

Inter-Hospital Knowledge Sharing: Insights From Case Studies on Infrastructure Issues During COVID-19

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Abstract: This paper presents findings on knowledge sharing (KS) behaviours among Estates and Facilities Management (EFM) staff in the English National Health Service (NHS). EFM departments play a crucial role in ensuring the safe delivery of healthcare services while facing the impacts of disasters, climate change hazards, and continuous organisational change. Effective KS among hospitals is required to efficiently manage these constantly changing conditions and emerging challenges. While previous research has largely focused on evidence-based clinical knowledge dissemination among clinical professionals, scant research has been conducted to investigate KS processes among EFM departments. The research draws on primary case study data from semi-structured interviews with 34 EFM professionals conducted in seven NHS hospitals across England. Using qualitative analysis and the persona technique, we identify variations in KS behaviour among managerial levels and explore the associated barriers to KS. The findings reveal that KS is more prevalent among strategic-level managers, who engage in regular peer discussions and focus on the sharing of knowledge and best practices. In contrast, operational-level managers face barriers to KS due to a lack of personal networks and time constraints. The study also highlights the effects of frequent organisational changes in the NHS, which has resulted in a lack of technical in-house expertise and slow central coordination. The study concludes that a centralised coordination function is necessary to facilitate effective KS, with a focus on the organisation of peer collaboration, enhancing the centralised online repository for best practice and academic research, and the use of a national skills register. The study extends the current literature by identifying variations in KS behaviour among managerial levels and providing insights into the barriers to KS in the NHS EFM workforce. The findings have implications for NHS managers and policymakers seeking to improve KS in the EFM workforce, particularly in addressing the barriers faced by operational-level managers and the need for a centralised coordination to facilitate effective KS.

Keywords: Knowledge sharing, National Health Service, Estates and facilities management, Managerial levels

1. Introduction

The current change towards integrated care systems (ICSs) in the UK's National Health System (NHS) is another major restructuring designed to integrate NHS and local government services. However, as highlighted by The House of Commons Public Accounts Committee, the reorganisation cannot be successful if the systemic problems in the NHS, such as expanding patient waiting lists, workforce recruitment and retention issues, and an ever-increasing backlog maintenance for the NHS Estate, are not addressed (Iacobucci, 2023). Moreover, inflationary pressures resulting from rising energy costs due to the Ukraine war and the ambitious net-zero carbon target by 2040 complicate the task (Jennings and Rao, 2020). The COVID-19 pandemic exposed these vulnerabilities by revealing bed capacity limits and staff shortages (Coyle, 2022).

NHS Estates and Facilities Management (EFM) departments – responsible for maintaining safety-critical infrastructure and essential support services – currently face the challenge of maintaining an ageing Estate while enduring various external stressors and internal change initiatives. To achieve this, the NHS needs to be able to effectively share knowledge, such as lessons learned and best practices across the NHS (AHSN Network, 2019). However, there is currently only fragmented KS among few NHS Trusts (HSIB, 2021), and most EFM departments have to resort to using their own resources to find guidance and innovative solutions to their safety-critical infrastructure issues. Moreover, previous research has shown that KS behaviours with peers from other Trusts differ among managerial levels within EFM (von Behr et al., 2022). Therefore, this paper aims to analyse KS behaviours and perspective on different managerial levels within EFM departments to enable the creation of KS channels customised to the needs of the employees.

The paper is structured as follows. Firstly, we summarise the existing literature on managerial levels and KS. Then, we review the methods that were used to collect, analyse, and present data for the research. Finally, we present and discuss the collected data and conclude by outlining academic and practical contributions, acknowledging the limitations of this study and highlighting further research opportunities.

2. Literature Review

2.1 Knowledge Sharing (KS) Behaviours in NHS EFM

To ensure patient safety, policies in many NHS Trusts require EFM services to operate based on national best practices (PH NHS Trust, 2019). Therefore, EFM staff must be able to access knowledge and experience of peers in other Trusts, necessitating effective KS across organisational boundaries. However, several studies have highlighted limited KS among NHS Trusts (Barlow et al., 2009; Kothari et al., 2011; Nutt, 2000), with poor attempts to address the issue (Pathirage et al., 2008).

According to Davenport and Prusak (1998), knowledge comprises a dynamic blend of structured experience, values, contextual data, and expert judgment. This knowledge is often ingrained not only in documents or databases but also in organisational routines, procedures, practices, and standards. Various categorisations of knowledge exist, including explicit and tacit types of knowledge (Nonaka, 1994; Polanyi, 1966). Explicit knowledge is the type of knowledge that can be embodied in a code or language and can be verbalised, communicated, processed, transmitted, and stored relatively easily. Tacit knowledge is based on personal experiences and is difficult to articulate or transfer to another individual because the possessor is unaware of its existence and how it could be beneficial to others (Nonaka, 1994).

A recent study (von Behr and Minshall, 2022) reviews the KS literature and identifies three overarching KS strategies for EFM departments: For documented knowledge, codification strategies such as guidance documents and library services provide effective storage tools, while newsletters, bulletins or blog posts provide effective ways by which to disseminate topical knowledge (Adeyemi and Olla, 2020). Undocumented knowledge can be shared via informal social networks or alternatively using personalisation mechanisms, such as communities of practices and action learning. These channels enable individuals to share undocumented knowledge of value in the same or different EFM disciplines (Kothari et al., 2011).

Similarly, several barriers to KS have been identified in the literature which can be categorised into four key areas: source-recipient relationship, knowledge transferred, organisational context, and flow mechanisms. Barriers in the source-recipient relationship include the lack adequate knowledge among EFM managers (Baaki et al., 2016), and the need for leadership programs for collaborative behaviour (Hope Hailey et al., 2017). For operational staff, several factors hinder effective KS, including lack of awareness of tacit knowledge (Pathirage et al., 2008), lack of expertise and insufficient professional development in the NHS (Naylor, 2017; von Behr and Minshall, 2022), and reliance on technical manuals (Wetherill et al., 2007). Additionally, some staff may be unopen to KS (Adeyemi and Olla, 2020; Kothari et al., 2011) or lack critical thinking skills (Kothari et al., 2011). Furthermore, there are various challenges related to the knowledge to be shared. For example, information overload (Kothari et al., 2011) can complicate KS. Moreover, some knowledge types – especially related to context-dependent factors – are difficult to share with external peer groups (Pathirage et al., 2008). The organisational context is another important factor that affects KS. In particular, in- and outsourcing of services (Yousefli et al., 2017), the PFI ownership model (Barlow et al., 2009; May, 2018), benchmarking/competitive pressures (Agostini et al., 2020), no or unsuitable reward systems (Kaushal and Nyoni, 2022; von Behr et al., 2022), and a lack of an overarching Estates strategy (Naylor, 2017) can all impact KS. Finally, issues around existing KS channels, such as reliance on top-down communication (Kothari et al., 2011), bureaucratic procedures (Adeyemi and Olla, 2020), and lack of formalised collaboration (Adeyemi and Olla, 2020) can hinder effective KS.

2.2 Managerial Levels Within NHS EFM

Secondary care hospitals in the NHS are run by so-called NHS Trusts that have varying organisational structures and degrees of autonomy to respond to local needs based (Auschra, 2018). Within NHS Trusts, EFM departments play a crucial role in ensuring that the physical infrastructure of hospitals and healthcare facilities is properly managed and maintained to support the delivery of high-quality patient care. EFM incorporates multi-disciplinary activities within hospitals' built environment, managing their impact on people and the workplace (Alexander, 1996). These activities ensure that hospital buildings, systems, and services align with the core clinical operations, thereby contributing to the organisation's strategic objectives. Therefore, EFM encompasses strategic, tactical, and operational considerations, and consists of a variety of disciplines that can be classified into Estates (building and infrastructure-related) and Facilities (support services) management.

The organisation of EFM departments within the UK NHS involves a complex structure of roles and responsibilities that must be considered when studying KS behaviours. This includes the management of specialised high-risk-impact services, such as high voltage electricity, medical gas pipeline systems (MGPS), and

water safety and quality. The NHS Trust board appoints a Designated Person (DP) – usually the Director of Estates and Facilities – to carry the responsibility for the services. The DP nominates technically qualified engineers as Authorised Persons (AP) who have the key operational responsibility for the specialised service and appoint Competent Persons (CPs) to carry out installation or maintenance works in accordance with the standard operating procedures. Additionally, Authorising Engineers (AEs) act as independent professional advisers to a portfolio of NHS Trusts (HSIB, 2021). These complex structures of actors with specific operational, tactical, or strategic roles within EFM departments must be considered when studying KS behaviours among NHS Trusts.

2.3 Research gap and Question

Effective EFM services require access to different types of information on strategic, tactical, and operational management levels. At the strategic NHS EFM level, Directors of EFM (DoEs) must consider new ways of thinking about healthcare buildings and create visions and translate these into policies to guide the organisation into the future. At the tactical level, Heads of EFM (HoEs) must implement those policies and monitor the performance to meet policy requirements. At the operational management level, APs and CPs are responsible for executing the policy interventions and reporting the progress on their implementation. As visible in Figure 1, the management literature associates different concepts with the different management levels: On strategic level, topics are centred around effectiveness, organisational alignment, governance, and competitive advantage, while on tactical level, the literature discusses the dilemmas between effectiveness vs. efficiency, outcomes vs. outputs, and system design vs. process design. For operational management, efficiency and business processes are key elements (Nechkoska et al., 2015).

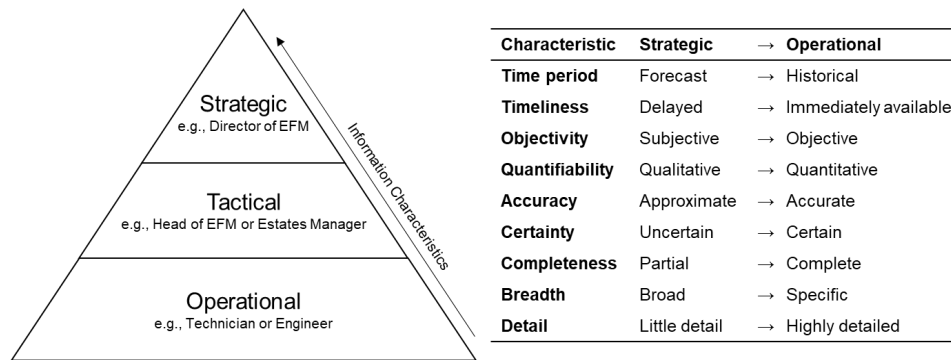


Figure 1: STO Framework Illustrating Management Levels and Required Information Types (Adapted From Anthony, 1965)

Despite the recognition of the importance of KS for organisational success, there is a lack of understanding on the variations in KS practices among managerial hierarchies within the NHS EFM workforce. Cresswell et al. (2021) argue that policy interventions should aim to reduce barriers and promote informal KS. Pfeffer (1981) emphasises the role of power differentials in shaping communication patterns and decision-making processes within organisations, suggesting that hierarchical structures can affect the ability of workers at different levels to share knowledge and influence decision-making. To address this gap, we formulated the following research question: *What are the variations in knowledge sharing practices among managerial levels within the NHS Estates and Facilities Management workforce?*

3. Research Design and Methodology

To address the proposed research question, a multiple retrospective case study methodology was selected to investigate KS behaviours of EFM staff responsible for medical oxygen infrastructure systems during the COVID-19 pandemic. The case sampling process was guided by a maximum variation rationale focussing on hospital site characteristics, including geographical region, size and type of hospital, and organisational structure. This rationale aimed to document unique or diverse variations that have emerged in adapting to different conditions (Patton, 2014).

After the identification of potential cases, the research departments of the Trusts were contacted and asked for participation in the study. Once the Trust and the EFM department confirmed capacity and capability to deliver the research activities, a “Non-Commercial Participant Identification Centre Agreement” was signed. In total, seven NHS Trusts, one in every region of England, agreed to participate. Interview guides were refined and validated during a pilot case study. Upon successful completion of these steps, the first interview was

conducted with the EFM employee that was nominated by the Trust's research department. During this interview, a snowball sampling strategy was used to identify other potential interviewees – both trust-internal and external (e.g., AEs) who were involved in the flow of knowledge related to the Trust's MGPS. In each case, we conducted 3 to 6 semi-structured interviews with stakeholders on strategic, tactical, and operational levels as well as external Authorising Engineers (AEs), each lasting 45-60 minutes. Table 1 summarises the conducted interviews and shows the differences in organisational and tenure type across the seven cases.

Table 1: Overview of Case Studies and Interviewed Stakeholders

Case studies	Code	Job title	Hierarchical level	Internal (I)/ External (E)	Interview date
Large Teaching Hospital Trust A (Part-site PFI)	1.1	Deputy Director of Estates and Facilities	Strategic (DoE)	I	26.05.2022
	1.2	Senior Mechanical Engineer	Operational (AP)	I	12.06.2022
	1.3	Head of Estates	Tactical (HoE)	I	14.06.2022
	1.4	Hospital Engineer	Operational (AP)	I	21.06.2022
	1.5	Authorising Engineer	External (AE)	E	21.06.2022
	1.6	Director of Capital, Estates and Facilities	Strategic (DoE)	I	20.10.2022
Multi-Service Trust A (Part-site PFI)	2.1	Director of Estates and Facilities	Strategic (DoE)	I	24.01.2023
	2.2	Head of Medical Technology	Operational (AP)	I	07.11.2022
	2.3	Head of Estates and Facilities	Tactical (HoE)	I	23.01.2023
	2.4	Authorising Engineer	External (AE)	E	05.12.2022
	2.5	Mechanical Technician	Operational (CP)	I	19.01.2023
Large Acute Hospital Trust A (Part-site PFI)	3.1	Head of Estates and Facilities	Tactical (HoE)	I	11.07.2022
	3.2	Authorising Engineer	External (AE)	E	20.07.2022
	3.3	Estates Manager	Operational (AP)	E	22.07.2022
	3.4	Project Engineer	Operational (CP)	E	19.07.2022
	3.5	Director of Finance	Strategic (DoE)	I	03.11.2022
Large Teaching Hospital Trust B (Freehold)	4.1	Director of Estates	Strategic (DoE)	I	25.08.2022
	4.2	Senior Operational Manager, Site A	Tactical (HoE)	I	17.11.2022
	4.3	Deputy Operations Manager, Site A	Operational (AP)	I	22.11.2022
	4.4	Estates Manager, Site B	Operational (AP)	I	22.11.2022
	4.5	Authorising Engineer	External (AE)	E	24.11.2022
Multi-Service Trust B (Freehold)	5.1	Interim Operational Estates Manager	Tactical (HoE)	I	20.10.2022
	5.2	Estates Officer	Operational (AP)	I	16.01.2023
	5.3	Authorising Engineer	External (AE)	E	24.01.2023
Large Acute Hospital Trust B (Whole-site PFI)	6.1	Director of Estates and Facilities	Strategic (DoE)	I	09.11.2022
	6.2	Senior Estates Manager	Tactical (HoE)	I	09.11.2022
	6.3	Mechanical Estates Officer	Operational (AP)	I	25.11.2022
	6.4	Estates Manager	Operational (AP)	E	21.11.2022
	6.5	Apprentice	Operational (CP)	E	30.11.2022
	6.6	Apprentice	Operational (CP)	E	30.11.2022
Medium Acute Hospital Trust (Part-site PFI)	7.1	Associate Director of Estates and Facilities	Strategic (DoE)	I	13.10.2022
	7.2	Estates Manager	Operational (AP)	E	25.10.2022
	7.3	Authorising Engineer	External (AE)	E	17.10.2022
	7.4	Senior Hard FM Manager	Tactical (HoE)	I	23.22.2022

All interviews were held remotely using Microsoft Teams due the uncertainty concerning the COVID-19 pandemic and its impact on in-person interactions in hospital environments. This arrangement allowed more scheduling flexibility and reduced research travel costs, facilitating access to NHS Trusts from different regions. The interviews were recorded through the respective platform and transcribed by the lead researcher. Subsequently, transcripts were pseudonymised with a unique code.

The data analysis involved three steps: (i) a two-step process of structural and axial coding to identify themes in the collected data, supported through the qualitative data management tool NVivo 12, (ii) the creation of personas for every interviewee, following Pruitt and Adlin's persona lifecycle process (2010), and (iii) the summarisation of KS behaviours by managerial level.

4. Findings and Discussion

This section examines the collected and analysed data as summarised in Table 2. Any direct quotes from the interviews will be in *italics* accompanied by the corresponding interviewee code. It is important to note that due to the restricted scope of this paper, the discussion is limited to managerial levels. However, to illustrate

the effect of organisational differences across the seven cases, additional information considering hospital and tenure type can be found in **Tables 3** and **4** in the appendix.

Table 2: KS Behaviours by Managerial Level (Most Frequently Mentioned Aspect per Managerial Level Bolded)

Level/ perspective		Strategic Director (n=7) (%)	Tactical Head (n=7) (%)	Operational		Overall excl. AEs (n=28) (%)
		AP (n=10) (%)	CP (n=4) (%)			
Origin	Preferred sources of information					
Trust int.	Internal collaboration (e.g., team members, colleagues within Trust, Committee meetings)	71	57	70	100	69
	Learning through practical experience	0	14	30	25	17
NHS-wide	Guidance, Standards, Regulations (e.g., HTM, ISO, BSI)	0	71	100	75	62
	NHS England Collaboration Hub	43	43	10	0	24
	CAS Alerts	14	43	10	0	17
	Benchmarking (e.g., ERIC, Model Hospital)	43	29	0	0	17
	Government & NHSE stakeholders	14	43	0	0	14
External	Personal development (e.g., training & CPD)	57	86	100	100	83
	Personal network (e.g., ex-colleagues)	100	57	50	50	62
	Authorising Engineer	14	43	100	25	52
	Professional bodies and institutes (e.g., IHEEM, HefmA, CIBSE, IET, IEng, NAFO)	86	57	40	0	48
	3 rd parties (e.g., manufacturers, universities, consultants, contractors)	29	29	80	50	48
	Peer collaboration via informal networks (e.g., peer groups, regional hubs, LinkedIn)	71	43	50	0	45
	Research (e.g., internet, journals, other industries)	43	29	10	0	21
Origin	Perceived barriers to sharing knowledge					
Trust internal	Time and resource constraints	43	86	30	0	41
	Communication issues (e.g., silo-working within Trusts, lack of meeting rooms, no feedback after escalation)	29	57	50	0	38
	Management/ leadership issues (e.g., ineffective knowledge retention, governance, board representation)	29	29	50	0	31
	Organisational culture issues (competition, power dynamics, commercial conflicts)	14	14	10	25	14
NHS-wide	Inadequate links among Trusts (no access to peers)	43	43	50	100	52
	Ineffective/slow central coordination/ facilitation (e.g., lack of feedback & central coordination)	29	57	50	25	41
	Insufficient training (e.g., inadequate training courses, lack of expertise, financial constraints on training)	71	29	30	0	34
	Varying contexts (e.g., different protocols and procedures among Trusts)	57	0	20	25	24
External	Challenges of remote meetings (e.g., distractions, lack of trust, anxiety)	29	43	40	25	34
	Difficulty to access trusted & reliable sources of information (e.g., standards, policy documents)	29	14	20	0	17
Ideal future of knowledge sharing with peers from other Trusts						
Channel	Regular peer discussion forums	71	71	70	75	69
	Online repository with best practice & research (e.g., extending functionality of Collaboration Hub)	14	29	30	50	28
	Email newsletter	0	0	20	0	7
Facilitation	KS facilitation through NHSE team (e.g., central moderation of dialogue, linking similar Trusts)	14	57	0	0	17
	Systems approach (e.g., ICS, cross-disciplinary)	29	14	0	0	10
	National skills register	0	0	0	0	0

4.1 KS Behaviours by Managerial Level

The dominant channels for strategic level EFM staff to acquire information include inter-disciplinary internal collaboration, seeking advice and comparing performance with people in the same role through personal networks, professional bodies, and informal peer networks. For example, interviewee 2.1 mentioned, that multiple team members are part of different professional bodies so the Trust is *"quite attached to those networks"*, while another DoE stated that the EFM team relied *"heavily on IHEEM and HefmA"* (4.1). Beyond professional bodies, informal peer networks are used to connect with peers and discuss best practices and strategies. Multiple DoEs mentioned being part of 'EFM Square' – *"a group of like-minded Directors of the Estates and Facilities"* (1.6). This network includes DoEs from *"the big teaching hospitals, [...] to try and influence policy and have a collective effort"* (1.6). DoEs also use the Collaboration Hub - an NHS EFM internal

online forum – and benchmarking tools to stay up-to-date with industry standards. The Collaboration Hub *"gives quite good information on new developments"* (4.1), while NHS benchmarking tools *"get the teams to understand how we compare with our peers"* (4.1). Moreover, personal development and industry research also play a crucial role in staying up-to-date with industry standards, as *"often questions come up which aren't answered in black and white in the [guidance documents], but often by talking to people and by using the internet, you can find lots of information."* (1.1)

At the tactical level, understanding the local operations and performance is crucial, hence, HoEs must *"be familiar with the HTMs, the guidance"* (4.3). They also rely on inter-disciplinary internal collaboration, seeking advice from colleagues in the senior management team who have more experience, and who can provide insights into their roles. Interviewee 1.3 noted, *"there are people within the senior management team that I would go to for advice [...] due their experience, having done it themselves for longer"*. In addition to personal networks and informal peer networks, many HoEs join professional bodies to share experiences and compare performance with peers in a similar role. To understand trends and risks, they rely on patient-safety alerts via the Central Alerting System (CAS) and stakeholders from NHS England (NHSE), who are responsible for *"supporting service improvement and transformation across systems and within providers"* (NHS, 2022), and the Collaboration Hub. Overall, HoEs use the widest range of information sources to understand how operational, often very technical activities align with the overarching strategic objectives.

Operational managers rely on various sources of information to understand their own operations and performance. Following guidance and standards documents is crucial, as one interviewee stated: *"we use the HTM which [...] is basically the guiding Bible"* (3.4). Beyond the guidance, they collaborate within their teams to ensure that they have a comprehensive understanding of the local operations, such as *"APs passing any knowledge or anything they pick up down"* (2.5) to CPs. When encountering technical issues, AEs are the *"first point of call"* (6.3), as *"they are the cream of the crop when it comes to your information"* (6.3). Operational managers rely heavily on the advice and expertise of the AEs, as they have experiences from different hospitals and can share this knowledge with their clients. AEs also benefit from extensive networking with other AEs to share information and identify potential issues. As one AE explained, *"I just pick the phone up and ring other AEs. If we do some training or something on a site that's not one of mine and I see something that's wrong, I'll normally ring the other AEs and say, you need to have a look at this, there's a problem"* (2.4). During COVID, NHSE stakeholders set up a regular call for MGPS AEs. Another source of information for operational staff are third-party contractors who work in different hospitals and share information about best practices. As one interviewee noted, *"if they see something good at another site, they'll come to us and say, have you thought about doing this?"* (4.3).

4.2 Barriers to Sharing Knowledge With Peers

At the strategic level, one of the main challenges is the lack of central coordination, highlighted by an interviewee stating that *"NHSE is not close enough to the operational stuff [so] they don't understand the pressures that we're dealing with on a day-to-day basis"* (2.1). The lack of capacity and technical in-house expertise of NHSE was confirmed by AEs. As one AE revealed the Department of Health has long considered *"engineering and building issues as non-core activity"* (7.3), which has led to a lack of attention by policymakers and budget cuts for the central coordination of NHS EFM activities. This resulted in the abandonment of the arms-length body NHS Estates in 2004 which was frequently criticised by AEs due to the bodies' central role in disseminating knowledge and fostering collaboration among NHS Trusts. The responsibility for coordination now lies with NHSE. However, NHS Estates *"had 80-90 staff at their disposal"*, compared to *"a department of about six people"* (7.3) within NHSE so they *"don't have an inhouse team to do it as they used to"* (3.2) and are *"understaffed to look after all the Trusts"* (4.5). Therefore, when NHSE does share information, it is often not timely enough, supported by a DoE stating that *"a faster process from the centre"* (5.1) is needed. This view was echoed by an AE noting that *"if you raise a hazard report, it could be literally [...] two years before it comes out, by which time things have been put"* (2.4). In addition, varying contexts of Trusts hinder effective KS since *"all the systems are actually very different [so] you need the knowledge of your system to relate your system to the information"* (1.1) from other Trusts (for further insights, see Table 3 in the appendix). As a result, DoEs prefer networking with peers from similar organisational and building contexts, such as the Shelford Group, a network of the largest Teaching Hospital Trusts, or EFM-Squared. However, these are *"not open to everybody, it's invitation-only"* (4.1), restricting wider collaboration across the NHS system.

At the tactical level, HoEs perceive time and resource constraints as major barriers to KS with peers. Managing the oversight and responsibility for multiple EFM disciplines means that *"everybody is massively busy and understaffed"* (4.2) so it *"takes your time away to perhaps visit other places to broaden horizons"* (6.2). As a result, communication issues such as silo working arise. Furthermore, interviewees criticised that training courses for APs are insufficient to equip them for their responsibilities as *"there seems to be a misunderstanding across the whole NHS that because you go on an AP course, that then makes you an expert in that field, which is not the case."* (7.4)

Operational managers highlighted inadequate links to peers. The majority of APs and CPs are early in their career, and therefore do not have similar personal networks as staff on tactical and strategic levels, as highlighted by an AE who said KS among operational staff occurs only when an employee *"knows somebody at another hospital, but a lot of times they don't"* (7.3). Time constraints are also a challenge, with many APs covering multiple responsibilities, leading to a high demand on their time and expertise. As one Director emphasised, *"certainly for APs and CPs, one of the big challenges is that the demand on their time and expertise is so big"* (2.1), which was reflected in the statement of an AP: *"I'm thinking of 55 things that I still need to do before I leave for home today"* (6.3).

4.3 Envisaged KS in the Future

For the majority of interviewees, regular peer discussion forums would be ideal way to share best practice and learning. One interviewee emphasised the importance of having all NHS EFM join groups with *"a focus around standard topics or issues"* (2.2). Additionally, interviewees highlighted the importance of having Trusts of similar size and context in such groups, as interviewees stated that they *"do find [...] quite a difference"* (2.5) with most neighbouring Trusts. While quarterly forums, either virtual or in-person, were suggested as an effective way to effectively share knowledge, one interviewee expressed doubts about the feasibility of organising such gatherings: *"I don't think we'd be able to get that type of gathering in place."* (4.4)

Regarding the responsibility for the required facilitation of KS across the NHS, interviewees stressed that this *"needs to come out of NHSE"* (6.2) so *"NHSE [...] need to gear up and get the correct staff capacity to be able to do that"* (7.3). It was also remarked that NHSE should have the ability to quickly review and distribute information such as best practice, as one interviewee explained, *"it definitely needs to be a centralised organisation that can review the information quickly, look at it, and then go out with best guidance"* (4.5). Overall, a majority of EFM staff on tactical level believe that a centralised organisation within the NHS is necessary to facilitate effective KS.

In addition to central coordination by NHSE, some interviewees suggested utilising existing systems and approaches to facilitate KS. One interviewee stated, *"there's an opportunity at ICB level to start to drive that collaborative thinking"* (4.1). Furthermore, the use of a national skills register was suggested as an effective way of identifying the right people for the KS groups. In such a register, every NHS employee would have their qualifications and completed trainings in certain disciplines recorded so *"any updates or safety alerts would be sent"* (1.5) to the interested and affected sub-groups with the NHS EFM domain.

Beyond the organisation of networking events, interviewees also suggested enhancing the existing Collaboration Hub. The goal should be to have *"an NHS knowledge hub where people can post things from one Trust and other Trusts look at it"* (1.4). Additionally, email newsletters were suggested as *"that would be probably the easiest way to share information across Trusts"* (4.4). Considering that the Collaboration Hub currently serves as the primary medium for NHSE to disseminate information, it is imperative to evaluate its efficacy in light of the fact that fewer than one-third of interviewees perceive it as an optimal channel for future use.

5. Conclusion

This paper has sought to answer the research question: What are the variations in knowledge sharing practices among managerial levels within the NHS Estates and Facilities Management workforce? As summarised in Figure 2, we have identified varying KS behaviours and barriers to KS for the different managerial levels of NHS EFM. The findings of the study enhance the understanding of KS processes in the NHS and extend the current literature by revealing the variations among managerial levels.

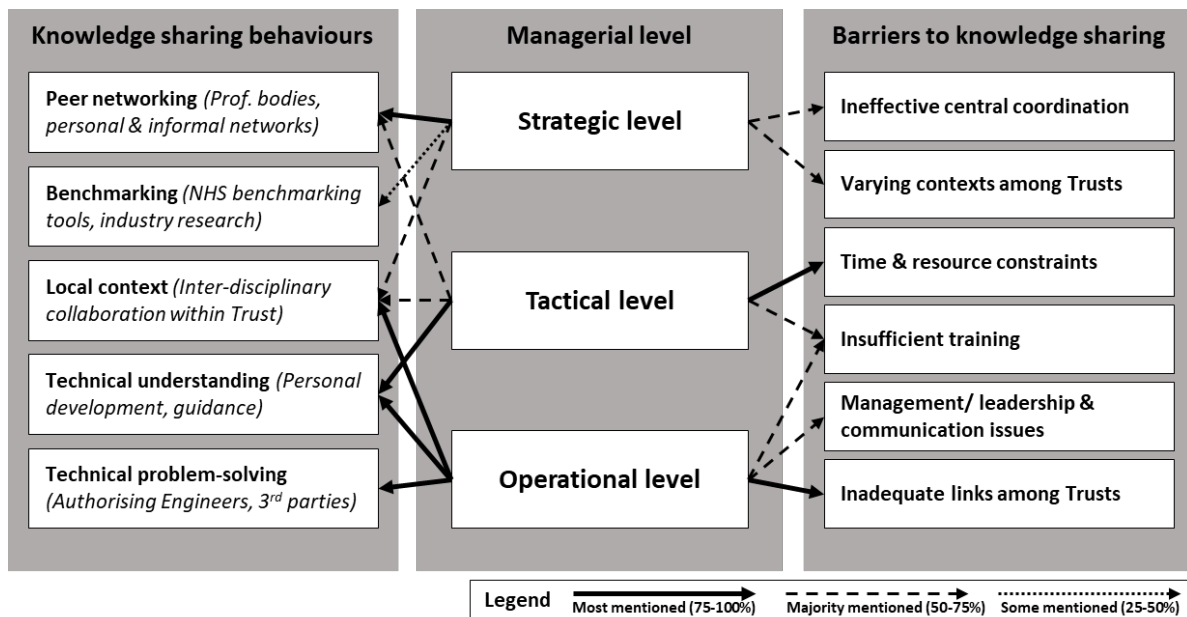


Figure 2: Summary of Knowledge Sharing Behaviours and Barriers to KS by Managerial Level

5.1 Contribution and Limitations

The findings can inform policymakers and decision-makers in creating customised KS channels for different managerial levels. The insights can also be used to develop targeted training curricula that cater to the specific needs of each managerial level. This targeted approach would enable NHS policymakers to address the unique challenges and requirements associated with KS at different managerial levels, ultimately leading to more effective collaboration across NHS Trusts. Additionally, the application of the findings of this research helps create an awareness of "who knows what" (Cross et al., 2003) within the NHS, enabling better knowledge flow, identifying and addressing knowledge gaps, and fostering a collaborative culture.

This research has some limitations. First, the sample size of seven NHS Trusts might not reflect the complexity and diversity of the entire NHS hospital landscape. The findings may not be generalisable to other NHS trusts, especially those with different sizes or specialties. Second, the case studies only focused on one discipline within EFM, namely MGPS, which is not representative of the multi-disciplinary nature of EFM. Therefore, the findings may not apply to other EFM areas or other healthcare systems. Third, due to the uncertainty caused by the COVID-19 pandemic, hospital site visits were not possible, and we were unable to conduct face-to-face interviews or on-site observations, which may have limited the depth and richness of the data collected. However, the engagement of AEs – who have vast portfolios of NHS Trusts as clients – allowed the researchers to capture highly experienced perspectives and gain a better understanding of the dysfunctions of the current system.

5.2 Further Research

This qualitative study analysed KS behaviours and barriers to KS across managerial levels of EFM, providing insights into the complex healthcare system environment. Future research could explore how organisational, cultural, and individual factors that impede or facilitate the flow of knowledge across organisational boundaries affect the management of challenges. Additionally, further investigation could examine best practice KS channels from other industries that could be adapted to meet the identified knowledge needs of the EFM workforce.

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Appendix 1: Tables 3 and 4

Table 3: Preliminary Insights from Table 4 (TH = Staff in Teaching Hospitals, AT = Staff in Acute Trusts, ST = Staff in Multi-Service Trusts, FH = Staff in Freehold Trusts, PSP = Staff in Part-site PFI, WSP = Staff in Whole-site PFI)

Dimension	Preferred source of information	Perceived barriers to KS	Ideal future of KS with peers from other Trusts
Trust type	- TH and AT focus on personal development of workforce and relationships within personal networks - MST seek knowledge external views from professional bodies/ institutes, and authorising engineers	- TH perceive lacking links to other Trusts (hence reliance on personal networks) and insufficient training opportunities (prohibiting upskilling the workforce) as major barriers - AT perceive Trust-internal communication issues - Majority of MST mentioned that ineffective/slow central coordination hampers KS	- All Trust types view regular peer discussion forums as ideal channel for KS with peers from other Trusts - 50% of MST also view an online repository, such as an upgraded Collaboration Hub, with best practice and research as useful KS channel
Tenure type	- PSP and WSP value personal development and personal networks. - FH engage more in peer collaboration via professional bodies and institutes	- WSP highlight communication issues (due to more complex organisational structures of PFIs) - Most FH perceive a lack of access to peers in other Trusts - PSP regard time and resource constraints and insufficient training as most important barriers	- All Tenure types view regular peer discussion forums as ideal channel for KS with peers from other Trusts
External	- AEs have strong focus on guidance, standards, and regulations as they need to be able to advise within regulatory guidance	- AEs perceive ineffective/slow central coordination as major barrier to KS among Trusts	- AEs also envision regular peer discussion forums to be beneficial for KS among Trusts, however, large majority see need for facilitation of such collaboration with central NHSE team

Table 4: KS behaviours by Trust and Tenure Type (most frequently mentioned aspect per type bolded)

Level/ perspective	Trust Type			Tenure Type			External	Overall
	Teaching Hospitals (n=9) (%)	Acute Trusts (n=13) (%)	Multi-Service Trusts (n=6) (%)	Freehold (n=6) (%)	Part-site PFI (n=16) (%)	Whole-site PFI (n=6) (%)	Authorising Engineers (n=6) (%)	Incl. AEs (n=34) (%)
Origin Preferred sources of information								
Trust Int.	Internal collaboration (e.g., team members, colleagues within Trust, Committee meetings)	67	77	67	67	63	100	83
	Learning through practical experience	33	8	17	33	13	17	33
	Guidance, Standards, Regulations (e.g., HTM, ISO, BSI)	56	77	50	67	56	83	100
NHS-wide	NHS England Collaboration Hub	33	15	33	17	31	17	0
	CAS Alerts	33	8	17	50	13	0	67
	Benchmarking (e.g., ERIC, Model Hospital)	22	15	17	33	19	0	15
External	Government & NHSE stakeholders	0	15	33	17	13	17	67
	Personal development (e.g., training & CPD)	89	92	67	67	88	100	50
	Personal network (e.g., ex-colleagues)	89	62	33	50	69	67	50
	Authorising Engineer	56	38	83	67	56	33	0
	Professional bodies and institutes (e.g., IHEEM, HefmA, CIBSE, IET, IEng, NAF0)	67	23	83	83	44	33	67
	3 rd parties (e.g., manufacturers, universities, consultants, contractors)	67	46	33	67	44	50	50
	Peer collaboration via informal networks (e.g., peer groups, regional hubs, LinkedIn)	78	23	50	50	56	17	17
	Research (e.g., internet, journals, other industries)	44	15	0	0	38	0	50
								24
Origin Perceived barriers to sharing knowledge								
Trust Internal	Time and resource constraints	56	38	33	50	50	17	33
	Communication issues (e.g., silo-working within Trusts, lack of meeting rooms, no feedback after escalation)	33	54	17	17	38	67	50
	Management/ leadership issues (e.g., ineffective knowledge retention, governance, board representation)	44	23	33	33	25	50	17
	Organisational culture issues (competition, power dynamics, commercial conflicts)	0	23	17	0	25	0	50
NHS-wide	Inadequate links among Trusts (no access to peers)	67	38	67	83	44	50	67
	Ineffective/slow central coordination/ facilitation (e.g., lack of feedback & central coordination)	44	15	67	67	38	0	83
	Insufficient training (e.g., inadequate training courses, lack of expertise, financial constraints on training)	67	31	33	33	50	33	45
	Varying contexts (e.g., different protocols and procedures among Trusts)	22	23	33	33	25	17	50
External	Challenges of remote meetings (e.g., distractions, lack of trust, anxiety)	44	31	33	33	38	33	0
	Difficulty to access trusted & reliable sources of information (e.g., standards, policy documents)	33	15	0	0	25	17	50
								24
Ideal future of knowledge sharing with peers from other Trusts								
Channel	Regular peer discussion forums	67	62	100	67	69	83	83
	Online repository with best practice & research (e.g., extending functionality of Collaboration Hub)	33	15	50	33	31	17	0
	Email newsletter	22	0	0	33	0	0	17
Facilitation	KS facilitation through NHSE team (e.g., central moderation of dialogue, linking similar Trusts)	22	23	0	17	19	17	83
	Systems approach (e.g., ICS, cross-disciplinary)	11	15	0	17	13	0	0
	National skills register	0	0	0	0	0	0	17

