	Kathuria et al. 2021	transactions	skill and achievement signals	supplier quality
	Holthaus and Stock 2017	freelancers	character traits, conventional and assessment signals	earnings
	Holthaus and Stock 2018	freelancers	tests, portfolio items, rating, self-promotion, ingratiation, price	
	Claussen et al. 2018	freelancer	skills, self-description, project experience	
	Banker and Hwang 2008	accounting services	past performance, achievements, skill certifications, top rated button	sales performance
	Lehdonvirta et al. 2019	transactions, micro providers	platform-generated, platform-verified and unverified signals	pay rate
supporting & pointing signal	Stanton and Thomas 2016	workers in an online labor market	outsourcing agency affiliation, feedback score	hiring probability, wages

Table 40. Complete Literature Review Table Regarding Signaling in Online Labor Markets

Appendix D: Data Structure (P5)

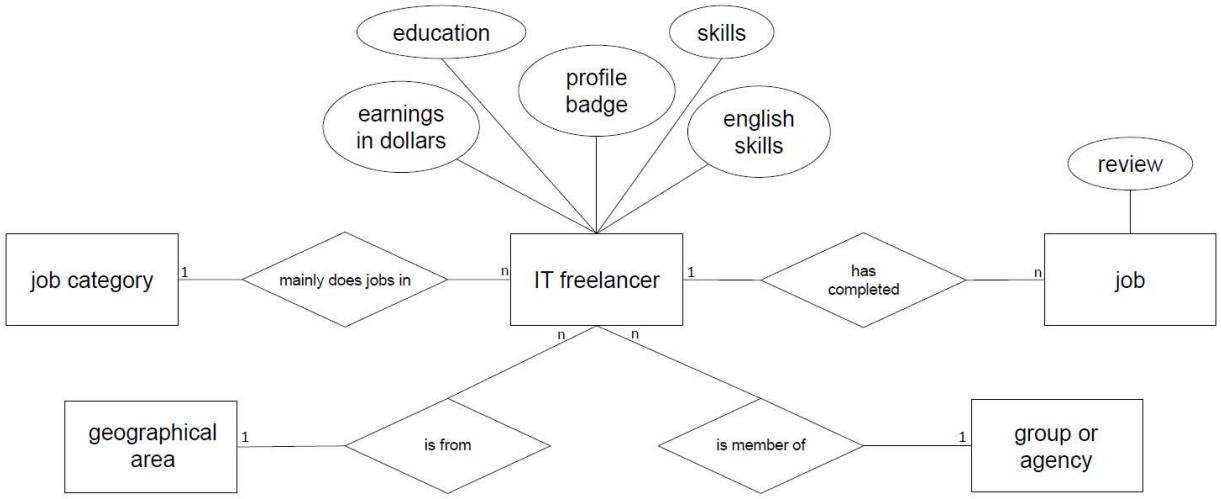

Figure 20. Data Structure