

Organizational Factors Driving the Realization of Digital Health Transformation Benefits from Health Service Managers: A Qualitative Study

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Introduction: Healthcare is experiencing a global period of profound transformation, and digital health shows the promise of dispensing innovative and contemporary service models. However, changes are required to improve the capabilities of health managers in driving successful digital transformation.

Objective: This paper aims to explore the organizational barriers that health service managers have encountered when realizing the benefits of a digitally transforming environment. This is part of a larger research study exploring digital competencies for health service managers, with the findings from focus group discussions providing a baseline from which to address the organizational improvements and changes in system capabilities required to assist in realizing the benefits of digital health transformation.

Methods: The study is qualitative in nature. It employs focus group discussions to gain an in-depth understanding of the experiences and views of health service managers and identify the benefits and barriers that managers have experienced in introducing digital health in their workplace.

Results: Barriers encountered in realizing digital health benefits in the workplace were evidenced across five major themes: (1) change resistance and usage, (2) trust and uniformity, (3) resourcing and procurement, (4) digital literacy, and (5) siloed systems.

Discussion: Findings from this study demonstrate that in driving the realization of digital health transformation benefits, health service managers need organizational and system-wide efforts to support managing in the digital health context. The key identified barriers experienced by health service managers include facing human and technical challenges with system adoption and the governance of data-driven decision-making in the digital context.

Conclusion: The importance of digital transformation in healthcare is evident and will increasingly become a necessity for organizational survival and success. This study adds important insights into the organizational barriers that health service managers have encountered when realizing the benefits resulting from digital transformation. Addressing these barriers requires macro-, meso- and micro-level system investments. These benefits are enhanced by enabling factors critical for digital health adoption that have been described in key categories involving health system related: (1) policy and system, (2) organizational structure and processes, and human resource management, and (3) people factors. The importance of ensuring the organizational factors driving the realization of benefits in a digitally transforming environment is also addressed and capitalized upon for health service managers.

Keywords: healthcare management, health service manager, digital transformation, digital health benefits, workforce development, digital health barriers

Introduction

Benefits That Digital Health Has Brought to Healthcare Organizations

Systemically, healthcare is experiencing a global period of profound change, fuelled by pandemics, an aging population, the escalating burden of chronic disease and accelerating workforce changes, which have all placed increasing demands on healthcare services.¹ Adopting innovative ways for service delivery is inevitable. Digital health is showing that it can,

in many local and global settings, deliver on the promise of dispensing innovative and contemporary service models that can advance the value, efficiency, and safety of healthcare services.^{2,3}

Digital health can be seen as the “field of knowledge and practice associated with the development and use of digital technologies to improve health”,⁴ with digital transformation denoting large, complex institutional interventions or system-wide implementations involving major changes to how healthcare systems and organizations operate.⁵ Recent examples from the global pandemic highlight the utility and value of digital tools in providing and supporting healthcare, particularly in response to COVID-19, by enhancing information capture and communication, improving disease monitoring and surveillance, increasing access to care through the delivery of virtual health services, and the targeting, administering and recording of vaccinations.^{2,6,7}

In addition, digital health is crucial in cultivating accessible, appropriate and affordable healthcare delivery that is targeted, timely and tenable.⁸ Concomitantly, digital health’s benefits continue to be realized globally. With a recognition by the World Health Organization (WHO) that “digital health can radically change health outcomes if it is supported by sufficient investment in governance, institutional and workforce capacity”.⁴ Essential investment in these structural enablers supports the attainment of digital healthcare benefits according to the patient, practitioner and provider.

Difficulties Managers Have Encountered in Realizing the Benefits of Digital Health

Realizing the benefits of digital health requires macro-, meso- and micro-level system investments to ensure that benefits can be translated into value within healthcare contexts.^{9–11} These benefits are enhanced by enabling factors crucial to digital health adoption, which have been identified in key categories, including (1) policy and system, (2) organizational structure and processes, and (3) people factors.⁸ The focus of the factors tends towards policy alignment with organizational objectives, digital investment, infrastructure, data privacy, transparent governance and supporting regulations. The elements of workflow alignment, access to technology support, trust building and empowering users to embrace change and innovation are essential to consider. In addition, the digital attitude of leaders, supported by an organizational culture of embracing technology-driven innovation, has also been noted.^{6,8,10,12} The phenomenon of digital literacy has been presented variously in the literature, with the current discourse centring around the ability to efficiently search for and effectively critique information, acknowledging the intrinsic risk of bias in information sources.^{13–16} Indeed, some authors are now describing digital literacy as a new determinant of health,^{17–19} which, along with digital accessibility, availability and affordability, are factors that “impact sociodemographic disparities, health inequities, and challenges with care accessibility, affordability, and quality outcomes” contributing to citizens’ digital determinants of health.¹⁸ In the management literature, there is a lack of clarity regarding the digital literacy capabilities of health service managers, which needs to be addressed.

Obstacles to realizing the benefits being accorded from digital health are influenced by the barriers to adopting digital health technologies, including infrastructure and technical concerns, psychological issues, and workload-related trepidations.^{4,20} Appropriate training, understanding healthcare practitioners’ willingness to use and their perception of the usefulness of digital technologies, along with targeted incentives for different stakeholders, are all notable enablers to enhance the adoption of digital health services.²⁰ Furthermore, barriers to achieving digital health benefits are prevalent across healthcare delivery transformation environments and underscore the need for healthcare services to be designed, developed, and delivered in an ethical, efficient, effective and evidence-based manner.^{4,21–24}

Looking at the challenges faced when leading and managing digital health transformation, the evidence is consistent across a number of categories, including (1) information technology and integration, (2) user acceptance of digital health, (3) security of digital health, (4) structural capabilities to attain competitive advantage, (5) resourcing for innovation and value, (6) distributed leadership and decision-making, and (7) supporting the development of a learning culture.^{25–28} In addition, specific challenges and responsibilities of health service managers in the context of digital transformation are differentially described in the literature, including Dal Mas et al’s (2023) contention that “the healthcare sector is undergoing a renaissance due to the pandemic”,²⁸ which has “significant management implications as managers seek to increase technology resources’ efficiency to achieve patient-centred care”.²⁵ Further, managers need to grapple with the “transformational abilities of digital technologies (that) go further than merely automating processes and satisfying

information needs to enable fundamental changes in a company's business model",²⁹ which have profound impacts on the way that healthcare in the digital age is managed and maintained.

The challenges are also evident in the digital organizational literature, which describes the challenges in digital service innovation more broadly, noting that

the threat of digital disruption negatively impacts an organization's innovation activities...(and)...that strategic partnerships can be leveraged by organizations that face an imminent threat of digital disruption.²⁹

Furthermore, executive-level sponsorship and governance of the digital transformation is an essential element for successful digital service innovation.²⁹

The changes required to improve capabilities in managing digital health transformation are detailed in the literature and focus on capability and capacity development.^{25–28} However, the specific capabilities required for health service managers to drive digital transformation benefits are not clearly evidenced. Enabling factors and barriers to digital health transformation have been described in the literature, with some consensus. However, factors that enable and inhibit health service managers demonstrating their digital health competence remain elusive.

It is important to recognize that realizing benefits from digital health transformation relies on requisite health service managers' digital competencies that necessitate system, professional, organizational, leadership, and individual capabilities to deliver the benefits achieved in a digital society.^{30,31} There are a number of existing professional body and industry certification competency frameworks for both health service management and digital health, though an empirically validated set of digital competencies for health service managers has yet to be evidenced. In the Australian setting, the Australian Health Informatics Competency Framework (AHICF)³² and the Master Health Service Management Competency Framework³³ guide digital health and health service management certification programs, respectively. Both frameworks were revised in 2022, to which the primary author contributed. Of note is the comprehensive review process for the Australian Health Informatics Competency Framework that included

an international environmental scan to examine changes in the extant competency frameworks to which the AHICF was mapped. This included international frameworks from Canada, Saudi Arabia, the United States of America, and the United Kingdom.³⁴

Health service managers require system-wide support to address the organizational, professional, technical, and operational barriers in order to realize the benefits of implementing digital health.^{18,22,35} These required changes in a health system affect several of the World Health Organization's (2010)³⁶ defined building blocks of a health system, and the need for a holistic approach is required to ensure optimal benefit from the digital transformation. There are six inter-related building blocks: (1) leadership and governance, (2) financing, (3) access to essential medicines and health-related commodities, (4) health information systems, (5) health workforce, and (6) service delivery. Emphasizing that "leadership/governance and health information systems, provide the basis for the overall policy and regulation of all the other health system blocks".³⁶

With healthcare services being delivered in such a dynamic and often unpredictable environment, system enablers require a supportive and sustainable setting that fosters digital-first capabilities for health service managers.³⁷ However, there is a lack of evidence specific to health service managers, with the contemporary literature focussing on enabling and inhibiting factors for patients, as well as the clinical, administrative, and technical healthcare workforce.^{25,27,28,38} As detailed in the previously published conceptual framework for a larger study,³⁹ identification of the barriers and enablers health service managers face in developing capability to manage in the digital health environment should be identified and validated in the specific healthcare context, by in-depth analysis of findings from focus group discussions with health service managers.

The findings are part of a larger PhD research study, the aim of which is to identify the competencies that will contribute to the development of capability for health service managers in managing in the digital health era and enabling digital transformation within the Australian healthcare environment.⁴⁰ This paper presents some of the data and findings from the six focus group discussions that were conducted in February and March 2023, in addressing the following two research questions, namely: (1) What are the benefits that health service managers have experienced from implementing

digital health in their workplace? and; (2) What difficulties have health service managers experienced in realizing the benefits of introducing digital health in their healthcare organization?

This research, while conducted in the Australian public hospital setting, is situated within the global context of digital health transformation, which has far-reaching impacts for healthcare management including

streamlining administrative processes, improving communication, and enhancing overall patient care ... (while ensuring) ... ethical considerations, patient privacy, and regulation compliance.⁴¹

These considerations need to be at the forefront of health managers' decision-making. Recent literature also emphasizes the imperative for healthcare managers to improve their "resilience, flexibility, and innovation" for managing digital transformation in the post-pandemic era, including system-wide policy and funding imperatives for improving required digital health infrastructure and furthering global cooperation.⁴² This study contributes to the empirical evidence by illuminating the key strategies that can support and enable health service managers in driving the realization of digital health transformation benefits.

The aim of this paper is to explore the organizational barriers that health service managers have encountered when realizing the benefits in a digitally transforming environment. This provides a baseline from which to acknowledge and address the organizational improvements and changes in system capabilities required to assist in realizing the benefits of digital health transformation.

Materials and Methods

Guided by a published protocol in developing digital competencies of health service managers,⁴⁰ the study has adopted a qualitative approach, employing focus group discussions to gain an in-depth understanding of the experiences and views of health service managers and identifying the benefits and barriers that managers have experienced in introducing digital health in their workplace. Six focus groups were conducted virtually using MS Teams (Microsoft) by two researchers, for approximately 90 minutes each, and digitally captured via the recording functionality of the Microsoft Teams videoconference call. The principal investigator acted as facilitator, and one other member of the research team performed the roles of observer and notetaker.

The focus group discussions employed the consolidated criteria for reporting qualitative research (COREQ) to ensure the study met the recommended data reporting standards for qualitative studies;⁴³ see [Appendix 1](#). To check participants' intended meaning, a number of strategies were employed "where participants are asked to input on whether an analysis faithfully or fairly represents their experience".⁴⁴ All participants were emailed their "cleaned-up" transcripts and invited to amend or delete any of their comments, should they wish to do so, particularly for validation of accuracy or to clarify a statement, as well as receiving a copy of the final results.

Target Population

Study participants were drawn from a sample of mid-level health service managers across Australia who are responsible for the day-to-day operations in Australian public hospitals. The participants represented management levels 3 and 4 in the Australian public hospitals. The management levels are defined by the organizational reporting hierarchy, as detailed in the Liang et al (2018) management competency study in the Australian health system,⁴⁵ with level 1 being the Chief Executive Officer (CEO), level 2 reporting to the CEO, level 3 reporting to level 2 management, and level 4 reporting to level 3 management.

Sampling

A purposive sampling technique was used to facilitate a deliberate selection of participants for the focus groups due to the characteristics of the participants being linked to the study variables. Potential participants were invited and recruited from members of the Australasian College of Health Service Management (ACHSM) and the Australasian Institute of Digital Health (AIDH) membership, as pre-eminent, member-based organizations representing health service management and digital health, respectively, across Australasia, to enlist participants who are experienced and informed with the phenomenon of interest.⁴⁶ In addition, snowball sampling was applied to assist in locating

Table 1 Focus Group Participant Characteristics

1. Location ^a	2. Position Functional Areas	3. Organization
SA – 11	Clinical – 16	Metropolitan Hospital – 11
VIC – 8	Corporate ^b – 11	Regional Hospital – 3
NSW – 9	Technical ^c – 9	Rural Hospital – 1
QLD – 11	Research – 2	Community Hospital – 1
WA – 2	Quality/Risk – 1	Regional Support ^d – 28
TAS – 1	Program – 5	
ACT – 2		
NT – 0	n = 44	

Notes: ^aLocation = South Australia (SA), Victoria (VIC), New South Wales (NSW), Queensland (QLD), Western Australia (WA), Tasmania (TAS), Australian Capital Territory (ACT), Northern Territory (NT). ^bCorporate = Administration, Finance, Operations, Planning, Performance and Support. ^cTechnical = Infrastructure, Electronic Records – implementation and architecture, Data Management. ^dRegional Support = Role includes working across more than one public hospital.

supplementary key informants who were information-rich and had a certain attribute of research relevance with the target population.⁴⁷ The number of participants is consistent with the qualitative methodology being used to ensure data saturation, which was reached.^{48–50} As Carlsen and Glenton's (2011) methodological study of sample-size reporting in focus group studies recommends, "Guidance on group size is common and seldom goes beyond a minimum of 4 and a maximum of 12 participants per group".⁵¹ There is a disparate discourse in the literature regarding the number of focus groups required to reach data saturation, with Hennink et al's (2019) focus group sample size research positing that "The vast majority of codes (60%) were identified in the first focus group discussion, with a sharp decline in new codes after this".^{50,51} Further, having participants represented from both metropolitan and regional sites can improve the generalizability of results.⁵² The authors also note that reaching a point where new findings do not add additional insights – the point of "diminishing returns" – is more significant than aiming for a particular target. To allow the inductive process to guide this research, a sample size of six focus groups was agreed, aiming for six to eight managers to be included in each group. The diversity in participant characteristics is detailed in Table 1 Focus group participant characteristics.

Recruitment

Invitations for participation were announced by ACHSM and AIDH in their respective e-newsletters and websites for health service managers who are management levels 3 and 4, employed by a public hospital in Australia that are managing and leading in a digitally transforming environment, as described in the target population. The following exclusion criteria were applicable: (1) health service managers who were not employed at an Australian public hospital and (2) other healthcare management personnel who were outside of management levels 3 and 4. The principal investigator's contact details were included in the announcement. The announcement encouraged and invited potential participants to contact the principal investigator directly to express their interest in participating.

Upon receipt of the expression of interest, the principal investigator assessed eligibility. Expressions of interest were received from 73 people, three of whom were ineligible to participate. Eligible participants were contacted directly via Email to provide a formal invitation to participate in the focus group discussion, which contained a copy of the Project Information Sheet and Consent Form. Each participant responded to the Email invitation with confirmation of participation and consent to participate in the research project. The principal investigator then emailed those who expressed their interest in participating and who were not eligible to provide them with an explanation for not being selected. Prior to commencing the discussions of the pre-determinate questions at each focus group, participants were invited to ask

questions and/or seek clarification of the project or project details included in the Participation Information Sheet. Participants were also advised again of the option of withdrawing their consent at any stage.

Ethical Considerations

This research received ethics approval on October 20, 2022, by the James Cook University Human Research Ethics Committee (approval H8877; expiry December 27, 2024). Prior to the focus groups, personal information, including participant name, position title, name of organization, and Email address, was collected; however, names of the participants were replaced by a code in the focus group transcript to maintain their anonymity, and all identifiable information was not included in data extraction and analysis. Participants engaged in the focus group discussion without receiving any form of payment or remuneration.

Data Collection and Analysis

Six focus groups were conducted virtually using MS Teams (Microsoft) by two researchers. The principal investigator acted as facilitator, and one other member of the research team performed the roles of observer and notetaker. The focus groups were conducted from 14 February to 15 March 2023 for approximately 90 minutes each, and the discussions were digitally captured via the recording and transcription functionality of the MS Teams videoconference call. Five standardized questions were used to guide the discussions, as detailed in [Appendix 2](#), and consistency was maintained across the six focus groups by using the same questions by the principal investigator conducting the discussions, with the other member of the research team observing for reliability. Data analysis then occurred iteratively throughout 2023 where the automatically transcribed text was downloaded, reviewed and proofread for language and readability before a full transcript of each focus group was ready for data extraction and analysis. All of the focus group discussion participants were emailed copies of their transcripts and asked to delete any of their comments if they wanted to do so, especially to validate accuracy or clarify a statement, to confirm inclusion of their comments, and request any specific information in the transcript to be excluded from the analysis and reporting in any relevant publications.

All transcripts were analyzed using NVivo[®] software version 14 (QSR International) as a qualitative data analysis tool. Thematic analysis was conducted iteratively, using data from the focus groups to inductively develop concepts, categories and themes. Analysis was also undertaken deductively to categorize competencies against current national and international health service management and digital health competency frameworks. Enabling and inhibiting factors were analyzed using Braun and Clarke's (2019) six-phase, reflexive thematic analysis (TA) approach to distinguish, explore, organize and advance insight into themes or categories of the factors emerging,⁵³ as previously detailed in a published protocol the stages were as follows: 1) familiarization, 2) generating codes, 3) constructing themes, 4) revising themes, 5) defining, and 6) producing the report.⁴⁰

As Braun et al (2019) explain,

In reflexive TA, themes are conceptualized as meaning-based patterns, evident in explicit (semantic) or conceptual (latent) ways, and as the output of coding – themes result from considerable analytic work on the part of the researcher to explore and develop an understanding of patterned meaning across the dataset.⁵³

This approach guided the coding and data analysis methods employed in this research. The data was thematically coded in NVivo 14 software by the primary author. Initial codes emerged from the focus group discussion participants' responses, which were identified iteratively via inductive coding. The two other co-investigators then collaboratively considered and compared the codes, which were then able to be collapsed into candidate themes for analysis. Consensus discussions were used to resolve any differences in coding.

Results

Focus Group Participant Characteristics

Forty-four mid-level managers from all Australian states and the Australian Capital Territory who were responsible for the day-to-day operations in Australian public hospitals participated in six different focus groups. Participants held various management positions in clinical, corporate, technical, research, quality, and program management roles (as detailed in [Table 1](#)).

Difficulties in Realizing the Benefits of Digital Health – Summative Findings

During the focus group discussions, participants were asked about the barriers encountered in realizing digital health benefits in their workplace. As a result, twenty-three barriers were raised. The following nine initial codes emerged from these 23 barriers at the first round of content analysis: (1) change resistance, (2) digital literacy, (3) procurement, (4) resourcing, (5) right roles, (6) siloed systems, (7) trust, (8) uniformity, and (9) usage. Based on the shared meanings of these initial codes in answering the research questions, they were then consolidated into five major themes: (1) change resistance and usage, (2) trust and uniformity, (3) resourcing and procurement, (4) digital literacy, and (5) siloed systems. For each of these five major themes, 4–9 sub-themes emerged, classified as “key difficulties”, as detailed in Table 2. These will be further elaborated on in the next section, supported by relevant health service manager participant exemplar quotes.

Table 2 Organizational Barrier Themes and Key Difficulties Identified by the Focus Groups

Barriers (Themes)	Key Difficulties Identified (by Number of Focus Groups)
Change resistance and usage were highlighted as barriers to realizing benefits from digital health in the workplace by all 6 of the focus groups	<ol style="list-style-type: none"> 1. inadequate forecasting and budgeting of the required resources to effect competency-based digital training (4) 2. data integrity, quality and provenance, upon which required clinical and business decisions are rapidly made (3) 3. interdisciplinary digital competence expectations of health service managers (3) 4. challenges faced with consumer access to personal digital health records and online appointments (1) 5. contextual authority concerns as to who now has the responsibility for making the just-in-time clinical and business decisions (1) 6. contextualizing information to make data-informed, clinical and business decisions (1) 7. inadequately articulated and poorly embedded organizational digital innovation policies and values (1) 8. operational and technical complications faced through sub-optimal communication of the organizational and operational digital framework (1)
Trust and uniformity were highlighted as barriers to realizing benefits from digital health in the workplace by 5 of the focus groups	<ol style="list-style-type: none"> 1. disparate organizational data governance requirements (2) 2. accelerating digital innovation agendas and the actualities of modern-day healthcare service delivery (1) 3. ability to provide competency-based, role-based digital training that is effective and efficient (1) 4. heightened security and confidentiality assurances required when dealing with personally identifiable health information (1) 5. integrity and confidence in the data collected, with the resultant surety of decision-making (1) 6. lack of technical aggregation or integration (1) 7. need to be digitally omniscient as HSMs (1) 8. organizational and data threats posed digitally, necessitating increased cybersecurity awareness and assurance (1) 9. the various ways data definitions are used or omitted (1)

(Continued)

Table 2 (Continued).

Barriers (Themes)	Key Difficulties Identified (by Number of Focus Groups)
Resourcing and procurement were highlighted as barriers to realizing benefits from digital health in the workplace by 4 of the focus groups	<ol style="list-style-type: none"> 1. differential understanding of data governance across stakeholders (2) 2. understanding of and alignment to organizational digital governance and procurement policies (2) 3. increased resource implications of competency-based digital training (2) 4. digital vulnerability considerations for data quality and the digital security of information (2) 5. procurement knowledge required of the digital health system life cycle (2) 6. both capital and recurrent resourcing requirements were not always accurately forecasted (1) 7. capable and contiguous change management expertise (1) 8. physical, technical and financial barriers marginalizing access to digital health (1) 9. resourcing challenges of promoting digital connectivity (1)
Digital literacy was highlighted as a barrier to realizing benefits from digital health in the workplace by 4 of the focus groups	<ol style="list-style-type: none"> 1. inadequate and insufficient digital training provided for all types of users (3) 2. contextualizing the volume and veracity of information presented digitally (1) 3. individual, team and organizational vulnerabilities exposed through enhanced digital literacy requirements (1) 4. integrity of the data captured, stored and aggregated to form information upon which business and clinical decisions are made (1) 5. required resourcing to address the challenges of digital literacy in supporting digital transformation (1) 6. the paucity of digital frameworks that organizations have adopted to guide digital health transformation (1) 7. various data definitions used or implied (1)
Siloed systems were highlighted as a barrier to realizing benefits from digital health in the workplace by 3 of the focus groups	<ol style="list-style-type: none"> 1. digital governance barriers that prevent the efficient and effective transfer of required information within jurisdictional boundaries (2) 2. increased digital training across multiple disconnected systems (1) 3. organizational, technical and regulatory barriers to digital connectivity required across healthcare services and locations (1) 4. technical aggregation challenges in accessing and using digital data being captured and stored in these different systems (1)

Elaboration on the Five Key Themes

Change Resistance and System Usage

Under this theme, three key difficulties were mentioned by participants from more than one focus group. Firstly, barriers to effective digital health usage were explored when participants discussed inadequate forecasting and budgeting of the required resources to effect competency-based digital training. The concern was articulated from both a financial forecasting and human resourcing perspective. Ensuring adequate financial and personnel budgets necessary for the scope and scale of competency-based training needed to deliver safe healthcare with digital health was not always seen as being appropriately budgeted in the initial digital technology business case. As managers highlighted, the recurrent human and fiscal resourcing allocations were also often inadequate. In illustrating this view, one manager stated:

So, I feel we don't forward plan enough and show people how's your workflow going to be different. We just sit them in front of a computer and then expect them to know how their new work is going to be imagined. And then it's very tricky. I think on our learning curve, we know that people lose it and so we spend so much time on training ... It's a foundational knowledge of how health, digital health works and then how do we train it. (FGD5-P7)

Secondly, participants described challenges in making data-informed, clinical and business decisions, particularly when facing the reality of unknown data integrity, quality and provenance. The surety of using system-sourced information to make just-in-time management decisions affecting practitioners, providers and patients was a pronounced issue. Managers in this study expressed their concerns about the expected accountabilities, including using information of unknown or unconfirmed provenance, to manage in the digital health environment effectively. Digital vulnerability and the associated risk with potential errors in accuracy were typically echoed by one participant:

I was going to look at something at a base level and that's (when) we really have become highly reliant on data quality. If it's not in the place where we expect it to be in the digitized system, using that is we're not going to get the value or we're going to miss things. (FGD2-P2)

Thirdly, managers are expected to be able to assist all types of system users with their issues in effectively using digital health technologies, exemplifying the actual need to know different practitioners' processes and information needs transposed in the workflow of delivering healthcare services. Hence, managers are challenged to be all things to all people and be able to provide just-in-time digital health support to other system users. This includes the ability to problem-solve a range of user issues when faced with digital technology challenges in accessing and using digital tools. As highlighted by one of the managers:

Keeping up to date with the technology itself and being able to interpret that on the ground level. So, I've become a resource person for everything and have to be more up to date or more technical because as they encounter some sort of question you interpret, and you help them navigate that kind of technology. So, I find myself being one foot forward and ahead of my staff in order to be able to respond to that in a timely manner. (FG2-P5)

Trust and Uniformity

Nine barriers are related to the lack of trust in and uniformity of the digital data, with only the barrier of "disparate organizational data governance requirements" being mentioned by participants from more than one focus group. Healthcare is based on trust in delivering safe, quality care, which is underpinned by having access to the right information at the right time, in the right place, for the right purpose. The concerns raised about the provenance and accuracy of the system-generated digital information were voiced by managers in this study, including their caution in trusting key performance indicators available in dashboards and management reports, reinforced by the lack of uniformity in definitions of the data being used. This was well summarized by one participant in emphasizing that:

the data is coming out at a really high level, but we're not putting the time and effort into actually making sure that data is correct and that starts at the very bottom line that is your financial data, that's your clinic data that is your patient data that is everything and we don't have the resources or the thought processes right now to actually make sure that data is right ... the data is rubbish and I know the data is rubbish because we're creating rubbish data ... we aren't doing the groundwork to make sure that our data is right. To actually make sure that those numbers that people are making critical decisions on are actually valid. (FGD1-P3)

Additional concerns acknowledged the ever-present organizational and data threats posed digitally, necessitating increased cybersecurity awareness and assurance. Noting that healthcare cyber attacks are now more prevalent and prominent, managers in this study expressed escalating trepidation about the safety, security and surety of having reliable, accurate and timely personal and organizational information available when and where needed. Typical of this discussion was one participant who said:

And the second one I thought, of course, is cyber security issues. So, we already learned from a previous experience here in XXXX, where a lot of health services were hit with cyber-attacks. We try to think of how best can we insulate ourselves from some attacks. So maybe those are the barriers that we really face as managers. (FGD3-P8)

Resourcing and Procurement

Under this theme, five key difficulties were mentioned by participants from more than one focus group. Inadequate resourcing and a lack of digital procurement prowess were highlighted as barriers to realizing benefits from digital health in the workplace. This consistently included specific resourcing and investment to support governance and innovation across the digital health system life cycle.

The first barrier described by participants included a differential understanding of data governance across stakeholders in their healthcare environment, such that local digital data is often being managed corporately in statewide systems. Once data is entered locally into statewide digital systems, for example, the electronic medical record, managers mentioned that when implementing local digital health systems, they often had to pay for integration of their new system with the corporate system, just to be able to access their pre-existing data. This was noted as a very arduous procurement and governance process. Secondly, this difficulty was compounded by concerns about staff understanding of and alignment with organizational digital governance and procurement policies. This was evidenced by managers often having to take up lead roles in the governance of local digital health procurement on behalf of the executive sponsor. Additionally, the challenges presented by the lengthy bureaucratic procurement governance processes were highlighted by one participant when looking for contemporary and timely digital procurement:

And then we're fighting with time as well, like the governance processes. The governance processes that we actually have to go through takes so much time that by the time we actually get to actually implement something, that was three years ago, we've already got different technology at our hands already. So, things like cloud based (technology) was something that came really quickly, and we've never actually been able to really get a grasp on how to actually move towards using all those cloud-based services easily because of our cyber security constraints and our governance constraints. (FGD5-P5)

Thirdly, participants identified an additional barrier of the increased resource implications of competency-based digital training to ensure that staff had role-based digital capabilities to deliver safe, quality care. Managers expressed the budgeting and resource concerns they faced in being able to efficiently and effectively develop staff capability to demonstrate digital competence in the context of a rapidly changing digital technology environment.

Fourthly, managers in this study also discussed digital vulnerability considerations for data quality and the digital security of information, which directly impacted the resourcing required to deliver enterprise-generated information. The managers raised concerns about the cost of relying on this data in making clinical and business decisions. As one manager recounted when discussing the digital vulnerability impacting data surety:

So, one of the classic costs that we now have is when we get data inaccuracies because we've got such a highly integrated system, the time it takes to correct those inaccuracies is massive because you're moving clinical notes as well as changing the administrative documentation. And that obviously has a risk associated with it of incorrect adjustments. (FDG5-P6)

Finally, some of the resourcing challenges were further elaborated on by participants when describing the organizational, technical and procurement knowledge required of the digital health system life cycle. This was further complicated by the different interpretations of whole-of-life system costs the managers experienced from system funders and organizational executives. Participants also voiced the challenges faced in dealing with disparate system funding sources and the different regulatory and reporting requirements. This was articulated by one participant when describing:

Some of the challenges are we obviously have to fund these systems you've got, you've got to source these systems, one that's appropriate to your needs and you want it to be sustainable, upgradable to make sure you get the most out during the investment. So, there is the funding aspect and then you also need the subject matter experts that are going to actually work with you to do

the sourcing, installation, implementation and then do the maintenance side of it as well. So that really forces you to cut in the beginning. (FGD4-P3)

Digital Literacy

Seven barriers were related to digital literacy, with only the barrier of “inadequate and insufficient digital training provided for all types of users” being mentioned by participants from more than one focus group. The high turnover rate of healthcare practitioners further exacerbated this issue. Using nursing as an example, there are permanent, casual and agency staff, graduate and student nurses all on the one shift, which presents a challenge in terms of variance in digital literacy and being able to ensure all staff are digitally proficient in using the electronic medical record and other enterprise systems. Managers discussed how they had to shadow agency staff to ensure their data entry was accurate. The risk to patient safety of capturing and using incomplete clinical information was reported as a potential outcome. Inadequate and insufficient digital training provided for all types of users was reported as a barrier contributing to this potential consequence. This barrier was discussed by one participant:

There are also different levels of computer literacy amongst different staff. So, with things changing all the time and there's a new system to learn every few months, it can get a little frustrating ... So, there's a flip side of having these different levels of literacy, and how comfortable some people are with them because one way we're saying that it's not rapidly evolving, but the other way, even the little bit that we have is a bit too rapid for a few of them. (FGD4-P5)

In contrast, there was also a focus on the individual, team and organizational vulnerabilities that were being exposed through the enhanced digital literacy requirements associated with the increased use of digital technologies. As one participant recounted:

I think turning so many things digital has introduced a lot of vulnerabilities. And we have a heavy reliance on things going the way that they're meant to and as soon as one little thing breaks, we can lose so much capability, so many efficiencies, and introduces so many problems. Just to what was the vulnerability of people not necessarily understanding the difference between data and information. (FGD1-P2)

Siloed Systems

Four barriers mentioned by participants were related to siloed corporate, organizational and clinical information systems. Corporate, clinical, and digital governance alignment is required for digitally enabled healthcare enterprises to realize the benefits of a connected healthcare organization. Barriers presented by the digital governance challenges faced by accessing and using required clinical and business information from the siloed digital health systems were described by managers. As participants observed, this was being confounded by digital governance barriers preventing the efficient and effective transfer of required clinical information across practitioners and disciplines within their healthcare service. In illustrating this view, one participant stated:

I described it as being heterogeneous in the extreme at the moment and so the LHD (Local Health District) have said, Chief Information Officers were quite strong on locking that stuff down, and they've inherited legacy systems which are siloed as you know, so there's no integration between a clinical information system, gastroenterology system and the EMR. So, you can be reporting in Gastroenterology, but if you got the same patient in the different setting, you've got no idea what they've done. (FGD4-P6)

Discussion

This research has explored organizational barriers to realizing the benefits of digital health transformation that health service managers have encountered in the digital context. Digital transformation is seen as a strategic organizational necessity. Yet, contemporary healthcare research frequently focuses on the introduction and implementation of new and novel technologies rather than the strategic or systemic standpoint.^{28,54} Findings from this study demonstrate that in driving the realization of digital health transformation benefits, health service managers need organizational and system-

wide efforts to support managing in the digital health context. The key identified barriers to realizing the benefits of digital health transformation in the workplace experienced by health service managers have been detailed across five major themes, including facing human and technical challenges with system adoption and the governance of data-driven decision-making in the digital context.

Change resistance and system usage are factors affecting many transformation programs that are further accentuated when adopting digital technologies. This is particularly so when contextualizing information in healthcare to make data-informed, clinical and business decisions.^{12,22,55,56} Managers in this study described the contextual authority concerns regarding the uncertainty as to who is now responsible for making these just-in-time clinical and business decisions, using the system-generated information, and the consequent personal and litigative risks attached to these decisions. These concerns reflect the discourse in the contemporary literature about administrative harm, which can be defined as

the adverse consequences of administrative decisions within health care and directly influences patient care and outcomes, professional practice, and organizational efficiencies regardless of employment setting.⁵⁷

In the digital environment, health service managers must make dynamic decisions in a fast-paced, high-risk context.^{58,59} Appropriate organizational structures and processes are essential to support the best possible decision-making. Uniquely, this study has evidenced managers' contextual authority concerns in the digital environment as to who now has the responsibility for making the just-in-time business and clinical decisions. A novel finding regarding both a perceived and potential barrier to realizing benefits from digital transformation.

For health service managers, these barriers can be modulated by articulating and embedding organizational digital innovation policies and the required operational digital frameworks and procedures.^{37,60} The impact of changing responsibilities in a transforming workplace, the rapid pace of digital change, and the increasing amounts of electronic data available are seen to confound existing decision-making hierarchies.^{61–63} Within this dynamic decision-making milieu, the benefits of digital decision support are well documented in the healthcare literature,^{56,64,65} though, there is a paucity of evidence about the contextual authority concerns. This is compounded by the decision-ownership conundrum when implementing these digital policies, where ambiguity surrounds the accountable leader or decision-maker. This increases the difficulty in assigning ownership to decisions.⁵⁷

Realizing benefits from digital health presumes the need to address concerns about system-generated information's digital provenance, safety and security. This is acknowledged in the digital organizational literature, which accentuates the difficulties in providing surety of digitally generated insights and supporting information-enabled decision-making.⁶⁶ The implications are profound, and impact system, organizational and enterprise factors, and digital governance policies and decision-making frameworks must be confirmed, implemented and actualized in practice. Lack of trust in digital systems and the ability to safely communicate using a uniform language supported by consistent data definitions are seen as inhibiting factors for digital health transformation, as apparent in contemporary literature.^{67,68} Digital safety and cybersecurity are now more acutely evident across healthcare systems, and healthcare cybersecurity is currently considered a crucial state infrastructure in many countries.⁶⁹ In this study, health service managers identified associations between the need to be digitally omniscient across the various healthcare practitioner roles and endeavouring to establish a sense of trust and assurance for the system users so that they can have confidence and surety in the digital systems. This is a novel finding with implications for the efficacy and efficiency of data-informed decision-making in a timely and secure manner, directly impacting human and fiscal resourcing.

Resourcing and procurement for technology adoption are seen as confounding influences across multiple industries,^{12,25,70} although in the digital health context, the barrier to adoption was amplified in this study. The health service managers highlighted the procurement knowledge required of the digital health system life-cycle by them, as well as the organizational need for both capital and recurrent resourcing requirements to be accurately forecasted for digital health. In addition, managers described an increasing need to be able to manage technology vendors, the commercial and contractual nuances required, and the interplay needed between clinical, business, technology and commercial necessities. There are profound commercial and financial implications for

the healthcare organization, with increased knowledge required of health service managers in understanding how to get better value from the digital health system life-cycle and the return-on-investment metrics. Preparing business cases and planning for whole-of-life digital health investments necessitates digital product life-cycle aptitude.^{32,71} This finding has important implications for targeted health service manager capability development, the required educational course curricula, and competency certification program preparation.

Managers in this study acknowledged that digital literacy is a foundational skill for managing information in the digital age. Digital literacy is an important and much discussed phenomenon affecting digital technology users in the twenty-first century.^{13–16} However, the managers in this study raised concerns about the escalating digital literacy requirements they needed as health service managers. Indeed, the impacts seen across the individual, team, and organization exposed vulnerabilities that were increasingly evident as a result of the enhanced digital literacy requirements needed by managers and their colleagues. They emphasized the importance of supporting healthcare practitioners in developing digital literacy skills, including their ability to contextualize the volume and veracity of information presented, along with the organizational vulnerabilities exposed from the integrity of the data captured, stored and aggregated to form information, upon which business and clinical decisions are made in the healthcare environment. The criticality of these decisions can have life-changing effects for patients and deleterious outcomes for healthcare organizations.^{3,35,72}

Previous research has examined the broad management competencies required from primary healthcare managers in the context of digital health services,⁷³ though the barriers managers perceived included the need to be able to constantly maintain and learn new skills in using digital systems, which impacted their ability to then teach and support employees in using digital technologies. This research has demonstrated that health service managers in this study experience difficulties in being able to provide effective and efficient competency-based, role-based digital training for staff, which is a barrier to realizing digital transformation benefits. The managers also revealed the link between digital literacy, digital governance and digital vulnerabilities, which impacts the accuracy and reliability of the information available to drive data-informed decision-making. This can be addressed with increased organizational alignment between corporate, clinical and digital governance, which must be understood and enacted by the health service managers.

Siloed systems are seen as a technology barrier to information access in many enterprises, and in healthcare, availability and timely access to clinical and business information are essential for quality and safe service delivery.^{56,74} The various disparate and disconnected health information systems must be able to link together and exchange information in an integrated manner to ensure appropriate and pervasive access to clinical information to treat patients and business information to manage the organization.⁷⁴ This supports recent research that highlights “successful integration requires more than just adopting technology; it necessitates a cultural shift and strategic alignment with organizational goals”.⁴¹ Findings in this study identify the digital governance barriers that prevent the efficient and effective transfer of required information across siloed systems. These are confounded by the organizational, technical and regulatory barriers to digital connectivity across healthcare services and locations. This disconnect between systems is increasingly apparent, which results in decision-making silos that are known to inhibit necessary information sharing and constrain collaborative problem-solving among healthcare teams.⁵⁷ System, technical and regulatory barriers to the digital connectivity required across organizational services and locations are not unique to healthcare.⁷⁵ However, the impact these barriers have on clinical risk and patient safety was magnified by managers in this study when explaining their increased level of accountability required to ensure that the right information is available for the right patient, in the right place, at the right time. These findings have implications for the governance of healthcare delivery across providers and locations of care, as the challenges in accessing and using digital data being captured and stored in these different systems must be overcome to ensure that essential personal health information can follow the patient across their care journey. Improvements are required in the enterprise, organization and local digital governance mechanisms that can better align the information access, including requisite delegation frameworks to ensure that role-based access controls are better tuned to the information requirements of healthcare practitioners. This also

includes the health service managers' prima facie need for appropriate access to organizational, clinical and business information.

Barriers to realizing the benefits being rendered from digital health are influenced by the barriers to adopting digital health technologies, including infrastructure and technical concerns, psychological issues, and workload-related trepidations.^{4,20} The findings from this study underscore that digital benefits are enhanced by addressing the organizational barriers to digital health adoption from a macro-system level, including digital governance, innovation and investment frameworks, resourcing for digital literacy, and digital security; a meso organizational structure and process level for reducing digital vulnerabilities, aligning corporate, clinical and digital governance structures, and supporting managers with whole-of-life digital systems investment capability; and the micro-human factors level including digital transformation capabilities, contextualized-authority certainty for decision-ownership, and cyber-hygiene.⁸ Health service managers need to see tangible digital health benefits evidenced in their workplaces, whilst being cognizant of contextual factors that can hinder the realization of these benefits.³⁷ Ensuring that organizational barriers and factors are addressed and capitalized upon in supporting the realization of benefits for health outcomes, responsiveness, efficiency, quality and safety³⁶ in a digitally transforming environment is imperative.

Recommendations for Healthcare Organizations and Policymakers

Recommendations for required changes across health systems can be considered using the World Health Organization's (2010)³⁶ six building blocks of a health system, to align the global policy recommendations and resourcing implications for how these barriers could be addressed on a larger scale, ensuring optimal benefits can be realized from digital health transformation. These are presented in Table 3 as digital changes required for health service managers to optimize the health system outcomes resulting from digital transformation in their hospitals (reflected in the bolded outcomes, as modified from the WHO six building blocks by the authors).

Table 3 Recommendations for Aligning Policy and Resourcing Requirements with Health System Building Blocks and Overall Health System Outcomes

Building Blocks of a Health System	Digital Changes Required	Health System Goals	Health System Outcomes
<ul style="list-style-type: none"> Service delivery 	<ul style="list-style-type: none"> Digital governance alignment between corporate and clinical governance. 	<ul style="list-style-type: none"> Access Coverage Quality Safety 	<ul style="list-style-type: none"> Improved Health Responsiveness Social and Financial Risk Protection Improved Efficiency
<ul style="list-style-type: none"> Health workforce 	<ul style="list-style-type: none"> Training in vendor management and negotiation for managers. Digital literacy training programs for healthcare workers. 		
<ul style="list-style-type: none"> Health information systems 	<ul style="list-style-type: none"> Organizational technology integration strategies. 		
<ul style="list-style-type: none"> Access to essential health-related commodities and products 	<ul style="list-style-type: none"> Contemporary digital health procurement guidelines need to be established and utilized. 		
<ul style="list-style-type: none"> Financing 	<ul style="list-style-type: none"> Financing available to incorporate and maintain digital systems. 		
<ul style="list-style-type: none"> Leadership/governance 	<ul style="list-style-type: none"> Integration of clinical decision support systems, data information exchanges, and analytics tools to enable data-informed decision-making. 		

Conclusions

The importance of digital transformation in healthcare is evident and will increasingly become a necessity for organizational survival and success. The changing competencies for health service managers to lead and manage in this digitally transforming environment are never more apparent. Complex adaptive change is also required in the organization of work, including capacity and system drivers that will support health service managers in leading and managing in this dynamic context. Organizational capacity, health service workforce capability, and individual health service manager digital health competencies are synergistic necessities.

System investments could therefore include targeted investment for manager training in vendor management and negotiation, as well as digital literacy training programs for healthcare workers. In the governance field, digital governance alignment between corporate and clinical governance is required. Under commodities management, contemporary digital health procurement guidelines need to be established and utilized. Furthermore, organizational technology integration strategies could benefit from including both new and emerging technologies like artificial intelligence along with existing virtual health services, business and clinical decision support systems, data information exchanges and analytics tools to enable data-informed decision-making.

This study contributes to the theoretical understanding of digital health transformation for healthcare management by confirming the capabilities required for health service managers to lead and manage the adoption and implementation of digital health technology and initiatives in the healthcare sector. This research also makes a novel contribution to the management competency development discourse that healthcare organizations, professional institutions and tertiary education providers can incorporate into their continuing professional development and training curricula. This study further adds important insights into the organizational barriers faced by health service managers in the Australian hospital sector when realizing the benefits of digital transformation. Addressing these barriers requires macro-, meso- and micro-level system investments, ensuring benefits can be transformed into value within the healthcare context. These benefits are enhanced by enabling factors critical for digital health adoption that have been described in key categories involving: (1) policy and system, (2) organizational structure and processes, and (3) people factors.

Limitations and Future Research

It is important to note some limitations associated with this research. Firstly, the study uses a qualitative approach to develop a contemporary understanding of experiences and perceptions of the organizational barriers that health service managers have encountered when realizing the benefits of a digitally transforming environment in the Australian context. The methods detailed could be applied in other jurisdictions, though the results should not be generalized to other country contexts without acknowledging local conditions and contexts. Second, although the empirically validated methodology was applied to mid-level public hospital managers, considerations about validity and applicability to other healthcare sectors and domains would necessitate alignment with local factors and prevailing research priorities.

As this research was conducted during and immediately post-pandemic, future research might focus on the longer term influences of managing digital health in the contemporary milieu of rapidly emerging technologies, the way in which healthcare organizations are evolving and adapting to ensure efficient, effective, safe and sustainable service delivery, as well as the nature of health service managers competencies required to successfully steer digital transformation in this fast-changing environment. It would also be useful to extend this research into other elements of the broader system, including primary care, rehabilitative and aged care.

Abbreviations

ACHSM, Australasian College of Health Service Management; AHICF, Australian Health Informatics Competency Framework; AIDH, Australasian Institute of Digital Health; COREQ, Consolidated Criteria for Reporting Qualitative Research; EMR, Electronic Medical Record; FGD, Focus Group Discussion; HSM, Health Service Manager; LHD, Local Health District; WHO, World Health Organization.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

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