Crowdsourcing for paid work as a new form of employment relationship: A content analysis[1]

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Abstract An increasing number of people around the world engage in "crowdworking" (CW), defined as digital gainful work on intermediary internet platforms. Though this new work arrangement is a trilateral exchange involving the client, the crowdworker, and the platform, it still has an employment relationship at its core: A crowdworker is compensated for a personal service, and the work process is at least partly imposed on the crowdworker. This paper systematically reviews empirical research (k=118) on CW as an employment relationship, drawing on extant theoretical insights from human resource management and psychology. It uses an Input-Process-Output model and bibliometric network analysis to examine which topical areas of crowdworking-as-employment relationship have been covered, and which areas remain under-explored. The topical areas discussed in this paper comprise incentives, work design, the crowdworker's traits, skills, and working records as inputs; effort, affect, motivation, satisfaction, self-efficacy as process-level phenomena; and satisfaction, commitment, and performance as outputs. Reviewing these topical areas show that CW research focuses more on issues related to optimizing the task process from the platforms' perspective rather than on topics of interest from the crowdworkers' and the clients' perspectives. The paper concludes by identifying five important but under-researched fields, namely long-term strategic workforce planning, legal issues, leadership styles, careers on platforms and employment relations. Therefore, it shows that compared to regular employment relationships, CW raises old problems in new and partly complex variations, on account of higher coordination efforts, fewer legal boundaries, crowdworkers' paradoxical social roles, and intensive interactions with client and platform.

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1 Introduction

Paid online work brokered by intermediary internet platforms, "crowdworking" (CW), is a growing phenomenon of the digital economy (Boudreau, Lacetera, & Lakhani, 2011; Fabo, Beblavý, Kilhoffer, & Lenaerts, 2017; Horton & Chilton, 2010; Kittur et al., 2013). In 2013, 48 million crowdworkers took on some tasks brokered by CW platforms, and that figure was expected to rise to over 100 million crowdworkers in 2020 (Kuek, Paradi-Guilford, Fayomi, Imaizumi, Ipeirotis, Pina, & Singh, 2015). There are no official numbers on how many crowdworkers there really are, but it can be said that CW offers employment opportunities for people all over the world (Bracha & Burke, 2016). It attracts a whole range of persons, from freelancers to employees in a regular job, from people on parental leave to those physically restricted, from students to old-age pensioners (Brabham, 2012).

Given the huge variety of online activities, there has been some debate on how to define the broader term crowdsourcing and its variant CW (Estellés-Arolas & González-Ladrón-de-Guevara, 2012; Schulte, Schlicher, & Maier, 2020). Both involve a trilateral exchange between a platform, clients and a crowd of individuals, who conduct online activities (Schulte et al., 2020). The clients, who may be individuals, groups, or organizations, propose a digital task with a clearly defined goal on a platform (Estellés-Arolas & González-Ladrón-de-Guevara, 2012). The platform displays these tasks online by a call to a specified crowd, usually the platform's registered users. The call includes the description of tasks and information about the benefits for each party involved. Crowdworkers take on these tasks voluntarily (Estellés-Arolas & González-Ladrón-de-Guevara, 2012). They bring in their resources such as time, money, effort, or expertise in return for a whole range of benefits such as the intrinsic joy of doing the activity or receiving some payment (Estellés-Arolas & González-Ladrón-de-Guevara, 2012). Compared to related terms such as crowdsourcing, gig or platform economy, CW differs in terms of task type, compensation and contractual obligations (Schulte et al., 2020). CW platforms trade only in tasks with digital outcomes (Schulte et al., 2020), which makes it globally accessible. This accessibility sets it apart from the gig and platform economy which refers to nearly every type of work, including locally restricted work such as delivery services, that are only mediated online (Schulte et al., 2020). Digital tasks outsourced to CW platforms vary from simple and repetitive tasks such as tagging photos, answering surveys, training artificial intelligence software to challenging tasks such as writing sophisticated texts, graphical designing or programming software (Durward, Blohm, & Leimeister, 2016). Usually, platforms only trade in few related task types, which makes platforms highly specialized. CW is a subset

of crowdsourcing exchanges as it only refers to exchanges in which the users receive financial compensation for their contribution; it is paid online work mediated through a platform (Schulte et al., 2020). Despite crowdworkers being paid online work, there are no employment contracts involved (Schulte et al., 2020). Only few contractual obligations are applied, including non-disclosure agreements for critical clients' information or platforms' terms of agreement.

This paper systematically reviews empirical research on CW as an employment relationship between crowdworkers and the platform. These employment relationships result from regular interactions with each other, whereas interactions between crowdworkers and clients are more often one-off exchanges and in some cases are even conducted anonymously (Brabham, 2008; Zheng, Li, & Hou, 2011). Crowdworkers do not conclude a regular employment contract with the platform. Nonetheless, crowdworkers enter an employment relationship if we define this broadly as "the connection between employees and employers through which people sell their labor" (Budd & Bhave, 2019: 41). The employment relationship is multi-faceted, it involves among other aspects of pay, working conditions, training and participation. Employees need to be attracted, retained and motivated through incentives or an appropriate design of tasks. All these issues also confront platforms organizing crowdwork (Boons, Stam, & Barkema, 2015; Schulten & Schaefer, 2015). The issues have been examined broadly for decades if not centuries in disciplines such as economics, sociology, management and psychology. Research on CW should seek to draw on this huge body of work to understand the dynamics of CW, and existing studies often do. However, there is no systematic review of empirical studies from the perspective of CW as an employment relationship. Prior research appears to focus more on issues of information technology, marketing or business strategy rather than work and employment as such. Therefore, a content analysis about crowdworkers' employment relationship concerning e.g. pay, working conditions, work design, motivation, satisfaction and commitment as well as similarities or distinctions to regular employment would be beneficial to understand the dynamics of CW as a new form of employment relationships.

Zhao and Zhu (2014), whose work was already published online in 2012, were the first to review research on crowdsourcing, which is broader than CW because it includes non-compensated tasks. Based on 55 articles, they suggest that future research should describe more thoroughly what crowdsourcing is, and should explore crowdsourcing components and crowdsourcing applications in different settings. Buettner (2015) reviewed crowdsourcing from a human resource management (HRM) perspective. Based on 109 articles, he discusses how the workforce in the crowd can be coordinated by applying eight interrelated components,

namely job design and analysis, workforce planning, recruitment and selection, training and development, performance measurement, leadership, compensation as well as legal and ethical issues. Surprisingly, he does not devote special attention to paid online work. Two additional reviews chose an Input-Process-Output model (IPO) to conceptualize crowdsourcing processes and to describe the interactions of crowdsourcing components mainly from the perspective of the platform (Ghezzi, Gabelloni, Martini, & Natalicchio, 2018; Pedersen et al., 2013). Both articles touch upon employment issues, for example task complexity or skill requirements, monitoring and control devices. However, these problems are minor details within the reviews, which primarily concentrate on information science research and discuss crowdsourcing in general rather than focusing on CW as paid work.

Our review extends previous research in three ways. Firstly, we restrict the scope of the analysis to CW because only this segment of crowdsourcing constitutes an employment relationship as conventionally defined. Emphasizing employment relationships on CW platforms allows us to refer to the extensive research in HRM and psychology. Secondly, we only include empirical research as this is a research strategy of choice in disciplines studying the employment relationship. Hence, we exclude conceptual contributions or those that discuss the technological design of CW or crowdsourcing environments. Despite this rather specific focus, we have been able to find 118 primary studies (scientific papers, conference proceedings, and dissertations). Thirdly, we analyze the content of these primary studies for key topical areas of the employment relationship. The 21 topical areas comprise incentives, work design, the crowdworker's traits, skills, and working record, effort, affect, motivation, self-efficacy, satisfaction, commitment, and performance. The long list of topics is structured along an Input-Process-Output model, which is often used as an organizing framework and, as mentioned, has been applied in reviews on crowdsourcing already (e.g. Ghezzi et al., 2018; Pedersen et al., 2013). In addition, we conducted a bibliometric network analysis (van Eck & Waltman, 2010) to uncover how often different topics have been studied, in which combinations, and what topics or combinations have been under-researched or even missing.

In sum, this paper addresses important questions: What do we know about crowdworkers' employment relationship from empirical research concerning e.g. pay, working conditions, work design, motivation, satisfaction and commitment – in short, the topical areas that make up the employment relationship? Building on this, which problems in this relationship are similar to, and which are different from regular employment? Are any topics under-researched? Two main findings evolve from our content analysis: First, the trilateral exchange inherent to

CW seems to induce particular problems. From an HRM perspective, these include the negotiation of compensation and the financing of crowdworker attraction and development (Holmqvist & Spicer, 2013; Marchington, Rubery, & Grimshaw, 2011; Mitlacher, 2005). From a psychological perspective, new problems result from paradoxical demands made by platforms and clients, comparisons of fairness between multiple platforms and clients, and overload and stress through shared commitment and multiple loyalties (Holmqvist & Spicer, 2013; Marchington et al., 2011; Mitlacher, 2005). Second, previous research has neglected or under-researched particular areas that are of key importance to CW. For example, participation and performance have been studied frequently, but other important output variables such as commitment, satisfaction and crowdworker-task fit have not. More generally, prior work has often focused on questions surrounding the optimization of tasks from the platform's perspective and has less often examined crowdworker benefits. Future work should turn to a number of under-explored topics, namely long-term strategic workforce planning, legal issues, leadership styles, career opportunities and employment relations.

2 Crowdworking as an employment relationship

As paid online work mediated through a platform, CW establishes an employment relationship. Crowdworkers receive payment in return for providing an online service personally, and the terms and conditions of that service are largely imposed on the crowdworker in an authority relation with the CW platform and partially with its clients. Despite the missing employment or service contracts for these exchanges, CW constitutes an employment relationship, which comprises a whole range of exchanges. It "might consist of an immigrant day laborer paid by the bushel to pick fruit in the hot sun, a tech industry freelancer completing episodic gigs without ever meeting a boss, a salaried manager who has been working in an air-conditioned office for the same company for 40 years, or innumerable other situations." (Budd & Bhave, 2019: 41). Therefore, the huge body of work on the employment relationship, in particular the theories and concepts in HRM and psychology, also applies to CW and it can be brought to bear on a better understanding of this new form of work.

Research on the employment relationship has had a long tradition and is heterogeneous (Budd & Bhave, 2019; Kaufman, 2014). It includes insights from various disciplines such as economics, sociology, law, psychology, and philosophy. For practical reasons, we broadly distinguish a HRM perspective, which combines insights from various disciplines, and a psychological perspective, which focuses strongly on working conditions from a

crowdworkers' point of view. From the HRM perspective, the employment relationship is an exchange in which the terms and conditions need to be adapted continuously. An analysis of CW from this perspectives involves questions of incentives, bargaining power, investments in specific skills and crowdworker voice (Kaufman, 2010). In psychology, crowdworkers enter the employment relationship for the sake of individual motivation, which may be financial such as to earn an income, or personal such as needs for structure or group membership (Cascio & Aguinis, 2008).

When concepts of conventional employments are applied to CW, a number of old problems are likely to surface in partly new and complex ways. This is because CW differs from the dominant employment relationship in two ways. First, it is not based on a regular employment contract; crowdworkers are not hired as employees by the platform. They remain freelancers who conduct work as independent contractors. In terms of transaction cost economics, the CW relationship resembles sequential spot contracting, a series of repeated exchanges on particular tasks, rather than an open-ended relational contract (Williamson, Wachter, & Harris, 1975). Platforms are not obliged to pay crowdworkers on an hourly basis or provide them with a regular stream of tasks. Crowdworkers, in turn, are not bound to a particular platform. They may leave at any time without notice and can sell their services to multiple platforms. Still, crowdworkers often develop a long-term relationship with a particular platform and may even acquire some specific skills, for example when they conduct similar tasks for the same clients and when they become familiar with the technical infrastructure of the platform (Giard et al., 2019; Schulten & Schaefer, 2015). Hence, though the relationship in formal terms remains independent and on an equal footing, platforms and crowdworkers may become interested in a continuation of the exchange, raising questions of retention and pay. Crowdworkers, though formally self-employed, may in turn expect to be treated much like regular employees in terms of compensation, recognition, training opportunities and long-term employment.

Second, CW is a trilateral exchange. The client buys a service from the crowdworker, and the exchange is mediated by the platform, who provides the work environment and acts as a trustee. In regular employment contracts, the employer buys the labor service and organizes work on a daily basis. Hence CW blurs the clear exchange which characterizes the employment relationship, similar to other new forms of work such as external agency work and work in joint ventures, project-based partnerships and supplier networks (Rubery, Earnshaw, Marchington, Cooke, & Vincent, 2002). Trilateral exchanges may increase the costs of coordination, weaken incentives and lead to stress among crowdworkers. This is because platforms and clients may

articulate paradoxical demands; crowdworkers may engage in comparisons of fairness between multiple platforms and clients; and on account of shared commitment and multiple loyalties they may feel stressed and overloaded with work (e.g. Holmqvist & Spicer, 2013; Marchington et al., 2011; Mitlacher, 2005).

3 Method

3.1 Identification of primary studies

Our review aims at synthesizing research that focuses on CW as an employment relationship. In a first step, we conducted a keyword search in three important databases of HRM and psychology: Business Source Complete (i.e. more than 2,000 active full-text journals and magazines), PsycINFO (i.e. more than 2,500 active full-text journals and magazines) and EconLit (i.e. more than 660 active full-text journals and magazines). We limited the time period for our literature research from 2006 to 2019, since 2006 is considered as the first time the term "crowdsourcing" was established by Howe (2006). To identify potential work about CW, we used broad search terms which we retrieved from the literature, namely crowd work*, crowdwork*, crowd sourc*, crowdsource*, platform economy, gig economy or crowd employment. We equally searched for CW and related terms even though our scope for this review was on CW, because definitions of the two constructs have not been uniformly used in previous research. Therefore, we also expected relevant primary studies on CW under related keywords such crowdsourcing, platform economy, gig economy or crowd employment. This first search resulted in 1027 studies in total.

We identified relevant primary studies by applying three selection criteria to each primary study: First, a primary study had to report research on the construct of CW, which corresponded to our definition. Second, a primary study had to show an emphasis, or allows at least references to the employment relationship as studied in HRM and psychology. Third, a primary study had to present empirical work, either qualitative or quantitative. We then extended the search to papers published in conference proceedings potentially dealing with the topic, namely IEEE explore, HCOMP proceedings, ILERA, Academy of Management proceedings and relevant primary studies based on our previous individual research. On the remaining key articles, we applied an additional backwards search strategy on the references. As a result, 118 empirical primary studies about CW remained. For more detailed information about the searching process see Figure 1.

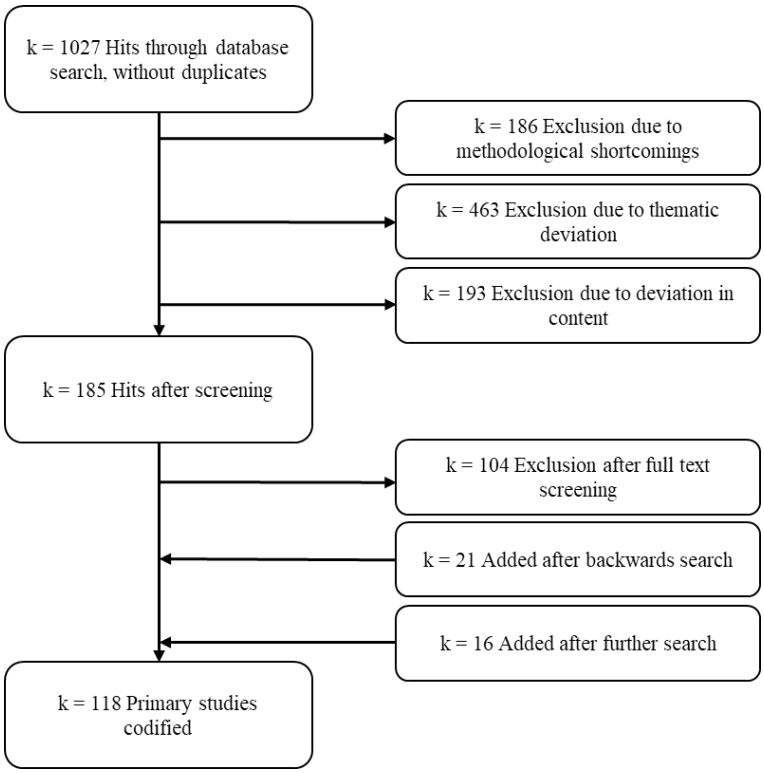


Figure 1. Search process

Among the primary studies included for our topical analysis, 87 were published in scientific journals such as Management Science, Organization Science, Research Policy, Management Information Systems and Information Systems Research, 24 primary studies were published in conference proceedings such as ACM Conference on Human Factors in Computing Systems, AAAI Conference on Artificial Intelligence and AAAI Conference on Human Computation and Crowdsourcing. As a result of their content fit and assessed quality, we also included 2 working papers and 5 dissertations. Of the 118 primary studies, a total of 99 different platforms were explicitly mentioned and surveyed such as Amazon Mechanical Turk, Elance, Taskcn, TopCoder and UpWork, to name just a few. Among these platforms, 43 trade in very simple and repetitive tasks (microtasks), 17 trade in tasks for innovation and idea generation, and the remaining ones are platforms for graphical design, software testing and development and for mixed types of freelancing work.

3.2 Coding procedure and content analysis

For each of the 118 primary studies we collected and coded general information on the article; information about the sample in terms of the studied platform(s) and crowdworkers; and details on research design. General information comprises author(s), year, title and publication type

such as journal, dissertation, conference, books or others. Platform information included the type of platform such as design, market, microtask, innovation, and testing or development (Durward et al., 2016); the platform's name, size, number of surveyed platforms in the article, and compensation system such as fixed pay rates or rating-based compensation forms. When crowdworkers were surveyed, we collected sample size as well as descriptive statistics on sex, age, nationality, occupation or specific target groups such as people with disabilities. Finally, information on the research design was documented, namely methodology, central research question, theoretical mechanisms, and reliability of measures.

A key outcome of our survey is an overview of the topics, which were focused on by primary studies. In a first step, we documented the constructs that these primary studies included into their research model. We applied a bottom-up approach by summarizing related constructs reported in primary studies to broader topical areas on the employment relationship. We grouped the topical areas following an Input-Process-Output (IPO) model as well as relating either to the platform, the task or the crowdworker. However, the client is not highlighted separately in this model, as the task dimension deals more comprehensively with all elements related to the source of the tasks, namely the client, and their processing on the platform. As a result of the two-way distinction, which distinguishes three IPO sections and three perspectives, we essentially propose a stacked version of three traditional IPO models. As other IPO models, it does not show causality or warrant predictions (Pedersen et al., 2013). However, it can help to distinguish the main antecedents, components and outcomes of the CW process (Ghezzi et al., 2018). Table 1 provides descriptions for each of the topical areas we included.

Table 1. Overview of formed input, process and output topical areas

Input Factor	
Qualification	A set of skills that crowdworkers bring with them, or the skill requirements that crowdworkers must meet to be suitable for a particular CW task.
Trait	Crowdworkers' personality traits and characteristics that describe or predict behaviors, cognitions or emotional patterns.
Work record	Quantitative (e.g. number of solved tasks or working time) and qualitative information (e.g. evaluation by the platform and clients) about crowdworkers' past task handling.
Monetary incentive	Incentives that are used to motivate crowdworkers to be active on a CW platform and compensate them financially for a satisfactory way of performing tasks.
Non-monetary incentive	Incentives that are used to motivate and recognize a high level of performance or success with non-cash rewards, such as privileges for task reservation.
Task design	Specification of the content of CW tasks, working procedures and practices as well as the relationships between these tasks.
Work environment	The organizational and technological constraints of the CW platform and CW market conditions shape the working environment for crowdworkers.
Process Factor	
Intrinsic motivation	Internal drive to perform an action because it is inherently interesting or enjoyable.
Extrinsic motivation	The drive to perform an action that is triggered by external stimuli.
Self-efficacy	Individual's beliefs about their capabilities to produce designated levels of performance.
Affect	Experience of feelings or emotions by the crowdworker during the CW process.
Condition appraisal	Crowdworkers' appraisals of task conditions, such as fairness, trust or psychological contract fulfillment.
Effort	The amount of toil a crowdworkers is willing to invest or already invested on a CW platform.
Enjoyment	Perceptions of joy and happiness during or because of an employment relationship on a CW platform.
Social exchange	Social behavior in the interaction of at least two parties conducting a cost-benefit analysis to determine risks and benefits.
Output Factor	
Job satisfaction	Positive state due to the assessment or experience of the employment relationship on a CW platform.
Commitment	Quality of the relationship between a crowdworker and a CW platform, the task, a client or CW itself.
Quantitative performance	The quantitative amount of measurable and relevant units of work performed on CW platforms.
Qualitative performance	The subjective assessment of how well crowdworkers perform on a CW platform or within a task.
Participation	The willingness of a crowdworker on a CW platform to perform tasks and engage in interactions on the platform.
Crowdworker-task fit	The match between the characteristics and skills of a crowdworker and the task requirements of a CW platform and its clients.

In a final step of the analysis, we sought to map how often each topical area has been discussed and combined with other topical areas. We conducted a bibliometric networks analysis using the visualization of similarities option in the software package VOS (van Eck & Waltman, 2010). In particular, the frequency of areas can be visualized by the knot size of a network, the frequency of connections by the thickness of lines, and the relatedness of areas by the distance between knots.

4 Findings

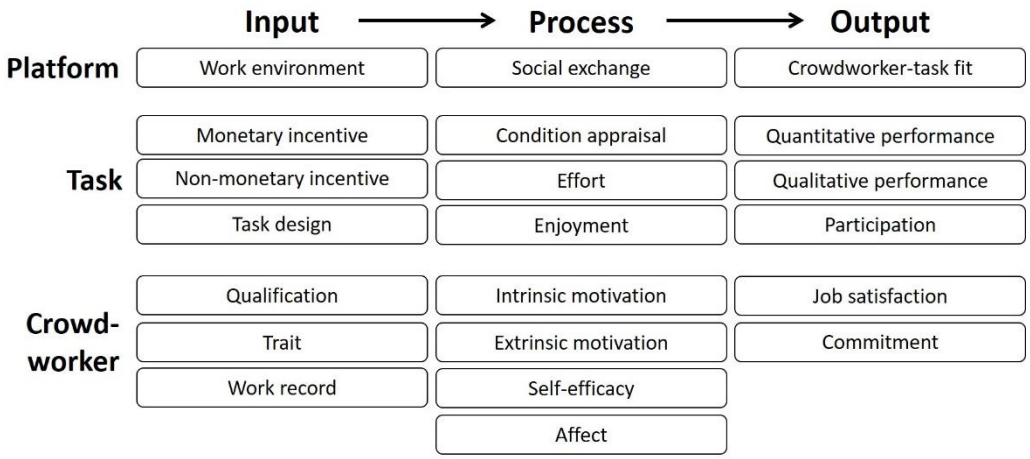


Figure 2. Input-Process-Output model based on formed topical areas of empirical literature on crowdworking

4.1 Input factors

For a better understanding of the IPO model in Figure 2, we briefly describe each topical area, their content and the observed relations between them. Table 2 and Table 3 provide an overview of identified primary studies.

The constructs discussed in 118 primary studies can be sorted into seven topical areas based on their similarity and content-related proximity. The topical areas *qualifications*, *traits* and *work record* are associated with crowdworkers. *Non-monetary incentives*, *monetary incentives* and *task design* are related to task. Finally, *work environment* is associated with the platform. As a result of the high number of researched relations in empirical primary studies, we highlight important themes for crowdworker, task and platform. Relations between areas which only mentioned marginally or not at all will be considered as under-researched topics or research gaps. Table 2 and Table 3 additionally illustrate these shortcomings or gaps by the small number of primary studies listed.

4.1.1 Crowdworker perspective

Qualification. Qualification refers to skill requirements that crowdworkers need to fulfil in order to be admitted to perform a certain CW task. These requirements mostly relate to crowdworkers' stated or validated skills, or reputation on the platform. Since CW platforms usually do not train their crowdworkers, information about crowdworkers' qualifications are

important to establish a match between skills and tasks and therefore to foster satisfactory outcomes. A considerable number of primary studies address this issue and show that qualifications can significantly increase crowdworkers' qualitative and quantitative performance, participation rates and job satisfaction (e.g. Chan, Li, & Zhu, 2015; Deng & Joshi, 2013; Frey, Lüthje, & Haag, 2011; Schemmann, Chappin, & Herrmann, 2017; Sodré & Brasileiro, 2017). Performance has been of particular interest. Several primary studies show that qualifications such as knowledge, experience or reputations positively influence the crowdworkers' success on the platform (Schemmann et al., 2017), the quality of results (Gadiraju, Fetahu, Kawase, Siehndel, & Dietze, 2017; Sodré & Brasileiro, 2017) and the innovativeness of ideas (Waldner, Poetz, & Bogers, 2016). How qualifications are precisely linked to the crowdworker-task fit or crowdworkers' perceived job satisfaction and commitment to the platform are less researched topics.

Trait. Trait refers to the crowdworkers' personality and characteristics that describe or predict behaviors, cognitions or emotional patterns. A number of primary studies show that crowdworkers' personality traits such as proactivity and creativity have a positive influence on their quantitative and qualitative performance on the platform (Goncalves, Hosio, Liu, & Kostakos, 2016; Samimi, Ravana, & Koh, 2016; Zhu, Djurjagina, & Leker, 2014). While performance is studied most often, one primary study also emphasizes the mixed impacts of personality traits on crowdworkers' job satisfaction during positive perceived events and negative perceived events (Brawley & Pury, 2016). The remaining primary studies also report mainly positive impacts of creativity and crowdworkers' socio demographics such as age and sex on crowdworkers' commitment to the platform (e.g. Franke, Keinz, & Klausberger, 2013) or willingness to participate (e.g. Franke et al., 2013; Goncalves et al., 2016). Even though there are primary studies that examined impacts of crowdworkers' personality traits and characteristics only a few report statistically significant findings. Reasons for this are manifold including crowdworkers' varying work and living conditions and differences in the scientific constructs. Accordingly, these are calls for additional studies to substantiate these findings.

Work record. Work record is defined in terms of solved tasks, time spent on task completion, the diversity of past solutions and other indicators of the handling of previous tasks. CW platforms as a digital work environment offer plenty of opportunities to legally track crowdworkers' activities on their own webpage through regular used HTTP cookies or logging protocols. These work records are often used to classify crowdworkers and to assign tasks or even incentives to crowdworkers based on their classification (Goes, Guo, & Lin, 2016). Some

primary studies show that crowdworkers' work records are associated with output measures such as future performance (Javadi Khasraghi & Aghaie, 2014), success on the platform (Schemmann et al., 2017; Schemmann, Herrmann, Chappin, & Heimeriks, 2016), and quality or quantity of generated content such as ideas in innovation processes (Bayus, 2013; Yang, 2011). Other primary studies focus on the influence of crowdworkers' work records on their commitment to the platform, contest participations and crowdworker-task fit. These reveal positive associations of work records with crowdworkers commitment to the platform (Boons et al., 2015) and crowdworker-task fits (Bracha & Burke, 2016; Carr, Hall, Mason, & Varney, 2017), whereas the relation to crowdworkers future participation is negatively associated (Heo & Toomey, 2016; Pee, Koh, & Goh, 2018; Wa Chan, Yiyan Li, & Jianjun Zhu, 2015; Yang, 2011). Possible reasons for this could be an increase in efficiency due to the experience of the crowdworkers over time or an adjustment of the work strategy to handle only a few, but more demanding and better paid tasks.

Table 2. Identified empirical primary studies on the influences of input and process areas on output areas

		Output: Platform	**Output: Task**			**Output: Crowdworker**	
	Areas	Crowd-worker-task fit	Quantitative performance	Qualitative performance	Participation	Job satisfaction	Commit-ment
Input: Platform	Work environment	-	Agapie, Teevan, & Monroy-Hernández, 2015; Calefato, Lanubile, & Novielli, 2018; Devece, Llopis-Albert, & Palacios-Marqués, 2017; Frey et al., 2011; Guth & Brabham, 2017; Liu, Xia, Zhang, & Wang, 2016; Straub, Gimpel, & Teschner, 2014b; Straub, Gimpel, Teschner, & Weinhardt, 2014a; Tran, Yonatany, & Mahnke, 2016	Ågerfalk & Fitzgerald, 2008; Hui, Glenn, Jue, Gerber, & Dow, 2015; Martinez, 2017; Walter & Back, 2011; Xu, Ribeiro-Soriano, & Gonzalez-Garcia, 2015	Hui et al., 2015; Thebault-Spieker, Terveen, & Hecht, 2015; Tinati, Luczak-Roesch, Simperl, & Hall, 2017; Ye & Kankanhalli, 2015; Ye & Kankanhalli, 2017; Zolkepli, Hasno, & Syed Mukhiar, 2015	Deng & Joshi, 2016	Hui et al., 2015; Kinnaird, Dabbish, Kiesler, & Faste, 2013; Shaqrah & Noor, 2017; Walter & Back, 2011
Input: Task	Monetary incentive	-	Acar, 2018; Dalle, den Besten, Martínez, & Maraut, 2017; Füller, Hutter, & Fries, 2012; Ikeda & Bernstein, 2016; Kittinger, 2015; Liu, Yang, Adamic, & Chen, 2014; Ming, Yiling, & Yu-An, 2014; Oberoi, Haon, Patel, & Bodas-Freitas, 2016; Riedl & Wooley, 2017; Yang, 2011; Yang, 2012	Acar, 2018; Goncalves et al., 2016; Goncalves, Hosio, Rogstadius, Karapanos, & Kostakos, 2015; Kittinger, 2015; Krause & Kizilcec, 2015; Lee, Chan, Ho, Choy, & Ip, 2015; Liu et al., 2014; Ming et al., 2014; Riedl & Wooley, 2017; Walter & Back, 2011; Xiao Liu, Yang, Adamic, & Chen, 2014	Acar, 2018; Battistella & Nonino, 2013; Brabham, 2008; Gadiraju, Kawase, & Dietze, 2014; Goncalves et al., 2015; Goncalves et al., 2016; Jiang, Wagner, & Nardi, 2015; Lee et al., 2015; Pee et al., 2018; Xiao Liu et al., 2014; Yang, 2011; Ye & Kankanhalli, 2017	Brawley & Pury, 2016; Durward & Blohm, 2017; Gadiraju et al., 2014	Ho, Slivkins, Suri, & Vaughan, 2015; Kinnaird et al., 2013; Kittinger, 2015; Ming, Yiling, & Yu-An, 2013; Walter & Back, 2011

Table 2. Continued

		Output: Platform	Output: Task			Output: Crowdworker	
Input: Task	**Area**	Crowd-worker-task fit	Quantitative performance	Qualitative performance	Participation	Job satisfaction	Commitment
	Non-monetary incentive	-	Calefato et al., 2018; Devece et al., 2017; Yang, 2011	Dalle et al., 2017; Goh, Pe-Than, & Lee, 2017; Lee et al., 2015	Al Sukaini, Ali Khalaf Mohammed, Zhang, & Albazooni, 2015a; Battistella & Nonino, 2013; Brabham, 2008; Feng, Jonathan Ye, Yu, Yang, & Cui, 2018; Franke et al., 2013; Layas, Petrie, & Power, 2015; Lee et al., 2015; Pee et al., 2018; Tinati et al., 2017; Yang, 2011; Ye & Kankanhalli, 2017	-	Franke et al., 2013
	Task design	Bracha & Burke, 2016; Carr et al., 2017; Schulze, Seedorf, Geiger, Kaufmann, & Schader, 2011	Agapie et al., 2015; Barbosu & Gans, 2017; Calefato et al., 2018; Dalle et al., 2017; Ghezzi et al., 2018; Goncalves et al., 2015; Gould, Cox, & Brumby, 2016; Guth & Brabham, 2017; Heo & Toomey, 2016; Javadi Khasraghi & Aghaie, 2014; Liu et al., 2014; Oberoi et al., 2016; Straub et al., 2014b; Yang, 2012	Al Sukaini, Ali Khalaf Mohammed, Zhang, & Albazooni, 2015b; Faullant & Dolfus, 2017; Goncalves et al., 2015; Gould et al., 2016; Krause & Kizilcec, 2015; Lasecki, Rzeszotarski, Marcus, & Bigham, 2015; Lee et al., 2015; Samimi et al., 2016; Waldner et al., 2016; Walter & Back, 2011; Wang, Nickerson, & Sakamoto, 2018; Wu, Kim, Chen, & Johnson, 2017	Al Sukaini, Ali Khalaf Mohammed et al., 2015b; Brabham, 2008; Chan et al., 2015; Faullant & Dolfus, 2017; Feng et al., 2018; Gadiraju et al., 2014; Heo & Toomey, 2016; Jiang et al., 2015; Lee et al., 2015; Sun, Wang, & Peng, 2011; Yang, 2011; Ye & Kankanhalli, 2017	Brawley & Pury, 2016; Deng & Joshi, 2016; Durward & Blohm, 2017; Gadiraju, Kawase, Dietze, & Demartini, 2015; Ichatha, 2013; Sun et al., 2011	Hui et al., 2015; Walter & Back, 2011

Table 2. Continued

		Output: Platform	Output: Task			Output: Crowdworker	
Input: Crowdworker	**Area**	Crowd-worker-task fit	Quantitative performance	Qualitative performance	Participation	Job satisfaction	Commitment
	Qualification	Barnes, Green, & deHoyos, 2015; Carr et al., 2017	Bayus, 2013; Calefato et al., 2018; Frey et al., 2011; Javadi Khasraghi & Aghaie, 2014; Liu et al., 2014; Nov, Laut, & Porfiri, 2016; Oberoi et al., 2016; Schemmann et al., 2017; Straub et al., 2014a; Straub et al., 2014b; Xiao Liu et al., 2014; Xu et al., 2015; Yang, 2011; Yang, 2012	Ågerfalk & Fitzgerald, 2008; Barnes et al., 2015; Deng & Joshi, 2013; Samimi et al., 2016; Sodré & Brasileiro, 2017; Waldner et al., 2016; Xu et al., 2015	Battistella & Nonino, 2013; Chan et al., 2015; Deng & Joshi, 2013; Gadiraju et al., 2017; Pee et al., 2018; Waldner et al., 2016; Yang, 2011; Ye & Kankanhalli, 2015; Zheng et al., 2011	Deng & Joshi, 2013	-
	Trait	-	Agapie et al., 2015; Frey et al., 2011; Nov et al., 2016; Riedl & Wooley, 2017; Samimi et al., 2016; Schemmann et al., 2016; Wu et al., 2017; Yang, 2012; Yu, Willis, Sun, & Wang, 2013; Zhu et al., 2014	Ågerfalk & Fitzgerald, 2008; Barnes et al., 2015; Fuger, Schimpf, Füller, & Hutter, 2017; Gadiraju et al., 2017; Goncalves et al., 2016; Necka, Cacioppo, Norman, & Cacioppo, 2016; Poetz & Schreier, 2012; Riedl & Wooley, 2017; Samimi et al., 2016; Waldner et al., 2016	Al Sukaini, Ali Khalaf Mohammed et al., 2015b; Battistella & Nonino, 2013; Chan et al., 2015; Franke et al., 2013; Goncalves et al., 2016; Layas et al., 2015; Necka et al., 2016; Pee et al., 2018; Poetz & Schreier, 2012; Thebault-Spieker et al., 2015; Tinati et al., 2017; Waldner et al., 2016; Zheng et al., 2011; Zhu et al., 2014	Brawley & Pury, 2016; Deng & Joshi, 2013; Deng & Joshi, 2016; Gadiraju et al., 2015	Franke et al., 2013; Necka et al., 2016

Table 2. Continued

		Output: Platform	Output: Task			Output: Crowdworker	
	Area	Crowd-worker-task fit	Quantitative performance	Qualitative performance	Participation	Job satisfaction	Commitment
Input: Crowdworker	Work record	Bracha & Burke, 2016; Carr et al., 2017	Bayus, 2013; Calefato et al., 2018; Javadi Khasraghi & Aghaie, 2014; Schemmann et al., 2016; Schemmann et al., 2017; Yang, 2011; Yang, 2012	Barnes et al., 2015; Peer, Vosgerau, & Acquisti, 2014	Chan et al., 2015; Heo & Toomey, 2016; Pee et al., 2018; Tinati et al., 2017; Yang, 2011	-	Boons et al., 2015
Process: Platform	Social exchange	-	Oberoi et al., 2016; Riedl & Wooley, 2017; Schemmann et al., 2017	-	Al Sukaini, Ali Khalaf Mohammed et al., 2015b; Battistella & Nonino, 2013; Feng et al., 2018; Shen, Lee, & Cheung, 2014	-	-
Process: Task	Condition appraisal	-	Goncalves et al., 2015; Schemmann et al., 2017	Faullant, Fueller, & Hutter, 2017; Waldner et al., 2016	Faullant et al., 2017; Franke et al., 2013; Martinez, 2017; Pee et al., 2018; Waldner et al., 2016; Ye & Kankanhalli, 2017; Zheng et al., 2011	Barnes et al., 2015; Brawley & Pury, 2016	Boons et al., 2015; Faullant et al., 2017; Franke et al., 2013; Schulten & Schaefer, 2015; Shen et al., 2014
	Effort	-	Calefato et al., 2018; Gould et al., 2016; Javadi Khasraghi & Aghaie, 2014; Yu et al., 2013	Al Sukaini, Ali Khalaf Mohammed et al., 2015b	Al Sukaini, Ali Khalaf Mohammed et al., 2015b; Heo & Toomey, 2016	-	-
	Enjoyment	-	-	-	Al Sukaini, Ali Khalaf Mohammed et al., 2015a; Battistella & Nonino, 2013; Brabham, 2008; Feng et al., 2018; Ye & Kankanhalli, 2017	-	-

Table 2. Continued

		Output: Platform	**Output: Task**			**Output: Crowdworker**	
	Area	Crowd-worker-task fit	Quantitative performance	Qualitative performance	Participation	Job satisfaction	Commit-ment
Process: Crowdworker	Intrinsic motivation	Barnes et al., 2015	Tran et al., 2016	Barnes et al., 2015	Al Sukaini, Ali Khalaf Mohammed et al., 2015b; Battistella & Nonino, 2013; Feng et al., 2018; Martinez, 2017; Tinati et al., 2017; Ye & Kankanhalli, 2017; Zheng et al., 2011	Brawley & Pury, 2016; Ichatha, 2013	Liang, Wang, Wang, & Xue, 2018
	Extrinsic motivation	-	Füller et al., 2012; Goncalves et al., 2015	Goncalves et al., 2015	Al Sukaini, Ali Khalaf Mohammed et al., 2015b; Battistella & Nonino, 2013; Brabham, 2008; Jiang et al., 2015; Pee et al., 2018; Zheng et al., 2011	-	Liang et al., 2018
	Self-efficacy	-	-	Barnes et al., 2015	Brabham, 2008; Feng et al., 2018	-	-
	Affect	-	Calefato et al., 2018	-	-	Brawley & Pury, 2016	Boons et al., 2015; Schulten & Schaefer, 2015

Table 3. Identified empirical primary studies on the influences of input areas on process areas

		Process: Platform	**Process: Task**			**Process: Crowdworker**			
	Area	Social exchange	Condition appraisal	Effort	Enjoyment	Intrinsic motivation	Extrinsic motivation	Self-efficacy	Affect
Input: Platform	Work environment	-	Fieseler, Bucher, & Hoffmann, 2019; Shaqrah & Noor, 2017; Ye & Kankanhalli, 2017	Calefato et al., 2018	-	-	Schulze et al., 2011	-	-
Input: Task	Monetary incentive	Brawley & Pury, 2016	Fieseler et al., 2019; Franke et al., 2013; Kinnaird et al., 2013; Ye & Kankanhalli, 2017	Gadiraju et al., 2017; Henley, Reed, Reed, & Kaplan, 2016; Hsieh & Kocielnik, 2016; Ming et al., 2013; Sun, Wang, Yin, & Zhang, 2015	-	Pee et al., 2018; Sodré & Brasileiro, 2017	Battistella & Nonino, 2013; Füller et al., 2012; Schulze et al., 2011	-	-
	Non-monetary incentive	Faullant & Dolfus, 2017; Feng et al., 2018; Kosonen, Gan, Vanhala, & Blomqvist, 2014	Fieseler et al., 2019; Franke et al., 2013	Goes et al., 2016	Feng et al., 2018; Goh et al., 2017	Battistella & Nonino, 2013; Faullant & Dolfus, 2017; Feng et al., 2018; Goh et al., 2017; Pee et al., 2018	Al Sukaini, Ali Khalaf Mohammed et al., 2015b; Battistella & Nonino, 2013	Feng et al., 2018	Boons et al., 2015

Table 3. Continued

		Process: Platform	**Process: Task**			**Process: Crowdworker**			
	Area	Social exchange	Condition appraisal	Effort	Enjoy-ment	Intrinsic motivation	Extrinsic motivation	Self-efficacy	Affect
Input: Task	Task design	Brawley & Pury, 2016; Feng et al., 2018; Kosonen, Gan, Olander, & Blomqvist, 2013; Stieger, Matzler, Chatterjee, & Ladstaetter-Fussenegger, 2012	Boons et al., 2015; Fieseler et al., 2019; Franke et al., 2013; Ye & Kankanhalli, 2017	Al Sukaini, Ali Khalaf Mohammed et al., 2015a; Calefato et al., 2018; Chandler & Kapelner, 2013; Goncalves et al., 2015; Javadi Khasraghi & Aghaie, 2014; Stieger et al., 2012; Sun et al., 2015; Zhao & Zhu, 2014	Feng et al., 2018	Dalle et al., 2017; Feng et al., 2018; Ichatha, 2013; Schäfer, Antons, Lüttgens, Piller, & Salge, 2017; Sodré & Brasileiro, 2017; Zheng et al., 2011	Schulze et al., 2011; Stieger et al., 2012; Zhao & Zhu, 2014	Feng et al., 2018; Sun et al., 2015	-
Input: Crowdworker	Qualification	Oberoi et al., 2016	Fieseler et al., 2019	Deng & Joshi, 2013; Javadi Khasraghi & Aghaie, 2014	-	Battistella & Nonino, 2013	-	Deng & Joshi, 2013; Gadiraju et al., 2017	-
	Trait	Brawley & Pury, 2016; Kosonen et al., 2014; Riedl & Wooley, 2017; Shen et al., 2014	Schulten & Schaefer, 2015	Chandler & Kapelner, 2013; Hsieh & Kocielnik, 2016	-	Battistella & Nonino, 2013; Zheng et al., 2011	Al Sukaini, Ali Khalaf Mohammed et al., 2015b; Battistella & Nonino, 2013; Layas et al., 2015	-	Schulten & Schaefer, 2015

Table 3. Continued

		Process: Platform	**Process: Task**			**Process: Crowdworker**			
Input: Crowdworker	**Area**	Social exchange	Condition appraisal	Effort	Enjoyment	Intrinsic motivation	Extrinsic motivation	Self-efficacy	Affect
	Work record	-	Boons et al., 2015	Calefato et al., 2018; Javadi Khasraghi & Aghaie, 2014; Yang, 2011	-	-	-	-	Boons et al., 2015

4.1.2 Task perspective

Non-monetary incentives, *monetary incentives* and *task design* focus on characteristics of the task itself, which are determined by clients' individual demands and the platforms' procedures.

Non-monetary incentives. A non-monetary incentive is a "non-cash award given in recognition of a high level of accomplishments or performance […]" (Rose, 1998). Most studies analyze the recognition of accomplishments or performance through gamified elements such as points, ratings, or leaderboards as forms of non-monetary incentives. These gamified elements are widespread on CW platforms and are often visible for others, which makes it possible to clearly communicate a crowdworkers' status on the respective platform. What these studies do not discuss are possible complementary incentives such as higher task availability or monetary incentives (e.g. higher pay rates per task). In sum, non-monetary incentives in the form of gamified elements have mostly been associated with positive significant influences on crowdworkers' participation (Feng et al., 2018; Franke et al., 2013), quantitative (Yang, 2011) and qualitative performance (Dalle et al., 2017; Goh et al., 2017; Lee et al., 2015). When non-monetary incentives are offered, crowdworkers are more willing to submit their results (Franke et al., 2013), participate in contests (Feng et al., 2018), work more accurately and timely (Goh et al., 2017), and perform more tasks (Yang, 2011). Although there are differences between types of gamified elements and their influences, their effects are largely positive. Future research should turn to the joint effects of non-monetary and monetary incentives, which are combined in ingenious ways in so-called rating systems.

Monetary incentives. Studies on monetary incentives usually vary elements of pay systems in a controlled manner to examine effects on crowdworkers' performance, participation or job satisfaction. In particular, they vary task prizes (e.g. Hsieh & Kocielnik, 2016; Lee et al., 2015; Liu et al., 2014), pay additional bonuses (e.g. Ho et al., 2015; Ming et al., 2013, 2014), use different payout intervals for the earned income (e.g. Ho et al., 2015; Ikeda & Bernstein, 2016) or even shift from individual payouts to group incentives (Riedl & Wooley, 2017). Overall, the primary studies show that higher pay rates are associated with a significant higher participation (e.g. Hsieh & Kocielnik, 2016; Lee et al., 2015), qualitative performance in form of accuracy and novelty (e.g. Liu et al., 2014), quantitative performance (e.g. Füller et al., 2012; Yang, 2012), and a higher job satisfaction (Brawley & Pury, 2016). Paying additional bonuses are associated with a significant higher effort of crowdworkers and qualitative performance (Ming et al., 2013, 2014). Surprisingly, longer payout intervals in form of bulk payments significantly increase crowdworkers' quantitative performance in the form of task completion (Ikeda &

Bernstein, 2016). Finally, group incentives, which are very unusual in the CW context and mostly used in innovation contests, lead to an increase of team activity in such contests (Riedl & Wooley, 2017). Despite the different impacts of monetary incentives, the vast majority of corresponding primary studies focus on the performance aspect. Therefore, studies focusing on relations to other topical areas such as commitment or satisfaction are desirable.

Task design. Task design is one of the most frequently studied topical areas, since it includes specifications of CW tasks' content, working procedures as well as relations between these tasks. The topics studied here are mostly those studied for regular employment (Hackman & Oldham, 1975), namely core dimensions such as skill variety, task identity, task significance, autonomy and feedback. Several studies examined their influences on crowdworkers' qualitative (e.g. Krause & Kizilcec, 2015; Lee et al., 2015; Samimi et al., 2016) and quantitative work performance (e.g. Heo & Toomey, 2016; Straub et al., 2014b; Yang, 2012), job satisfaction (e.g. Brawley & Pury, 2016; Durward & Blohm, 2017; Ichatha, 2013) and participation (e.g. Feng et al., 2018; Heo & Toomey, 2016; Lee et al., 2015; Ye & Kankanhalli, 2017). Overall, these studies find that all five dimensions show a positive influence on crowdworkers' job satisfaction on the platform (Brawley & Pury, 2016; Durward & Blohm, 2017). While skill variety, autonomy and feedback additionally show a mainly positive association with crowdworkers' willingness to participate (Feng et al., 2018; Heo & Toomey, 2016; Lee et al., 2015; Ye & Kankanhalli, 2017) and their overall performance (Heo & Toomey, 2016; Lee et al., 2015; Straub et al., 2014b). Research gaps in this area include the impact of task design elements on the crowdworker-task fit or crowdworkers' commitment to CW platforms.

4.1.3 Platform perspective

Work environment. Work environment includes the organizational and technological constraints of the CW platform and CW market conditions (e.g. Frey et al., 2011; Liu et al., 2016; Walter & Back, 2011). Despite the small number of studies in this topical area and the strong focus on crowdworkers' performance, several interesting findings emerge. Some studies show that environmental factors can have a positive impact on crowdworkers' performance, for instance, when they receive performance feedback in moderately or strongly competitive situations (Straub et al., 2014b), use the anonymity on the platform (Hui et al., 2015), and when they perceive the involved costs (Guth & Brabham, 2017) or risks (Liu et al., 2016) resulting from requirements and task complexity as low. In addition to the perceived costs of the crowdworkers, the cost perception of clients was also examined. One study shows that high

codification, proposal and evaluation costs for clients' outsourced tasks have a negative impact on their intention to participate in CW initiatives (Ye & Kankanhalli, 2017). Apart from the influences on crowdworkers performance and clients' intention to outsource tasks, this topical area is less researched. Since the work environment highly influences the working and living conditions of crowdworkers, this area deserves more research in the future.

4.2 Process factors

The process section of the IPO-model is meant to illustrate how the input-output relationships are mediated or moderated by constructs of process topical areas. However, a large proportion of the empirical studies only focus on parts of these relationships by examining either the input-process relationships or process-output relationships. We have identified eight of these process topical areas and labeled them as: *intrinsic motivation*, *extrinsic motivation*, *self-efficacy* and *affect* related to the crowdworker; *condition appraisal*, *effort* and *enjoyment* related to the tasks; and *social exchange* related to the platform.

4.2.1 Crowdworker perspective

Intrinsic motivation. Intrinsic motivation refers to the internal drive to perform an action because it is inherently interesting or enjoyable (Ryan & Deci, 2000). The studies consider intrinsic motivation to do crowdwork either as one construct or by distinguishing different aspects such as learning, psychological empowerment, and crowdworkers' own values and norms. The research on the moderating or mediating mechanisms of learning often focus on the influences of monetary and non-monetary incentives (e.g. leaderboards, badges, profiles) (Goh et al., 2017; Pee et al., 2018) and task design elements (e.g. feedback) (Feng et al., 2018) as inputs on crowdworkers' participations as output (Al Sukaini, Ali Khalaf Mohammed et al., 2015b; Feng et al., 2018; Ye & Kankanhalli, 2015; Ye & Kankanhalli, 2017). At the same time, these studies show that input-output relationships with learning as the moderating or mediating mechanism are mainly positively related to each other. The studies on input-process relationships focus on how psychological empowerment or crowdworkers' values and norms are positively influenced by task design elements (e.g. autonomy) (Ichatha, 2013) and non-monetary incentives (Goh et al., 2017; Sodré & Brasileiro, 2017). The remaining studies on process-output relationships show positive associations between crowdworkers' intrinsic motivation and their perceived job satisfaction (Ichatha, 2013) and commitment to the platform (Liang et al., 2018).

Extrinsic motivation. Extrinsic motivation is based on external drivers for individual actions, such as the urge to generate income or reputation. The few related studies mainly examine input-output relationships moderated or mediated by the extrinsic motivations of crowdworkers and the direct effects of extrinsic motivations on output factors. In summary, the input-output relationship studies show positive influences of both monetary and non-monetary incentives on the participation of crowdworkers (Al Sukaini, Ali Khalaf Mohammed et al., 2015b) and their quantitative performance (Füller et al., 2012), which are positively moderated or mediated by extrinsic motivation. In addition, extrinsic motivation related to the urge for recognition or money directly influences the intention of crowdworkers to participate (Al Sukaini, Ali Khalaf Mohammed et al., 2015b; Zheng et al., 2011) and their quantitative and qualitative performance on the platform (Goncalves et al., 2015). However, the influence of input factors on the factor extrinsic motivation seems to be of less interest in research.

Affect. Affect as crowdworkers' experience of feelings or emotions is a topical area, which has not received much attention in the literature. Only direct influences of crowdworkers' perceived affect on CW outputs seemed to be of interest in past research. The four corresponding studies show significant positive influences of crowdworkers' affect or sentiments on their commitment and loyalty to the platform (Boons et al., 2015; Schulten & Schaefer, 2015), whereas affect has mixed effects on crowdworkers' quantitative and qualitative performance (Brawley & Pury, 2016; Calefato et al., 2018). Understanding what drives crowdworkers' affects and sentiments on CW platforms and how they moderate or mediate input-output relationships would be a promising extension of this research.

Self-efficacy. Self-efficacy as a topical area includes constructs regarding individual's beliefs about their capabilities to produce designated levels of performance. Four studies consider drivers of crowdworkers self-efficacy and how self-efficacy may influence crowdworkers' level of participation on the CW platform (Deng & Joshi, 2013; Feng et al., 2018; Gadiraju et al., 2017; Sun et al., 2015). These studies come to the following conclusions: Mediated by crowdworkers' perceived self-efficacy, point rewards (a non-monetary incentive) and feedback giving (a task design element) are associated with a significantly positive effect on crowdworkers' level of participation (Feng et al., 2018). Besides point rewarding and feedback giving, further studies show additional significant positive relations of crowdworkers' qualifications and the task complexity, which is a task design element, on crowdworkers' perception of their self-efficacy (Deng & Joshi, 2013; Gadiraju et al., 2017; Sun et al., 2015). Self-efficacy is a topical area deserving further research, since low self-efficacy potentially

leads to higher attrition rates on CW platforms. Inputs directing crowdworkers' self-efficacy towards a more realistic level could improve crowdworkers' and platforms success.

4.2.2 Task perspective

Condition appraisal. Condition appraisal refers to the appraisal of working conditions by crowdworkers in connection with the tasks. A large share of the relevant studies deals with the influence of trust (Faullant et al., 2017; Franke et al., 2013; Waldner et al., 2016), fairness and psychological contract performance, on the commitment of crowdworkers to the platform (Boons et al., 2015; Schulten & Schaefer, 2015), their intention to participate (Ye & Kankanhalli, 2017; Zheng et al., 2011) and their job satisfaction (Brawley & Pury, 2016). For example, studies on fairness show that transparency, intellectual property, monetary profits and reputation are key factors in the perception of procedural and distributive fairness by crowdworkers on a CW platform (Franke et al., 2013). With the exception of monetary profits, the other factors are positively related to both dimensions of fairness perception (Franke et al., 2013). Furthermore, an increased perception of fairness has a positive effect on the commitment of crowdworkers to the platform, their intention to participate (Faullant et al., 2017; Franke et al., 2013) and qualitative performance aspects such as value creation (Waldner et al., 2016). As other studies show, commitment to a platform is also positively influenced by the crowdworker's appraisal of working conditions as respectful (Boons et al., 2015), immersive and influenceable (Schulten & Schaefer, 2015). While participation is also positively influenced by trustful working conditions (Ye & Kankanhalli, 2017; Zheng et al., 2011) and the job satisfaction of the crowdworker by fulfilling psychological contracts (Brawley & Pury, 2016). Similar to the antecedents or related factors that influence fairness perception, further studies that consider the antecedents of trust, respect, immersion and psychological contract fulfillment would be desirable.

Effort. Effort refers to the amount of toil a crowdworker is willing to invest or has already invested during a working relationship. Despite the similarities between effort and performance, crowdworker effort is defined as only one aspect of individual performance alongside quantity and quality of output. Existing studies primarily focus on how effort mediates various input-output relationships and which constructs have an influence on crowdworkers' effort on a CW platform. They show that efforts, such as invested time, positively mediate the input-output relationship between various task design elements (e.g. complexity, visual and non-visual content) on one hand and crowdworkers participation on a CW platform as well as their qualitative and quantitative performance on the other (Al Sukaini, Ali Khalaf Mohammed et

al., 2015a; Calefato et al., 2018). Furthermore, effort also positively mediates the input-output relationship between crowdworkers qualification (e.g. tenure) or work record (e.g. last performance) and their qualitative and quantitative performance on the CW platform (Javadi Khasraghi & Aghaie, 2014). As far as antecedents are concerned, effort is positively influenced by meaningful tasks (Chandler & Kapelner, 2013), monetary (Gadiraju et al., 2017; Henley et al., 2016; Hsieh & Kocielnik, 2016; Ming et al., 2013; Sun et al., 2015; Zhao & Zhu, 2014) and non-monetary incentives like a crowdworker rating (Goes et al., 2016) as well as by workers underlying intrinsic and extrinsic motivations (Goncalves et al., 2015; Liang et al., 2018). Overall, the studies examining effort exclusively focus on task-related outputs, such as performance and participation. Research considering the potential mediation or moderation effects on other input-outputs relations would be interesting as well as efforts to examine the relations between crowdworkers effort and their satisfaction or commitment to the CW platform.

Enjoyment. Perceptions of pleasure and happiness resulting from an employment relationship are constructs summarized by the topical area enjoyment. The enjoyment of CW tasks has not been covered extensively in previous work. Nonetheless, a few studies address mediation effects of crowdworkers' enjoyment and on which input variables impact its perception. One study shows that enjoyment positively mediates the input-output relationship between point rewarding (a non-monetary incentive) or feedback giving (a task design element) and crowdworkers intention to participate on CW platforms (Feng et al., 2018). Two further studies emphasize the positive impact of enjoyment on the participation intention (Al Sukaini, Ali Khalaf Mohammed et al., 2015b; Ye & Kankanhalli, 2017). Furthermore, the remaining study in this context emphasizes in detail the positive effects of virtual badges, leaderboards and individual profiles (i.e. non-monetary incentives) on crowdworkers perceived affective, cognitive and behavioral enjoyment (Goh et al., 2017). Open questions still remain, such as how crowdworkers personality traits drive their enjoyment.

4.2.3 Platform perspective

Social exchange. Social exchange as a topical area refers to interactions of at least two parties in employment relationships on CW platforms. Although previous work on this topic is minimal, some studies examined in detail what factors influence the social exchange on a platform, especially knowledge sharing. The studies cover various of potentially influencing constructs such as crowdworkers' pay satisfaction, positive and negative affect, psychological contract fulfillment, intrinsic motivation, task design elements such as feedback, autonomy and

task significance, recognition of peers and clients, qualifications as well as personality traits (Brawley & Pury, 2016; Kosonen et al., 2013; Kosonen et al., 2014). They conclude that especially feedback and support from clients, trust in the platform, work autonomy, openness to new experience, friendships between peers, intrinsic motivations, such as learning or social benefits, positively impact a crowdworker's knowledge-sharing intention. The question as to how knowledge-sharing intentions impact outputs was not part of these studies. However, further studies do address the effect of social exchanges on output variables such as participation and quantitative performance. One study concludes that acting as a team (i.e. as a social exchange) has a positive impact on a crowdworker's participation (Shen et al., 2014). Other studies show that social exchange positively influences the input-output-relationships between group cash incentives (i.e. monetary incentives) or team skills (i.e. qualifications) and crowdworkers team performance (Oberoi et al., 2016; Riedl & Wooley, 2017). It would be interesting to include in future studies other forms of social exchange in addition to the knowledge sharing such as the perception of companionship, support and acceptance on the CW platform.

4.3 Output factors

In the area of output *job satisfaction* and *commitment* are related to the crowdworker's perspective. *Quantitative* and *qualitative performance* as well as *participation* are assigned to the task-related view, and *crowdworker-task fit* as a topical area is mostly related to the responsibility of the CW platform.

4.3.1 Crowdworker perspective

Job satisfaction. Job satisfaction refers to constructs considering crowdworkers positive or negative state caused by their appraisal or experience of the job (Roodt, Rieger, & Sempane, 2002). Existing studies mostly focus on the impact of classical work design characteristics such as task variety, task significance, task identity, feedback and autonomy on job satisfaction (Brawley & Pury, 2016; Ichatha, 2013; Sun et al., 2015). These studies show that especially feedback from clients, and autonomy in form of psychological empowerment and decision-making authority have significantly positive effects on crowdworkers' job satisfaction. Additionally, the topical area of monetary incentives also has been linked to job satisfaction showing that an increased pay satisfaction also increases crowdworkers' job satisfaction (Brawley & Pury, 2016; Gadiraju et al., 2017), whereas researched impacts of crowdworkers' personality traits show very mixed results, which makes it difficult to describe tendencies for

specific traits (Brawley & Pury, 2016; Deng & Joshi, 2013). As can be seen, there are still several under-researched potential relationships that could explain crowdworkers' job satisfaction on a CW platform.

Commitment. Commitment subsumes constructs describing the quality of relationships of crowdworkers' to the platform, clients, tasks or CW itself. Though CW is a highly flexible work environment, this topical area has nonetheless been discussed in previous work. Several studies show that crowdworkers' actually do feel commitment to specific CW platforms. Constructs included in this area are loyalty (Faullant et al., 2017; Schulten & Schaefer, 2015), identification (Boons et al., 2015; Franke et al., 2013), engagement (Liang et al., 2018), and commitment as such (Schulten & Schaefer, 2015; Shen et al., 2014). These phenomena are strongly affected by variables discussed as process areas in the IPO model. Commitment is positively affected by positive condition appraisals and perceptions of fairness (Faullant et al., 2017; Franke et al., 2013), respect (Boons et al., 2015) or immersion during their work on the CW platform (Schulten & Schaefer, 2015). Furthermore, positive affect or sentiments in connection with the CW platform also increase crowdworkers' commitment (Boons et al., 2015; Schulten & Schaefer, 2015). Although these studies discuss interesting findings, they do not discuss different components of organizational commitment. Only one study considers one of three commitment dimension, namely the affective dimension (Schulten & Schaefer, 2015), whereas continuance and normative commitment dimensions as well as their combinations into commitment profiles are still missing. This could be a promising direction for further research in this context.

4.3.2 Task perspective

Quantitative performance. Quantitative performance summarizes variables that express the quantitative amount of measurable and relevant units of performed work on CW platforms. A hallmark of crowdwork is the large number of completed tasks produced within a short period of time. Therefore, not surprisingly, some primary studies apply output measures such as temporal aspects of quantitative performance, e.g. duration until completion, (Barbosu & Gans, 2017; Gould et al., 2016; Kittinger, 2015; Liu et al., 2014; Yang, 2011) or participation time (Liu et al., 2014; Yang, 2012). Other measures include the completion of the task (Ghezzi et al., 2018; Goncalves et al., 2015; Heo & Toomey, 2016; Zhu et al., 2014), its successful submission (Bayus, 2013; Calefato et al., 2018; Oberoi et al., 2016; Schemmann et al., 2016; Schemmann et al., 2017), the number of submissions per task (Bayus, 2013; Goncalves et al., 2015; Yang, 2011; Yang, 2012) and the number of a person's submissions for different tasks

(Barbosu & Gans, 2017). Quantitative performance has been investigated in the context of all topical areas of the input and process in our model with two exceptions: enjoyment and effort have not been investigated so far. Therefore, it is difficult to draw general conclusions as to which constructs mainly influence quantitative performance as it is linked to nearly all other topical areas. Strong links have been observed with monetary incentives (e.g. Acar, 2018; Füller et al., 2012; Yang, 2011), non-monetary incentives (e.g. Yang, 2011) and crowdworkers past work record (e.g. Bayus, 2013; Javadi Khasraghi & Aghaie, 2014; Schemmann et al., 2016), whereas work environment variables such as involved costs (Guth & Brabham, 2017) and risks (Liu et al., 2016) as well as task design elements such as task complexity (Yang, 2012) show mainly negative links to quantitative performance. Furthermore, there are still under-researched relations, for instance the moderation or mediation effects of crowdworkers' enjoyment or invested effort on crowdworkers performance.

Qualitative performance. Qualitative performance summarizes constructs in which crowdworkers' performance is assessed subjectively. A number of measures have been studied in previous work, in particular creativity (Acar, 2018), innovativeness (Faullant et al., 2017; Lee et al., 2015), originality (Wang et al., 2018), accuracy (Goh et al., 2017; Goncalves et al., 2015; Goncalves et al., 2016; Sodré & Brasileiro, 2017), reliability (Dalle et al., 2017; Samimi et al., 2016) and value of the created content (Waldner et al., 2016). The explanatory factors which have been studied closely resemble those examined for quantitative output. The positive link of monetary incentives with qualitative output has been investigated several times (Goncalves et al., 2015; Lee et al., 2015; Ming et al., 2014). Qualification has been examined by several studies but found little (Peer et al., 2014; Sodré & Brasileiro, 2017) or even no effect (Waldner et al., 2016) on qualitative performance. Non-monetary incentives such as badges or scores on platforms are also positively related to qualitative performance (Dalle et al., 2017; Goh et al., 2017). The topical area of task design, here the complexity of a task even at a medium level, seems to produce lower quality outputs (Krause & Kizilcec, 2015; Lee et al., 2015), a finding that seems to contradict research and models of task design. However, previous work rarely distinguishes between task types, such as programming, writing texts or simple and repetitive microtasks. Since work quality and its measures are highly task-specific, the influence of task type should be given more attention in future research.

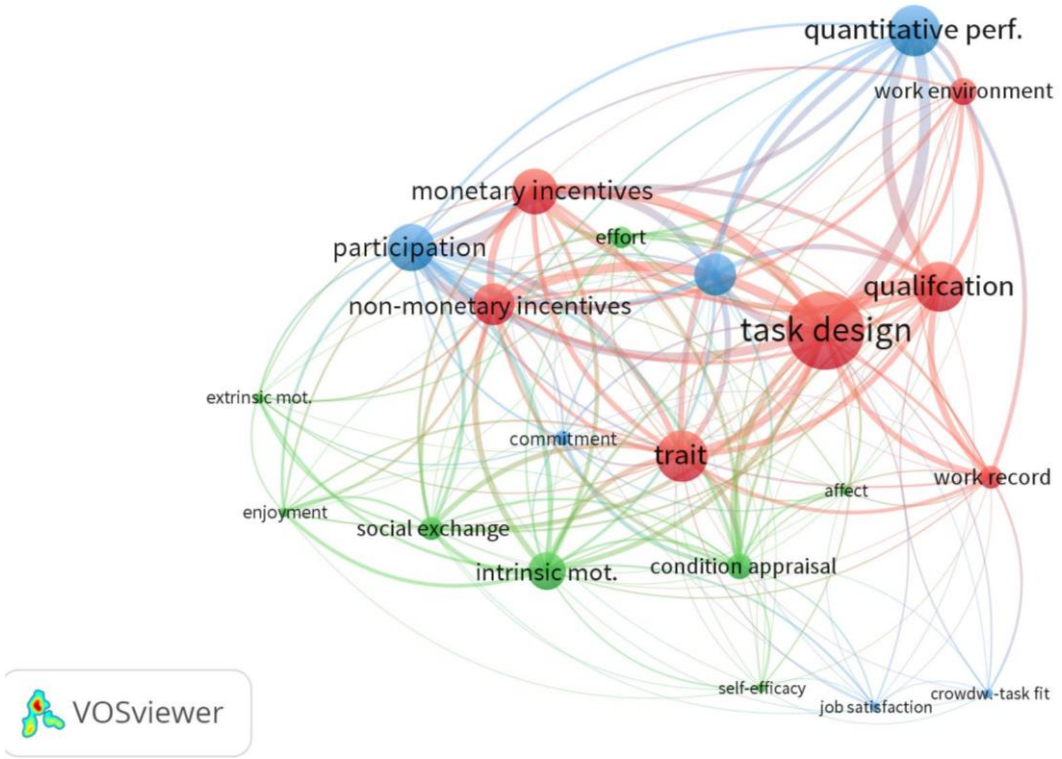
Participation. Participation summarizes constructs such as the willingness of task uptake, submitting of ideas or similar contributions (Al Sukaini, Ali Khalaf Mohammed et al., 2015b; Chan et al., 2015; Füller et al., 2012; Yang, 2011; Ye & Kankanhalli, 2017). There is extensive

research on participation because crowdworkers choose tasks by themselves instead of being ordered to or instructed by a supervisor; it is of particularly high practical interest to identify reasons for workers to take up certain tasks. Other measures of participation are the attractiveness of a single task (Liu et al., 2014), the interest raised by certain tasks (Faullant et al., 2017), the willingness to submit (Franke et al., 2013) and the anticipated motivation to participate (Tinati et al., 2017). Overall, measures of participation were shown to be associated positively to both monetary and non-monetary incentives (Feng et al., 2018; Liu et al., 2014; Pee et al., 2018). In line with this, measures of participation are also affected positively by extrinsic motivation (Al Sukaini, Ali Khalaf Mohammed et al., 2015b; Pee et al., 2018; Zheng et al., 2011) and intrinsic motivation (Martinez, 2017; Ye & Kankanhalli, 2017), which are process variables within the IPO model. What is largely missing is work on more long-term participation of crowdworkers on CW platforms and their tasks. Especially within the context of CW as an employment relationship without employment or service contracts, more constant and regular activities are likely to be of great interest to platforms and clients as they promote the predictability of an accessible workforce.

4.3.3 Platform perspective

Crowdworker-task fit. The area crowdworker-task fit is located mainly at the level of the platform because it is of interest to the specialized platform how their registered crowdworkers can be effectively assigned to tasks that are suitable to them. Only two primary studies actually focus on crowdworker-task fit. They show that detailed task-relevant reviews about crowdworkers qualifications and past performance positively influence the crowdworker-task fit (Bracha & Burke, 2016; Carr et al., 2017). Since it is an essential element of CW platforms to effectively match suitable crowdworkers with unresolved tasks, this area clearly calls for more research.

4.4 Bibliometric network



Notes: Number of occurrences of topical areas in this article (k = 118) were analyzed. Knot size represents frequency of topical areas. Thickness of lines indicate frequency of co-occurrence within primary studies. Distance between knots indicates relatedness of terms. The graphic was created with VOSviewer (van Eck & Waltman, 2010). Topical areas in red refer to inputs, in green to process topics, and in blue to outputs.

Figure 3. Results of the bibliometric network analysis of formed topical areas

In this section, the bibliometric network analysis illustrates and quantifies how the various topical areas have been covered in previous research. The result of the analysis is summarized in Figure 3. The analysis yields information about how often each topical area is covered (knot size), how often each area co-occurs with each of the other areas (line thickness) and how related or close each pair of topical areas is (knot distance).

It is obvious from Figure 3 that input and output topical areas are more frequently linked than input and process or process and output topical areas. Examples are links between task design and quantitative performance and between non-monetary incentives and participation. Process variables such as intrinsic motivation are studied less often. As this implies, most primary studies research main effects rather than moderation and mediation mechanisms. Most of the studies target particular outputs, namely participation, quantitative performance and qualitative performance and examine how they link to a small number of particular inputs, often task

design, crowdworker traits, their qualification and monetary incentives. Far fewer studies include crowdworker-related output variables such as commitment and job satisfaction. This is an interesting finding, because it shows that research interest has focused strongly on task process optimization from the platform's perspective rather than on the crowdworker's perspective. Among crowdworker-related output variables, commitment is covered most frequently. It is often combined with monetary incentives. Research on job satisfaction is less frequent, and it is driven by connections to task design as well as crowdworker traits. Connections to crowdworker-task fit are hardly covered. Only two studies consider crowdworker-task fit, controlled by the platform, and the influences through crowdworkers' qualifications and their working history. A number of process areas are not linked to any output areas at all, namely enjoyment, effort, self-efficacy and social exchange. These are all topical areas that plausibly could have an impact on output such as crowdworkers performance, intention to participate, or on factors describing crowdworkers perception of the work relationship.

As mentioned before, process variables are less often studied and combined with output variables, but there are two topical areas of research worth mentioning. Participation from the output dimension co-occurs with almost every process area (excluding crowdworker affect), in particular with intrinsic motivation, extrinsic motivation and social exchange. Furthermore, intrinsic motivation is most heavily covered, with direct combinations to almost any output area. Besides research connections of participation and intrinsic motivations, this supports the assumption that the surveyed studies seemed to be interested in main effects rather than moderation and mediation mechanisms. Nonetheless, it opens up varieties of possible extensions of research to moderating or mediating mechanisms.

Among the connections between input and process areas, the input areas of task design stand out. It is most frequently researched, with its impact on crowdworker effort and intrinsic motivation as the main focus. Among the input areas, monetary incentives, non-monetary incentives as well as crowdworkers' traits are also areas with a particularly high research density. These input areas are also related to task enjoyment and crowdworkers' self-efficacy, process areas which in general are not strongly covered. For the input areas of crowdworker's skills, work record and platforms' work environment, only 12 primary studies in total draw links to process areas. Several connections to process areas are missing such as those to task enjoyment, crowdworkers' intrinsic motivation, their self-efficacy and social exchanges on platforms.

5 Routes for future research on crowdworking

The previous section has documented an impressive landscape of empirical research on CW. However, many topical areas remain under-researched. In order to derive what we think are the most important routes for future research on this new form of employment relationship, we juxtapose in this section the topical areas identified in section 4 with key areas of traditional research on the employment relationship. When we identify gaps, these are natural candidates for research in the future – unless the topic is irrelevant for the particular conditions of CW.

The core topics of HRM research and research in industrial and organizational psychology can be gleaned from important literature reviews. Two reviews on HRM, one of which even focuses on crowdsourcing, list nine core areas (Buettner, 2015; Wright & Boswell, 2002): selection, training and development, recruitment, compensation, performance management, participation or work design, workforce planning, leadership, and legal and ethical issues. An important review on industrial and organizational (IO) psychology names 12 core areas (Cascio & Aguinis, 2008), which partly overlap with the HRM list: job analysis and design, predictors of performance, performance appraisal, training and development, reward systems, work motivation and attitudes, leader influences, work groups – teams, career issues, decision making, consumer behavior, and employment and legal issue. In total, 21 core topics from two disciplines, with extant research on work relationships, were identified as frequently occurring and highly relevant topics to study regular and irregular work arrangements in general.

Table 4. Input, process and output areas and their related human resource management or industrial and organizational psychology core topics

View	Topical area	HRM core topics	IO psychology core topics
		Input	
Platform	Work environment	Work design	Job analysis and design
Task	Monetary incentive	Compensation	Reward systems, work groups-teams
	Non-monetary incentive	Compensation	Reward systems
	Task design	Work design	Job analysis and design
Crowd-worker	Qualification	Training and development, selection	Training and development
	Trait	-	Performance appraisal, employment and legal issues
	Work record	Performance management, selection	Performance appraisal
		Process	
Platform	Social Exchange	-	Work groups-teams
Task	Condition appraisal	Ethical issues	-
	Effort	Performance management	Performance appraisal
	Enjoyment	-	Consumer behavior
Crowd-worker	Intrinsic motivation	Work design	Work motivations and attitudes
	Extrinsic motivation	Compensation	Work motivations and attitudes
	Self-efficacy	-	Work motivations and attitudes
	Affect	-	Work motivations and attitudes
		Output	
Platform	Crowdworker-task fit	Recruitment	-
Task	Quantitative performance	Performance management	Performance appraisal
	Qualitative performance	Performance management	Performance appraisal
	Participation	Participation	-
Crowd-worker	Job satisfaction	Work design	Work motivations and attitudes
	Commitment	-	Work motivations and attitudes

Table 4 compares the topical areas in CW research with the core topics in HRM and IO psychology. It is obvious that most core topic have been taken up to some extent in CW research. Though the frequencies with which areas are covered varies strongly, as the previous section has shown, Table 4 still illustrates that empirical CW research has already assembled a rich array of topics and insights. However, some core topics of traditional research have been missing in CW primary research. Since each of these core topics is important to CW, we argue that future research should turn to these five core areas.

Long-term strategic workforce planning. Workforce planning has not been studied in CW research. But CW relies on a flexible on-demand provision of work tasks and therefore a constant supply of crowdworkers, so long-term strategic planning of the workforce seems to be crucial for platforms, especially when they provide specialized services. One might argue the topic is even more important than for firms who offer regular employment contracts because

crowdworker turnover is high and participation voluntary on CW platforms. Previous studies have argued how important it is to generate strong emotional commitment to the platform among crowdworkers because the platform is dependent on a sufficient number of skilled crowdworkers who are willing to participate regularly (Boons et al., 2015; Schulten & Schaefer, 2015; Ye & Kankanhalli, 2017). Hence, strategic workforce planning seems to be an important area for future research. Interesting topics would be how to attract and retain suitable crowdworkers, how to increase or develop skills of registered crowdworkers, or how to foster crowdworkers' perception of membership, fairness, trust when they are part of the workforce.

Impact of legal issues. Empirical research on legal issues are mostly missing from the literature. Only one identified study touched on this topic by examining how intellectual property ownership influences crowdworkers' perceived distributional and procedural fairness (Franke et al., 2013). Legal issues are important in any employment relationship. But as CW is so new, it entails a whole range of unresolved, complex issues relating to employment law, patent inventorships, intellectual property ownership, and data security, to name only the major ones (Buettner, 2015). Legal issues may affect CW in various important ways. For example, the legal status of crowdworkers is partly unresolved and has important repercussions for social security and employment protection. Similarly, unclear or inappropriate ownership structures may prevent crowdworkers from participating in CW contests. Beside the risk of economic losses, it is reasonable to assume that these legal issues and resulting uncertainties also have an impact on crowdworkers well-being. There is therefore a need for research looking into how a legal framework creates a beneficial and healthy work environment.

Leadership styles. Leadership styles are not only a core topic for both disciplines, HRM and IO psychology, there has also been some research on remote leadership for virtual teams independent from their locations (e.g. Kelley & Kelloway, 2012). Although CW platforms do not have direct superiors with authority, the general concept of leadership is still applicable. After all, leadership refers to the guidance of individuals or teams by other individuals or an organization to achieve set goals, such as fulfilling outsourced tasks. By default, CW employment relationships reveal similarities to laissez-faire or transactional leadership styles because platforms and clients only define their individual requirements and goals as well as the compensation (Vries, Bakker-Pieper, & Oostenveld, 2010). As long as crowdworkers move within this framework, they are allowed to decide how to achieve the goals. Furthermore, these CW relationships also include elements of remote leadership styles, since crowdworkers receive their platforms' and clients' instructions and feedback entirely online via the CW

platform (Kelley & Kelloway, 2012). Though remote leadership has been studied before, we have not identified any empirical research on the impact of leadership on CW platforms.

Career development. Career or status development opportunities have not been studied at all. Some platforms offer crowdworkers with a long working history with the platform a position as community moderators or project leaders. The consequences of having different status positions requires more research. More importantly, some platforms have implemented rating systems that assign crowdworkers to a particular status based on their past record in terms of participation and quality of performance. Over time, crowdworkers may be promoted to a higher level in the rating hierarchy and will then receive higher pay rates, more demanding and interesting tasks as well as other privileges. Hence, moving up the rating system shares important features of a promotion in regular employment. The rating-based incentives may motivate crowdworkers in terms of participation. They may also help to retain and commit crowdworkers. This is because achieving a higher level in the rating system takes time and effort. When crowdworkers move to other platforms, they will forego the privileges of an experienced crowdworker and will have to re-build their status in the new environment. The consequences of these rating systems need further research. Furthermore, a status that is visible to other potential employers and the public may help to create an impression of CW as a serious alternative to regular employment. But these effects also need research.

Employment relations. Finally, there is still little research on employment relations, comprising the employment relationship as such and collective representation by works councils or trade unions. A few primary studies have measured crowdworkers' affective commitment to the CW platform (e.g. Boons et al., 2015; Schulten & Schaefer, 2015). These primary studies focus on the positive relations of pride and respect to organizational identification and membership as well as the positive effects of perceived fairness on affective commitment and loyalty to the platform. Further research considering different aspects of organizational commitment such as normative and calculative (or continuance) commitment would enrich the literature. As there has been some concern that platforms may offer low pay and poor conditions, future research should also focus on collective dimensions of the employment relationship, in particular the representation of crowdworkers by trade unions or similar organizations. No empirical research has been devoted to these issues, which are becoming more important in practice. For example, some platforms with a headquarter in Germany already cooperate with the union "IG Metall", the biggest single workers' union in Germany (Hofmann, 2017). They have developed a specific code of conduct, and the platforms

have committed themselves to paying at least the German legal minimum wage rate per hour. What impact such voluntary code of conduct and the observance of a minimum wage have on the quality of the employment relations and how the situation of crowdworkers in particular improves should also be researched in future studies.

6 Discussion and conclusions

In this paper we have analyzed the empirical results on employment relationships in CW, designed an IPO-Model, pictured the amount of research with a bibliometric analysis, and derived future research trends by a comparison of transitional research streams in our two disciplines. Our systematic and extensive content analysis differs from previous research in three ways. Firstly, we restrict the scope of the analysis to CW because only this segment of crowdsourcing constitutes an employment relationship as conventionally defined. This allows us to refer additionally to the extensive research in HRM and IO psychology and we emphasize that compared to regular work relationships, CW raises old problems in new and partly complex variations. Secondly, we only consider empirical primary studies as this is a method of choice in these disciplines studying the employment relationship. Thirdly, we analyze the content and researched constructs of these primary studies for key topical areas of the employment relationship. The extensive list of 21 topical areas is structured along a stacked Input-Process-Output model that additionally distinguishes inputs, processes and outputs for the CW platform, the CW task and crowdworkers, respectively. In addition, we conducted a bibliometric network analysis (van Eck & Waltman, 2010) to uncover how often different topical areas are studied and in which combination.

As it turns out, previous empirical literature has strongly focused on optimizing CW processes, which is mostly of interest to the platform. But we do not know much about many topical areas of the crowdworkers' perspective, such as job satisfaction, affect, enjoyment during crowdwork or commitment to a platform. Based on this evidence, we have identified five topics for future research, namely long-term strategic workforce planning, legal issues, leadership styles, career opportunities and employment relations.

In addition, this paper offers practical implications as it also contains various consequences for platform providers and their clients. Platforms may benefit from this review as a kind of checklist of components that need to be considered in the long run to keep up their business. Clients, on the other hand, may benefit of the better understanding of involved factors and its

similarities to established forms of regular or irregular work arrangements, which supports internal outsourcing processes.

This paper is not without limitations. Firstly, the research method employed for gathering and selection of the reviewed primary studies may not totally avoid any loss of information. Basing the review on different databases, conference publications as well as backwards searching approaches of primary studies references can possibly reduce this limitation. Secondly, although the authors were rigorous in the different steps, there may be some sort of observer bias in the selection of articles. This limitation should be attenuated by the breadth of the final database of articles reviewed and additionally, by cross checks between the authors. Thirdly, the deliberate choice of excluding primary studies based on methodological shortcomings, thematic deviation or deviation in content may have determined the loss of collateral information. On the other hand, including studies with methodological shortcomings and deviations in thematic or content may result in confoundedness and therefore, hardly interpretable and comparable results. Fourth, the Input-Process-Output model may suggest that there is a linear and one directional causal relationship between the formed topical area. This characteristic of the Input-Process-Output model should be carefully assessed in studies where the aim is to investigate causality relationships among the topical areas.

In conclusion, this paper provides a comprehensive overview of current empirical CW research and links it to key questions from previous research on employment relationship. Building on this, this paper questions whether CW is a completely new, disruptive form of work organization that threatens to replace regular forms of work. Rather, this paper suggests that CW shares a number of similarities with conventional employment relationships, making it an easily accessible global variant.

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