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Knocking on Doors - How Healthcare Workers Informally Develop Expertise in Biomedical and Health Informatics

Sidsel VILLUMSEN[a,1], Rikke Amalie Agergaard JENSEN[b,c], Klaus NIELSEN[a], Ouafa RIAN[d] and Charlotte JONASSON[a]
[a] *Department of Psychology, Aarhus University, Denmark*
[b] *Unit for Psychiatric Research, Children and Adult, Department of Regional Health Services Research, University of Southern Denmark, Denmark*
[c] *Centre for Involvement of Relatives, Mental Health Services Region of Southern Denmark, Denmark*
[d] *Koncern HR, Udvikling, Central Region Denmark, Aarhus, Denmark*
ORCiD ID: Sidsel Villumsen https://orcid.org/0000-0003-0832-0861,
Rikke Amalie Agergaard Jensen https://orcid.org/0000-0001-7325-8115,
Klaus Nielsen https://orcid.org/0000-0001-7287-8400,
Charlotte Jonasson https://orcid.org/0000-0003-1247-3377

Abstract. With digital systems permeating the healthcare sector, the healthcare workforce (clinical and administrative) need insight in biomedical health informatics (BMHI) to some degree. This study shows how novices in BMHI had to knock hard on several doors to find and become part of a community of practice to gain such expertise within BMHI. While it may be generally understood that gaining access to expertise is important, our findings suggest that more attention is needed to how such access is gained. The study exemplifies that the needed skills and competencies are difficult to identify in the individual projects and are highly situated – not least because it requires access to various experts in communities of practices. Therefore, there is a continued need to reframe the necessary education and training. Knowing *when* to knock on doors, *which* doors to knock on, and *keeping* doors open is central to becoming - and keep on being - a part of a community of practice centring on health information technology and BMHI.

Keywords. competencies, healthcare workforce, communities of practice, situated learning

1. Introduction

It is no secret that implementing technology and health information technologies (HIT) in healthcare is challenging [1]. With the multiple complexities of healthcare follows a need for the healthcare workforce to be capable of adopting and adapting these new technologies [2]. To do this, they need to know about biomedical and health informatics (BMHI). BMHI, as an interdisciplinary field, requires practitioners to have expertise in various areas, including biomedicine, healthcare, computer science, mathematics, data

[1] Corresponding Author: Sidsel Villumsen, sidvil@psy.au.dk

science, and machine learning. Additionally, professionals working in this field often need to be able to effectively navigate complex organizational and interpersonal issues [3]. However, the extent and nature of the BMHI knowledge and skills needed depends on the context in which the person is situated (i.e., role, responsibility, and setting) [2, 4], leading to a multiplicity of learners with related diverse educational needs [3].

Previous work has identified a specific group of employees dedicated to digitally transforming the healthcare system [4], carrying out important work in implementing and developing HIT, often without being appointed formal authority in doing so. These employees are all experts in their specific field of practice, be they nurses, doctors, medical secretaries, administrative workers, or other profession, taking on the task of implementing and managing HIT on top of their daily work. Rarely they have access to formalised BMHI training and are thus often novices within BMHI. Yet, developing skills and competencies can also be sought through situated learning in communities of practice [6,7], where novices develop skills through participating in situated work practices with experts. Therefore, we have studied dedicated healthcare workers' approach to informally developing expertise within BMHI [5], through a theoretical framework of communities of practice [6,7]. However, as the healthcare system is vast and complex, and BMHI bridges many different work areas of healthcare [8], it may be far from easy for these novices to find and become part of a relevant community of practice.

2. Methods

The paper builds upon the preliminary findings presented in [5] – a study on how novices in BMHI gain access to communities of practice. The study was conducted in a Scandinavian secondary public healthcare sector, studying the participation of employees and managers in department-local HIT projects. Data originated from participant observations of project related meetings and everyday work and was elaborated through semi-structured interviews (n=29) with project participants (i.e., healthcare practitioners and administrative workers), managers, and informaticians. Notes and transcripts were inductively coded during and after the data collection [9] through a theoretical lens of communities of practice and situated learning [5-7].

3. Results

We studied how novices in BMHI gained access to communities, where they could engage in situated learning to increase their expertise within BMHI [5]. We followed the processes of local HIT-projects over a period of two years. Project participants had various professional backgrounds and roles (i.e., some were healthcare practitioners, some were administrative workers, and some were managers). Although experts in their specific field of practice, the participants knew that they were novices in implementing HIT and that they, through working with a community of practice, could become more experienced in this area of work. Nevertheless, findings showed that the novices had to knock hard on several doors to find and become a legitimate participant in a community of practice. Below we highlight facilitators and barriers for three aspects of gaining access to communities of practice within BMHI; that is 1) planning and implementing

HIT; 2) forming a digital and organizational overview; and 3) insisting on expert relations [5].

3.1. Planning and Implementing HIT: Figuring Out When to Knock on Doors for Help

The results showed that planning and implementing HIT was not an easy task for the novices. They were often developing the solution(s) while determining how to implement it. Along these, often winding, roads, they encountered highly various barriers ranging from more technical problems to organizational issues such as resource allocation. However, it was difficult for the novices to figure out whether it was a barrier they could overcome themselves or whether they had to ask for help.

> *Novice 1: "But I think we are almost there. It looks good, and we have a clear plan for what [the HIT] should contain."*
>
> *Novice 2: "Well yes, but there are some uncertainties – like we don't know exactly how to distribute this and how long it takes. I really do think we need to go and ask for [IT] support on this before we continue."*
>
> *Novice 1: "I see your point, but I think that should be later on in the process. For now, we need to get the other [colleagues] to give their input and hopefully nod to that being good, and then we deal with the technical matters in the next step."*

Thus, the novices had to draw up a plan, not only for the HIT itself but also for *when* to reach out to *which* people to gain their support, their approval, or their input. This was not easy and there were no clear criteria for when it was suitable to reach out and seek access to help and expertise. Instead, the novices, together with fellow novices, had to negotiate when it was the right timing to reach out to experts.

3.2. Forming a Digital and Organizational Overview: Which Doors to Knock On?

In their everyday work, the novices most often knew whom to contact if they needed help for something related to their core work. However, when it came to HIT, it was often unclear whom to contact – not least because this also depended on the nature of the HIT-related barrier(s). For example, sometimes they would encounter technical problems, sometimes the problems were communication-related, sometimes they had problems related to financial clearance, and sometimes they had to overcome problems convincing users.

> *"If this [problem] had been [in my healthcare field] I would have known exactly whom to contact, but it isn't. So, I spent a lot of time on trying to figure out who to ask. I mean, it is a simple problem, I think, but is it the IT department or the technical department that can help us? I was also thinking of getting in contact with somebody at a different hospital, because I heard that they had installed this solution - but it turned out it was not the same. But we had a nice talk about their solution, which I think is not for us".*

The novices showed considerable patience in figuring out which doors to knock on to gain access to relevant experts, who were able to help the novices in their specific situations. Although this was time consuming, even when contacting 'the wrong' people the novices gained valuable understandings of BMHI. Moreover, through this process of knocking on doors, they slowly widened their digital and organizational overview.

3.3. Insisting on Expert Relations: Keeping the Doors Open

Our study showed that gaining access to communities of practice was a continuous endeavor for these novices in BMHI. Even when the novices were becoming less newcomers and knowing with more certainty that they needed help and from whom, they had to work to keep the doors open. Sometimes one door to an expert would close because the expert had changed their work area or because their time for support was limited:

> *Novice: "I don't know if we can keep contacting you, but I have this problem […]."*
>
> *Expert: "You can, but not for long because I will move to […]. But then you can contact my colleague. But we are also trying to make a network of other people who have worked with the same [HIT] so that you can reach out to each other, and then we will take more care of the background stuff."*
>
> *Novice: "But for now, I can get you to look at this?"*

The novices had to carry on with a level of insistence on being, or rather keep on becoming, part of a community of practice centering around HIT and BMHI. This could also be more formally structured such as networks of interest. However, the novices kept knocking on their well-known doors, while waiting for such networks to take form. They had gained a clear understanding of the importance of honing relations with experts and that this was not an easy skill to gain.

4. Discussion

With digital systems permeating the healthcare sector, the healthcare workforce (clinical and administrative) need BMHI insight to some degree, depending on their role [2]. While it may be generally understood that gaining access to expertise is important, our findings suggest that more attention is needed to *how* such access is gained.

The BMHI novices we have studied were – and are – users but also took on a key role in bridging HIT and healthcare through adoption and adaption. However, this role is a challenging role to fill. These novices are rarely formally appointed in these BHMI roles or trained in doing so, nor do they have the opportunities to acquire formal BHMI-training, as opportunities for enrolling in formal education (i.e., courses or programs) are limited. Thus, they need to go "knocking on doors" to gain access to opportunities for gaining the skills and expertise necessary. The process of gaining and keeping legitimate access to relevant experts accentuates the situatedness of competence development [7]. Our study shows examples of novices in healthcare gaining skills within BMHI through the everyday work with local digitalization projects and engaging with experts in a variety of areas. Although our paper does not focus on their becoming sufficiently skilled to improve and develop the field of BMHI, the findings suggest that becoming skilled in *gaining access* to highly interdisciplinary BMHI communities of practice is a first and important step on the road.

The field of BMHI is vast. Although knowing that its development calls for complex and complementary skills and competences, the findings of this study exemplify that the needed skills and competencies are difficult to identify in the individual projects and are highly situated – not least because it requires access to various experts in communities of practices. As the need for skills and expertise depends on the particular project and

due the ever-changing nature of the HIT landscape, it could be advantageous to take on an approach of life-long, situated learning when addressing competency development in the wider healthcare workforce [4,5]. Not as a replacement for formal BHMI-training where this is an option, but as a supplement available for the broader scope of healthcare workers.

5. Conclusion

This study takes departure in situated learning in communities of practice as fundamental to generalists' development of skills and competencies in BMHI. The findings show that novices in BMHI had to work hard to gain access to communities of practice with different experts and other novices in BMHI. We conclude that knowing *when* to knock on doors, *which* doors to knock on, and *keeping these doors open* is central to becoming and keep on being a part of a community of practice centering on HIT and BMHI.

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