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‘Data Saves Lives’: Data Work in a Healthcare Business Intelligence Unit

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Abstract. Big Data and the digitalization of healthcare have encouraged a movement toward becoming data-driven. Although hailed as a solution to a plethora of challenges, the hype of Big Data, however, often overlooks that data requires work – by humans. The emergent field of data work emphasizes these skilled but oft-invisible efforts required to make healthcare data-driven. Based on an ethnographic study, this project investigates data work in a healthcare business intelligence unit. The project's purpose is to identify the skills and tasks that constitute data work within the unit, as well as how healthcare data work roles and tasks change in the process. In this paper, I present findings from my project: I first describe the collaborative work in constructing standardized and reliable data products that are applicable across multiple sites; I then describe the necessary work conducted to implement and disseminate data products in local healthcare practices. Finally, I summarize my next steps and expected contributions.

Introduction

This project investigates data work ethnographically in a public healthcare Business Intelligence unit (BIU). The work presented here is part of a larger project that follows the call for investigations of data work in healthcare (Bossen

et al., 2019; Fiske, Prainsack, and Buyx, 2019) and explores the new knowledge and skills required to work with data as well as the effects of data (work) on professions, roles, and tasks.

While much attention has been paid to the benefits and challenges of Big Data and datafication of healthcare (Hogle, 2016), there is a dearth of studies on the required data work and the people conducting it (Bossen et al., 2019). Studies within the emergent field of healthcare data work, as well as in CSCW and CHI, emphasize the skillful but hidden work on and by data (Bossen et al., 2016; McVey et al., 2021). Among others, this includes studies of medical secretaries' role in achieving and maintaining high data quality (Knudsen and Bertelsen, 2022); how nurses use data to personalize care in remote monitoring of chronic patients (Grisot et al., 2019); and the emergence of new healthcare data workers such as medical scribes (Bossen, Chen, and Pine, 2019).

However, there is a lack of studies of occupations with data work as their primary task in healthcare, such as data professionals. Although Data Scientists have received much attention in general (Rothschild et al., 2022), only a few studies on other data professionals' work practices in healthcare have started to emerge (e.g., (Choroszewicz, 2022; Thakkar et al., 2022)). This leaves us with an impoverished understanding of their work and how they influence and co-create data-driven technologies in healthcare. Hence, this project investigates BI developers' (BIDs) data work and explores how healthcare data work tasks and roles change with the introduction of BI data and technologies.

Methodological Approach

The project's ethnographic approach follows a long-standing tradition of workplace studies and ethnography in CSCW (Blomberg and Karasti, 2013; Randall, Rouncefield, and Tolmie, 2021) that aim to uncover and understand the often-invisible work, collaboration, and coordination that takes place in organizations. The study has been divided into three phases with different analytical focuses that, however, are coherent and overlapping: 1) An explorative investigation of the BIU staff's data work, 2) an investigation of the BIU's work with implementing BI technologies, and 3) two concurrent investigations where I revisit data work practices within the BIU and Healthcare professionals' data work with implementing and using BI technologies.

The investigations were conducted between January 2021 and March 2023. I initially interviewed two BI managers (1.5 hours) and 19 BIDs (14.5 hours). Further, I conducted 79 hours of fieldwork, following the BIDs' work practices. Lastly, I conducted 11 semi-structured interviews (6.5 hours) and participant observations (6 hours) with healthcare professionals, both clinical and non-clinical, who work with BI technologies in their respective departments.

In all three phases, field notes and photographs were taken, interviews were recorded and transcribed, and documents and artifacts were collected for analysis.

Analytically, the study employs a grounded theory approach (Charmaz, 2014) where data is coded and categorized inductively. Additionally, I draw on insights from data work studies and theoretical frameworks of CSCW and STS. In the following sections, I will shortly present the case and summarize the findings from the project.

Case: A Public Healthcare Business Intelligence Unit

The BIU is part of a regional healthcare system in Denmark. It repurposes and delivers data to five hospital units and other relevant departments within the healthcare sector. When established in 2015, it employed 16 people and serviced 290 users. It has since grown rapidly and today it employs more than 50 people and services approximately 4000 users. The BIU's setup consists of a data warehouse through which they integrate different data sources (electronic health records, medicine, HR, etc.) that is then 'wrangled' (Muller et al., 2019), curated, and visualized according to different subjects (e.g., 'Booking', 'Contacts', 'Diagnose Guarantee') in reports that can be adjusted for the specific departments and needs. All reports can be accessed by the regional healthcare staff through a dashboard called the BI Portal.

Findings

The BIU's strategy is to support the organization '... in delivering more welfare, better quality, higher impact, and greater sustainability for less money' (Internal BI strategy document) and 'save lives with data' (Interview, BI Manager, 2021). However, three of their challenges involve: How to create relevant and accurate reports to support work and decision-making; how to adopt users - especially in clinical practice; and how to make healthcare staff more self-reliant. Hence, their work areas can roughly be divided into two categories which however are entangled in their everyday practices: 1) Data warehousing and report development, and 2) training and user engagement to secure the implementation of BI technologies in clinical and non-clinical practices (Asbjørn Malte Pedersen and Bossen, 2021).

Data Work in a Healthcare BIU: Between the general and specific

The BIDs construct standardized data products that must be applicable at all hospitals within the region. Standardization is often a common approach in regional and national technology implementations which then have to be

configured to local practices (Ellingsen, Hertzum, and Melby, 2022). To ensure the relevance and accuracy of their products, the BIDs also allow for the specificity of different healthcare contexts. They, in other words, balance the general and specific aspects of data work practices through close collaboration with healthcare professionals and negotiations of data representations. In the following, I will present a central aspect of their data work which I have categorized as ‘consolidating standards’.

Consolidating standards involves the construction of new reports and data sets which happens through various processes of standardization and negotiations. When new projects are initiated, it is the hospital management and BI board that decide which projects the BIU can advance with, and the ideas must be broadly applicable across multiple departments to be relevant. The BIDs then organize data and develop common definitions on which they base their reports. This corresponds to the notion of ‘a single version of the truth’ within BI and data warehousing: A curated data set that allows users ‘to analyze and report on the same underlying reality’ (Aspin, 2022, pp. 3). However, data is highly contextual and various departments may perceive a given phenomenon differently. Hence, they collaborate closely with domain experts from different departments (e.g., healthcare professionals, administrative staff, etc.) to figure out which key indicators to use and how to define certain phenomena (e.g., what counts as a new patient?). The BIDs and domain experts gather relevant information on registration practices, workflows, and challenges from the respective departments while negotiating how to accommodate and align differences.

However, errors may occur in data sets or reports, leading to negotiations and disputes about data between the BIDs and healthcare professionals. For example, patients missing from a list. If this happens, the BIDs must work out why the error occurred in the first place. Sometimes the healthcare professionals do not adhere to national registration requirements and sometimes they simply do not agree with the data representations. Other times, reports are faulty due to errors in data queries, changes in data type inputs, or the constructed logic of the data sets. Either way, these negotiations help the BIDs to ensure valid data representations over time which reflect the real-world experience of the healthcare professionals.

These collaborations and negotiations are imperative to overcome tensions between standardization and specificity when developing data technologies that must be both useful and reliable in multiple contexts. Additionally, these findings demonstrate how BIDs and healthcare professionals co-create new data standards. Following the argument of Muller et al. (2019) and Muller and Strohmayer (2022), I argue for more transparency of these BI processes, as they are an important aspect of how data and data-driven healthcare come to exist and are shaped.

Boundary Object Cultivation: The creation of ‘smarter data workers’

What kind of data work is conducted to implement BI technologies? Drawing on Susan Leigh Star, I characterize the reports and data warehouse as ‘boundary objects’ (Star, 2010; Star and Griesemer, 1989) that can support cooperation across boundaries and be adapted to local conditions and contingencies. While it requires work to create these boundary objects, it is rarely enough to make them available; they must be implemented and used in practice. This also requires extensive efforts from the BIDs. In this regard, I have identified three categories of work (‘mobilizing interest’, ‘building local capabilities’, and ‘local implementation’) and propose to conceptualize these efforts as ‘boundary object cultivation’. This notion designates how we cannot assume that boundary objects (in this case, BI data and technologies) spread easily, are self-evident, or are automatically put into use. The ground must be cultivated for boundary objects to grow and form the networks of cooperation they are created for (Pedersen and Bossen, Submitted).

Mobilizing interest involves arousing the interest of healthcare professionals through activities and artifacts. They promote the potential of BI at self-organized events called ‘The BI Day’; they travel to different hospitals and advocate for the BI setup at ‘BI Cafés’ while helping new users get started at BI workshops; and they nurture their relationships with users through data culture, producing data related merchandise (e.g., T-shirts, cups, and fake tattoos) and organizing quizzes where healthcare departments can win prizes. These activities help the BIU make themselves visible to the healthcare staff, create interest in their setup, and communicate the potential.

Building local capabilities involve the training of healthcare professionals to become ‘smarter data workers’ who are more self-reliant. The BIU organizes training courses that produce ‘BI Ninjas’ (non-technical actors who can set up reports) and ‘Data heroes’ (technical actors who build reports and do data warehousing). These findings emphasize how BI reports are not self-evident, even when standardized and user-friendly, but require knowledge of data structures, filtering, sorting, and sense-making.

Local implementation designates how BI technologies disseminate when BI Ninjas and Data heroes work with and introduce them within their departments. Medical secretaries set up reports for themselves and other colleagues to support their work; a head physician introduces the reports to other clinicians while using them for management purposes; and a physiotherapist is granted access to the data warehouse to produce his own reports and projection models for the hospital. One key finding here is that these people often become ambassadors of the BIU, helping to champion, spread, and manage the BI technologies and use of data in their departments.

Next Step and Expected Contributions

I am finishing the last phase of fieldwork, gathering empirical data on data work in the BI unit and different healthcare departments. Currently, I am preoccupied with three questions and contributions.

First, how are challenges of invisibilities overcome in BI data work? During my last round of fieldwork, I identified several challenges related to public-private relations in BI data work: Where to locate data? How to get access? And how has data been transformed? While we often think of Danish healthcare as a public institution, it is highly entangled with private organizations which form and take part in the ever-growing healthcare infrastructure. This obscures certain aspects of data that the BIU attempts to overcome.

Second, how do healthcare BI technologies support clinical and non-clinical work? I am currently investigating how healthcare professionals work with BI technologies in their local context, which skills are needed, what challenges they encounter, and how they solve these. Further, I am interested in the work conducted to appropriate new technologies within their local context.

Third, which kind of work does healthcare BI support and for what purposes? So far, many empirical studies demonstrate how Big Data and BI can succeed in healthcare, supporting management and clinical decision-making. However, recent discussions on healthcare data work highlight the implications of data-driven technologies for professions and suggest focusing more on the ethical aspects of these efforts (Green et al., 2022). I hope to contribute to these discussions with a nuanced understanding of what work BI supports while suggesting future potentials.

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