

# Knowledge Sharing and Design Discourses Among Healthcare Practitioners

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**Abstract:** This paper explores the role of a digital channel as catalyst for employee-driven innovation in the domain of daily operations in the health care sector, enabling knowledge sharing in the innovation ecology. A program for organizational knowledge sharing is introduced as a collaborative initiative between a technical university and Danish hospitals. This study follows a design research methodology applying design interventions with the outset in a baseline survey. Key findings strongly indicate that the proposed channel promotes the design discourse among healthcare practitioners at hospitals.

*Keywords:* Collaborative Design, Design Discourse, Employee-Driven Innovation, Healthcare Design, Knowledge Sharing

## 1 Introduction

Hospitals play a crucial role in the healthcare system, involving various actors in complex processes and interconnected services with other healthcare providers (Sal Moslehian et al., 2023). A closer look shows that hospitals are vital but also face significant challenges, including limited resources, reduced public funding, and increasing technological demands, especially with an aging population and a rise in multimorbidity (National Health Service, 2021; Salisbury, 2012). The Covid 19 pandemic just a couple of years back pushed the sector to its limit, imposing an urgency for resilience and adaptation (Capolongo et al., 2020; McCabe et al., 2020). Given these challenges, there is a recognized need for a design-oriented approach to innovation, focusing on local support for practitioners to address problems and emerging needs effectively (Region Hovedstaden, 2023).

Previous research has stressed the importance of knowledge sharing practices to boost organizational performance in healthcare. For instance, Kim et al. (2012) have found that institutional structures strongly influence knowledge sharing practices in hospitals, being remarkable for healthcare practitioners to have a safe space to discuss and report problems, but also to showcase good solutions. Specifically, scholars have referred to employee-driven innovation in healthcare (Cadeddu et al., 2023). However, despite the fact that healthcare practitioners have the knowledge about needs and solutions that could create value to patients (Grol and Wensing, 2013), commonly there are no established channels or routines to communicate them, and the culture of innovation is often not in place. As a result, innovation initiatives with potential to solve problems at a larger scale in the hospital's network end up 'in the drawer', or implemented as ad hoc solutions (Greenhalgh et al., 2017; Scarbrough and Kyratsis, 2022).

This study takes place in Denmark, with focus on hospitals from an innovation network perspective, framing the hospital and healthcare sector as an 'innovation ecology'. Like in a natural ecosystem, "[...] each element of the innovation ecology has a niche, a special role to play - and the whole system works best when each element fulfills its role effectively" (Wulf, 2008). As part of a complex healthcare ecosystem, encompassing a myriad of organizations, Danish hospitals emerge as intricate networks shaped by diverse actors operating at various levels (TechBBQ, 2024).

At an upper level, the Ministry of Health, the Danish Health Authority, and Danish Regions govern hospitals in Denmark. In addition to that, Danish hospitals are also strongly influenced by other governmental agencies, commercial actors as well as professional and patient associations (Healthcare Denmark, 2023). At a mid-level, the hospital ecosystem is built from wards with medical specialties and support units, each being organizations with their own management, often clustered into divisions led by top management. Finally, at the bottom of the ecosystem, you will find the key actors in focus in this study such as medical students, nurses, physicians, social workers, and others. They are the vital hands that keep the ecosystem alive, by performing their assigned tasks in the domain of patient care. They are also vital from an innovation perspective due to their knowledge and insight in the domain of daily operations. These key actors work in a close-knit ecology, interacting and negotiating with other actors, e.g., patients, relatives, professionals, and specialists from numerous fields, as well as non-human actors like budgets, rules, systems, and procedures, and a lot of technology that is constantly renewed and developed.

Within this dynamic environment, innovation requires a continual process of adaptation and responsiveness to identified needs. A key component in the innovation ecology is the practice of recurring articulation of proposed solutions, a practice deeply embedded in 'design discourses' (Verganti, 2009), a concept depicting the unformal mobilization of actors in a

recurring process of explication, (re)interpreting, and maturing of needs and visions, laying the ground for a user centered design processes or a product design process. This dialogical process fosters creative exchanges among diverse actors with varied agendas and expertise, facilitating the mobilization of resources within the innovation ecology. However, as explained by Wulf (2008), the process of change needs to be institutionalized, built into the culture of the organization as a practice, and distributed through channels able to support the dialogical process of continuous renewal in the ecology.

From a design perspective, this paper claims that hospitals can benefit from the facilitation of open channels for design discourses to unfold the creative dialogues and release the potential as innovation ecologies. To explore this hypothesis, the paper builds on an already established university-hospital collaboration between a technical university and hospitals in the Capital Region of Denmark. Initial documented experiences from this collaboration identified a hidden demand for knowledge sharing (Keiding et al., 2023; Keiding and Gish, 2020). These findings were the starting point to a knowledge-sharing program for organizational innovation in the healthcare sector, called MIE (Mapping Innovation Ecology), supported by a digital service.

Based on the identified demand, it is of interest to intervene and learn more about the role a program like MIE could have in fostering design discourses in the innovation ecology. One research question paves the way for exploration:

How does enhancing a knowledge-sharing practice, through the program MIE (Mapping Innovation Ecology), influence the design discourses within hospitals?

The paper goes as follows: the next section expands employee-driven innovation in hospitals and the background of MIE. In the sequence, the methodology section presents three propositions that guided the process of data collection and analysis. After that, findings are presented, organized around the propositions and the first round of data inputs of MIE, followed by a discussion and a conclusion chapter at the end.

## **2 Background**

### **2.1 Employee-driven innovation in hospitals**

The healthcare sector, and particularly hospitals, are knowledge-intensive organizations where their practices offer great opportunity to learn from mistakes and improve (Adler, 2003). The fact that hospitals have different actors with varied backgrounds, which can potentially share their perspectives, makes hospitals a vivid environment for innovation to happen. Aligned with that, hospitals can benefit from employee-driven innovation (EDI). In a scoping review of more than sixty papers about EDI in healthcare (and mostly hospitals), Cadeddu et al. (2023) found EDI has three core dimensions: participatory innovation process, learning process, and innovation outcomes. In that sense, even though EDI was most often top-down oriented, launched by upper management or outside researchers, it was necessary to involve frontline employees to share their knowledge and foster innovation initiatives. That is because frontline workers, e.g. nurses, are the ones closer to practice, and capable of spotting problems and generate new solutions (Knoff, 2019; Luz et al., 2019). This also becomes a learning process, as frontline workers are offered a space to discover, test, and learn about innovating and proposing new ideas. Summarizing, with the words of Cadeddu et al; "EDI as an innovation outcome focused on the product, service, process, practice or organizational innovation [is] resulting from frontline actors' ideation and innovation development" (Cadeddu et al., 2023). Interestingly, studies in the review mentioned the use of 'design tools', e.g., Eines and Vatne (2018), however few studies included the use of digital technology or resources to facilitate EDI. This reveals an opportunity for further exploration both in practice as well as from a theoretical point of view.

### **2.2. The MIE project**

The project MIE (Mapping Innovation Ecology) is a knowledge-sharing program for organizational innovation in the healthcare sector. MIE outset was an aim to create a dynamic real-time overview ('mapping') of needs, solutions, and available knowledge in the innovation ecology of Danish Hospitals. MIE is designed as an alliance between hospitals and universities and the objective is two-folded: from the perspective of the hospitals, it is to enhance employee-driven innovation through the introduction of a new knowledge sharing practice supported by a digital platform and database and by the mobilization of students as a resource in data collection and dissemination. From a university and student perspective, the objective is to enhance the learning outcome and the quality of innovative projects conducted with hospitals as cases, and to provide extended access to knowledge and cases in the sector.

The MIE project was initiated in 2022 as a partnership between *The Technical University of Denmark (DTU), The Department of Spine Surgery, Joint and Connective Tissue Diseases at Rigshospitalet, Copenhagen University College (KP) and the Innovation Unit of Rigshospitalet*. In 2023 the *Department of Orthopaedic Surgery at North Seeland Hospital* joined MIE. MIE is founded by DTU and The Danish Foundation for Entrepreneurship.

From 2016, and before the start of MIE, the academic staff behind a course at 4<sup>th</sup> semester at a design engineering program called 'Innovation in an Organization Context' (IOC) established a systematic innovation collaboration between the course and hospital departments in the Capital Region of Denmark. Over time, the collaboration has grown to include 24 departments in six hospitals (the IOC network). Four years later, on request from healthcare practitioners, students on the IOC course began to document the needs discovered throughout the whole course and to share summaries of insights with the hospital departments participating. With the initiation of the MIE project in 2022, a digital-database platform was designed in its early stages for documentation of identified needs and proposed solutions. The idea is that the MIE platform should encompass a series of functions, including documenting and sharing of needs, showcasing of results, search in already documented needs, discussion forums etc. Currently, the MIE platform has been redesigned a couple of times, also with the help of students and feedback from healthcare staff, to improve its interface and functionalities. However, the MIE platform is to be considered an early prototype.

Data in the MIE system is referred to as 'records', and includes need, comments, and proposed solutions. Since 2022 and until the day of publishing this paper, the MIE system has accumulated 300 records, with researchers contributing one-third. Out of these, 56 records were added during a four-week intervention period for this study. Students entered the remaining 200 records as part of the IOC course.

## Service Team: Samlet uddannelse for rengøring, service og patienttransport \*

### Kontaktperson

NSJ

### Om behovet \*\*

Der er behov for at flere medarbejder kan påtage sig forskellige arbejdsopgaver indenfor serviceområdet. Så hvis der f.eks. er travlhed hos portørerne er rengøringspersonalet også oplært i patienttransport.

### Løsningsforslag \*\*\*

På Nordsjællands Hospital har man de seneste 20 år haft stor succes med at lave en samlet uddannelse for service teamet. Dette giver mulighed for at flere medarbejdere kan varetage flere forskellige arbejdsopgaver. På den måde kan de bedre dække ind ved sygdom, ferie eller travlhed på specifikke områder. Det drejer sig både om patienttransport, rengøring, madservice, og klargøring af senge.

The screenshot shows a user interface with a 'Kommentarer' (Comments) tab selected. A comment is visible, dated 14-11-2023, discussing the need for more staff in patient transport. Below the comment is a 'Løsningsforslag' (Solution proposal) section with a 'Post' button. The text of the proposal describes a training program for a service team at North Zealand Hospital.

- \* Service Team: Comprehensive training for cleaning, service and patient transport
- \*\* About the need:  
There is a need for more employees to take on different tasks within the service area. So, for example, if the porters are busy, the cleaning staff are also trained in patient transport.
- \*\*\* Proposed Solution:  
North Zealand Hospital has had great success over the past 20 years in creating a single training programme for the service team. This allows for more employees to take on more different tasks. This way, they can better cover for illness, holidays or busy periods in specific areas. This includes patient transport, cleaning, food service and bed preparation.
- \*\*\*\* Comments:  
At RLB, Blegdamsvej, empty beds are often left in the corridors because there is no time for nurses to pick them up when a patient is discharged. Therefore, the beds are rolled out of the wards and placed in the corridors to make room for a new patient in the wards. In this connection, there is talk about whether there are others who can also handle this workflow when the porters are pressed for resources."
- \*\*\*\*\* Related needs (Not translated)

### Relaterede behov \*\*\*\*\*

#### Svært at rekruttere studerende

Kontakt: Innovationsenheden Bipebjerg og Frederiksberg Hospital Innovationsenheden Bipebjerg-frederiksberg-hospitaler@regionh.dk

Som led i opsamlngen af klini...

#### Rekruttering og nye tider

Kontakt:

Rundt om i sygehusvæsenet ses ...

#### CV

Kontakt:

CV, kompetenceudvikling for fa...

#### Service Team: Samlet uddannelse for rengøring, service og patienttransport

Kontakt: NSJ

På Nordsjællands Hospital har ...

#### Tverrfaglighed og den 'tælles forståelse' på tværs af matrikler

Kontakt: RLB

På RLB har vi matrikler spredt...

#### Personalet skal være opmærksomme på at få indberettet utilsigtede hændelser (UTH)

Kontakt: RLB, Glostrup

Det er vigtigt at medarbejdern...

#### Mere tid til undervisning af studerende til dagligt

Kontakt: 0721, Ortopæd, NSJ

De mange arbejdsopgaver tilgod...

Figure 1. Screenshot from the MIE platform interface exemplifies how content is shared. The content is translated below the screenshot.

### 3. Methodology

As stated in the introduction, this paper draws on the initial implementation of MIE and its platform among participating Danish hospitals. Based on the research question, three propositions were elaborated for further exploration:

*Proposition 1: Knowledge sharing is an inherent part of the culture and practice regarding the domain of patientcare.*

Knowledge sharing practices are already established among healthcare professionals in the matter of patient care, being an inherent part of the professional work culture at the hospitals, institutionalized by the means of systems, protocols, meetings and more. This strong culture is likely to pave the way for a similar knowledge sharing practice in daily operations where it can be observed that staff also share knowledge about needs and potential solutions, but ad hoc, not professionalized nor institutionalized.

*Proposition 2: Access to data about needs and solutions through knowledge-sharing programs inspires healthcare practitioners to actively engage in design discourses, fostering problem solving and innovation.*

Implementation of knowledge-sharing programs, like MIE, are expected to provide a structured platform and channel for healthcare practitioners to express their intentions, share knowledge, and engage in creative dialogues, contributing to the emergence of innovation. When practitioners can access data that allows them to draw insights from existing needs and solutions, this also encourages their participation in dialogue and promoting the exchange of valuable knowledge within the hospital.

*Proposition 3: Digital-databased services, such as MIE, enhance knowledge sharing and innovation:* The integration of digital-databased services, as exemplified in the MIE program, provides a technological infrastructure and a channel that enhances knowledge sharing among healthcare practitioners. This digital platform serves as an open space for communication, exchange of ideas, storage of valuable insights, and is expected to contribute to design discourses to emerge in the hospital.

To explore and attest the propositions, a mixed-method approach to data collection was deemed relevant, based on a baseline survey and a series of design interventions.

### **3.1 Baseline survey**

In the case of MIE, a baseline survey was conducted to identify existing knowledge sharing practices in hospital departments, framed as "knowledge sharing related to workflows, needs and proposed solutions in daily operations". The survey was presented for the two collaborating hospital departments on September 28<sup>th</sup>, 2023, first at staff meetings at both wards and afterwards distributed in news mails. The survey closed on October 11<sup>th</sup>, 2023. A total of 97 responses to the survey were received out of n1=150 (participants in the staff meetings) and n2=700 (recipients of the newsletter via email).

The healthcare practitioners were asked: "In the past week, how often have you participated in professional knowledge sharing with the colleagues you work with on a daily basis in your unit?". Six optional replies could be chosen: "several times a day", "daily", "a few times a week", "weekly", "rarely" or "never". In all cases but "never" the reply was followed by a question about the communication channel; "How did the knowledge sharing take place?", where several optional replies could be chosen: "Ad hoc, we talk together", "As written notes", "In connection with training", "By phone", "By email", "At seminars", "At meetings", "On digital platforms", "Other".

The questions were repeated, addressing four organizational levels:

- Unit level: current practices of knowledge sharing among the closest colleagues and within the daily work group or unit in the department.
- Department level: Current practices of knowledge sharing among other colleagues in the same department (i.e., colleagues that do not meet each other at every shift).
- Division level: Current practices of knowledge sharing between colleagues from other departments but within the same hospital.
- Cross-hospital level: Sharing with colleagues from other departments in other hospitals.

### **3.2. Design interventions**

The core data in this paper comes from design interventions. As proposed by Halse (2020), "design interventions are increasingly seen as a research method, not to test a prefigured solution to a defined problem, but to enable new forms of experience, dialogue and awareness about the problematic to emerge". In that sense, design interventions were applied as a design-research method to introduce the underlying proposed benefits, opportunities and reasons for having MIE and the shared digital platform. By that, design researchers intervened by using the MIE prototype platform. The design researchers 'enacted' the MIE platform in the sense that they offered access to the knowledge explicated in MIE platform, and the ability to healthcare practitioners to explicate their own knowledge without needing to directly interact with the platform, thereby bypassing the friction of an only partly functional early prototype. It should be stressed that in this study the platform is only applied as a tool for researchers to conduct design interventions, not with the purpose of testing the prototype.

Data collection through design interventions

A research team, consisting of three researchers, conducted the design interventions. Data for this study derives from four hospital departments, at three different hospitals, located in the Capital Region of Denmark (Table 1), all recruited to the MIE project through the IOC network. Decisions on what specific units should be exposed to the design

interventions were made in a dialogue between department management and the lead researcher. Information was then disseminated via the department and interested healthcare staff voluntarily registered to participate.

Table 1. List of respondents and hospital departments

RESPONDENT ACRONYM	RESPONDENT POSITION	DEPARTMENT ACRONYM	DEPARTMENT	HOSPITAL CODE
R1	Assisting Head Nurse	HMD	Hormone and Metabolic Disorders	A
R2	Head Nurse	RD	Renal Diseases	A
R3	Program Coordinator	RD	Renal Diseases	A
R4	Intensive care nurse	IC	Intensive Care	B
R5	Healthcare assistant with specialized clinical function	IC	Intensive Care	B
R6	Clinical nurse specialist	RSD	Center for Rheumatology and Spine Diseases	C
R7	Nurse	RSD	Center for Rheumatology and Spine Diseases	C
R8	Nurse	RSD	Center for Rheumatology and Spine Diseases	C
R9	Nurse	RSD	Center for Rheumatology and Spine Diseases	C

Data was collected following a semi-structured intervention setting, adapted to the hospital's daily workflow. For instance, some interventions took place as seated and planned meetings, while other interventions took place as a short conversation in the hallway between two patient consultations. Nevertheless, each design intervention essentially consisted of the following parts:

- a) *Opening the dialogue:* The researcher introduces the MIE project and asks introductory questions: *Who are you? What do you do daily at the hospital? What is on the current agenda when it comes to daily operations?* Needs and matters are elaborated in a dialogue.
- b) *The innovative culture and practice:* Questions are asked to explore the local practice on how to deal with specific needs and matters: *What do you do when you observe a need? Who do you typically want to involve? How will you act on it?*
- c) *Looking up knowledge:* The researcher introduces the shared platform by asking: *Should we see if anyone else has experienced the same thing?* Together they do searches in the MIE system with keywords from needs mentioned earlier in the conversation. The search results, mostly needs posted by others, are explored, and discussed. In-depth questions are asked about the need(s) and explained by the employee, like e.g. *What are you doing to find solutions?* The possible use of the MIE platform is discussed.
- d) *Posting content:* The researcher invites the healthcare respondent to share content in MIE. Together the researcher and the employer comment in MIE on some of the needs found, formulate own need(s) and proposed solutions, if such exists or emerge, and post them in MIE.
- e) *Conclusion & mobilization:* The intervention ends by discussing what the healthcare respondent can do to address own needs: The questions in response to a particular need are: *What knowledge is needed? Who should be involved? How should they be approached? What's the next step?*

Data analysis

The design interventions were audio recorded and transcribed verbatim using an auto-transcriber application within Microsoft Word. Transcriptions were then checked, and minor corrections were made. Data analysis was made by following a pre-defined codebook (Table 2), consisting of nine codes distributed within themes formulated as working questions. The codes were applied to the transcripts, line-by-line, or paragraph-by-paragraph.

Table 2. The codebook

WORKING QUESTIONS	CODES	DEFINITIONS
What needs do hospital staff explicate?	<ul style="list-style-type: none"> <li>• NEED</li> <li>• RECORD</li> </ul>	The code 'NEED' marks a need, a problem, or a proposal (in general: matter) explicated by respondents during the interview/ intervention. Add the code 'RECORD' as a comment, in cases an explicated need has become documented in MIE in the situation.
Which are the actors mentioned?	<ul style="list-style-type: none"> <li>• ACTOR</li> </ul>	The code 'ACTOR' marks a human actor mentioned in the interview as partaking or otherwise involved/mobilized to the discourse about a 'NEED.'
How do staff explicate needs?	<ul style="list-style-type: none"> <li>• CHANNEL</li> </ul>	The code 'CHANNEL' marks how, in what situation or in what media a 'NEED' has been discussed, referring to, but not limited to, the baseline question: 'How did this knowledge sharing take place?'
Thoughts from staff about the actual knowledge sharing practice	<ul style="list-style-type: none"> <li>• PRACTICE</li> </ul>	Use the code 'PRACTICE' for thoughts and comments from respondents on the need for knowledge sharing and the ways it takes place.
How do staff respond when being introduced to knowledge shared in MIE?	<ul style="list-style-type: none"> <li>• DATA</li> <li>• RESPONSE</li> </ul>	The code 'DATA' marks when data saved in MIE are presented during the intervention. Add the code 'RESPONSE' when the presented data affects or inspires the dialogue during the intervention, e.g., if it makes respondents twist a topic, change topic, articulate experienced relevance, mention actions to take, or add to or reformulate an already explicated matter.
How do staff verbalize MIE? (with the words of the respondent: What is it?)	<ul style="list-style-type: none"> <li>• MIE IS</li> <li>• FEEDBACK</li> </ul>	The code 'MIE IS' marks when a respondent verbalizes the use of MIE in context of the respondents' daily or future practice. The respondent may understand and envision MIE differently from how we see MIE, and such explications are valuable inspiration for future development. Example: A respondents wish for 'a MIE' that include the primary sector (nursing homes...) The code 'FEEDBACK' marks feedback and ideas for functionality, design, wording, application, and the like related to the existing version of MIE

## 4. Findings

In this chapter, the propositions are revisited with support of the data collected and the most relevant findings.

### 4.1 Proposition 1: Knowledge sharing is an inherent part of the culture and practice regarding the domain of patient care

Data from the baseline survey and the design interventions highlight many cases where healthcare professionals share knowledge in the domain of patient care. This confirms that knowledge sharing is already part of their practice in hospitals. Formally, text-based documentation of patient care is commonly done through comprehensive patient record systems. However, informal practices also exist, revealing that healthcare practitioners communicate and share a lot during a shift in their specific units, as exemplified here, where the dissemination of updates of working procedures (VIP's) is debated:

*"[...] I make sure that it is posted if it's something that I need them to know in the next shift, they read it in the newsletter, but it could be that there's something that's so urgent that the night shift needs it tonight. Then I write it on our attendance board in there, then I hang up the new VIP and write: 'Attention night shift'. We have an agreement in the department that you must orient yourself on the board" (R6).*

This was corroborated by results from the baseline survey. When asked about 'how often they share knowledge with their colleagues (including professional needs, problems, and solutions)', 72% responded that they share knowledge at least once a day with colleagues in the local unit. Open conversations (35%), joint meetings (17%), and sharing at learning activities (15%) were the preferred channels and dominant compared to technological channels, of which the preferred ones were email (13%), and phone (8%).

Commonly, the kind of knowledge that is shared is often experienced based and held by individuals. As a nurse at one department said: *"I always go to my colleagues first, as a rule, I have someone who has been here for many years and knows a lot of things. (If) it is a rare task we have, everyone is a little unsure about how we do it? [...] we have a little note on how we should do it, right? But it is much nicer to talk to a colleague than it is to read a note" (R8).*

With the kind of knowledge and the preferred channels taken into consideration, the study strongly indicates that sharing experience-based knowledge takes place to a wide extent, but preferably locally and in person, not across.

### 4.2 Proposition 2: Access to data about needs and solutions through knowledge-sharing programs inspires healthcare practitioners to actively engage in design discourses, fostering problem solving and innovation

Even though knowledge sharing is practiced daily (as stated in 4.1), access to the knowledge explained as needs and solutions is still limited, and very locally based. According to data from the baseline survey, staff reported (51%) that they 'never' or 'seldom' interact outside their own department. Direct personal interaction also dominates here: 50% of the interaction takes place face to face or by phone. Only 5 % of the interactions take place at digital platforms. Similarly, 70% of respondents said they 'never' or 'seldom' interact with other hospitals. Of those who do interact, 35% still talk directly or by phone.

Yet, several times healthcare staff mentioned in the design interventions the need to access and share knowledge across departments, and even across hospitals. At one department, one member of the staff reflects that: *"It would have been beneficial that their knowledge [a solution already developed by another hospital unit] had been available to us, because we had to invent the patient material ourselves" (R7).* This quote reveals that, in many cases, access to data is local, meaning solutions also end up being locally developed. In practice, this meant healthcare practitioners do not engage in broader design discourses in the eco system.

Lack of access to needs and solutions often results in resources spent on redundant developing, as exemplified by a nurse: *"We don't use each other to say 'okay, how have you done it and implemented it'. Banal things like pamphlets, for example. We make our pamphlet on, 'Sex and arthritis' for example, and they do that at [another hospital] too" (R7).*

Another nurse mentioned a patient handbook and associated checklist to ensure that patients are aware of their entire surgical pathway as an example of a solution that should be shared and disseminated:

*Nurse: "The [patient handbook] works well, and I think it might be something that could be good to implement in other surgical departments, right?" (R9)*

Similarly, a nurse emphasized the waste of resources by not knowing of solutions developed by other hospitals:

*"[...] the healthcare system spends an insane amount of resources on re-inventing the wheel over and over and over again, because we have no way of knowing, I mean, I don't know how they have done it in Aalborg? I can call them, but*

*you don't do that with everything, so you tend to just do the work yourself, but it could be that someone else has already done it. Yes, I think there's a lot of that going on.” (R6)*

Findings indicate that access to data is valued by healthcare practitioners. Content in MIE acts as a conversation starter and new knowledge and needs emerge during the sessions. Moreover, practitioners articulate interest in getting access to the MIE platform, something that validates the presumed relevance of access to data.

### **4.3 Proposition 3: Digital-databased services, such as MIE, enhance knowledge sharing and innovation**

As presented in point 4.1, existing practices of knowledge sharing already exist, but they are mostly not taking place in a digital sphere – which also makes much of the knowledge generated to reside tacit with the sole practitioner, and not made accessible to a wider circle of colleagues. By the time of data collection, some hospital departments had a presence on social media, e.g., Instagram or YouTube, and used these platforms to disseminate solutions. Similarly practitioners also used their private social media accounts to gain knowledge.

Based on that, it was interesting to explore the potential of having a dedicated digital-databased platform, such as MIE, in place. Introduced to the opportunity of accessing data digitally daily through a digital-databased platform, practitioners responded optimistic and enthusiastic, as exemplified here: *“I can then go in and search if I need to do something, so I go into the system and see if anyone has done anything about it. It's damn smart this” (R1).*

As a part of the design interventions, the researchers explored the prototype platform with the healthcare staff. This sparked conversations about the potential role of the platform, as seems here: *“Yes, you should organize it [knowledge sharing] much, much better and it's so good that you want to look into it” (R7).* In another example, the researcher attempted to seek out an identified need, however, the need had not been recorded yet. Nevertheless, this created a space for dialogue about the MIE platform as an open space for knowledge-sharing:

*“Well, I actually think that maybe that's one of the things that the healthcare system is missing, that we can talk to each other across the regions. Our department here at Blegdamsvej, we are highly specialized, which means that we can't necessarily just mirror ourselves in the others, but there are also some other highly specialized departments within rheumatology in the other regions. That is, I actually call Aarhus or Odense or Aalborg if I need sparring on some of these patient flows” (R6).*

Despite the potential of the MIE platform to enhance knowledge sharing and innovation, there are still challenges to overcome. The design interventions showed that some practitioners do not feel comfortable with digital services (aka ‘IT’), here quoting a head nurse: *“We are old nurses and also not very good at IT [...] and super layman-like when it comes to our IT skills” (R1).* For those, digital database services might represent a challenge or would need a more tailored introduction to get accepted. Furthermore, healthcare staff experience an overload of systems and platforms already existing in hospitals: *“So it must be simple. It should be a simple setup. Because we already have 1000 IT systems and systems. There is the Health Platform, which we work on every day. Then we have the VIP portal. Then we work on a different system when we must register things, and then we work on a new system when we must order porters and so on and so on. And then we are working on a new system again in relation to competence development” (R6).*

## **5. Discussion**

Knowledge sharing is an inherent part of the culture and practice in patient care at hospitals (Kim et al., 2012). This was also supported by evidence from our study. Healthcare professionals continuously share knowledge to improve their daily operations of patient care. In daily operations, the focus of this study; the design discourse, as defined in the introduction, seems like a consistent representation of the nature of employee-driven innovation taking place at the hospital. Healthcare practitioners try to deal with needs in a very dialogical way: They reach out to each other for knowledge, they propose solutions, and they try to mobilize important actors to make changes happen. However, as found in this study, knowledge sharing practices in daily operations are still primarily local and ad hoc, in many cases individualized – meaning that access to knowledge and relevant information might also depend on “who knows who”. Similarly, other scholars have come to the same conclusions, emphasizing the implementation of ad hoc solutions as a dominant practice in healthcare (Scarbrough and Kyratsis, 2022).

As expressed by Tucker and Edmonson (2003), the dynamic of an ecosystem for problem solving “[...] is not unique to hospitals, although it may be exaggerated in health care by the task variability, the extreme time pressure faced by workers, and the increasing cost pressures faced by hospitals”. In this context, nurses, especially, are key actors and are ready to understand, propose, and adapt to meet the needs of patient care (Tucker and Edmondson, 2003). Yet, to go further than hoc solutions, access to knowledge should become available and operationalized. Our data revealed redundant needs and solutions, where nurses and other healthcare staff would have benefited from a channel like the MIE platform.



When presented to data about practice in a shared digital database, practitioners were observed engaging and instantly responding with interests and curiosity, metaphorically like opening a floodgate. Dialogue emerged and stories about colleagues doing things differently, opportunities and solutions worth trying, were exchanged with the researchers. In many cases, it led to elaborate dialogues about current knowledge-sharing practice, needs and solutions. In other cases, it led to stories about working conditions and limitations for innovation, as well as the lack of forums, channels, methods, and resources for the design discourse to unfold and expand. Regarding this, a channel like the MIE platform seems very much requested. Nonetheless, its implementation also comes with challenges, as healthcare staff are also already overwhelmed by many digital platforms – a common trend in countries like Denmark, where digitalization of healthcare is part of the current agenda. Lessons learned so far from the MIE project resemble lessons learned by other researchers as well, who also identified digitalization in healthcare as a process of transformation, where human actors are vital and where many knowledge exchanges take places outside digital platforms (Meister et al., 2019).

## 6. Conclusion

This paper explored the role of digital systems as a catalyst for knowledge sharing in daily operations among healthcare practitioners at hospitals, enhancing employee driven innovation. In this study, we apply design interventions building on the foundation established by a baseline survey. The design interventions took place at two levels of abstraction. On a concrete level, the aim was to facilitate the design discourse by enabling the explication, clarification and interpretation of needs and proposed solutions that could be documented in the shared MIE digital platform. On a meta-level, the design interventions served as an exploration of the design discourse and the innovation culture, aiming to understand how things emerge in an innovation ecology contextualized by selected Danish hospitals.

Key findings strongly indicate that access to data about needs and solutions from other hospitals and departments infuses the design discourse and inspires healthcare practitioners to take part in the creative dialogue and share their own knowledge. From a design-research perspective, the findings showed that a system with the proposed features can provide a channel for knowledge sharing, with potential to boost employee-driven innovation initiatives. Moreover, the mobilization that took place during the period of interventions served as an argument for the continuation of the MIE project. However, it is important to mention that study neither intends nor claims to paint an exhaustive picture of the culture of innovation and knowledge sharing in Danish hospitals. A more comprehensive study is needed to do that. Data used in this study was based on interventions involving 9 employees at 4 departments and it should be seen in the context that there are more than 100 departments and 44,000 employees at 10 hospitals in the Capital Region of Denmark, one out of five Danish regions.

From a theoretical perspective, the MIE project builds a strong case for learning and experimenting with design approaches in a context that is not design-oriented in the outset, and where an innovative culture is not often built from within. Through that, this paper also contributes to organizational studies as a case on how knowledge sharing practices can be facilitated and mediated by systematic access to data.

Further research will be conducted along with a continued experimental development of the MIE platform and mobilization of the ecology to the program following a design research methodology. A series of questions arises, and can serve as the outset for this research. Here are five mentioned:

- Does the access to digital mediated knowledge sharing as proposed with MIE provide sufficient incentives for healthcare professionals to actively share? What other potential incentives could be considered?
- How does a changed culture for knowledge sharing in the innovation ecology affect the value creation from the innovation activities?
- How will the MIE program be perceived by the actors at mid-level in the innovation eco system - being managers, administration, and more? What utilization will they envision, and what are the implications derived from that, practically and in the context, ethically and particularly in terms of data-ethics?
- From a university perspective: How does participation in the MIE program affect the students' learning and the quality of their projects?
- And finally, going back to the original intent of the project 'Mapping Innovation Ecology': With access to a large dynamic updated dataset documenting actual needs and proposed solutions in the innovation ecology at the hospitals, what can be learned about the innovation culture and practice by following the trace of the emergence and dissemination of knowledge and innovative solutions to urgent needs?

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