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Easier material management - at what cost?

Librarians meet IMMS

Abstract

Intelligent Material Management System, IMMS, was developed in a collaboration between Lyngsoe Systems, a commercial company, and public libraries in Aarhus and Copenhagen, Denmark, with the aim to reduce the time staff spend on managing library materials. The aim of this article is to shed light on what IMMS means for the library practices and hence for the librarian profession. Two research questions will guide the analysis: How do librarians and IMMS interplay at the public library in Copenhagen, Denmark? How does the implementation of IMMS impact the library practices at the branch libraries in Copenhagen, Denmark? With the theoretical lens of practice theory, the article shows how new norms and rules as well as new tools and objects are implemented with IMMS. Librarians need to be able to work with the new objects and tools, the new norms and to create an inspiring library room for library users. Their relation to collection management is changed, and their ability to evaluate materials is not needed in the same way when it comes to selection of titles for the collection. This sometimes creates a tension between the librarian and the system, especially when the librarians' role in the practice is to perform the decision-making by the algorithm, and not to use their skills to evaluate resources.

Keywords: IMMS, Collection management, library automation, Lyngsoe systems, floating collection, practice theory

Introduction

In recent years, a shift has been made in public libraries from *collections* to *connections* (Thorhaug, 2010, p. 7). The core task of public libraries is no longer solely to provide access to a collection, but equally if not more to create engagement and activities for the local population (Kann-Rasmussen & Balling, 2014; Wandi, 2019). One of the consequences of this shift is that shelves are being used to display books, rather than to store them. At the same time, public libraries are dealing with tighter budgets and higher demands on statistical results in line with new public management. New technology continues to grow and offers new ways for libraries to carry out their activities. It is within this context that the company Lyngsoe Systems, together with the public libraries in Aarhus and Copenhagen, Denmark, developed the system called IMMS (Intelligent Material Management System). The system has been implemented in different libraries around the world (see for example Lyngsoe Systems, 2019c; Lyngsoe Systems, 2019d). The system reduces the time staff spend on managing materials, i.e., books and other items available to patrons, by introducing floating collection and logistical principles, i.e., chaotic storage principle and batch management. The system also consists of an algorithm that manages data provided by the library system through machine learning.

Little is known of how IMMS and librarians cooperate. The aim of this article is to shed light on what IMMS means for the library practices and hence for librarians as a profession.¹ Two research questions guide the analysis: How do librarians and IMMS interplay at the public library in Copenhagen, Denmark? How does the implementation of IMMS impact the library practices at the branch libraries in Copenhagen, Denmark? The first research question enables a broader perspective on the public library organization in Copenhagen as a whole; considering IMMS in its context as a system containing different parts, i.e., new physical objects as well as new rules, and observing how the different parts interplay with the existing parts at the public library in Copenhagen. The second research question focuses on the library practices at the branch libraries in Copenhagen. The article connects several research areas within the field of library and information studies: collection management, floating collections, library automation, and the use of algorithms and machine learning in libraries as well as the professional knowledge of librarians. Previous research in these areas is presented in the following section.

Background and previous research

The aim of a library collection is to provide its users with a balanced selection (Saponaro & Evans, 2019, pp.3-4). To determine what resources should be available to library patrons and users therefore lies at the core of collection management. During the last decade, collection management has encountered different challenges and opportunities due to new technology, new expectations from library users as well as tighter budgets (Albitz et al., 2014). The American Library Association makes a distinction between collection-centred and user-centred methods for evaluation of the collection (Saponaro & Evans, 2019, p. 183), where the latter is becoming more common. Saponaro and Evans (2019, p. 72) define this approach as a focus on the wants and desires of the users with less emphasis on what users need, which is associated with a more professional selection made by librarians. Just-in-case titles should be reduced in favour of just-in-time titles (Allison, 2013, p. 91). That is, no resources should remain unused, and the libraries need to be one-step ahead of their users to be able to provide resources before patrons ask for it. A consequence of this user-oriented approach can be a management style that shares many similarities with commercial business (see for example Kann-Christensen & Andersen, 2009).

¹ This article is based on the author's master thesis SMARTA BIBLIOTEK[ARIER] : samspelet mellan IMMS och bibliotekarier på folkbiblioteken i Köpenhamn (Liljegren 2021).

Floating collections

One way for library organizations to provide a user-oriented collection is to adopt a floating collection i.e., a system where items do not belong to a specific branch, but stay where they are returned (Bartlett, 2014). The positive aspects of floating collections include cost-efficiency (Bartlett, 2014, p. 5) and quicker access to resources (Greever, 2014). It is a user-centred system since it is based on patron activity (Saponaro & Evans, 2019, p. 46) which makes it important to investigate whether there are library patrons who are not reserving items and thereby not partaking in building their branch's collection (Obydzińska, 2016). An important question is thus to ask how the library can stay relevant for those people who are yet to become library patrons or the ones who do not want to place reservations for items. Another risk of floating collections is that they might create unbalanced collections, for example, one library might have overfilled shelves while another library's shelves are empty (Bartlett, 2014, p. 7). There are systems aimed to counteract unbalanced collections, for example a module from Decision Center (Enis, 2013) and Collection HQ (Obydzińska, 2016, pp. 130-131). IMMS can be seen partially in relation to these systems. A centralization of selection and acquisition is viewed as necessary to benefit economically from floating collections (Bartlett, 2014, p. 25). Little research has been made on floating collections. However, an article by Obydzińska (2016) as well as a master's thesis (Weber, 2014) both note that librarians experience a reduction in their knowledge of the collection. This consequently affects the professional knowledge of librarians where their knowledge of individual titles in the collection is reduced.

Library automation

Libraries have a long history of trying to find better ways to manage information resources and provide faster and better service through automating library practices (for historical accounts of library automation, see Hayes, 2010; Jost, 2015, pp. 1-5). One example is the introduction of RFID chips (Ferguson et al., 2014), which, among other things, has enabled libraries to offer unstaffed opening hours (Engström, 2019). What future automation might bring us remains to be seen and depends on technological developments (for a discussion of this, see Weiss, 2018, pp. 186-187).

Bibliographic records are now inscribed in databases in tandem with circulation data, in so-called integrated library systems. However, integrated library systems cannot always manage circulation data in a satisfying way, which means that libraries often adopt different modules like Decision Center or Alma Analytics. The data need to be translated into activities to be fruitful and therefore requires interpretation by humans. In the definition of smart libraries by Cao et al. (2018, p. 816) this idea is integrated by giving the definition three different components: smart technology, smart service, and smart people. Different ideas on what constitutes a smart library are circulating (see for example Jadhav & Shenoy, 2020; Ozeer et al., 2019; Weiss, 2018, p. 182). Smart technology, e.g., machine learning as well as automation of time-consuming tasks are often included in the definition. With this definition, IMMS can be seen as helping to create a smart library. Weiss (2018, p. 116) argues that it is important to remain critical of what data are being used and made available and for what purpose those data are being used. For example, library systems cannot yet incorporate data on e.g., societal events outside the library.

Technologies like artificial intelligence and machine learning are tools to manage data more efficiently (Boman, 2019) and to provide more generalized decisions and answers (Coleman, 2020). For a long time, algorithms in different search engines have captured the interest of researchers within library and information studies (see for example Bucher, 2018; Haider & Sundin, 2019; Noble, 2018). Much of the research on the implementation of AI in libraries is forward thinking (see for example Anoop & Ubale, 2020; Fei et al., 2015; Griffey, 2019). When it comes to this kind of technology new competencies, like data literacy and critical algorithm literacy (Olsson Dahlquist & Sundin, 2020), are needed in our society. Cox et al. (2019) asked library managers about the challenges that AI

implementation in a library setting entails. They received a wide range of answers regarding both opportunities and challenges, and containing librarians' lack of knowledge on how to use the technology. To create smart libraries with the use of AI technology, library staff will need to know how the technology works and how to work with it.

Adapting to new technologies

Jost (2015, p. 87) describes how long periods of stability in the advancement of technology have been replaced today by fast-paced changes that put significant pressure on library staffs' ability to adapt and learn. As seen in the previous section, library technology continues to develop where new professional skills and competencies are needed. For example, studies shows that librarians have insufficient knowledge of how AI works, how it can be used and what it really is (Hervieux & Wheatley, 2021; Li & Fleischmann, 2020). This could potentially constitute a challenge for future libraries and librarians, especially when new technologies are implemented in libraries.

Ørom wrote as early as in 1993 about how technology challenged the librarian's identity as a promoter of culture and as an expert at information retrieval and would be replaced with a focus on service, instead of enlightenment (cited in Kann-Christensen & Balling, 2011). As the users' perspectives and their wants and desires are becoming more important for librarians, it is not surprising how the idea of librarians as experts and users as laypeople has become outdated (Huvila et al., 2013). The term librarian 2.0 has been used to describe the changed relationship between professional librarians and library users explained by how social media and the web have changed the expected role and competencies of librarians (Huvila et al., 2013).

Theoretical framework

To be able to make sense of the interplay between librarians and IMMS the analysis builds on practice theory as presented by Shove et al. (2012). There are different understandings of what practices really are (for some definitions, see Barnes, 2001, p. 20; Schatzki, 2001, p. 2). In this article practices will be understood as "a routinized type of behaviour" consisting of different elements (Shove et al., 2012, p. 6). These are not inherent to individuals but constitute elements of practices that the individual performs. Shove et al. (2012) divide the practices into three elements: material, competence, meaning, and these will guide the analysis. These elements can change, move, and transform separately and practices are enacted when the three elements are linked and integrated. This means that the practices change when elements transform and change, or when the links between the elements are broken (Shove et al., 2012, pp. 21-22). This version of practice theory is thereby particularly useful to study both change and stability (see for example Carlsson, 2013) and it is thus useful when studying the implementation of new technology. The concept of "library practices" is used here to refer to the daily activities performed by the branch librarians at the branch libraries in Copenhagen, Denmark. The focus is on the practices concerning the physical collection at the branch libraries. IMMS does not affect the e-resources as these are managed separately. Using the three elements of practice makes it possible to de-centre the human in the practices (Shove et al., 2012, p. 22) and to see the entanglement of different elements that constitute a practice. Hence, the use of "library practices" and not librarian practices.

The three elements of practice are used to understand how the interplay between librarians and IMMS takes shape. The material elements encompass objects, tools and bodies (Shove et al., 2012, p. 23). Meaning elements refer to the symbolic significance of a practice, i.e., the norms and value of the practice. The competence elements refer to the know-how of the practice, i.e., the practical knowledge of how to perform a practice (ibid). The three elements will be used to conceptualize the library practices and to see the transformation of the elements with the implementation of IMMS. The three elements affect each other, and together form the practices. Using these three elements

make it possible to see the sociomaterial aspect of the practices, i.e., to see how the social and material are integrated (Orlikowski, 2007). The sociomaterial lens thereby reconfigures agency (Gherardi, 2017, p. 50) in the same way as practices consist of both meaning, competence and material elements. Orlikowski (2007, p. 1438) calls this “the constitutive entanglement of the social and material of everyday organizational life” and this is useful to study the effects of introducing IMMS to the library practices, which consists of sociomaterial entanglements.

The theoretical lens is important to unpack the black box that constitutes IMMS, that is, to see the different parts that constitutes IMMS. These includes both new material elements in the shape of new objects and tools, but also meaning elements in the shape of new ways to manage the physical collection. Being able to see the different parts of the system and how they interplay with the public library is connected to the first research question. Thus, the second research question zooms in on the branch libraries and how the library practices play out.

Methodology

A qualitative approach has been used to understand the interplay between IMMS and librarians. The empirical data consist of interviews with six branch librarians, A-F, and one branch assistant, G, located at three different branch libraries as well as one special librarian, H, located at the main library. The special librarian was interviewed to gain a deeper understanding of the IT side of the system. The informants are working at different branch libraries of different sizes and in different areas of Copenhagen. However, to protect their identities, they are not described in more detail.

Interviews were held during the spring of 2021 and because of the covid-19 pandemic, they were conducted digitally. An interview guide was used with five different themes: background, the role of librarians, users, collection management, and IMMS. Text material (Appendix A) consists of documents from Lyngsoe Systems, the company behind IMMS. Policy documents for the public library in Copenhagen are also used. All quotes in this article will be in English while the spoken language of the informants was Danish. Some informants interviewed were responsible for the IMMS at their branch, while others were not responsible. Their understanding of the system hence differed. Videos (Appendix B) were used to gain a visual understanding of the system. Because of the pandemic, it was not possible to conduct observations. The understanding of the library practices is thus built upon the analysis of interviews, videos and text documents.

The pilot project to develop IMMS began in 2011 in Copenhagen and Aarhus, Denmark (Lyngsoe Systems, 2014). Since then, the system has been implemented in different parts of the world, mainly in public libraries. The choice of Copenhagen, Denmark as the field of study is based on its relatively long use of the system. The interplay between IMMS and librarians most likely differs between different organizations since the system contains different parts meaning that it is possible to implement it in different ways. Therefore, my choice to focus on only one library organization has an effect on the results of this study.

When it comes to floating collections, previous research indicates that the biggest differences can be discerned at smaller branch libraries (Bartlett, 2014, p. 21). The reason behind this is that librarians at smaller branch libraries often do know their collection title by title in a different way than librarians in bigger libraries do, but also that they are working closer with their local community. Floating collections are also often centralized. In Copenhagen, they have decided to not let the main library’s collection float, so the staff there do not see this aspect of the system. These are the reasons behind the focus on library practices in branch libraries.

The analysis was conducted with the help of NVivo. Different themes arose from the informants' statements, which created the categories used to analyse the material: standardization, centralization, the role of the librarian. The analysis was also conducted by unpacking the black box that constitutes IMMS to be able to see the different parts that constitute the whole. That is, to be able to see IMMS not as one thing, but instead as many different though interconnected parts. The unpacking of IMMS is accomplished through the use of the different elements as described by practice theory. This is connected to the first research question, which takes a broader stance and involves the library organization. The different elements are furthermore used to answer the following research questions on how the implementation of IMMS affects the library practices. The interviews as well as the text documents have been analysed in the same way to be able to see the relations between the different elements that constitutes the practices.

Results and analysis

Implementing IMMS means implementing a wide range of objects and new norms and rules as well as competencies, which are presented and analysed in this section. I will start by outlining the meaning of the library practices as established in policy documents, but also introducing the material elements and how the new materials interact with the already existing material elements, e.g., the library system. These elements are closely intertwined with the meaning elements, i.e., norms for daily activities that together form the library practices. This part is thus connected to the first research question. In the following, I will turn specifically to the third element, that of competence and how it relates to the meaning and material elements. The three elements together constitute the library practices (Shove et al., 2012), which is the focus of the second research question.

New material and meaning elements

Lyngsoe Systems is a company specialized in storage management for a variety of organizations including libraries and airports, among others (Lyngsoe Systems, 2021b). The company developed IMMS together with the public libraries in Copenhagen and Aarhus, and financially funded by the ABT Foundation, a foundation specialized in technology for the public sector (Lyngsoe Systems, 2019b). The aim of the project, which started in 2011, was to reduce the time staff spent managing material and consequently increase the time spent providing service to library patrons (Lyngsoe Systems, 2014, p. 3). The special librarian, informant H, confirms the reason behind the development of the system: "I think it was motivated by the staff complaining about all the time they spent on moving around books." This also confirms the explicit shift at the public library in Copenhagen to focus more on creating *connections* (Københavns Biblioteker, 2012) where activities and inspirational exhibitions of books are important. Lyngsoe Systems (2014) distinguishes between value-activities and non-value activities where material management is the latter whereas activities and service are the former. This shift of the meaning elements of the practices at public libraries; to decrease the non-value activities (e.g., managing materials) and increase the value activities (e.g., meeting the patrons), has been mentioned previously in numerous studies (see for example Huvila et al., 2013; Kann-Christensen & Balling, 2011; Thorhauge, 2010; Wandt, 2019).

Previous research on public libraries have noted the shift of the use of the library room where the number of items is reduced in favour of inspiring exhibitions, emphasizing the role of the library as a centre for experiences (see for example Audunson, 2018; Carlsson, 2013, pp. 56-57). At the public library in Copenhagen, there is an explicit shift from the library as a room storing information resources to the use of the library room as an *inspirational space* showing the physical information resources (Københavns Biblioteker, 2019, p. 25). The role of the public libraries in Copenhagen is to create engaged citizens, eager readers, and critical cultural consumers (Københavns Biblioteker, 2019, p. 6). The meaning of the library practices can thereby be discerned in the documents as having a democratic value as well as inspiring its users to read and to relate critically to ones' environment.

Lyngsoe Systems also writes that one reason for implementing IMMS is to make time for meetings with the library patrons (Lyngsoe Systems, 2021a). Thus, the role of librarians and library staff is to be an intermediary between the library and the patrons. Less emphasis is put on selecting titles for the collection, which of course changes the professional knowledge of librarians and the competencies needed. This is discussed in the following section.

IMMS introduced new material elements that impact library practices. These include mobile phones that each branch library has, the application IMMS (connected to a web-based program), and a scanner. These three material elements are necessary to provide communication between librarians and the application. The library system Cicero generates circulation data to be processed and it contains bibliographic posts. The main library in Copenhagen has a central sorter where items are sorted to be sent to either other branch libraries, the main library, or the media hotel. The media hotel is a storage room where books not currently needed in circulation are stored. The items are stored based on the chaotic storage principle also used by e.g., Amazon, meaning that the items are placed where there is space and thereby not logically organized (Lyngsoe Systems, 2019a, p. 4). Batch management makes it possible to know where each item is currently located without having them organized, thus “chaos means control” (Lyngsoe Systems, 2021a). Batch management needs different objects in order to work, including an RFID-chip in each item as well as a barcode or RFID-chip on each box that can be connected to the RFID-chips on the items that are placed in the box. This makes it possible for the application, together with the library system to know what is in each box, and where each item is placed. The same principle is used for reserved books at the main and branch libraries. IDA (Intelligent Distribution-Algorithm) renders it possible to process data in real time by using machine learning and making decisions based on where items should be displayed or stored (Lyngsoe Systems, 2019a, p. 3). The parameters for the algorithms are set by the special librarians, but the algorithm is owned and developed by Lyngsoe Systems. These are all new material elements being introduced with the implementation of IMMS.

The meaning of the library practices is here defined to be to create connections through an inspiring library room and activities for the library users. The role of the librarians is emphasized to meet and guide the library users. New material elements are hence introduced along with new norms and rules on how to carry out the daily activities. The new norms and rules contain, beyond creating an inspiring room and guiding the patrons, using the new material elements, e.g., the scanner when moving items at the branch libraries. These are linked to the last element, that of competence.

Branch librarians and their competencies

Competencies in the library practices include the ability to attract and inspire the local population to use the library’s collection through inspiring exhibitions, activities, and encounters. Meeting with library users was mentioned frequently when the branch librarians were asked to define the role of the librarian. This transforms the activities in the library not only in relation to the patrons, but also when it comes to working with the collection and when creating different exhibitions. Informant D explains: “but we always move items around, like ‘this should be here now, should this be here?’ but that is not IMMS.” The informant indicates that deciding the shape of the library room is not something that is related to IMMS; still, IMMS is an aspect of this process since the librarians communicate with the algorithm and application through scanning the books with a mobile phone. It is also possible to discern the same reason for implementing IMMS as the need to move things around in the library room. That is, to focus on creating an inspiring room where people can meet and get inspired. Several of the informants emphasize this. An important competence for librarians is to have an instinct for what attracts and inspires. The focus of the branch librarians is consequently not on the individual items in the library collection, but instead on providing an inspiring and welcoming

room for library patrons. Hence, the focus on the shape of the library room, and the need to move things around.

The daily activities at the branch libraries consist of managing items, mainly books, in the library room. This is the aspect mentioned in documents by Lyngsoe Systems to be the main reason for implementing IMMS. When the library staff are moving items in the library room, or between branches and the main library, they need to use the mobile phone as an extended body. It is not enough that they as individual librarians know where a book is; they need to communicate with the application by using the mobile phone to scan the items they are moving and thereby telling the application where the items are being moved. Thus, the information of where each item is should always be found in the application. This obviously makes it easier to find items, as explained by many of the informants. For instance, the informant A says: "In the old days we could look everywhere [to find a book] but now I know that it is [e.g.,] at exhibition 5 [...]". However, there are some problems, as explained by the informant B: "I have some colleagues who [when they take a book] completely refuse to scan [it] so that IMMS believes that it is still on the shelf. But the book is not there, so the book is gone." The same informant continues to explain how overfilled shelves, as has been mentioned as a problem with floating collections (Bartlett, 2014, p. 7) can still arise. This happens when the library staff still use the previous rules and norms and not the new ones connected to the implementation of IMMS and its material elements. Therefore, they do not use the new material elements and the linkage between the elements is disrupted. This creates a tension and discrepancy between the new material elements and how they are supposed to be used (their norms and rules) and the actual norms of the branch librarians. The informant clarifies that the colleagues refusing to use the scanner and application do not lack the skill, but the motivation. There is a tension between the new norms and rules being implemented through IMMS and the motivations for some of the library staff. One informant says that some of their colleagues do not see IMMS as something they need to care about, hence they do not see, or refuses to take part in creating a library practice in collaboration with IMMS. Since IMMS is intertwined with the whole library organization, this refusal affects the interplay and how well IMMS, and specifically IDA, can perform.

Centralization of collection management is a natural part of the implementation of IMMS, as the special librarian, informant H, explains when asked if the system is possible to use without a centralization: "you can, but it doesn't give much." The acquisition is one aspect that has been centralized at the public library in Copenhagen, meaning that only some of the librarians in the organization are working with acquisitions. Selection of individual items at the branch libraries is done through different actors: IDA (and the special librarian and Lyngsoe systems who have decided how the algorithm works), acquisition librarians, the library user (giving data to Cicero and to the branch staff), the library room and the branch librarians (selecting the sections of the library room). There is thus an interplay between material elements (e.g., IDA) and meaning elements (the requested books of the library patrons are prioritized, the library should be able to give the patrons what they want when they want it) and the competency elements (the librarians involved know how to acquire the requested books and how to interpret statistics from the library system). The selection of individual items on the shelves can thus be seen as a sociomaterial practice (Orlikowski, 2007). I.e., it is a constitutive entanglement of the social and material doing the selection of where each individual title should be placed.

An overall view of the collection

The role of the branch librarians is to manage different sections in the library room, that is, deciding what and how many shelves each genre should be given. Thus, the branch librarians (if they are not part of the acquisition group) are not working with acquisition but shelving. Still, with IMMS, shelving is a part of collection management since the branch librarians can decide how large and what sections

there should be at their branch. Hence, the branch librarians will need to know how to arrange a section at their branches and how to work with both the technology (telling the systems what sections), patrons (knowing what sections the patrons want and need) and other branches (sharing the collection).

The sections, in turn, are affected by how the items are catalogued in Cicero. The branch librarians can affect their specific branch collection but only when it comes to deciding the different sections in the library room, not individual titles. If they want a specific title, they need to reserve in Cicero. The branch librarians hence decide the shape of the library room and the sections, i.e., what genres and how much of that genre their branches should contain. One informant, for instance, described how a fantasy section was established and how IMMS automatically filled up the new section with the same principle of selection as described above. They may also reserve individual titles in the same way as their patrons, meaning that they can affect the individual titles on the shelves in the same manner as the patrons.

The work that the branch librarians are doing with the collection is therefore on an overall level, i.e., deciding the shape of the physical library room (the sections), rather than building a collection by acquiring individual items. Some of the informants mention that one of the consequences is that their knowledge about what is on the shelves has been reduced. The informant F says: "You can no longer have a personal connection to the collection, one could say. I'm not sure if that really matters, I'm not sure. But perhaps you did feel a responsibility for your own [branch] collection. We no longer have that responsibility over selection." The informant E says almost identically: "So what I mean, what I 100 % mean, is that we do not have the same knowledge of what there is in our collection as we used to. But that does not mean... What I mean is that IMMS is not bad in that way." They thereby do not see their decreased knowledge of the collection as something negative. This can be seen in light of the changing role of public libraries in a digitized society, as will be discussed further down.

Though knowledge about the items standing on the shelves has been reduced, different knowledge has been gained. Many of the branch librarians say that it is easier to get an overview of the collection and what parts are being used. That is, they do not have the same knowledge of the titles in the collection, but they have knowledge on what parts of the collections that are being used and how. These two changes in knowledge and how a collection is built and managed have consequences for what competencies are needed and are established. Many of the branch librarians answer technical, statistical, and mathematical knowledge to the question of what competencies are needed from them in relation to IMMS. It is logical that more statistical and mathematical knowledge is needed since the collection is being translated to numbers and data through e.g., circulation data. Many of the informants also say that they do not have these competencies and contrast it by saying that they are humanities-oriented people, interested in literature and movies as opposed to numbers and computers.

Cheating the system?

Weeding is a core task of librarians working with a collection, that is, deciding when an item is no longer needed in the collection to create a balanced collection for the library users (Johnson, 2018, p. 197). When asked of the challenges with IMMS almost all the informants answer uniformly: weeding. Weeding is one aspect that has been outsourced to the algorithm whose parameters are set at the main library. Weeding is performed through the IDA (and the special librarian and Lyngsoe systems who have decided how the algorithm works) and the library user (giving circulation data to Cicero). Similar to the practice of selecting individual items for the collection, the practice of weeding is sociomaterial in the sense that the algorithm has been set up by the special librarians and Lyngsoe Systems, and its decision is based on data provided by the library users. Unlike the selection practice,

the branch librarians are not part of the decision-making process when it comes to weeding. New norms and rules are hence set up, meaning that the branch librarians' need to weed what the algorithm decides. Their competence to evaluate the library's resources is thus not needed in relation to building the physical collection. Weeding has, in other words, been centralized, meaning that the branch librarians do not have a lot to say when it comes to what items should be in the collections and what items should get weeded. This is though met with resistance.

For instance, informant B says: "...the problem with IMMS is that it doesn't consider if the book is worn out or not," so books or other items that have not been used or have been standing at the media hotel can be weeded. Informant C clarifies: "it could be a new shiny book. That's uninteresting. It should be weeded. There is no professionalism in it whatsoever." They explain that they usually place interns to do the weeding since "we get a stomach ache from it." The librarians can weed more books than the algorithm decides, but never less. The special librarian explains that the consequences need to be taken into consideration: if a book has not been circulated, it should not be included in the collection.

Many of the branch librarians talk about cheating the system in relation to weeding. A explains: "We sometimes hide a book and then put it back into the system later again. You shouldn't do it. But when you think, this book... in three months the same author will release a new novel and this novel will get reservations again." They explain later: "I miss a button that says valuation." The branch librarians consequently find it difficult to work with the new meaning elements, i.e., the new norms and rules set up with the implementation of IMMS, when it comes to weeding, and they thereby pose resistance through working outside the new material elements. This means that other norms are set up, where the librarians have found a creative way of, as they themselves explained it, cheating the system. The competence to evaluate individual items in the collection is delegated to the algorithm and is thus not needed by the librarians. This causes a tension where the librarians sometimes do not think that the algorithm makes the right decision. The librarians have the practical skills to perform the practice, but since they do not agree with the decision-making of the algorithm, they sometimes find new ways to perform the practice in which their competence to evaluate items is still needed, e.g., when they hide books to be able to put it back in the collection.

Discussion

IMMS was developed with the aim to reduce the time library staff spend at managing materials. It was implemented in the context of the shift from collections to connection in public libraries (Thorhauge, 2010). User-oriented methods for collection development are becoming more common and one way is through the use circulation data. New technology, like machine learning and algorithms, offers new ways to manage data more efficiently and is used as tools to predict what the users will need and want in the future. In the case of IMMS, the selection of items to the different branch libraries are centralized to the main library and decided by an algorithm. Using circulation data to manage a collection is not new in itself (Weiss, 2018, p. 117), but the outsourcing of decisions to an algorithm is. The role of the branch librarian in relation to the collection thus changes, and more emphasis is put on meeting the users, while the building of the collection is centralized and accomplished by the work of the acquisition librarian, special librarian, and library users (from circulation data). Two research questions guides this article: How do librarians and IMMS interplay at the public library in Copenhagen, Denmark? How does the implementation of IMMS impact the library practices at the branch libraries in Copenhagen, Denmark? The following section discusses the findings of the study in relation to two topics: the professional role of librarians, as well as new tools for a data-driven collection management.

The library practices

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Using practice theory as a theoretical lens makes it possible to see how new material elements are introduced with IMMS, and consequently, new meaning and competency elements. For example, the norms of always scanning material when moving them around and weeding the items that the algorithm decides. This in turn means that new competencies are needed from branch librarians, like how to use the technology, but also how to work with the library room and the collection in collaboration with IMMS. These are more quantitative competencies like statistical and math skills. An eye for the inspirational is also important to be able to inspire the patrons to become critical cultural consumers. Some competencies are not developed as much after the implementation of IMMS, such as knowledge about individual items in the collection, meaning that the branch librarians do not have the same knowledge as previously of what items are standing on the shelves. The branch librarians work on an overall level with the collection (e.g., with sections in the library room and not individual titles) which requires an ability to interpret and work with data. Many of the informants talked about their own lack of this competency.

Less knowledge of individual items

Two studies on floating collections point to the effect the system has on the librarians' knowledge of the collection (Obydzińska, 2016; Weber, 2014). This lack of knowledge of individual titles in the collection can also be discerned after the implementation of IMMS. Interestingly, the informants in this study do not see this lack of knowledge of the collection as a problem. This can be seen in the context of the new information landscape where the physical collection does not have the same position as it once had (Audunson, 2018). Audunson (2018, p. 360) explains this decreased focus on the physical collection with the rise of digitization and "the world as a library." He argues that the traditional value of librarians as both experts at information and literature promotion remain, though how the tasks are performed has changed. This is something that can be seen in the branch libraries in Copenhagen, where the tasks of literature promotion and information retrieval are still important daily activities for the librarians. However, these tasks are related to their relation to library users and not to the building of a collection. The public library as a centre for experiences (Audunson, 2018) where the physical collection does not have the same role as it once had, means that librarians are working more public-facing, creating inspiring activities for their users (Kann-Rasmussen & Balling, 2014). At the same time, the librarian maintains the role of guiding users to find relevant sources as well as books to read. With the rise of digitization this is not only in relation to the library collection, but also to the digital environment (cf. Olsson Dahlquist, 2019). Olsson Dahlquist (2019, p. 217) writes how the role of librarian as a guide will probably become more important in the future. The shifting focus where branch librarians do not have the same responsibility for the individual titles in the collection can thus be seen in this light.

When the branch librarians are working with the collection, they are doing so in a different way than with individual titles. Instead, they select the shape of the library room and what sections there should be. In other words, they are working with the collection on an overall level. When working with the application IMMS the librarians are working with data, thereby other competencies are needed from them that are not related to books or culture, but technology and statistics. To be able to work with the new technology, librarians need to know the basics of it. As previously mentioned, studies show that librarians do not possess sufficient knowledge of how AI works and what it is (Hervieux & Wheatley, 2021; Li & Fleischmann, 2020). If the librarians' role is to be a guide in a society characterized by information overload with selection made by algorithms, these competencies are necessary to have. For example, the algorithm can only gain data connected to the collection and how it is used, and not from a societal context. It is thus important to remain critical of how the collection can stay relevant for those patrons who have not yet found their way to the library. The system is primarily based on quantitative parameters, hence not seeing other parameters that could benefit the collection development. Perhaps this could be a moment for librarians to start talking with

patrons about algorithms and how they decide much of what information we obtain, even at their public library. However, the informants said themselves that their own knowledge is limited.

The informants emphasized their increased knowledge of what parts of the collections are being used, which goes hand in hand with the user-oriented collection management (Saponaro & Evans, 2019, p. 183). This shows how it is important for the librarians to provide resources that the users ask for (Kann-Christensen & Balling, 2011). With the use of smart technology, it is possible to manage data efficiently to be able to provide so-called smart service. That is, data is used to predict the future and to provide titles just in time (Allison, 2013, p. 91). Smart technology and smart service are two parts of the definitions of a smart library mentioned by Cao et al. (2018, p. 816). However, these two need to collaborate with smart people, i.e., librarians, to promote the library's resources and activities, hence highlighting the librarians' role as an intermediary between information, culture, and library users.

The limits of circulation data

There are aspects that need to be addressed when circulation data is becoming the main tool for collection management. Transparency and integrity of the individual are two common concerns in the research on e.g., commercial search engines and social media platforms (see for example Bucher, 2018; Haider & Sundin, 2019; Noble, 2018). Even though IMMS does not collect any data, it manages data from the library system in a new way through machine learning. The use of machine learning provides a more generalized decision-making (Coleman, 2020). There is a tendency to view this as less biased (Coleman, 2020, p. 11) although it is important to note that the parameters are human made meaning bias will always be present (Haider & Sundin, 2020; Noble, 2018). When it comes to collection management, the shortcomings of data generated by the library system is not something new (Breeding, 2013). The shortcomings of data are important aspects when it comes to outsourcing decision-making to an algorithm that only has access to circulation data and bibliographic posts. Questions must be asked: Is there enough metadata in the bibliographic posts to create well-balanced collections at the different branch libraries? Are there, for example, some parameters that ensure perspectives from LBGTQ+ and other minorities at each branch? How can branch librarians and the algorithm, in practice, work with diversity in their collections when circulation data is the main source?

There are many aspects of IMMS that remain to be explored. Most importantly, the interplay between IMMS and librarians is context-based and further research needs to be done to examine how different library organizations shape the interplay. Though the system contributes to easier material management, questions remain as to how librarians can work together with the IMMS to create a library for not only the patrons already using the library, but also for potential users. It would also be interesting to investigate why some of librarians lack the motivation to collaborate with the system. Other questions arise as to how the branch librarians are working with reading promotion when their knowledge of individual titles in the collection is decreased. In the long run, these are questions connected to the meaning of the public library and more overarching questions like: what role should the public libraries have in our society and what competencies are thus needed from future librarians?

Conclusion

This article has shed light on what IMMS means for librarians at the public library in Copenhagen. Two research questions have been answered: How do librarians and IMMS interplay at the public library in Copenhagen, Denmark? How does the implementation of IMMS impact the library practices at the branch libraries in Copenhagen, Denmark? The theoretical lens of Practice theory made it possible to see how new meaning and material elements are implemented in the library practices, but also some

unexpected new meaning elements, like hiding books from the system. New materials, e.g., mobile phone and scanner, application, and an algorithm (IDA), are introduced to the practices and are used in tandem with new norms and rules for the daily activities. For instance, the use of the mobile phone as an extended body when items in the library room are being moved. This changes the last element, that of competence, where the competence to evaluate individual items in the collection is not needed by the branch librarians in service of building and maintaining the collection. This causes tension between librarian and system since the librarians' sometimes think that the algorithm does not always make the right decisions. This tension is most visible when it comes to the practice of weeding, where the branch librarians' role is to perform the decision taken by the algorithm. This problem can be seen in the light of the limited data that the algorithm has access to. The librarians' professional knowledge as information experts is challenged in relation to the building of a physical collection. This can be seen in a context where digitization has changed the role of the physical collection in public libraries. Information can be found online, and users do not need to visit their public library in order to receive information. Though the branch librarians do not have the same role in relation to collection management, they still work as intermediators between information, culture, and library users. Thus, information retrieval and literature promotion are still important tasks for the branch librarians to perform but not in relation to the building of a collection. How this changes the librarian's ability to give their patrons (and non-patrons) good service merits further research, as does further investigations of these issues from a user perspective.

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Appendix A: Text materials

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