

# Co-creating platform governance models using boundary resources: A case study from dementia care services<sup>1</sup>

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**Abstract.** Digital labor platforms are gaining in popularity in our societies. Information systems and software engineering disciplines have focused on organizational and technological aspects of these platforms, favoring the views of platform owners. At the same time, extensive knowledge of how workers use these platforms, and how they are affected by them, is emerging within computer-supported collaborative work and human-computer interaction disciplines. These two strands of research, one favoring the views of the platform owners and the other advocating the views of the platform users, are mainly developed in parallel and without influencing each other much. In this paper, we describe a case study of designing a digital labor platform for person-centered dementia care in a small company. Dementia care illustrates an extreme case of a complex type of work. This complexity helps us debate some of the benefits and shortcoming of current platforms and platform governance models. We analyze our case using an adaptation of the platform boundary resources model. This model helps us illustrate the tensions between platform owners and workers. A focus on platform governance models and how we co-create such models can hopefully lead to better designs for both views.

**Keywords:** digital labor platform; digital platform; platform governance model; digital workplace; boundary resource; dementia care service; healthcare service; co-design; co-creation; person-centered dementia care; dementia.

## 1 Introduction

The platform model has become a leading business, organizational and technological model thanks to the astronomic growth of platform companies such

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<sup>1</sup> This is a preprint of the article published in the CSCW journal by Springer. See <https://doi.org/10.1007/s10606-019-09353-0>.

as Google, Amazon, Facebook and Apple (Tiwana 2013). A *digital platform* often underlies this platform model in modern companies. A digital platform can be defined as “a set of digital resources—including services and content—that enable value-creating interactions between external producers and consumers” (Constantinides et al. 2018). We also define *platformization* as the process of organizational, financial and technological transformation that an organization often has to go through in order to effectively utilize a platform model (see Zhu and Furr 2016 for an example of such a process). From initially being of interest to IS (Information Systems) and SE (Software Engineering), we have seen a recent increase of interest in platforms in HCI (Human Computer Interaction) and CSCW (Computer-Supported Cooperative Work). This interest has been partially surged by the current societal and political debates about global gig economies, on-demand workforces, crowdsourcing platforms etc. These various forms of two-sided economies (Eisenmann et al. 2006) –for instance the car-hailing services Uber and Lyft and the house rental service AirBnB –have become such dominant actors in our societies that governments are modifying current laws to regulate their disruptive effects. For instance, the Norwegian government recently published an in-depth policy document about the effect of sharing economies on the Norwegian society (Finansdepartementet 2017). The document makes several recommendations, including a liberalization of taxi driver permits.

In this paper we are interested in digital platforms that support the management and exchange of labor which is offered by an individual *worker* to a *consumer*, through a digital platform owned by a *platform owner*. We will call such platforms *digital labor platforms* (Choudary 2018) and will interchangeably use the terms digital platforms, or simply platforms throughout the paper. Digital labor platforms are not only used in global crowdsourcing and on-demand economies (Frenken and Schor 2017), where media coverage has recently been. We argue that this way of organizing labor is in fact becoming ubiquitous in most private and public, small and large organizations. This kind of platformization process is creating new *digital workplaces* for an increasing number of workers where management happens at arm’s length using digital tools. Digital labor platforms can eventually have a long-term impact on all forms of work, as we for instance see in the increasing dominance of “freelancing” and “peer-to-peer” as a new form of employment (Aloisi 2015).

Platforms are defined in different ways by different disciplines. What seems to be common is that the platform model divides the world into a *core* –owned by the platform’s owners –and a *periphery* –owned jointly by the platform’s owners and users<sup>2</sup> (Baldwin and Woodard 2011; Tiwana et al. 2010). The model enables strong network effects, scalability, and reduced transaction costs. Importantly, the model outsources innovation costs to users, or so-called *complementors* (Gann 2015;

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<sup>2</sup> The origins of the idea of core and periphery can be traced back to the work of Wallerstein on the world-systems theory. See for instance (Robinson 2011). We thank the reviewers for pointing this out.

Tiwana et al. 2010). Platform *governance models* are used by platform owners to promote and enforce specific types of behavior among users or complementors (Schrieck et al. 2016). Governance models have a strong impact on how collaboration among platform owners and complementors happens. As such, they are of concern to the CSCW community and a central topic in our study.

The IS discipline has studied platforms extensively (Constantinides et al. 2018; de Reuver et al. 2017). In the IS literature, the main beneficiary of a platform model is often the platform owner (Schrieck et al. 2016). Platform business and governance models are studied as tools to increase platform owner's revenue through managing external innovation (Boudreau and Lakhani 2009). As far as the users of the platforms –i.e. the workers and consumers –are concerned, extant IS literature often regards them as complementors that contribute to increased revenues for platform owners –obviously while creating revenues for themselves (Ceccagnoli and Forman 2012). IS literature does not pay much attention to how users experience digital labor platforms. This often results in an oversimplified perception of platforms as workplaces.

On the other hand, CSCW and HCI literature contains extensive amount of knowledge about how platform workers –and partly also consumers –experience platforms as digital workplaces. We will review some of this literature later. Platforms create invisible and remote/global management and governance structures that affect work environments and workers in radically new ways. Because of their focus on platform users, we believe that workplace studies from CSCW literature often provide local and partial views of platform ecosystems. They often neglect the views of other players –such-as platform owners –and fail to initiate a discussion about *why* platforms are built in certain ways (seemingly contrary to the interests of the workers).

Regardless of discipline, CSCW and IS researchers have studied workers and organizations in clearly defined –often physical –boundaries. In such settings, digital collaboration tools are merely additional elements in an already existing brick and mortar workplace, where employment, relationships between employers and employees, among employees, between employees and customers etc. are already regulated by existing social, legal, cultural, physical and other frameworks. In digital labor platforms none of this is the case yet. Frameworks are changed fundamentally (Choudary 2018; Aloisi 2015). We risk, as various researchers have expressed (Gupta et al. 2014; C. J. Martin 2016; Glöss et al. 2016), that these emerging digital and global workplaces will erode hard-won employee rights, and bring back a new form of Taylorism mediated by digital platforms.

Our research question is: "How can we design sustainable digital labor platforms to best support users when the task at hand is complex and requires creativity and local knowledge?"

Our long-term research agenda is to study digital labor platforms with respect to their capabilities and limitations to support complex services and tasks, where the

creativity of the users, and collaboration among them, play central roles. We believe that research can contribute to creating platforms that are sustainable economically, and at the same time are engaging and fair places to work. To achieve this, in this paper we propose to combine existing knowledge and theories from information systems and workplace studies. We believe it is at the boundary of these two disciplines that engaging and fair platforms can be designed. To combine knowledge from two fields, we apply an extension of an existing model, the platform boundary resource model (Ghazawneh and Henfridsson 2013), as an analytical lens. This model provides a useful way of materializing abstract business and governance models into digital artifacts that constitute the digital workplace encountered by platform users. In this way we can directly inform the design of new platforms and develop a set of guidelines for good platform development.

To demonstrate the usefulness of our proposal, we present empirical evidence in form of a case study of an evolving digital platform for exchange of dementia care services. This case study is based on our engagement with a Norwegian company during past years. Prevalence of dementia is rapidly increasing, making dementia care one of the most resource-demanding tasks facing healthcare systems in many countries (Prince et al. 2016). Community-based services –such as supporting family caregivers with paid caregivers or respite services –is one interesting area within dementia care in need of additional research (Dawson et al. 2015). The market for dementia services is fragmented, and there is a lack of structured and efficient ways of providing person-centered dementia care (Rothera et al. 2008; Lloyd and Stirling 2015). This makes dementia an interesting case for digital labor platform models.

Our case contributes to the study of digital labor platforms in several ways. First, contrary to the extreme simplification and standardization of work in many global labor platforms, our case presents a type of work that is complex, personalized and non-transactional. It demonstrates the need for continuity and local knowledge that is inherent in dementia care, and we contribute to the discussion of how this complexity affects the design and use of platforms (Kittur et al. 2013). Although we have seen an increase in research publications studying digital labor platforms, most of these studies focus on large global platforms such as Uber and Amazon Mechanical Turk. Our study, being about the initial design of a platform in a small company, contributes to extant research by demonstrating how a labor platform is initially conceived of and developed in small scale (Islind et al. 2016). By applying the boundary resources model, we also contribute to research and practice by proposing a structured way of co-designing and co-creating platforms where emphasis is given to all affected stakeholders, in this way improving the sustainability of such platforms. Our study contributes to the field of dementia care by documenting and demonstrating a structured technology-enhanced way of providing person-centered and activity-based dementia care services.

In the rest of this paper we first introduce relevant research in the field of digital labor platforms. We then introduce our case, i.e. dementia case services, and the company and the platform we have studied. Our case study method is then presented and is followed by our findings from the study, and finally a discussion of the findings.

## 2 Theoretical background

Digital labor platforms enable and enforce organizational models that affect the collaboration among the involved actors and create tensions in this collaboration. To design better platforms, we need to understand these tensions. In the following sections we will first discuss the origins of the term platform and introduce relevant research in the field of information systems related to digital labor platforms and platform governance models. We will then provide an overview of how platforms support collaboration among the involved stakeholders through a short review of some CSCW and HCI literature. We will then introduce the platform boundary resource model (Ghazawneh and Henfridsson 2013). We use this model to frame our empirical data by connecting governance and organizational models to tangible artifacts such as apps and web services that are used to support collaboration among stakeholders in our case study.

### 2.1 Digital Platforms: An IS perspective

Platform organizations have emerged as a major business model to increase flexibility and resilience in evolving markets (Kenney and Zysman 2016; Tiwana 2013). The power of the platform model lies in its division of organizations into two parts, i.e. the *core* competences and the *peripheral* emerging constellations (Baldwin and Woodard 2011; Tiwana et al. 2010). As noted early by Ciborra: "The platform turns out to be an unrecognized source of productivity in the high-tech industries, because of its intrinsic potential to efficiently generate new combinations of resources, routines and structures which are able to match the present, turbulent circumstances" (Ciborra 1996, p.104). The division into core and periphery allows platforms to emerge: "as an exciting mixture of ready-made arrangements and interpretations, and of half-realized, not-yet-made solutions and visions" (ibid, p.104).

Digital platforms mirror the idea of a platform organization through their division of functionality into core and periphery, as evident in this much cited definition of a platform as an "extensible codebase of a software-based system that provides core functionality shared by the modules that interoperate with it and the interfaces through which they interoperate" (Tiwana et al. 2010). Digital platform development, being so strategically central to many networked organizations, has moved from an "engineering management" process to "strategic management,"

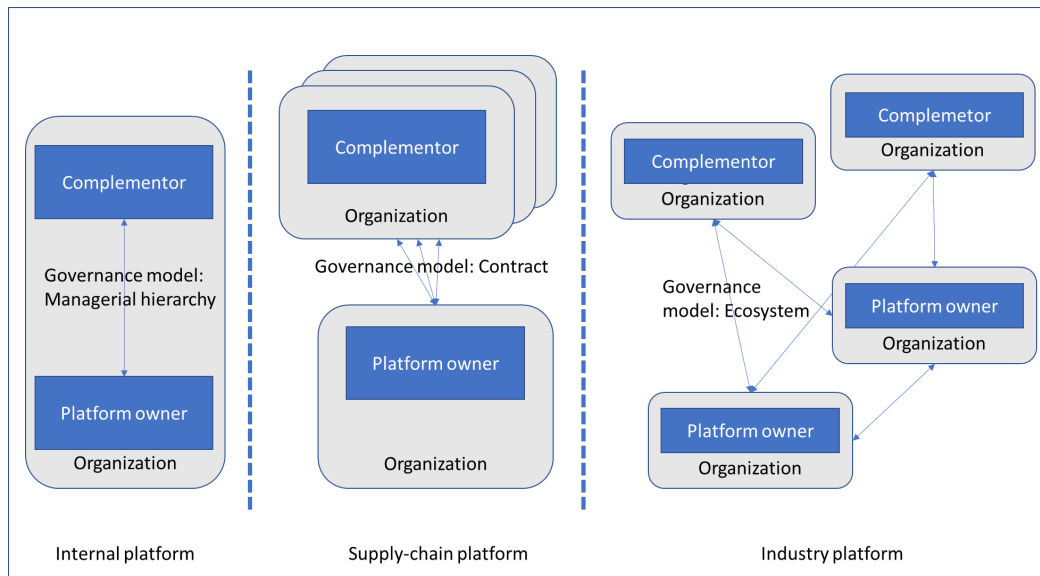


Figure 1: Platforms are moving from internal to supply-chain to industry platforms (Gawer 2014).

where different leverages enabled by digital platforms –e.g. production, innovation and transaction –have turned out to play a central role in strategic management of platform organizations (Gann 2015). As such, a definition more suitable to our research is platform “as a set of digital resources –including services and content – that enable value-creating interactions between external producers and consumers” (Constantinides et al. 2018, p.381).

In his discussion, Ciborra was mainly concerned with platforms where core and periphery belonged to the same organization and were under the same managerial governance model. As Gawer (2014) points out, platform models have since evolved considerably by going through three stages: 1) internal platforms, 2) supply-chain platforms, and 3) industry platforms, as shown in Figure 1. (In this paper we will refer to 1 as internal platforms, and to 2 and 3 as open platforms). Traditionally, both IS and CSCW research fields were concerned with internal platforms, confined to the boundaries of individual organizations. In a networked world, few platforms remain totally internal. In a typical workday, we juggle among several internal and open platforms. Eroding boundaries between work and leisure amplify platform openness.

The ubiquity of open platforms have led to an increased attention in the IS field to digital platform *governance models*, which are “the partitioning of decision-making authority between platform owners and app developers, control mechanisms, and pricing and pie-sharing structures” (Schreieck et al. 2016). Creating new governance models has in particular been important for open platforms, such as global digital labor platforms, where a conventional managerial hierarchy cannot function as a governance model. In these platforms, the governance model becomes a model for *arm’s-length control and management of the platform and its users* (ibid). Governance models “would let platforms control

interactions between multiple stakeholders without jeopardizing their incentives for value-creation” (Constantinides et al. 2018, p.383). A typical governance model for a digital labor platform would include, among other things, decisions on incentives and subsidies, on creating network effects, increasing multihoming costs, reducing transaction costs, managing reputation and maximizing liquidity (Choudary 2018)

A platform's governance model strongly affects how collaboration between platform owners (the core) and users (the periphery) happens, which makes governance models relevant for CSCW research. Importantly, most research on platform governance models takes the perspective of the platform owner (Schrieck et al. 2016). The focus of such research is to devise governance models that maximize platform owners' revenues. Complementors –i.e. platform users –are interesting as long as they can be seen as sources of revenue for the platform owner. This can lead to centralized power in platforms. While also internal platforms – such as the case studied by Ciborra (1996) –contain tensions between core and periphery, platform openness increases such tensions. For instance, many digital labor platforms implement their governance models to subsidize customers (to attract customers and thereby workers), to make it difficult for workers to move to other platforms (e.g. by taking ownership of workers' reputation built through the platform), to immediately exclude failing workers (to protect platform reputation), to reduce transaction costs by reducing worker wages, and to create information asymmetries where workers have access to as little information as possible (Choudary 2018; Rosenblat and Stark 2015). This centralization of power –and the reaction to it from labor unions –is excellently demonstrated by Harmon and Silberman (2018). As we will see later, our research interest is to see how research from CSCW can inform the design of governance models and platforms that combine the interests of both platform owners and users.

## 2.2 Digital platforms: A CSCW perspective

The CSCW series of conferences started in 1986 with the following question – among the many –that the young research field had set out to answer: “how will technological innovation effect the way large-scale group activity is organized in the future?” (from Preface to the proceedings of CSCW 1986). In some sense, CSCW has always been about building digital labor platforms. Terminologies might have changed –e.g. what was called a server in the old days is now called a cloud. or fog. Technologies pioneered by CSCW researchers are now ubiquitous in modern collaboration tools found in many digital labor platforms.

We see however two important and closely interconnected developments in the recent years that have attracted the attention of many CSCW and HCI researchers. First, the shared workplace is not anymore augmented by the digital platform but in many cases is completely replaced by it; working in a digital labor platform is often a lonely endeavor. Second, platform owners have become dominant actors

who are not interested in how work is done, but how it is traded. We will discuss these two developments in the rest of this section

One of the taken for granted aspects of traditional work places is that workers socialize with each other, their bosses and customers. The minutiae of this socialization is central to workplace studies and to our understanding of work. In fact, studies of informal interactions in and across physical workplaces are a hallmark of the CSCW literature (Kraut et al. 1990; Bly et al. 1993). In modern labor platforms there is no longer a shared physical workspace. Platform owners outsource the ownership of physical facilities and means in order to reduce their own ownership risks (Eisenmann et al. 2006) –for example, Uber does not own taxis, and UpWork does not own offices. Moreover, workers are often isolate from consumers in order to create information asymmetries: "the task creator [in Amazon Mechanical Turk] has no way of knowing if the task worker is male or female, young or old, religious or atheist, etc." (Gray et al. 2016, p.134). Even in platforms where workers have to meet the consumer face-to-face –such as in the ride-hailing service Uber –designs such as rigid rating mechanisms can make collaboration difficult: "The drivers are scared of the customers but also the customers are scared of the drivers" (Glöss et al. 2016, p.1635). We also see examples where the platform introduces a new balance of power by putting the workers in disadvantage during interaction with consumers. An example is the "music-enabled Uber" that allows passengers –through the Uber app –to choose the music during their ride (Ormseth 2016) –i.e. altering conventional power relationships by turning the passenger into a "backseat DJ". There is in general an emphasis on those worker skills that can make consumers happy. This is for instance demonstrated in the case of “emotional labor” documented by Raval and Dourish: “while doing the daily driving work, both verbal and bodily communicative acts are intrinsic to performing one’s identity as a driver who deserves to be rated a 5” (2016, p.102).

Although these are examples where platform owners actively counteract or restrict socialization among users, in some cases platform support for socialization and collaboration is lacking because platform owners do not consider it to be important. As noted by Bellotti et al. "Although providers talked a lot about their users helping each other ... they said little about how their designs supported users in helping and giving. This is another mismatch, because these, although not top motivations, were important for [users]" (2015, p.1092).

Despite the lack of collaboration support offered by some platforms, users seem to always find other ways to cooperate and socialize: "When platforms do not natively support collaboration, workers create widespread yet invisible forms of collaboration that take place off-platform" and that "workers turn to each other to actually do the work itself, recreating social work environments to encourage each other’s progress and development as crowdworkers" (Gray et al. 2016, p.134). As another more advanced “off-the-platform” solution, Bernstein et al. (2010) have



come up with the idea of *friendsourcing*, i.e. tools that allow workers and consumers create small groups online and collaborate around various tasks.

Restraining and standardizing social interaction are a consequence of another more fundamental development in digital labor platforms, i.e. the emergence of platform owner as a strong actor. Platform owners, as we saw in previous section, focus on maximizing revenue through platform governance models. For instance, social interaction among users is not supported by the platform when it is not considered as a revenue-generating activity. Another consequence of focus on revenue-generating activities –in particular large global platforms –is that these platforms limit themselves to the exchange of transactional, well-defined, standardized and often simple services, with low demand on creativity, collaboration and interaction among users (Kittur et al. 2013). In the extreme case of micro-task platforms –such as Amazon Mechanical Turk (AMT) –tasks are broken down into small pieces that each can be performed by a different user: "Turkers (termed 'Providers' by AMT) are the users completing the [Human Intelligence Tasks], which typically take seconds or minutes paid at a few cents at a time" (Martin et al. 2014). This breaking down of tasks helps eliminate the need for specialized skills: "Such simple, small-scale work has engendered low-pay, piece rate reward structures, in part due to the perception that workers are homogenous and unskilled" (Kittur et al. 2013).

Platform owners also attempt to regulate several labor issues in order to keep platform ownership expenses down. This includes contractual and wage-related aspects of labor: "While much of the tradition of design-focused workplace studies has focused on work practice, with applications such as Uber, technology is directly involved in labour issues. That is, pay, flexibility and work conditions – not only in how the work is done but also the conditions under which it is done" (Glöss et al. 2016). Platforms can achieve this by for instance creating extreme information asymmetries (Rosenblat and Stark 2015). One example is from Amazon Mechanical Turk: "[Amazon Mechanical Turk] is something of a 'black box.' That is, while Amazon does publish their terms and conditions, little information is released about how these policies are specifically realised. Furthermore, the decision making process is not transparent and there are no public processes for dealing with complaints or grievances" (Gupta et al. 2014).

To sum up, digital labor platforms often restrict and reshape collaboration among users, with important consequences for work practices and labor conditions. These restrictions are often guided by platform governance models.

### 2.3 Boundary resources: Co-creating governance models

One way to conceptualize the new digital workplace discussed above is through the lens of *boundary resources model* developed by Ghazawneh and Henfridsson (2013). In this model, digital platforms –and their governance models –are analyzed through the *boundary resources* they provide and the impact these resources have

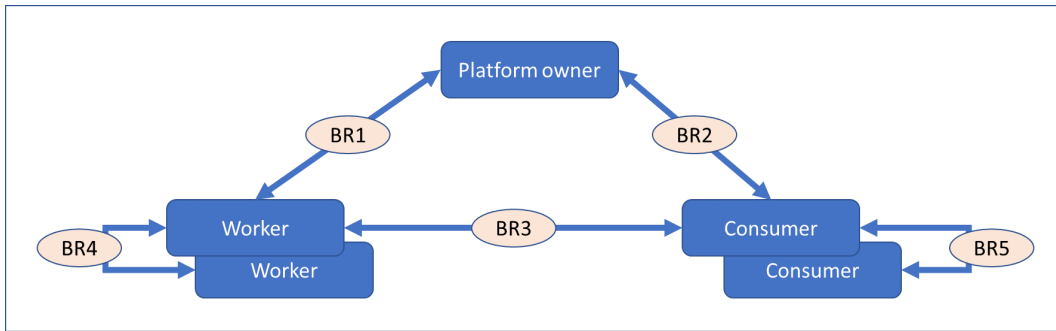


Figure 2: Boundary resources (BR) mediate collaboration among actors in a platform.

on the platform ecosystem. Platform boundary resources are "software tools and regulations that serve as the interface for the arm's-length relationship between the platform owner and the application developer" (Ghazawneh and Henfridsson 2013). Examples can be an Application programming Interface (API), or a mandatory server –e.g. provided by platform owner –to store data (Farshchian and Vilarinho 2017). Platform designers explicitly design boundary resources with the goal of enforcing their governance model. Boundary resource *design* is "the platform owner's act of developing new, or modified, boundary resources as a response to perceived external contribution opportunities and control concerns" (ibid). Being a balancing act in a competitive market, this design process includes *resourcing*, i.e. "the process by which the scope and diversity of a platform is enhanced" and *securing*, where "the control of a platform and its related services is increased" (ibid).

We will use the boundary resources model as an analytical lens, however with two adaptations. First, the model was originally developed to analyze the relationship between platform owners and third-party application developers. Therefore, the focus of initial case studies has been on developers and the resources they need to extend the platform –e.g. APIs, source code documentation, and source code license agreements. In our analysis we find it useful to extend the model's application to analyze the relationships among all the actors in a platform ecosystem –and not only developers. This would mean the relationships between platform owner, workers and consumers, as illustrated in Figure 2 (in form of boundary resource BR 1, 2 and 3). Additionally, boundary resources can support the relationships among workers (BR4) and among consumers (BR5). For instance, in our analysis in the previous section, a "star rating" feature in an app for a car hailing service would be a boundary resource mainly of type BR3 –i.e. workers and consumer giving ratings to each other. The feature might also be used as a form of BR1 or BR2–e.g. if the platform owner uses the star rating to exclude drivers and passengers from the platform. This extension is useful, particularly in small-scale platform development and in initial phases of platform design because it emphasizes exploiting the tacit knowledge of all the involved actors (Islind et al. 2016)

The second adaptation of the model is the recognition that boundary resources do not need to be designed and owned by the platform owner alone. For instance, in a case study of Apple's iOS ecosystem, Eaton et al. (2015) have demonstrated how boundary resources are shaped, changed, and "tuned" by all the involved actors –and not only by platform owners. In our analysis in the previous section we saw that third-party tools and discussion forums are developed –primarily by workers in micro-task labor platforms –to facilitate collaboration among workers and consumers, even though the platform owner did not provide such tools. This adaptation to co-creation is relevant to our healthcare-related case in this paper. Importance of co-creation and co-production in healthcare and independent living is documented also by others (see Procter et al. 2014).

This last adaptation of the model is also one of the core arguments in our paper, as we believe boundary resources can be used to co-create the governance model of a digital labor platform. The model can in this way be used to unite research in the fields of SE, IS and CSCW.

From a CSCW perspective it thus makes sense to say that platform boundary resources constitute the virtual workplace where mediated collaboration among the actors in the platform ecosystem happens. For the paid “freelance” caregivers in our case study, it is mainly the sum of these boundary resources –the educational material, the web services, the payment system –that constitutes their virtual workplace. By being in the boundary of governance models and workplaces, boundary resources, as any boundary object (Leigh Star 2010) mediate between several communities of practice–i.e. platform owners, workers and consumers.

The CSCW community has been involved in participatory design for decades (Bratteteig and Wagner 2016). Earlier discussions of power in participatory design have been mainly handled face-to-face “alongside” the technology development processes. In the case of digital labor platforms these face-to-face encounters are replaced by the platform. For instance, wage negotiations and payments are handled online using digital contracts and apps: "Uber thus demonstrates how issues around collaboration are intermingled with those around money...[Amazon Mechanical Turk] and Airbnb return labour issues to relevance, since the apps are involved in payment income, rates, productivity and conditions of the work being completed through them" (Glöss et al. 2016). An emphasis on governance models and boundary resources can make such practices explicit and promote a stronger connection to participatory design of online digital workplaces.

### 3 Description of the case

Changing demographics is a worldwide concern for health and care services. One of the most challenging consequences of an aging society is the increase in the prevalence of dementia. Dementia is a progressive and irreversible neurodegenerative disorder that often appears in later life stages. The total

prevalence of dementia among EU27 citizens of age 65+ is 7.23%, and 11% in USA (Dawson et al. 2015). Dementia's worldwide costs were forecasted to reach a trillion dollars in 2018, making it one of the most costly diseases ever (Prince et al. 2016). Dementia patients need labor-intensive care in various forms. Continuous, holistic and integrated care services delivered efficiently are crucial to cope with the burden in a sustainable way.

Our focus in this case study is community-based, nonpharmacological interventions that have a person-centered approach and focus on meaningful interactions between a (paid) caregiver and the person with dementia (PwD). This is an interesting case for digital labor platforms. First, our case shows an attempt to implement an innovative way of addressing dementia care by connecting candidate paid trained caregivers with families of persons with dementia. Access to a paid trained caregiver is one of the few dementia care instruments with positive effect (Livingston et al. 2014). However, barriers related to availability, trust, and a strong sense of family privacy hampers widespread use of such services (Morgan et al. 2011). Second, dementia care constitutes an extreme case due to the nature of the service and work to be supported. Dementia care services need to be continuous, holistic and integrated (Prince et al. 2016) while platforms tend to support simple, transactional and episodic tasks. Can digital labor platforms, with the promise of efficient and largescale throughput, help solve the global dementia care challenge? Third, our case also demonstrates how platformization of labor is currently happening in a variety of professions, also those with highly qualitative nature.

In the rest of this section we will first give a short introduction to dementia care in order to put our case study in context. We will then introduce the company we have studied. A description of the prototype of a digital labor platform and the dementia care service it implements is then provided and its various boundary resources introduced.

### 3.1 Delivering person-centered dementia care

Dementia's main clinical outcome is cognitive impairment, which leads to non-cognitive neuropsychiatric symptoms (NPS) in the PwD, such as personality alterations, mood changes, depression, agitation, aggression, sleep disturbances, hallucinations and apathy (Lyketsos et al. 2011). NPS is prevalent in almost all phases of cognitive impairment, and a major cause of caregiver distress and early institutionalization (Gauthier et al. 2010; Burgener et al. 2009). Current practice to cope with NPS employs both pharmacological and non-pharmacological interventions. Recent research seems to support non-pharmacological interventions (Kales et al. 2014; Burgener et al. 2009), although using medication is still a major problem in NPS-related dementia care (Burgener et al. 2009).

As an alternative to the use of medication and institutionalization, community-based dementia care has gained attention in recent years. Community-based services attempt to keep the patient at or close to home, family and neighborhood

(Dawson et al. 2015). Community-based dementia care services include services targeting PwD during later stages of dementia, e.g. activity-based services (Gitlin et al. 2009) – which is the focus of our research.

Dementia care can easily become "task oriented, objectifying, and depersonalising if psychosocial needs are not considered" (Edvardsson et al. 2008, p.362). Parallel to the development of community-based dementia care services is, therefore, an ongoing alteration of the values underlying the dementia care model. Due to initiatives from various researchers, notably Tom Kitwood (Kitwood 1997), the psychosocial needs of the PwD have started to play a more central role in dementia care. Person-centered dementia care has emerged as a new care model and an approach to care based on the psychosocial needs of the person with dementia: "The basic human needs of a person with severe [Alzheimer's Disease] also include psychosocial aspects, such as feeling safe, having a sense of belonging and acceptance, maintaining social contacts, feeling respected, and experiencing a sense of contribution" (Edvardsson et al. 2008, p.362). In this way, person-centered dementia care denotes services that "bring together ideas and ways of working that emphasized communication and relationships" (Brooker 2003, p.2015).

Person-centered dementia care is a psychosocial process. A first task is to discover the personality of the person with dementia –"hidden behind the disease" –and adapt the service to this personality: "The exploration of personality through psycho-metric methods highlights the importance of recognizing the uniqueness of each person and the likelihood that there will be great differences in their experience" (Kitwood 1997, p.14). Kitwood introduces the concept of *resources* – the ability to do things easily –and *hang-ups* –earlier experiences of failures and humiliation –as defining elements of each person's coping style: "Each person continues to use his or her coping style as the first signs of mental impairment make their appearance" (ibid, p.14). As we will see later, this process of identifying the PwD's coping style is one of the main aspects of the dementia services provided by our case company.

Person-centered dementia care demonstrates several positive clinical outcomes compared to many conventional forms of dementia care. Dawson et al. (2015) in their review of what services help sustain care at home noted that "the best outcomes for people with dementia are associated with services that are timely, responsive, flexible and tailored to individual need." In a large-scale systematic literature review, Livingston et al. found that: "There is convincing evidence from high-quality studies that training and supervising paid caregivers in communication or person-centred care skills is effective for symptomatic and severe agitation, immediately and up to 6 months after" (2014). Person-centered dementia care can make the caregiving process easier and more rewarding, and reduce the burden of care (Edvardsson et al. 2008; Rothera et al. 2008).

Despite the documented positive effect, person-centered dementia care is not widespread. A major reason is a gap in our knowledge about how such services can

be delivered efficiently and in a cost-effective way. There are few qualitative studies describing person-centered dementia care service organization and delivery. One such study concludes: "The necessary conditions for delivering improved home care services for older people with dementia are not fully understood, particularly in comparison with standard service provision" (Rothera et al. 2008, p.71). One of the reasons for our lack of knowledge and of measurement tools is because many services are delivered informally and are not documented properly. As Lloyd and Stirling (2015) note, a major challenge related to person-centered dementia care is the lack of tangible structures that can directly translate to practice: "Ethically sound concepts need appropriate, user-friendly structures to enable them to be translated into specific activities" (ibid).

There is a tendency in available technologies to focus on a task-oriented view of dementia rather than a holistic person-centered view. In a literature survey of 66 technology-enhanced studies, the majority were found to be about technology to manage diagnosis, problematic behavior and burden of care, while only a few were about coping with social isolation, loss of autonomy, and lack of intellectual activities (Topo 2009).

Supporting paid trained caregivers has shown to have positive effect on the quality of the service (Livingston et al. 2014). According to Lorenz et al. "As new tools are developed, paid carers will have to be shown that adopting these tools will make some aspects of their jobs easier and will ultimately not cost them their jobs because they will have enhanced IT skills" (Lorenz et al. 2017). "Home Care Aide" companies use various combinations of technology such as online calendars and call centers (Farshchian et al. 2017) to coordinate and mediate access to paid trained caregivers, with the goal of creating continuity and trust, in addition to creating a business (Gross 2008). There are also some emerging research results demonstrating the potential of sharing platforms –such as timebanking –as mediators of elderly care (see for instance Moser et al. 2015).

### 3.2 The company

Our case company is a Norwegian company in the Middle-Norway region that offers a range of privately paid services to persons with dementia and their families. This includes services targeting the well-being of the PwD, respite services, training, and information-related services for caregivers. The main participants in our study were the employees of the company, i.e. paid caregivers, and the company management. The paid caregivers are called *counsellors*, preserving the term used by the company (i.e. "veileder" in Norwegian).

Our study focuses on one of the services offered by the company, i.e. the *activity service*. As part of this service, a counsellor visits the PwD at home or in the local community on a regular basis —normally twice a week for 1-2 hours—and is engaged with the PwD in a meaningful engagement in form of an activity—e.g. engaging in a hobby or taking a walk in the woods. This process of engaging with

the PwD is called *interaction*. The activity service can be characterized as a person-centered dementia care service. The service is heavily based on the coping style of the individual PwD (Kitwood 1997), and is adapted continuously to fit the evolving psychosocial resources of the PwD. The company has offered this service since 2008, although without systematic use of digital platforms beyond some internal administrative systems.

The company has a loosely coupled organizational form characterized by the following: 1) Employment is not fulltime and does not require formal education—the company provides counsellor training; 2) There are no office spaces for the counsellors. They work from their own homes and use their own car to visit PwD; 3) The company management and the employees do not have daily physical contact, only monthly reflection meetings; 4) The counsellors do not meet each other except during monthly reflection meetings. The customers of the company – i.e. the PwD and their families – normally live at own home or an elderly home and are diagnosed with mild to moderate dementia. Every PwD has one permanent counsellor, while each counsellor might serve several PwD. The company developed their services mainly through hands-on experience, and currently offer services to approximately 300 families. The company is planning to scale up.

The company's business model is that of mediator of dementia care work, which makes it suitable to study platformization. The company fulfills several functions in this mediator role, including hiring and training of paid caregivers, matching paid caregivers with families, following up and documenting the care process, and managing the finances and payments.

According to the CEO, the company experiences some challenges due to recent growth, and sees the need for making some adjustments to scale up its business. Health and welfare service in Norway are mainly funded through public tax money. The company gets its private customers through referrals from public primary care services. Private service providers who get their customers through such referrals need to document the effect of their services to be eligible for public funds. The company therefore wishes to:

- Improve the documentation of the quality and effect of the service to be able to communicate the service value proposition to the private customers and the public health authorities.
- Implement effective training, education and follow up of the counsellors who do not necessarily have formal education. This means guiding the counsellors through a structured method of providing person-centered dementia care to ensure a knowledge-based service.
- Support counsellors in their daily work and decision-making by developing a user-friendly platform.

Based on the necessities outlined above, the company wished to enter a platformization process in order to implement a platform-based business model

backed by a digital platform. During this process –which is still ongoing –the company’s activity service has been revised, and a prototype of a digital platform was developed through a user-centered co-design process. In the following section we describe the service and the digital platform prototype as they were during our case study.

### 3.3 The service and the platform

During a period of six years –2010-2015 –our research team cooperated with the company with the goal of creating a more structured method of delivering the activity service. This cooperation has centered around both service and technology design through an iterative user-centered process. When describing the service and the digital platform supporting it, it is important to emphasize that the case study reported here documents a part of an ongoing platformization process. The digital platform discussed here only implemented parts of the envisioned platform. It is therefore to be considered a snapshot in an ongoing process. Therefore, when describing the platform we distinguish between the *integrated boundary resources* –implemented in the studied prototype, and *other boundary resources*, partly digital, that were used during our study as part of the service but that were not technically integrated in the main platform prototype. This is in our view the only pragmatic way of studying the effect of a platform because few research projects of this type –when designing a new platform –provide researchers with the luxury of a fully functional integrated prototype. When considering the platform as a digital labor platform, it is therefore important to see the integrated and other boundary resources discussed below as part of one conceptual digital labor platform.

The company was interested in taking advantage of digital technologies to support the new structured service. One of the main foreseen advantages was the possibility to open up internal processes, and to allow counsellors and customers to do a greater deal of self-service using web services and apps. During our cooperation, our research team was involved in the co-design and field evaluation of the service model and the platform, while a professional software company implemented the platform prototype used in the pilot. Some existing tools were also used during the study, though not integrated technically in the platform prototype –for instance internal systems for exchange of payments.



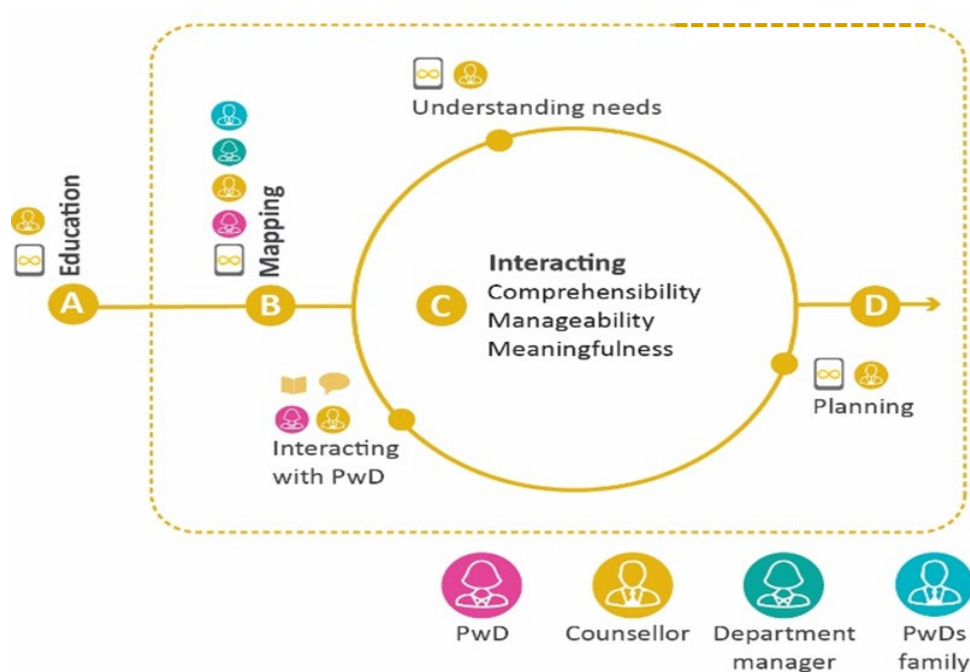


Figure 3: The structured method of activity-based person-centered dementia care, with the interaction cycles as the central element.

Figure 3 illustrates the new structured method of providing the activity service in the company. The solid yellow line (stretching from A to D) represents the trajectory along which a counselor provides the service to a PwD. The process consists of the following steps (from left to right as labeled in the figure):

- **A)** Hiring and initial education and training of the counsellor. The company offers a weeklong course on dementia theory, the activity service, and practical aspects such as the use of the platform.
- **B)** Mapping of the needs of the individual PwD and his/her family. The company collects a considerable amount of background information about the PwD, such as life stories and interests, psychosocial resources and hang-ups, what stage of dementia the patient is in etc. This step is done face-to-face in a meeting with the PwD and the family. All documentation is stored in a specific section of the platform. The mapping is repeated once every three months in form of new face-to-face evaluation meetings with the customer.
- **C)** The cycles of activity-centred interactions. This is illustrated by the big circle in the middle of Figure 3. This cycle is where the counsellor, for each interaction, 1) revises his/her understanding of the latest needs and resources of the PwD based on the last interaction, 2) plans the next interaction, and 3) visits the PwD for the interaction session, reflects on the interaction, and updates the PwD's wellbeing-related data after the visit. This cycle typically happens twice a week. Steps 1 and 2 are done in counsellor's premises, while the interaction session in step 3 happens in PwD's home or community. Once a month, the

counsellor also performs an independent and subjective evaluation of the PwD’s resources.

- **D)** Return to B after three months of interactions, where the company, together with the customer, revises the needs and reflects on what has happened so far. A revised mapping is conducted, and the criteria for the next period's interactions are created together with the PwD and his/her family.

All counsellors participate in monthly face-to-face *reflection meetings* (a parallel step E, not shown in the figure) where they exchange their experiences with other counsellors and with the employees from the company.

The platform functionality mirrors the steps described above and offers some technology support for most of the steps. Table 1 below shows this support in form of a list of boundary resources, and maps it to the boundary resource types shown earlier in Figure 2. Boundary resources that are in bold are integrated boundary resources –as defined above. Other boundary resources are shown in non-bold. All boundary resource names are capitalized in the rest of the paper.

Table 1. Boundary resources for each step in the service. Digital platform tools are in bold.

<b><u>Step</u></b>	<b><u>Task</u></b>	<b><u>Platform boundary resource</u></b>	<b><u>Boundary resource type (see Figure 2)</u></b>
A	Hiring new counsellors: Applicants contact the company through the company web page referrals.	Company web page. Emails. Phone calls. Meetings. Work contracts.	BR1
A	Training new counsellors: Company provides a training program consisting of courses and meetings. The platform is used in the program as teaching material.	Training program.	BR1
A	Counsellor profile creation: A profile is created on paper/computer during the training week based on self-reflection exercises.	Counsellor profile.	BR1
B	Registering new customers: Customers are registered with a Customer profile.	<b>Customer profile.</b>	BR2, BR3

<b><u>Step</u></b>	<b><u>Task</u></b>	<b><u>Platform boundary resource</u></b>	<b><u>Boundary resource type (see Figure 2)</u></b>
B	Matchmaking between customer and counsellor: CEO does the matching based on her knowledge of customer and counsellors.	Counsellor profile. <b>Customer profile.</b> <b>Background information.</b> Test visits. Manual work.	BR3
B	Registering customer background information: Family conditions, habits, interests, hang-ups, specific health conditions are documented in Background information.	<b>Background information.</b>	BR3
C	Preparing for an activity session: Counsellor reviews PwD's strong and weak psychosocial resources based on earlier evaluations.	<b>Resource profile.</b>	BR3
C	Planning the activity session: Counsellor receives suggestions from the platform for the kind of activity to perform.	<b>Activity planner.</b> <b>Background information.</b>	BR3
C	Perform the interaction session: Counsellor visits customer and performs the activity during a normally 1.5 hours long session.	Interaction session.	BR3
C	Evaluate activity session: Counsellor evaluates the last session using a form and own private notes.	<b>Activity evaluation form.</b> Private notebook.	BR3, BR1
C	Monthly resource evaluation: Counsellor registers latest developments in PwDs psychosocial resources. Generates input to <b>Resource profile</b> and <b>OBS-Demens graph.</b>	<b>Resource assessment form.</b>	BR3, BR1
D	Evaluation and planning: Reviewing accumulated evaluation results from the past three-month resource development, and using these results to plan for the next three months	<b>OBS-demens graph.</b> Customer evaluation meetings.	BR1, BR2, BR3

<u>Step</u>	<u>Task</u>	<u>Platform boundary resource</u>	<u>Boundary resource type (see Figure 2)</u>
E	Reflection and discussion among counsellors: Counsellors gather in physical face-to-face meetings where also the company staff are present.	Reflection meetings.	BR1, BR4

The following figures show some of the functionality of the integrated boundary resources. Figure 4 shows a list of **Customer profiles**. The counsellor, after logging in to the platform, is shown a photo display of all the PwDs he/she is responsible for. (Photos concealed in the figure for privacy reasons. Also note that the figure shows a larger than normal number of customers for a part-time counsellor). By clicking on a **Customer profile** icon, the counsellor can see the detailed **Customer profile**.

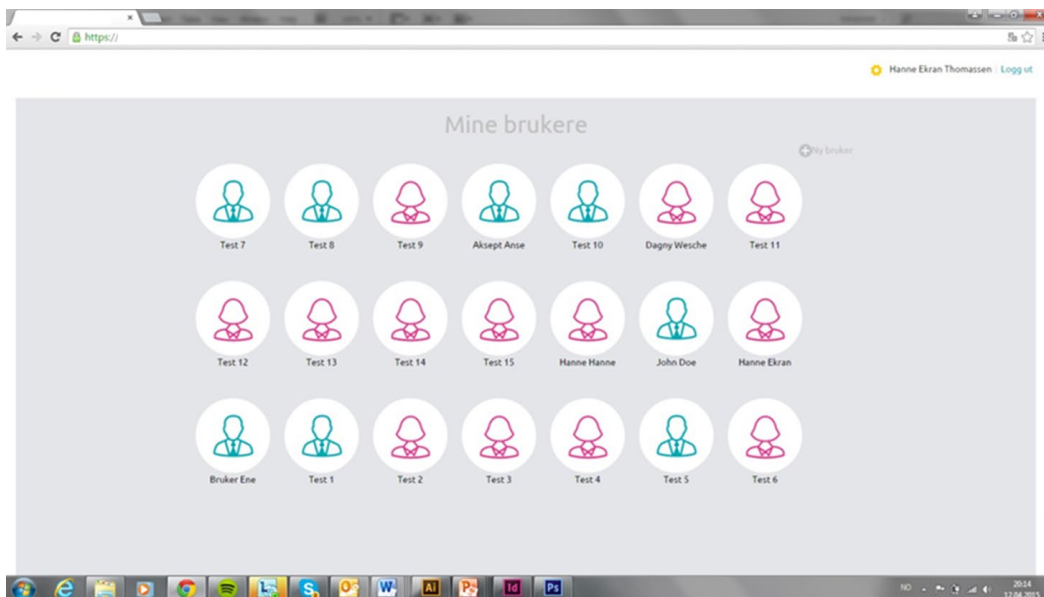


Figure 4: **Customer profiles** a counsellor is responsible for. Clicking on the photo of the customer brings the counsellor to detailed background information about that customer.

The detailed **Customer profile** is shown in Figure 5. It includes some information from the **Resource profile** (the bottom part), which shows the current level of the PwD's psychosocial resources. It also shows some suggested –weak – areas from the **Resource profile** to work on, such as physical activity. The top part shows information about the last interaction session. From this page, the counsellor can start planning the next interaction session by either selecting the activity from the last session or initiating the selection of a new activity through the **Activity planner**. Planning an activity involves asking the platform for a new type of activity (e.g. walk in the forest), then accepting or asking for a new one.

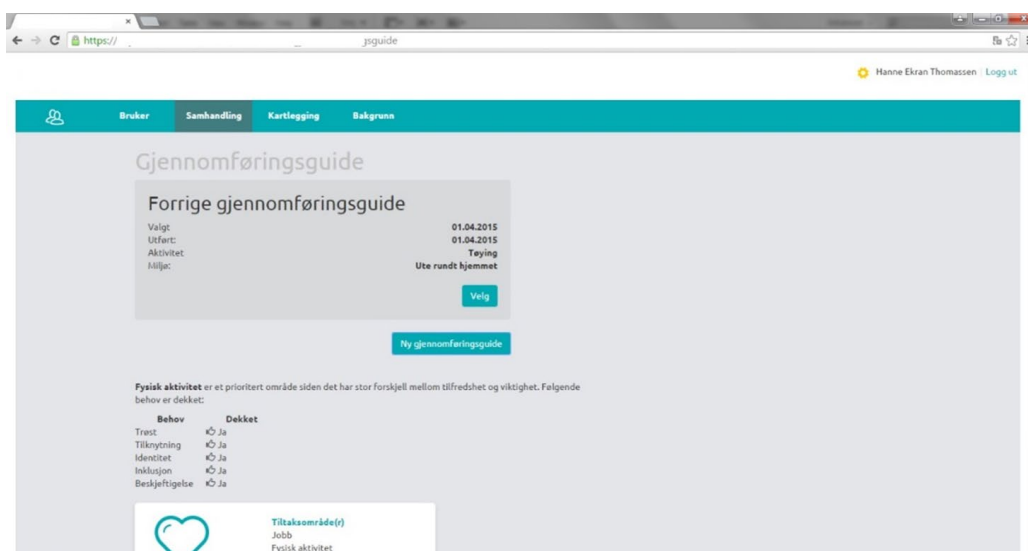


Figure 5: The **Customer profile**, using parts of the **Resource profile** and **Activity planning tool**.



Figure 7 shows the **OBS-Demens graph**. The graph summarizes continuous development of mental, physical and social resources of a PwD over time. Data for this graph is collected during monthly assessments with **Resources assessment form**.

Although the platform prototype did not support a number of activities, the CEO was clear that these activities needed to be supported in future versions. Activities that were part of the backlog for the prototype included support for customer self-registration and self-service, allowing customers to directly fill in customer profile and background information, scheduling and reminder tools to coordinate activity sessions between counsellors and customers etc. Since there were no existing boundary resources to evaluate these functionalities we have omitted them from our study.

## 4 Method and approach

Our research team cooperated with the company during the period of 2010-2015 as part of two consequent research projects. A large amount of data was collected during these projects, ranging from interviews, observations, co-design session notes, to prototypes and design artifacts (See Table 3). The last project contained a three-month field-based evaluation of the resulting activity service and the platform prototype in the summer of 2015. When working on our preliminary evaluation results (Thomassen and Farshchian 2016) we realized similarities between the company, the service and the platform, and existing research on digital labor platforms. This resulted in a new analysis of our data using the analytical lenses of platforms, governance models and boundary resources, as presented in this paper.

*Table 2: The events related to the case study*

Period	Event
2010-2011	Pre-study with the goal of gathering requirements for an IT platform.
2012-2014	Co-design process where the IT platform was developed in cooperation with company employees.
2015-2016	Final field-based evaluation of the platform with company employees. Follow-up interviews and meetings with company management.

In our study we have used the case study research design (Yin 2014). Yin defines a case study as "an empirical inquiry that investigates a contemporary phenomenon (the 'case') in depth and within its real-world context, especially when the

boundaries between the phenomenon and context may not be clearly evident" (ibid, p.16). We adopted a rather open research question: "How can we design sustainable digital labor platforms to best support users when the task at hand is complex and requires creativity and local knowledge?" The case we have studied is the dementia care provider company during a platformization process. The unit of analysis in our study is the activity service provided by the service provider company and supported by a new service model and digital platform.

Our case can be regarded as an *extreme* or *deviant* case (Flyvbjerg 2006). Person-centered dementia care is a highly personalized and creative activity. This type of activity is not what we currently associate with digital labor platforms, especially global platforms that tend to support micro-tasks or other simple and de-personalized labor. Our case's deviation from the current norm therefore brings to foreground underlying issues related to creating a digital workplace using a platform: "Atypical or extreme cases often reveal more information because they activate more actors and more basic mechanisms in the situation studied" (ibid, p.229).

Table 3: Data generation methods, data and informants in our case study.

Data generation method	Informants
<p><b>During pre-study:</b> Structured interviews with company representatives, counsellors and customers.</p> <p><b>Form of data:</b> One-page textual summary note from each interview in form of a table written down during each interview. No transcriptions were made.</p>	<p>Five counsellors, three customers of the company (family caregivers or members), and the CEO of the company.</p>
<p><b>During co-design:</b> Several co-design sessions involving representatives from the company, a software development team, and our research team.</p> <p><b>Form of data:</b> Informal notes from the workshops, design artifacts such as sketches, scenario descriptions, service blueprints, and interactive prototypes.</p>	<p>A group of 5-8 counsellors, CEO of the company, company representative responsible for training, 2-3 representatives from the software development team.</p>
<p><b>During final evaluation:</b> Pre-evaluation workshop with counsellors.</p> <p><b>Form of data:</b> Informal notes</p>	<p>Seven counsellors, CEO of the company, company representative responsible for training,</p>



Data generation method	Informants
<p><b>After final evaluation:</b> In-depth individual interviews with counsellors. 1,5-2 hours of length. In one case two of the counsellors were interviewed together. Interviews with the management.</p> <p><b>Form of data:</b> Transcriptions of the relevant parts of the interviews from sound files.</p>	<p>Six counsellors of the seven participating in the evaluation were interviewed. CEO of the company and representative responsible for training.</p>
<p><b>After final evaluation:</b> Research literature and various political and strategy documents.</p>	<p>Existing literature.</p>

The set of available data for our study is shown in Table 3. Initial pre-study interviews were conducted and documented by other researchers. Co-design sessions, and all workshops and interviews related to the final field-based evaluation of the service and the platform, were done by these authors. We both participated in all the final evaluation interviews. The interviews, lasting 1.5-2 hours each, were recorded and partially transcribed. Written transcriptions were imported into NVivo –a tool for qualitative data analysis –and analyzed further. These transcriptions, together with the design artifacts, constitute our main first-hand source of empirical data for this study.

The data analysis for this study was done following an interpretative approach (Klein and Myers 1999). Our earlier analysis of the data (Thomassen and Farshchian 2016) was mainly about how the platform was used by the counsellors during the final evaluation, and what improvements we could do to the platform. We then interpret our results in the larger context of labor platforms. This we thought was relevant both for the research community and for the company owner who was interested in scaling up the company. Initially, we analyzed our data with the lenses of on-demand labor platforms –such as Uber and Lyft. Based on reviews and comments we re-aligned our theoretical framework to focus on the different views of platform owners and users and the role of platform governance models. We added more data to our analysis to illustrate the views of the platform owner, i.e. the company management. We also focused on co-creation and platform boundary resources as analytical tools. This kind of new interpretations fits well with the framework of Klein and Myers: "The process of interpretation moves from a pre-cursory understanding of the parts to the whole and from a global understanding of the whole context back to an improved understanding of each part, i.e., the meanings of the words" (Klein and Myers 1999, p.71).

Our data analysis follows the thematic analysis process (Braun and Clarke 2006). The second author (HET) did most of the transcription of the interviews and extracted quotations that she found relevant. The first author (BAF) collected and analyzed other material such as design artifacts, and reviewed research literature. We did an initial coding of the data in NVivo. This resulted in around 40-50 codes,

including examples such as "relationship among counsellors", "reflection meeting", "activity evaluation", and "OBS-demens". Starting from these initial codes, and after several meetings, we identified four high-level themes, presented in more details in the next section.

The first author BAF has a background in computer science, information systems and CSCW. The second author HET is an interaction designer and has worked with service design and digitalized services. The study was registered in the Norwegian national ethics committee (NSD), with the application number 31848.

## 5 Findings from interviews

This section provides an overview of our findings from the interviews, divided into the four themes:

- **Personalization of the service:** At the core of the studied activity service is personalization and adaptation of the service to the needs of the person with dementia. Platform tools supporting this personalization are used extensively by the counsellors. At the same time, personalization is a costly process. The platform is seen by the management as a potential cost-reduction tool.
- **Local competences and knowledge sharing:** Counsellors develop practical interpersonal skills during their interactions with PwDs, the company, and other counsellors. These skills are based on extensive local knowledge about each PwD and his/her context and life situation. The company also strives to standardize this knowledge and use it as a competitive advantage.
- **Flexibility and continuity:** Delivering the activity service requires a lot of flexibility and adjustments by the counsellor. Providing the PwD with a sense of continuity amid this flexibility is central to the service. There is also a value, perceived by the management, assigned to standardized and documented practices that can be used to justify the service towards health authorities.
- **Standardization and documentation:** The company is interested in documenting the process and creating standardized procedures. The counsellors considered this useful to some extent. There were tensions related to the amount of documentation considered practically possible, ethically acceptable, or useful.

### 5.1 Personalization of the service

At the core of the company's activity service –and person-centered care in general –is personalization. Personalization starts already when a customer approaches the company for the first time, before a counsellor is assigned to a customer. Personalization is then reinforced at each step of the service. Personalization is regarded by the CEO as company's main competitive advantage:

*"We choose dedicated counsellors with unique competences needed for the specific customer. It is the conduct of the counsellor in a specific job that is what our customers see as the face of the company... Good cooperation between the counsellor and the customer, and regular evaluation meetings, are the most important elements of the service seen from our customers' perspective."*

Matchmaking, i.e. finding the right counsellor for each customer, is important and is done by the company through interviews and test visits. The platform supported matchmaking by allowing the company to document the information they collected about the PwD in the **Background information** tool and Counsellor profile. Moreover, the CEO was also interested in additional technological support for the matchmaking process itself, as this process was very time-consuming:

*"I as the company manager do all the initial matchmaking. I do an initial mapping of the customer [in the **Background information** tool]. Then I go through [the Counsellor profiles], see their personal interests, what experience they have, where they live, if they have a car, allergies, a lot of other stuff, and try to match them [with the customer] ... Following up new and existing customers and matchmaking and mapping processes take up to 80% of my time. That is absolutely the biggest job I do."*

The importance of this personalized matchmaking was also evident among counsellors and customers. The counsellors talked about the right "chemistry", i.e. a relationship where both the counsellor and the PwD feel comfortable:

*Counsellor: "I visited another [PwD]. But there was no chemistry between us. That was my last visit."*

*Family caregiver: "I already knew the counsellor and that was a big plus because I knew he had the same interests as my father, and that he was a man. They go for walks, have coffee and picnics. They do the stuff that my father used to do. Father looks forward for the counselor to arrive. So do I."*

After successful matchmaking, the service is delivered through interactions that are adapted to the personality of the PwD, his/her strengths and weaknesses and coping style. This process of adaptation constitutes the core competence of the counsellors as expressed by one counsellor:

*"You normally start with making things understandable for [PwD]. You don't start with high expectations...start very low with very small things. Then make them see it, because then they understand, and they see they understand. Then you can gradually raise the bar."*

The counsellors used several boundary resources before and after activity sessions –i.e. the home visits (see Table 1 earlier). The usefulness of these tools depended on how well they supported the personalization of the interactions. The

**Background information** tool documents the findings from the initial interviews with the family and is updated continuously with new information about the PwD. The feedback from the counsellors regarding tool support was generally positive:

*"Starting with a new PwD, the background information had a lot of useful hints about him. I visited the page a number of times each day."*

*"If you have someone [a PwD] who cannot talk, who does not say anything about what he wants or does not know what he wants. Then the tool can be good to have. It gives you some ideas about what you can do."*

*"Sometimes we [I and the PwD] did not have much to talk about. Then I went to the **Background information** page to find some inspiration."*

Another tool that was initially thought to be used to personalize the service was the **Activity planner** tool. This tool suggests activities to counsellors, based on the available resources of the PwD. The **Activity planner** was the main idea behind the digitalization project when it was started by the CEO. It was an attempt to help new unskilled counsellors, but also to provide better overview for the company as described by the CEO:

*"I could extract [from the **Activity planner**] overviews of what activities counsellors chose to do and where they went with their customers. I think it was really interesting to see those lists. This kind of information helps us to create a log of what is happening in the service and we are less dependent on the memory of the counsellors. It is also interesting for the customers to see this information."*

However, it was gradually understood that the idea would not work as intended. For instance, **Activity planner** did not have access to all relevant context information when recommending a personalized activity, as this information was dynamically changing as stated here by a counsellor:

*"We did it a bit different than the recommendations that came up [in the **Activity planner**]. They often did not fit. It had to do with the weather, wind, [the client's] form. If he says no, then it is not so easy [to go with the recommendation]"*

We discuss this lack of flexibility in the **Activity planner** later. In general, **Activity planner** usage was controversial as counsellors saw no value in the tool as it was regarded as a documentation tool that did not help them in personalizing the service.

## 5.2 Local competences and standardization of knowledge

The CEO frequently expressed the need to have a standardized knowledge profile for the counsellors. She believed that company training program and the digital platform played important role in this knowledge standardization:

*"The goal of our [Training program] is to turn tacit knowledge into externalized competence. The platform facilitates this. It provides a standard for guaranteed minimum competence among our counsellors, and creates awareness [among our customers] of what kind of knowledge we have. [During the pilot] I could go to any evaluation meeting, assured [because of the platform] that here we have delivered the best possible service at all levels."*

The counsellors are not hired based on their formal education; the company provides a one-week training package and monthly reflection meetings. Most of the counsellors have had earlier jobs that involved caring for others, e.g. nursing and kindergarten, where they have developed caregiving skills that they believe are important for the company as these quotations from counsellors demonstrate:

*"My competence is my life experience. Very much of this experience is useful in this job, in particular the fact that I don't hurry and don't stress"*

*"The most important skill... that is... that you care for people and can acknowledge them no matter how they are."*

However, it was evident that the CEO expected more than generic social skills and wanted to have standardized knowledge as a trademark for the company:

*"For me it is important that our counsellors are perceived [by our customers] as someone more than a contact person or a volunteer friend. They should have specialized competence. So far we have not managed to communicate this competence to our customers."*

In some of the earlier interviews the issue of formal competence was raised by some customers. They pointed out that the company did not provide any documentation of the counsellor's formal education, and that they therefore did not know how counsellors would react in challenging situations. There was also an acknowledgement among the counsellors that dementia care sometimes needs more specialized skills, for instance when there are comorbidities or when the impairment has developed further. This is evident from the following two quotations by two counsellors:

*"My customer is OK, quite healthy. It is obvious that if I had other type of customer I would have needed more training."*

*"I don't have healthcare background. I sometimes think: What if something happens to him? What can I do in addition to calling emergency?"*

The platform itself was regarded by the CEO as a learning vehicle. Her vision was that a standardized process supported by a digital tool would raise the competence level in the company:

*"The platform makes it more transparent what kind of task gives the desired effect and what doesn't. That is the biggest difference. More specific and systematic... [the platform] helps us increase our competence and appear more professional. The platform and the pilot have helped us to be more specific and explicit about training families and creating awareness, and share knowledge."*

At the same time, the platform also created situations where the counsellors felt insecure about their own skills. **Activity planner** was one tool that created considerable insecurity among counsellors because the tool increased the focus on "finding the right activity," a process that used to be done tacitly:

*"I recognize that I am not very creative with respect to [finding the right] activity. I am obsessed with the fact that I must find something else. Something that can develop his [PwD's] old personhood, somehow."*

*"I had a lot of questions [during the Reflection meetings]. But the one I asked often was whether I had to change the activity. Because I felt I used the same activity all the time"*

This focus on activities was considered by the CEO as a result of bad platform design:

*"The platform resulted in counsellors becoming focused on [planning] the activities, what activity should I do now? Did I do the right activity? This is because the platform unfortunately made activities more visible and made them look more important [than the holistic view promoted by the method]."*

As part of the training program, the company held monthly reflection meetings. Counsellors appreciated these meetings, and the company promoted them as almost mandatory to attend –though geographic spread made it difficult for all counsellors to participate all the time. The meetings were important as a social gathering to get to know the other counsellors –the only occasion for counsellors to meet each other. At the same time, the counsellors could discuss challenging issues during these meetings, share their experience, and learn from others. No platform support was provided in the prototype for these reflection meetings.

### 5.3 Flexibility and continuity

The CEO's vision for the platform was to be able to standardize the delivery of the activity service, and to be able to collect and share data:

*"With the platform and the underlying method, it is much clearer how the right flow of tasks should be. Starting up and evaluating after one month, when we should collect data, that counsellors can do the mapping on computer, and I can log in and see the information. Sharing of information. The platform shows this to me, albeit it can always be improved."*

At the same time, an important part of dealing with people with dementia in a person-centered way is the ability to be flexible. Things are unpredictable with dementia patients, and care needs to be adjusted almost minute by minute, as expressed by counsellors:

*"Often it is not as you plan. You arrive there, and the settings are completely different than what you had imagined."*

*"I plan a trip to the forest. He [PwD] does not like the route I suggest. We take another route. That is OK for me."*

One of the intentions of the platform was to help the counsellors to plan the home-based interactions beforehand. To achieve this, the platform offered the **Activity planner**. Based on information from **Resource profile** and assessments of earlier activities, the **Activity planner** would present personalized suggestions about what the counsellor could do together with the PwD. **Activity planner** did not work as intended due to both technical and non-technical reasons. In some cases, the planner was used but the plan had to be changed because of other events such as bad weather. In other cases, the tool did not work because the PwD was not part of the decision:

*"He [PwD] was very clear about what he wanted to do. So it did not make any sense to come up with recommendations."*

*"I rather look at [the PwD], in what mood and physical form he is, rather than looking at what is written there [in the **Activity planner**]."*

At the same time, experienced counsellors did not feel quite comfortable with allowing the PwD to totally decide what activities to perform. **Activity planner** was used by some counsellors as a starting point and as an idea generation tool:

*"I often saw that I could get a recommendation, and then the actual activity could be something similar. Not exactly what I had in mind, but similar. I got this recommendation [from the **Activity planner**] to use stairs for physical activity. I thought about [a specific place], but then we ended up in [another place] that also had stairs."*

In the case of PwD with mild impairment who could fully participate in the decision making, the use of the recommender tool was not regarded as necessary:

*Counsellor: "I am not sure whether this [**Activity planner**] is so important in my case. I have healthy and alert customers who know what they want. And*

*they also know what they don't want. So when you get to know them you know what interests they have. When I arrive at for instance [her] place, we end up discussing: what do we do today? What do you feel like doing? Then she might have shopping to do or wants to eat out. It depends a lot on what she wants."*

Our data therefore suggests that unpredictability is an inherent part of the caregiving process and a high level of flexibility is needed in the support tools.

#### 5.4 Standardization and documentation

One of the major perceived benefits of the platform for the CEO was the explicit and standardized structure and way of doing things that the platform was enforcing:

*"I would like more guidance for the counsellors in the tool. For example, now [with the platform] it is much clearer for them. Now they go to [the platform] and do the mapping and see what they have already done. It gives them much more structure. Structure is important because it creates predictable process and makes things more effective. It creates a shared understanding. Not the least, now that we want to grow and become bigger. To do the training, assure the quality, processes, otherwise we do things ad hoc."*

With the structure provided by the platform came also the need to document all the steps to show –e.g. to the customers –that the standard structure was followed. Additional documentation was a result of not only the platform but also the introduction of a revised service model. Documentation should help the counsellors reflect on the right approach to the interactions –for instance, by seeing how the condition of the PwD evolves during a period. Counsellors would additionally document the service delivery process and its results, of importance to the company and its marketing efforts.

One area that needed to be documented was the assessment of the PwD and the effect of the activity service. After each interaction, the counsellor was asked to evaluate the visit and the activity that was performed during the interaction using platform's **Activity evaluation form**. The form asks questions such as: Did the PwD manage to stay involved in the activity? Was the activity understandable for the user? Was the activity meaningful to the user? Answers to these questions were used to fine-tune the recommendations from the **Activity planner** and refine the **Resource profile**. In addition, counsellors were asked to do a monthly assessment of PwD's resources and weak functions by providing direct input to the customer's **Resource profile**. This profile was used to create the **OBS-demens graph** that was used as a tool for communication with the customers.

The counsellors were worried that they spent a lot of –non-paid –time to do these assessments, and they could not see how the assessments were necessary for the job they were doing, as evident from these two quotations:



*"I do as well as I can and add all the data into the system. The tool does not have any effect on wellbeing of the PwD. But I understand it is needed and I need to fill in the forms. I see the importance of it for others who will use the data."*

*"Maybe I was a bit lazy. I used the [Activity evaluation form] once a week and wrote down assessment for all my [interaction sessions]. I both wrote my assessments for the week and looked at [activity recommendations] for the next week. I piled them all up, so to speak."*

For the company management, on the other hand, the documentation of interaction sessions –and their assessment –by the counsellors became an important part of the dialog the company had with the customers, as stated by the CEO:

*"One of the big improvements in the pilot project is when counsellors use evaluation and activity guides. This means that they have registered what they have done. This results in time saving for setting up and running evaluation meetings [with the customers] because I can just get an overview of what is done [from the platform]."*

As opposed to regular documentation of activity sessions, the monthly assessment of resources was perceived as more useful by counsellors. In monthly assessments, the counsellor assigned his/her subjective values to the various areas of psychosocial, physical and mental strength and weakness for the PwD, and important aspects of the PwD's life. Results from these assessments, the **OBS-demens form**, were available as a spider graph as shown in Figure XX. The graph acted as a useful boundary resource due to its graphical nature, but also because it showed an easily understandable picture of how the PwD was developing, as stated by this counsellor:

*"I think [the graph] is important to get a full understanding. Off course you see when he [the PwD] is happy and talks positively and you are happy too for providing that.. but this kind of tangible thing... it shows what it really is we are working with. What is our starting point, why we are able to make changes."*

The third evaluation was done during quarterly face-to-face meetings with the customer. During these meetings a company representative, together with the PwD, his/her family, and the counsellor, reviewed the developments of the last three months and decide the goals for the next three months. The **OBS-Demens graph** was also useful in the quarterly meeting with the customer. The graph was used as a communication tool in some of these meetings during the pilot period:

*Counsellor: "I think it is good to have [the OBS-demens graph] there [in the customer meeting] when we have that discussion, and you can point at it. Because sitting in those meetings I never remember everything that happened. But I am reminded why I plotted it that way in the graph. I think it*

*is very good. But as I said, [the graph] is not something I log in to see every day.*

During their close interaction with the customer, counsellors acquired a lot of – sometimes sensitive – information about the PwD and their family caregivers. Consequently, we observed a tension between the need for documenting the process and the need the counsellors saw in preserving the dignity and privacy of their customers. As stated by this counsellor, not all of this information was registered in the platform:

*"I am careful about what I enter. I write more details [about the PwD] in my own notebook than in the [platform] tool."*

Withholding information can also result from counsellors not trusting their own competence. One of the counsellors who volunteered for participation in the pilot study withdrew later and let us know the reason for withdrawal:

*"My problem is that the assessments are based on my subjective experience [of the PwD], where in my case is based on only a few hours of interaction. My assessments will necessarily not be very precise. For me this has been difficult. I am sure employees with more experience who know their users better can give more precise assessments through this kind of forms."*

## 6 Discussion

Our case study of person-centered dementia care has revealed some of the inherent complexity of mediating this kind of care. This mediation process, in order to be useful for the stakeholders, involves several steps, frequent reconfigurations, continuous documentation, and multiple actors. There are three aspects of the care process that we believe illustrate its complexity, i.e. *personalization*, *creativity* and *continuity*. First, person-centered dementia care –as its name suggests –is fundamentally personalized. Interactions are planned and executed based on the needs, resources, and life situation of each individual PwD (Person with Dementia). They are not only different from one PwD to another, but also vary for the same PwD from one interaction to the next. Second, the flow of the care process is only partly planned. It involves a high level of creativity and flexibility during execution, enabled by counsellors' local knowledge. Third, person-centered dementia care requires continuity. Each interaction in the care process is a step in a continuous, iterative and evolving care process, where earlier steps play a crucial role.

Our case study also demonstrates the sometimes-contrasting perspectives of what a platform should support, seen from platform owner and users' perspective. While counsellors –the platform users –are mainly focused on the above-mentioned aspects of personalization, creativity and continuity, the company –the platform owner –is additionally concerned about the dialog with the customers and revenue,

and how the platform will help run a sustainable business. In our case, even though the company is small, the reason for designing and introducing a digital platform is a desire on the part of the CEO to grow and acquire a national market for dementia care mediation. This is apparent in the CEO's perspective, especially with respect to the standardization and documentation of the care process. At the same time, because the company is small and the CEO herself has caregiver background, we also see considerably more overlapping perspectives compare to what we are used to see from large-scale and global labor platforms. As the CEO herself put it: *"I care about whether this [platform] gives any added value to the counsellors. I also care about whether this will save us time and money, what are the costs of educating them to use the tool, does the tool help the counsellors to see the bigger picture?"*

More importantly, our focus on boundary resources can help us identify where the tensions in the differing perspectives lie, what the reasons behind these tensions are, and how we can redesign the boundary resources to ease the tensions. Table 4 below shows some examples of what roles boundary resources in our discussed platform have played, seen from platform owner's and workers' perspectives. It also shows how this information can be used to suggest future revisions of the current design. It is important to mention that this table is only for illustrating some examples, strictly based on the data we collected during our evaluation of the pilot. A more valid table of this kind could have been generated by a structured and continuous co-design process involving the management and the counsellors, something that we did not have time to organize as part of our study. However, it should be evident to the reader that a focus on a dialog between the involved stakeholders, coupled with empirical evaluation and co-design processes, can result in platforms that have a governance model acceptable to all stakeholders.

As one example from the table, the Activity planner was regarded by the CEO as an important tool for standardizing the quality of the service. The counsellors had a mixed experience of using the tool. They thought it worked when they needed initial suggestions, but they also thought the tool was not flexible enough. Ideas to improve the flexibility of the tool –e.g. providing a list of recommendation instead of only one, or allowing the counsellor to update the plan afterwards if it failed – came up already during the pilot period. Using such ideas –co-created by the stakeholders --we can retain the value of the boundary resource as perceived by the company, and at the same time turn the resource into a useful tool for the counsellors.

Table 4: Different perspectives on platform boundary resources in our case study.

<b><u>Boundary resource</u></b>	<b><u>Platform owner perspective</u></b>	<b><u>Worker perspective</u></b>	<b><u>Possible revision of design</u></b>
Training program.	Standardized competence.	Acknowledgement of social skills.	Training program with focus on social skills.
Counsellor profile.	Facilitate matchmaking.	Acknowledgement of social skills.	Emphasize social skills in profile.
Background information.	Facilitate matchmaking.	Facilitate service personalization.	Allow customer to revise the information.
Resource profile.	Facilitate dialog with customers.	Facilitate service personalization.	Allow easier updating of information. Allow customer to propose revisions.
Activity planner.	Standardize service quality.	Remove uncertainty. Facilitate service personalization.	Provide more flexibility in the tool. Focus on PwD resources.
Activity evaluation form.	Standardize service quality.	Not much useful.	Allow easier update. Provide payment for updating.
OBS-demens graph	Facilitate dialog with customer. Standardize service quality.	Facilitate dialog with customer. Self-motivation.	None foreseen based on our data.
The platform.	Standardized usage of the platform.	Not always easy to see the logic behind the platform.	More pedagogical design. Online help. Use GUI techniques to improve understanding.

Another useful aspect of the boundary resources model is that identified resources can be both digital –supported by the platform –and paper-based or otherwise manual. In this way the model allows us to identify candidates for further digitalization, or even discover completely new boundary resources. One such example is matchmaking, i.e. recommending and connecting the right counsellor and customer. Matchmaking is in general at the heart of the platform business

model. It is often done by the platform –through automated recommendations –or is outsourced to users through peer reviews. In our case company, matchmaking was done mainly manually relying on three other resources, i.e. Counsellor profile, Customer profile, and Background information. At the same time, we found that matchmaking was perceived as an extremely demanding process, in her own words “taking up more than 80%” of the CEO’s time. This means that more research is needed to find out how a proper matchmaking resource can be made for a future version of the platform. Other non-digital boundary resources that might benefit from some digital support are reflection meetings and the training program in general.

Our data also demonstrates how the sum of the boundary resources constitutes – as perceived by the platform owner –the platform’s governance model. The quotations by the CEO demonstrate how she sees the platform itself as a boundary object in her collaboration with counsellors and customers. Having a digital platform was regarded as a sign of professionalism and competence. The platform was also gradually integrated into the Training program, and the main concepts from the underlying service model were used as the standard vocabulary in training material. Her views about individual boundary resources also reflected her envisioned governance model. For instance, she regarded several boundary resources as tools to document the evidence-based practice, and a way for her to promote the company.

In the rest of this discussion we provide some more examples of how existing platform boundary resources need to be revised, touching upon several of the rows in Table 4 above. The platform business model is attractive because it enables scalability. A prerequisite for scalability has often been to simplify, standardize and de-contextualize labor. Current research on task complexity in digital labor platforms often focuses on breaking down the task (Kittur et al. 2013). Our case study demonstrates the need to support complexity also in other dimensions –i.e. personalization, creativity and continuity. This type of complexity can challenge some of the established aspects of existing large-scale platforms.

For instance, many labor platforms try to limit the communication between buyers and sellers (Gray et al. 2016). The complexity in our case illustrates that this communication –i.e. between counsellors and customers –is not only necessary but a fundamentally essential part of the service itself. Any future platform needs to provide systematic support for this communication.

Matchmaking is another example that we already have touched upon. Many digital labor platforms use reviews and “star ratings” to support matchmaking. This includes also platforms for more complex and creative tasks, such as UpWork. It is difficult to see how these mechanisms could work in dementia care. For instance, matchmaking in our case study involves several actors and uses an iterative approach including test visits to customer’s home. Moreover, matchmaking

involves access to information that cannot be stored in a platform due to privacy and ethical reasons, e.g. information about the person with dementia.

Conventional star ratings are transactional, and often depend on having fully comparable services or products. Our case study demonstrates that this kind of rating will be of little value to the users. Evaluations need to be longitudinal and focus on improvements. The OBS-demens graph in our case is an illustrative example of how continuous evaluation, taking into account relevant aspects of the service, can help improve the service while it is being delivered.

Our case study sheds light on several issues related to knowledge, skills, and learning. As we have seen, large-scale labor platforms often try to eliminate the need for specialized knowledge and skills among users (Kittur et al. 2013; Glöss et al. 2016). Often, these platforms assume that the necessary knowledge and skills already exist –e.g. having a driving license is a prerequisite for becoming an Uber driver. Platform owners therefore invest minimum resources in training and learning beyond teaching the users how to use the platform. Our case demonstrates that such taken-for-granted knowledge might not exist in more specialized domains. In our case, the company found it advantageous to invest their resources in the initial recruitment process, provide a one-week training to all new counsellors, and follow this up by monthly face-to-face reflection meetings. In addition, the company had an open call center to answer questions from counsellors.

The knowledge aspect will not disappear but might even become amplified if the company scales up. Person-centered dementia care, although not requiring advanced skills on a day-to-day basis, depends heavily on a culture of person-centeredness (Kirkley et al. 2011). Face-to-face and occasional training courses can teach some of this culture. However, the culture should be continuously reinforced through on-the-job training, and maintained through socialization. The company's formalized service model and the prototype platform created a common framework that might assist with teaching and maintaining such a culture. We believe the platform can take a stronger educational role when the company scales up and can no longer provide the type of personal training and follow-up that is currently provided. First, the platform itself can become more pedagogic –e.g. by supporting learning and reflection and reinforcing the care culture through better interaction design. Second, the tool can better support exchange of knowledge through socialization among counsellors –augmenting the face-to-face reflection meetings and the call center. Third, specialized educational material can be made available in the platform, potentially through e-learning technologies.

In general, the process of developing a formal service model and a prototype digital platform has created a common vocabulary in the company. Lloyd and Stirling (2015) note that a major challenge related to person-centered care processes is the lack of tangible structures that can directly translate to practice. Using a clearly visualized and formalized service model, supported by IT, creates a

materialization of care practices. These artifacts can be useful in a domain that is otherwise characterized by informal processes that are difficult to replicate and measure.

## 6.1 Limitations and future research

A limitation of the boundary resources model is that it is purely artifact-oriented and does not take into account the complexity of organizational routines within which these artifacts reside (Pentland and Feldman 2008). This is partly because the model is originally designed to mediate between platform owners and third-party software developers –i.e. creators of artifacts. An important future work is therefore to investigate routines within which boundary resources operate, and what impact they have on the theory and the model itself.

Our study is limited in its inclusion of relevant stakeholders. The informal caregivers of the patients were minimally involved and need to be consulted in future research. The same is the case for funders and regulators, who play a central role in healthcare services in Norway. We have not demonstrated how the platform boundary resource model can include such peripheral but important stakeholders who do not directly interact with the IT-based resources. It will be interesting to see whether the model can be applied to nested and layered constellations of stakeholders, and what type of boundary resources can emerge from this. (For instance, Eaton et al. 2015 have demonstrated boundary resources of legal and regulatory nature in their study of Apple’s ecosystem.)

Our use of boundary resources model as a co-creation tool is here demonstrated in small-scale platform development. Our case was characterized by good communication and understanding between the platform owner and the workers. This communication not only reduces tensions to start with, it also allows us to discuss alternative designs in a safe environment where all stakeholders can participate. This does not need to be the case in large-scale platform development –as many studies in the IS and CSCW literature demonstrate. As we have seen, in many of these studies only one stakeholder’s perspective is dominating. In some cases, even the slightest cooperation with the other side has been impossible, either practically or politically. More research is needed to see how using boundary resource model can go beyond mere analysis and incorporate platform design in large-scale platform development.

## 7 Conclusion

In this paper we have presented a case study of designing digital labor platforms in the field of person-centered dementia care. Our case study sheds light on inherent complexities that exist in this field from a platform support perspective. We demonstrate how an extension of the platform boundary resource model can be

used to bring together insights from two parallel developments in the field of digital labor platforms –i.e. in CSCW and IS –and allow us to design platform governance that can take into account the needs of all stakeholders and create a more sustainable and fairer platform.

Dementia care services are under great pressure and in the need for radical change. Statistics revealed while we were working on this paper show that more than 32 000 persons with dementia in Norway –of the total of more than 77 000 – do not have any form of meaningful activity in their daily life<sup>3</sup>. Due to lack of resources, many nursing homes resort to medications or physically restricting person’s with dementia<sup>4</sup>. At the same time, we know that there is a reserve of resourceful caregivers in the society. Many of the counsellors that our case company has employed were unemployed before they started working for the company.

Our case study contributes to the growing number of studies that pinpoint the challenges related to the governing principles behind digital labor platforms. These platforms potentially introduce powerful and efficient ways of providing services, but need to be designed in a sustainable way, taking into consideration the needs and the rights of all involved actors. An Uber for dementia care should therefore be different than Uber –sometimes in fundamental ways.

## 8 Acknowledgments

The work was partly funded by the Norwegian Research Council under its BIA program. We thank the counsellors and the management of the company for close cooperation and for providing to us their time and effort. We also thank anonymous reviewers for valuable comments. Both authors were working at SINTEF when we conducted the reported study.

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<sup>3</sup> [https://www.nrk.no/sorlandet/\\_-minst-32.000-demente-er-fortsatt-uten-dagtilbud-1.13646295](https://www.nrk.no/sorlandet/_-minst-32.000-demente-er-fortsatt-uten-dagtilbud-1.13646295)

<sup>4</sup> Human rights breaches in Norwegian elderly care, such as physical restrictions and drug abuse, was investigated by the Norwegian national broadcaster NRK in 2014. See for instance <https://www.nrk.no/norge/erkjenner-menneskerettighetsbrudd-i-norsk-eldreomsorg-1.12063524>.



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