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# Understanding data and cooperation in a public sector arena

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**Abstract.** This note explores how data work takes place in a public sector arena. We report on findings from a 3-year research project with a Danish organisation, which, amongst other things, aimed to improve current data practices in the organisation. We make use of the notion of 'social arenas' as a lens to understand the complex setting the organisation is situated in. We find that data work in this context takes place among multiple stakeholders and requires cooperation across organisational boundaries. Moreover, changes in data practices in one site changes cooperation among multiple stakeholders in the arena. Additionally, we develop a diagram of this complex setting, which constitutes an analytical tool that supports our understanding of the site (or sites) of intervention where data work is examined. Our study contributes to the field of CSCW by proposing and showing how the notion of sub-arena helps to comprehend the cooperation and interaction within the surprisingly complex public sector and locate the (sub-)arenas and stakeholders affected by a change in how data is provided and used.

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# Introduction

The growing development and use of digital technologies and data are transforming societies with great implications for how daily operations are (and can be) run in the public sector. This development has generated an increasing number of organisations, who are trying to improve practices and implement tools to transform data into ‘insights’ or ‘innovation’ (Bright et al., 2019; OECD, 2019; Ostrom et al., 2015). However, while data is becoming increasingly important in society, at work, and in everyday life, little is known about how the increased focus on data, and thus the increased work with or related to data affect cooperation in the public sector. Therefore, we explore how data practices influence cooperation and impact the organisation of stakeholders in the public sector. Moreover, we question the role data play in this (re-)organisation.

In this paper, we draw on a perspective of data as defined through the ways data are embedded and enacted in everyday practices. As Bossen et al. (2019, p. 465) points out ‘data do not sit in ready repository, fully formed, and easily harvestable. Data must be created through various forms of situated work’. Furthermore, we argue, to research data and data-based services provided by and integrating whole sectors, research as well as design of such services has to develop ways to conceptualise practices and work beyond individual organisations and across societal sectors. We make use of the concept of ‘data work’ (Bossen et al., 2019; McMillan et al., 2016) as a lens to consider what such conceptualisation of cross-organisational data practices may look like in the public sector.

Our study is situated in a public sector arena that deals with vocational education and continuing education. This arena involves many different stakeholders, including ministries, governmental agencies, trade unions, employer associations, and education secretariats. As our point of departure, we focus on an organisation, Industriens Uddannelser (English: The Education Secretariat for Industry, hereafter the acronym IU is used), which assists the collaboration between these diverse stakeholders to develop, among other things, educational programs for vocational education and continuing education in the industrial sector in Denmark. In this paper, the notion of “stakeholder” is used to indicate that any specific person does not only contribute with his/her expertise, but also represents the interest of e.g. a labour market organisation, a vocational college, or the student body of a specific program.

During our longitudinal study with the goal to develop methods and tools that enable the employees of IU to design data based services, we came to understand that most of IU’s activity as well as the respective data needs includes other organisations and stakeholders like vocational colleges, labour market organisations, and other governmental agencies. We recognised that the concepts around data and data work did not provide us with a way to conceptualise these cooperation structures and the interaction between organisations and people.

Therefore, we draw on the concept of ‘social arena’ (Strauss, 1985) as a way to frame the stakeholders that work and collaborate in this particular part of the public sector in Denmark around vocational education and continuing. We make use of this lens to better understand the types of multiple-stakeholder environments that are common in the public sector in order to further to understand data work and data practices in this context. As any such sector in society, the sector of vocational education and training is further structured to allow for cooperation around more specific concerns. IU facilitates particular meeting structures that enable representatives from different organisations in the arena to work and collaborate in order to address certain shared concerns. We propose to use the concept of ‘sub-arena’ in order to describe the interaction between stakeholders around specific tasks, e.g. specific educational programs and their implementation at specific vocational colleges, and the interaction of between these sub-arenas and the overall arena, where these sub-arenas are decided on and their mandate is framed.

The note’s core contribution is our demonstration of how and that these concepts can help to comprehend the cooperation and interaction within the surprisingly complex public sector and locate the (sub-) arenas and stakeholders affected by a change in how data is provided and used. We propose the set of concepts adopted from sociology as a tool to make sense of and design for cross organisational data work. The remainder of the note is structured as follows: First, we relate our study to previous work in CSCW that has considered the role data play in and for collaboration in different context. Moreover, we elaborate on the concept of social arenas. Then, we present our field site and method before turning to our findings which shed light on the data work in this particular arena on the Danish public sector. Finally, we discuss our proposal to use the concept of sub-arenas and how our diagram may constitute a tool for scoping the site (or sites) of intervention in multi-stakeholder environments.

## Related Work

In this section, we elaborate on the notion of data work and present very brief accounts of studies that examine data practices and the role of data CSCW research. Then we explain on the notion of social arena and how we make use of it as our conceptual frame.

Data consists of symbols that are stored to support specific activities, e.g. by representing relevant aspects of a specific domain (Kitchin, 2014). In this paper, what constitutes data reflects the people working in this arena’s understanding of data. Thus, we look at data with a broad lens, including a diverse set of data types that encounter both qualitative and quantitative, unstructured and structured forms of data. Moreover, we refer to “data work” as complex and distributed human activities related to data practices (Bossen et al., 2019; Fischer et al., 2017). Specifically, the notion of data work has been conceptualized to address “any human activity related to creating, collecting, managing, curating, analysing,

interpreting, and communicating data” (Bossen et al., 2019, p. 466). This form of work is complex, distributed, and often interdependent of other stakeholders (Bossen et al., 2019; Fischer et al., 2017). The literature on data work and digital data practices cover various contexts. Examples includes studies examining data practices in the context of civic engagement, which emphasise that although data are often ‘broken’ (Pink et al., 2018), they are essential to the work of activists because it supports actions around social issues (Alvarado Garcia et al., 2017). Thus, data and data work strongly influences how non-profit organisations can work and coordinate future initiatives (Erete et al., 2016). In the context of distributed collective practice and scientific data collections, scholars addresses the opportunities and challenges that data sharing and collaboration hold for the design of data directories and more broadly scientific communities (Birnholtz & Bietz, 2003; Paine et al., 2015). Moreover, examples in the literature include investigations into the growing current work practices related to data science (Muller et al., 2019; Passi & Jackson, 2018; Tanweer, 2018). These studies examine amongst other things what constitutes current data science practices and they develop in different organisational contexts.

These different perspectives on data work emphasise practices related to work and cooperation around data as recognised activity and show data as an acknowledged entity that to various degrees shape how work (can) take place. Our study contributes to this discourse by demonstrating how data work takes place in a multiple-stakeholder environment in the public sector.

The notion of distributed organizations is well-known in CSCW. The concept is often used to shed light on the various social and technical aspects of work and coordination that is needed in order to support work across distance (e.g. Becker, 2001; Hinds & Kiesler, 2002; Ribes et al., 2013). Previous research has examined data sharing and collaboration in dispersed contexts (Paine et al., 2015). In our case, data work also takes place across organisations. We therefore considered if we could conceptualise our case as a distributed organisation. However, we were not able to identify one organisation or governance body, but a set of independent and cooperating heterogeneous stakeholders.

In our attempts to make sense of and describe this highly connected field site, we made use of the notion of ‘social arena’ (Strauss, 1985). The concept of social arena has been defined as ‘a place in which different communities of actors meet to discuss shared or overlapping projects or concerns’ (Balka et al., 2008, p. 517), and thus constitutes a field that is contained by dominant processual and structural conditions (Strauss, 1985). The place is here meant in a metaphorical sense as a forum for discussion and negotiation. Gärtner and Wagner (1996) apply the notion of social arena as a lens to consider different forms of participation in industrial research and design projects. They propose a framework, which describes three arenas for participatory design in this context. The arenas are characterized as follows: ‘the political and policy-making context (Arena A); the institutional/organizational context for action (Arena B); and the context of design – support of work practice, public spaces for community involvement, and so on (Arena C)’ (Wagner, 2018). The authors argue that the social arenas, where systems

and workplace design take place, have to be thought of as local interpretations and understandings of processes that cut across the arenas and are adapted and embedded within them (Gärtner & Wagner, 1996). They propose to use the concepts to make sense of the the highly situational context of a project. In this note, we will not apply their framework per se; however, we will draw on their idea that the notion of an arena emphasises the political and organisational context of social action in a large network of distinct organisations.

## Method

This note builds on data from a 3-year action research project, which focused on how organisational members of IU could improve their data practices as a means to deliberately promote the organisation's design and innovation of data-based services. Hayes states "action research offers a systematic collaborative approach to conducting research in HCI that satisfies both the need for scientific rigour and promotion of sustainable change" (2011, p. 2). We draw on this perspective and understand Action Research as a methodology that implies that the research aims to induce change and improvement of certain aspects of the targeted research domain (Hayes, 2011; Reason & Bradbury, 2013; Robson, 2002). In this case, the primary research domain constitutes IU. To engage with the research domain, the first author was working in the organisation approximately three days a week from September 2016 to July 2019. During this period, the author used different methods to understand the field site, in particular, the stakeholders involved, and the data practices used by different stakeholders to collaborate, negotiate, and make decisions. Overall the fieldwork consisted of more than 250 units of observation, including (1) design, facilitation, and documentation of 22 workshops, (2) participation and observation of 51 meetings, (3) 12 in-depth interviews, (4) approximately 70 documents (emails, reports, presentations), (5) images, and (6) ongoing field notes to document informal conversations, observations and reflections throughout the project period. The result of the action research is discussed in other articles. This note addresses a challenge, we as researchers and designers were confronted with: How to understand and relate to the complex network of stakeholders that the organization collaborated with in order to solve its core tasks. We observed that this organization fell outside the category of a 'normal' organization that mainly use data (at least in part) for internal tasks. As argued above, the concept of distributed organizations did not fit either. On the contrary, IU is an organization that is put into being – in a specific location – to support public governance of a specific domain, and this organizational constellation influences how data are used. For this reason, we chose to make use of our body of material to analyze the complex collaborations between different stakeholders and how data are used in these collaborations within particular area of the public sector domain. We developed our analysis in two main ways, which happened in parallel and influenced each other.

One way we developed our analysis was by identifying specific examples that could help us to develop our thinking about what constitutes collaboration in

this arena, and whether/how data are used. We categorized the examples, and on this basis four themes emerged: (1) Data work underpins much of the cooperation in this public sector arena, (2) data interdependence shapes data work, (3) data are used to support negotiation and decision-making, and (4) enables new forms of data work to emerge which further prompts new forms of cooperation to emerge in this context. We drew on the whole dataset to develop our categorization and especially looked out for examples that would not fit. We elaborate on the themes in the Findings section.

The other way we developed our analysis was by trying to depict the arena. The fieldwork generated rich empirical material that led to an in-depth understanding of the complex network of actors that constitutes the arena. The complexity of this arena is depicted in the description below, and, especially in the diagram (Figure 1). Initially, the diagram emerged from discussions about how to characterise IU as an organisation. As the diagram developed through 10 iterations, it became an analytical tool for relating the data work at IU with the cooperation of different stakeholders in the arena. As a way to prevent researcher bias in this flexible design, the first author checked the understanding the diagram represents by discussing with organisational members at IU (Robson, 2002). This occurred in two rounds; the first round included the CEO and a manager, and the second round involved the three employees in the IT-department (a senior IT developer, a senior IT consultant, and a junior IT-consultant). In both instances, the organisational members related instantly to the model, which they thought reflected a good understanding of “their world”. The CEO and manager asked if the trade associations could be named so they could print the diagram and display it at IU. The members of the IT-department questioned the “level” of the diagram, and also suggested adding more details, for instance, “the individual student who contacts IU outside of their vocational college or industry employer. However, due to the focus of the paper we decided to maintain the diagram at an organisational level. As such, figure 1 constitutes a significant finding in that it has provided an overview of the arena and its (data) interconnectedness.

## Field site

Based on the perspective of IU, this research deals the public sector arena that works to maintain and develop vocational educations and continuing educations in Denmark. In order to make sense of this arena, we briefly introduce the Danish labour market model, which constitute a central governing frame for the stakeholders in this arena. This is followed by an elaboration of IU, as a way to describe this complex space in more depth.

Danish labour market model constitutes a dominant condition for how organisations in Denmark operate and collaborate, and thereby becomes an important aspect for understanding the wider context of our field site. The model is a term for the overall organisation of the Danish labour market, which constitutes a division of labour between the state and the social partners (being employers’

organisations and trade unions) (Danish Business Authority, 2019). In our case, it is, in particular, the model's inherent requirement for Tripartite Cooperation that governs the ways in which vocational educations and adult vocational educations are negotiated, regulated, and developed in Denmark. Tripartite Cooperation refers to the embedded obligation for the social partners to be accountable for agreements being made, e.g. in relation to negotiations regarding topics such as 'work environment' or 'education'. The public sector arena which we focus on this paper can be considered an outcome of the Danish Labour Market Model because the social partners of the labour market are required to develop the educations in accordance with the Tripartite Cooperation.

In order to bundle interests and expertise, the governance of vocational education and training is organised according to four main fields: 1) Food, agriculture, and experiences, 2) Office, trade, and business, 3) care, health, and pedagogy, and 4) technology, construction, and transportation. This study specifically focuses on the organisation of the 4<sup>th</sup> field, which includes Industry-related educations. The central stakeholders in this arena include the government, in particular the Ministry of Education, the governmental agency for Learning and IT, employer associations, trade unions, industry companies, vocational colleges (and students), and education secretariats, such as IU. The many different stakeholders represent varying and different interests in the arena. They all cooperate on an ongoing basis to solve their shared or overlapping projects and concerns related to vocational educations and continuing education courses. Much of this cooperation takes place in committees like Sector Skills Councils, Local Education Committees, and Development Committees. In the following, we elaborate on IU, which constitutes a particular organisation that exists to support and facilitate much of the cross-organisational collaboration in this arena.

IU is an education secretariat based in Copenhagen, Denmark. IU was founded as a self-governing institution in 2000 by three major employer and employee associations. As such, these core stakeholders gave IU a mandate to facilitate and support the corporation that is necessary in order for them to meet the requirements of the Danish labour market model. The aim of the organisation is to improve the utilization of resources in order to enhance efficiency and improve the quality of processes related to the maintenance and development of vocational education programs and continuing education courses.

IU has six overall tasks that emphasise the work the organisation performs in this public sector arena. These overall tasks include: 1) Education development, 2) Operations of educations, like e.g. approval of companies to train apprentices, 3) Events to promote vocational industrial educations, 4) Communication with the same purpose, 5) Policy-support, and 6) Administration. IU provides and facilitates particular meetings structures that enable representatives from different organisations in the arena to work and collaborate in order to address certain shared concerns. We term these cross-organisational fora as sub-arenas to make this specific collaborative character of the arena visible.

## Findings

This section presents the main findings from our exploration of data work in a public sector arena and the role data play in this context. First, we make the complex setting in which IU is situated visible by presenting a diagram that depicts the public sector arena. On this basis, we show how data work underpins much of the cooperation in this large network of stakeholders. Furthermore, we show how data interdependence shapes data work and how data support cooperation amongst the many different stakeholders in this setting.

### Data work underpins cooperation among stakeholders in the complex world of vocational educations

To maintain and develop vocational education and continuing education requires involvement of multiple stakeholders for IU to solve its core tasks. We have attempted to visualise the complexity of the arena in Figure 1, which illustrates how IU interacts with the many different stakeholders in order to maintain and develop the organisation's service provisioning. Every circle is an actor in the arena. Every line indicates collaboration and participation. The triangles represent sub-arenas, formally established as well as temporary committees of cross-organisational collaboration. Considering the model in this way emphasises the complexity of the arena in which IU exists and navigates.

For example, the way in which IU maintains and develops the education programs is through highly organised committee work. IU handles and facilitates 12 Sector Skills Councils (see triangles in figure 1), which constitute authorities that are responsible for making sure that the vocational education programs and continuing education courses are developed according to the needs of the labour market. A sector skills council consists of representatives from employer associations and unions, and an education consultant from IU who coordinates and support the council and its members. Altogether, IU handles 39 vocational educations and more than 1000 continuing education courses. Our examination of data work in this public sector arena is primarily based on the perspective of IU. Thus, in the process of understanding what constitutes data work in this particular arena, the diagram enabled us to consider which stakeholders might be involved and/or affected by the data work we examined.



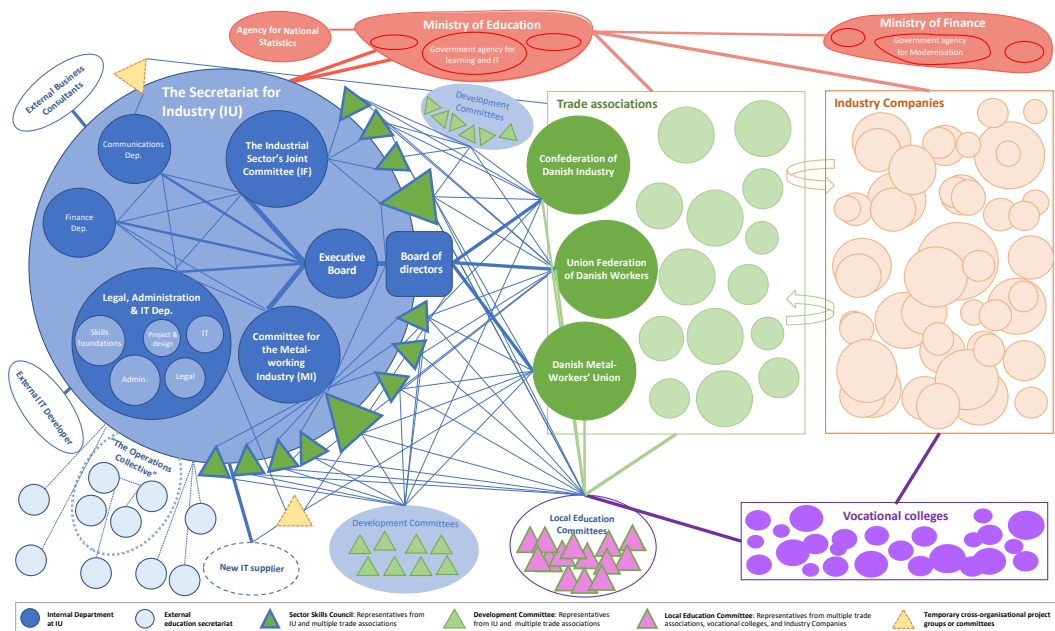


Figure 1. Diagram of the public sector arena for vocational education and training in Denmark.<sup>1</sup>

To illustrate what constitutes data work this complex setting, we elaborate on an example where data practices in and across multiple organisations support cooperation in the arena. The example revolves around Local Education Committees (LECs, visualised as pink triangles in figure 1) that exist to strengthen the relations between the local industry and vocational colleges to ensure agreement between the labour market's needs and the vocational educations. LECs work locally to implement the legal frameworks provided by the Sector Skills Councils and the Ministry of Education (Danish Ministry of Education, 2019). LECs are made up of 4-8 committee members that represent both employer associations and unions, and additionally, two representatives from the local vocational college. The representatives from the employer associations and unions are often local people who have been appointed by the association or union they are affiliated with. There are 165 LECs alone in the industrial sector in Denmark (IU, 2019). As shown in previous work (Seidelin et al., 2018), it requires careful organisation and cross-organisational data work to audit the members of the LECs and to make sure that each LEC is equally staffed with representatives from employer associations and unions, as required by law. IU acts as a “neutral” part between the stakeholders, and has been trusted with the task to collect, store, and maintain all relevant data about the LECs in the so-called LEC database. In order for IU to be able to maintain the data, it is necessary to coordinate with other stakeholders in the arena. When a LEC member retires, or a new member is appointed, an administrative worker at IU initiates an array of data practices that involves multiple stakeholders, leading

<sup>1</sup> The size of the figures in the diagram does not indicate the actual size of the organisations. Due to the situatedness of the research project, the diagram highlights the perspective of IU. This means that the figures might have been depicted differently in the diagram if another stakeholder in the arena had been the focal point of the project.

to the formal assignment of a new member and update of related data in the LEC database (Seidelin et al., 2018). Consequently, the LEC data and the related maintenance work constitute a system that assists ongoing cooperation in the arena. This example demonstrates how cross-organisational data work supports the collaboration around the shared task to maintain the LECs.

## Data work shapes negotiation and decision-making in the arena

Data practices related to certain tasks play a key role in how negotiations (can) develop and how decisions are made in this public sector arena. To substantiate this observation, we highlight an example that show how data work inform negotiations and support decision-making.

The example revolves around data work which was undertaken to investigate the state of automatization in the Danish Industry. Industry 4.0 is a concept that has been used to describe the automatization of the industrial sector (Schwab, 2018). Industry 4.0 is expected to have a major influence in terms of which skills will be needed and in order to support an increased level of atomisation in Industry (Tænketanken Mandag Morgen & Teknisk Landsforbund, 2018). This development has also attracted attention amongst stakeholders in the arena. The trade associations (depicted as green circles in figure 1), in particular, were very concerned about how Industry 4.0 will affect for instance the need to upskill workers in industry. IU was therefore commissioned by the board, and thus multiple trade associations, to develop an analysis of the current level of digital competencies in various industry companies.

An education consultant at IU explained how the data work they undertook both shaped and supported the following negotiation process among the stakeholders:

“We were talking a lot about Industry 4.0, and therefore it was decided that we should do a “digital check-up”, which consisted of us [education consultants] interviewing a number of industry companies about their understanding of Industry 4.0. The purpose was to develop an analysis and a report that described the current state in various Danish companies. Based on the interviews, we concluded that “Industry 4.0” is primarily a concept that is used in big cities and in academia. For me, it was a realization of how we play a central role in the conceptualization of this concept... Most companies did not have an organizational narrative about “we are 4.0”, but we needed “company profiles” to provide the “digital check-up”. So, by questioning them [industry companies], we are also shaping the need to be 4.0... When we question this system [the arena], we disturb the system so that it begins to reflect on why, for instance, our machine operators are not learning about Big Data. This changes things”. (Education Consultant. Workshop video recording. May 2019)

The citation illustrates how organisational members of IU created data and insights through their data work. The outcome of these practices was eventually included in negotiation and decision-making processes related to how the many involved stakeholders should address the requirements of Industry 4.0. The data created and interpreted by the education consultants at IU influenced multiple stakeholders in the network through their data practices. Specifically, this array of data practices resulted in, amongst other things, new continuous education courses for plastic processing technicians about, e.g. data-driven production and maintenance (3D-

printing). Consequently, industry companies are now upskilling their employees in technologies and techniques that prepare them for Industry 4.0.

During our research, we observed similar situations, for instance, when IU consultants were discussing the development of educations and new courses with external stakeholders in sub-arenas; when management was developing a new strategy; or when vocational students would make a complaint about their apprenticeship. Thus, the example emphasised here demonstrates that when certain data practices are undertaken in the arena, it is likely to influence what future steps are (and can be) taken in negotiation and decision-making processes.

## Changes to data practices changes cooperation in the arena and sub-arenas

Data and cooperation are tightly intertwined; changes to data practices changes cooperation in the area and sub-arenas. To illustrate this finding, we elaborate on an example where a specific dataset was included to support routine cooperation, initially, in one sub-arena. The example deals with Elective Specialization Courses (ESCs), which constitute a mandatory part of all vocational education programs in Denmark. ESCs are developed by the sub-arenas, who are responsible for making sure that the vocational education programs are developed according to the needs of the labour market. The ESC arrangement is therefore designed to be dynamic to make sure the education programmes meet current needs and future industry demands. The demand for a new ESC can emerge from different stakeholders in the arena. However, the vocational education act states that there can only be a certain number of ESCs per vocational education program. This means in order for a council to develop new courses, they need to close down others. It used to be very difficult for the sub-arenas to decide whether to maintain, develop, or close down an ESC. Education consultants at IU used to share a spreadsheet with relevant vocational colleges and ask which ECSs they offered. The vocational colleges often replied that they offered all courses, and this prevented any action. To improve this work practice, an education consultant at IU reached out to an acquaintance at the governmental agency for IT and learning. This person developed an SQL query that provided a dataset that contained the number of gradings for each course. This data was used as an indicator for whether and to which degree an ESC is actually taken. The underlying assumption was that *'if you get a grade, then you have most likely attended the course'* (Education Consultant at IU. June 2019). The availability of this dataset has allowed the sub-arenas to get new insights about the ESCs in order to update the education programs continuously. Today, this dataset is used regularly both to close down courses in order to develop new ones, and likewise, to identify popular ESCs that might become a mandatory course due to the documented increased demand. Thus, the example demonstrates how the changed data work changed the cooperation amongst involved stakeholders in the area and sub-arenas.

## Discussion

Based on our empirical findings, we discuss three key points that contribute to a better understanding of the role data play and how data work takes place in a public sector arena. First, we discuss how the organisation of this particular arena involves sub-arenas and how it requires IU to use data both on a routine basis and in emergent ways. This is followed by how data constitutes a form of participation in the arena. Finally, we discuss stable and emergent data needs in the arena and point to future work.

### Data interdependence and Sub-arenas

The stakeholders in this public sector arena work together – though in different ways – to maintain and develop vocational education that addresses the needs of the labour market in the industrial sector in Denmark. Figure 1 emphasises the complexity the actors of the arena navigate in. The diagram reveals how many different sites of collaboration exist and are needed in order to maintain and develop the tasks determining the arena. In this way, we shed light on how data work takes place and the role data play in the creation and maintenance of the interdependence among stakeholders in this particular public sector arena. The diagram also reveals the importance of IU's role to facilitate and support different meeting structures in order to ensure the cross-organisational collaboration that enables representatives from different organisations in the arena to cooperate around shared concerns.

We have proposed the concept of sub-arenas to describe the regular interaction between stakeholders around specific tasks. Furthermore, our empirical findings show that there are two types of sub-arenas in this context. We categorise these as 'fixed sub-arenas' and 'temporary sub-arenas' (Figure 1, green and yellow triangles). The Sector Skills Councils and LECs constitute fixed sub-arenas in that these entities are well-established and formally organised. This form of sub-arena primarily involves routine-based data needs that support continuous committee work. However, sometimes this form of sub-arena addresses emergent data needs, for example, when IU was commissioned to develop the analysis of the current level of digital competencies companies. With 'temporary sub-arenas' we refer to forms of organisation, where different stakeholders collaborate within a provisional time frame to define and/or solve a specific problem. The temporal aspect of this form of sub-arena creates situations where discussion about what data should be included for a specific project are explored and defined "on the go".

Our study reveals that most of the data usages were concerned with making specific aspects of the domain of industrial vocational education and training accessible to the stakeholders of the arena. Thus, rather than informing and supporting one organisation, data was in most cases collected, used and acted upon across different organisations.

## A tool for scoping the site of intervention in multi-stakeholder environments

This section discusses how the diagram (Figure 1) that emerged through our explorations of data work in the public sector might constitute a way to support researchers and designers when scoping the site (or sites) of interventions in multi-stakeholder environments. In this study, the diagram has constituted an analytical tool that has allowed us to model (sub-)arenas and stakeholders and in this way grasp the complexity of a particular public sector domain. Stakeholder mapping and analysis are part of many project management and (service) design methods. The concept of social arenas enables one to more easily recognize the shared interests and objectives that constitute social arenas when identifying and involving stakeholders, instead of relying on simple checklists.

When first studying the data practices around one specific set of data in this context, we ‘followed the data’ to identify relevant domain experts as a way to make sense of the data work related to the LEC database (Seidelin et al., 2018). Initially, we perceived this databased and its related services as a relatively simple. However, this intervention unfolded into a complex interorganisational cooperation, which also influenced stakeholders who were not directly involved in the data work round LECs. Over time, we learned that this high level of interdependence and complexity was the norm, rather than the exception, when it comes to data practices at IU. In this context, any data-based service design will involve a heterogeneous network of actors who are either directly involved in the data practices or effected by the change. We would argue that a tool, such as Figure 1, from the very beginning of the research process could have helped us to identify both stakeholders and individuals directly involved in the data practices as well as stakeholders who are affected by the project and thus would have to be involved. For example, in our research, vocational colleges did not figure as directly involved in the data practices in the beginning. Including them in the redesign would have allowed stakeholders to address collaboration through the LEC data in a more comprehensive manner early on. In sum, the figure that emerged from our explorations of data work in the public sector and the concepts of arenas and sub-arenas point to a useful way to shed light on the fact that there are many different ways to scope the site of intervention. This could help designers and researchers to not only acknowledge the complexity, but also to better understand and furthermore to be able to be more precise about our scoping of the site of intervention.

## Conclusion

The aim of this note was to develop a better understanding of the role data play and how data work takes place in a public sector arena. By examining some of the overall tasks of a central stakeholder in such an arena, our findings highlight how data work in this context takes place among multiple stakeholders and require

cooperation across organisational boundaries. We propose to use the notion of sub-arena to describe the interaction between stakeholders around specific tasks, as a way to comprehend the cooperation and interaction in a multi-stakeholder environment such as the public sector. Moreover, we provide a complex figure of the public sector arena, which we argue constitutes an analytical tool for understanding the site of intervention. Thus, we offer these concepts as a way to make sense of and design for cross-organisational data work. \*

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