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Beyond Barriers: Innovative Collaboration for Enhancing Malaysia's Healthcare Future

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Abstract

This study explores the challenges faced by public service management in the evolving economic and societal landscape, emphasizing the need for visionary strategies. It focuses on the transformative potential of innovative collaboration and examines the Health Data Repository (HDR) project within Malaysia's public health organization as a case study. The research employs qualitative methods, including interviews with HDR team members spanning the project's ideation to implementation phases. Thematic analysis is utilized to extract key insights and attributes related to innovative collaboration in the context of public healthcare service. The HDR project serves as a noteworthy example of innovative collaboration within Malaysian healthcare informatics. The study identifies inclusivity, knowledge, and empowerment as key values driving effective collaboration. Additionally, effective governance and collaborative synergy are highlighted as driving principles for successful collaboration. The findings contribute to a nuanced understanding of innovative collaboration, offering strategies to overcome inherent barriers and challenges. The study recommends practical measures such as the mitigation of obstacles, harnessing external expertise, and streamlining procedures. Emphasizing the importance of knowledge-sharing initiatives, interdisciplinary teams, and improved communication, the study underscores the impact of these pragmatic approaches on the development of a robust and agile healthcare system. The insights collected from the HDR project are not only relevant to the field of public health but also offer valuable lessons for diverse public service domains. The study presents a comprehensive framework for innovative collaboration, providing a blueprint to address contemporary challenges faced by public service organizations.

Keywords: Innovative collaboration, Public service delivery, Public health sector

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Introduction

In a bustling public hospital, patients from diverse backgrounds, each with theirown complex medical needs, flood the waiting room - a poignant scene that portrays the strain on the overburdened healthcare system. Meanwhile, at the back office, the dedicated healthcare administrators find themselves buried under stacks of paperwork, an enduring symbol of the bureaucratic complexities inherent in deliveringhealthcare to such a diverse population. As this scene unfolds, the leadership of the Public Health Organization convened in the headquarters for a pivotal meeting, to address a

pressing need; how to develop a healthcare that is not only robust but alsoresilient in the face of myriad challenges. This scenario encapsulates the overarching issues that look at large within today's public healthcare organizations. Furthermore, fragmented healthcare delivery system led to inefficiencies and disparities in access. According to Ramli et al (2019), in the study of Malaysia's public health sector, there are limited integration between public and private healthcare service providers which often operate in silos. As traditional methods prove insufficient and the need for innovation and collaboration becomes increasingly critical, the public healthcare sector brings together the collective wisdom, resources, and expertise of various stakeholders to reach a common goal. In the quest to increase the reach of public health, a pursuit of transformative approaches begins to transpire, transcending traditional boundaries and fostering collaboration in innovative ways. Public health sector utilizes cross-sectoral collaboration, as according to Shahzad et al (2019), to develop a range of healthcare service interventions which can address unmet health needs for diverse communities, making health services more equitable for high-risk and most vulnerable population groups within the community. The buck does not stop there, because collaborative efforts in the public health care sector, particularly in the realm of digital health systems, further enhance public healthcare services. Through the utilization of digital infrastructure that thrives on inclusivity, the public health sector opens the horizon to a more equitable distribution of health resources (Rich et al, 2019).

In this context, the Health Data Repository (HDR) project is an apt representation of an innovative collaboration concepts, paving the way for modern healthcare informatics as a solution to the multifaceted challenges in the public healthcare sector in Malaysia. Serving as the cornerstone of Malaysia's data-driven healthcare system, the HDR initiative enhances significantly healthcare service delivery, especially during the COVID 19 crisis. Furthermore, there is a critical need for more accurate information to inform policy design, particularly for diseases disproportionately affecting Malaysia's 2.91 million low-income households. According to N. Abu Bakar et al (2023), this action will enhance onthe public healthcare programs aimed at improving the health and well-being of marginalized community. Beyond the established benefits of patient information collection, as noted by Gialloreti et al (2020), a data-driven health system empowers decision makers to provide well-informed responses, effectively addressing both present and emerging population needs. The primary research objectives of this study explore the implementation process, challenges, and strategies that were engineered to achieve the outcomes of HDR project. Additionally, the study underscores the pivotal role of innovative collaboration concepts in shaping the success of this project, aimed at providing valuable insights within the specificity of the healthcare informatics project.

Literature Review

In anticipating emerging challenges, the healthcare system proactively engages in collaborative initiatives with diverse public agencies and stakeholders. Thisstrategic approach aims to formulate innovative policies and execute one-off project tailored to the current demands of the healthcare landscape. Although external collaboration and partnerships demand substantial commitment and resources, the pursuit of these efforts are grounded in the recognition that these endeavours are often beyond the capacity of an individual healthcare organizations.

Exacerbated by COVID-19 pandemic, according to Lehne et al (2019), previous suboptimal conditions for healthcare data-driven technologies were burdened with data silos and incompatible issues, rendering outdated technologies virtually useless at the time of crisis. As the pressure to further strengthen the health system's resilience intensifies, the focus on digitalization of healthcare compels collaborative efforts to increase preparedness and response capabilities, specifically targeting future health challenges. The digitalization of healthcare improves service delivery and infrastructure development to strive for quality healthcare, particularly for populations with the most pressing needs (Matenga, 2019). Spurred by the global demand for information exchange and connectivity solutions, digital technology for public healthcare systems facilitates precise information exchange and deeper connectivity solutions through real-time digital reporting.

Study by Lehne et al (2019), which focused on the German and European perspectives, has shown that the issue of interoperability still prevails. In other regions, there are also concern of digital divide in healthcare which affect the potential transformation in services and outcomes. There is a surge in demand for not only a higher standard of data interoperability solutions in post-pandemic era but also exploring the full potential of digitalization within the healthcare system (Alper et al, 2020). The emphasis on innovative practices underscores the development of advance and digital technologies as a key component of the healthcare systems. It pushes forth the need for an innovative collaboration agenda within the public healthcare sector with a focus on new and useful projects to substantially improve healthcare delivery. It requires engagement with an extensive group of key stakeholders in healthcare which include patients, healthcare providers, health service organizations, technological providers, regulatory organizations, and other entities to implement digital platforms for an equitable healthcare system (Hossain et al, 2020).

Discussions of collaboration within the healthcare sector prior to the COVID-19 pandemic had a focus on initiatives such as collaborative partnerships, public-private integration, and community engagement. Nevertheless, while these collaborative efforts in healthcare sectors demonstrate a willingness to collaborate in addressing pressing healthcare needs, they often rudimentary and tend to produce less impactful results with a profound influence on the healthcare system. The long-term sustainability of these collaborative initiatives has been plagued by management challenges attributed to several critical factors. These include underdeveloped infrastructure and a framework to support the collaboration initiative, a lack of crucial resources, and the emergence of issues pertaining equity (Moskal et al, 2022 and Hackett et al, 2020). Indeed, the urgency for more innovative approaches to address the limitations of conventional efforts is increasingly evident. Enhancing the effectiveness of collaborative initiatives necessitates leveraging a broader range of creative resources. This involves engaging diverse stakeholders, including governmental and non-governmental institutions, industry leaders, and innovators, providing access to a pool of knowledge and creativity that is beyond what can be achieved through a more closed or bureaucratic process.

Henceforth, it is established that the pursuit of transformative public healthcare demands a pragmatic exchange of innovative techniques and integration of various sectors (Mukherjee et al, 2022; Martin et al, 2022; Su et al, 2021, Han et al, 2020; Boni et al, 2020). This involves the inclusion of cross-sector collaborations, incorporating fields such as computer science and statistical data to address interoperability and data informatics requirements, achieved through the utilization of a collaborative framework (Small et al, 2019; Larissa et al, 2021). These efforts, considered part of the future merging approach in healthcare, have significantly impacted the landscape of public healthcare practices, particularly through collaborative digital health technologies.

With the release of the Global Strategy on Digital Health 2020-2025 by the World Health Organization (WHO), the visionary document provides a framework for countries to implement and expand digital health services (Dhingra et al, 2020). The WHO has proposed actions to support and ensure digital health transformation, emphasizing collaboration as a key driver. This collaborative effort involves several strategic tasks outlined to prioritized, sustainable and accelerated digital health transformation. It underscores the utilization of cutting-edge technological advancements, digital mechanisms, and the development of infrastructures to elevate the standard of healthcare services and enhance patient outcomes.

In Malaysia, the gaps identified within its healthcare services, particularly in relation to resources and quality assurance, present significant challenges to achieving quality, equity, and continuity of care. Furthermore, working climate within the public health sector in Malaysia, were described as “stressful” by Ramli et al. (2019) due to the non-efficient working environment, characterised by redundancy and demands for multitasking. This may be the result of non-coordinated public health programmes organised by various divisions. The public health sector is also laden with fragmented and duplicated roles which are causing resource wastages and strain. The call for successful collaboration efforts would potentially offer service capabilities, enhanced emergency response, and effective disease prevention strategies (George K, 2019). These initiatives lay the groundwork for transformative changes in the healthcare landscape.

Embracing the path of sustainable digital healthcare, Malaysia welcomes the collaborative spirit (Shoesmith et al, 2020;) as guiding principle in the adoption of innovative solutions for the country's healthcare system (Ghaleb et al, 2023). The enhanced healthcare partnerships are formed to adapt to the changing needs of the population, especially during the COVID-19 pandemic, ensuring the sustainability and resilience of the overall healthcare system (Tan et al, 2021). There is a pressing need for an efficient and effective healthcare delivery system that can drive transformation towards reaching robust standards comparable to those of developed countries. As a developing nation riding the wave of transformation, Malaysia offers a unique purview that encapsulates the involvement of various strategies.

The commitment of the Malaysian public sector to embrace digital transformation is globally revered, with the country's innovation positively influencing government agencies and public institutions (Edrak et al, 2022). Despite the increasing utilisation of digital technology in public healthcare in Malaysia, its current application remains limited and has not been fully exploited (Ngongo et al., 2023). The ongoing journey toward digital economy policies holds promise for improvement. Moreover, the active involvement of extensive stakeholders and society offers evolving aspirations, particularly in addressing the digital divides, focusing on healthcare. This premise significantly contributes to enhancing our understanding of innovative collaboration, with a close examination of pivotal projects such as health informatics, which play a crucial role in reshaping the healthcare system environment in Malaysia.

Health informatics harnesses the dynamic capabilities of information and communication technologies, standing at the forefront of healthcare digitalization. A pivotal milestone in Malaysia's healthcare system is the Health Data Repository (HDR), representing a significant step in IT-focused approach that unfolds a myriad of innovative solutions. The advanced technology seamlessly integrated into the HDR system enhances the quality of data and analysis capabilities. These enhancements serve as vital pillars supporting healthcare surveillance, facilitating research, and contributing to the development and management of healthcare programs.

The HDR project intricately embodies the complexities outlined by the principles of health informatics. Serving as a significant representation of innovative collaboration within the public sector, the HDR project contributes a wealth of knowledge and experience by fostering synergy and dynamic environments within the collaborative sphere. It not only promotes the development of innovative solutions, but also adapts to the changing needs. Ensuring the sustained evolution of the HDR system, this project stands as a testament of the pivotal role of innovative collaboration in shaping the future of healthcare in Malaysia.

The importance of understanding the innovative collaboration approach utilized within HDR projects lies in its top transformative potential for public service agencies. This initiative not only aims to improve service delivery and increase efficiency but also strives to produce better outcomes for citizens. Essentially, the practical approaches embedded in the initiative offer a comprehensive roadmap to navigate the complexities of innovation through collaboration. These approaches provide essential principles for overcoming barriers, adapting to evolving landscapes, and ultimately delivering services that are more attuned to the needs of the public.

Methodology

This study adopts a descriptive qualitative research approach within the interpretivist paradigm. The research approach enables the translation of findings intopractice by following the general principles of naturalistic inquiry (Roudsari, 2019). Thestudy prioritizes the voices of participants actively involved in the Health Data Repository (HDR) project, which is led by the Informatics Sector (IS). The study provides a comprehensive and nuanced exploration of innovative collaboration withinthe Malaysian public healthcare sector, considering various dimensions, challenges, and strategies. By focusing on real-world experiences and practices, it seeks to gain insights that align with the characteristics of a descriptive study. The research design and methods were preapproved by the ethical committee and received formal recognition from the Medical Research and Ethics Committee (MREC), enhancing thesignificance of the research.

The purposive sampling involves employees of the Informatics Sector (IS), Malaysian Public Health organization (PHO) who are actively involved in the Health Data Repository (HDR) project, to offer consistent and substantive first-hand knowledge. They are members of the Informatics Section (IS) who hold varying roles such as team leaders and team members, along with technical experts from the Malaysian Institute of Microelectronic System Berhad (MIMOS), and representatives from other supporting agencies.

Nine sessions of in-depth interviews were conducted onsite using semi structured and open-ended questions for a comprehensive exploration that thoroughlyexplore key concepts and categories of the topic (Foley et al, 2021). Furthermore, any misinterpretation can be immediately clarified as the interview follows a structured flow (Bryman & Bell, 2022). Recordings assisted in the transcription process to minimize researcher bias and interpretation. Additionally, member checking was employed, allowing participants the opportunity to review and validate their own interview transcripts. These steps contribute to the overall rigor andtrustworthiness of the data and findings, as outlined by Alexander (2019) based on Lincoln and Guba (1985).

This study adopted thematic analysis as a data analysis procedure to provide an unbiased qualitative approach, analysing research data by identifying, analysing, and developing themes, as described by Braun & Clarke (2022). This approach will identify and explore significant themes to substantiate an in-depth understanding of the phenomenon, revealing key strategies and principles for public sector and innovative collaboration within the Malaysian public healthcare sector. This study applied the use of the data management software, ATLAS.ti, to support a robust thematic analysis for data coding and theme discovery. It contributes towards efficientdata management, supporting systematic coding, providing visualization tools, and improving the overall rigour and transparency of the qualitative research process.

Results and Analysis

Understanding of Innovative Collaboration in the Health Sector

The first research question was - *To what extent is innovative collaboration understood in the Malaysian health sector?* This question aimed to explore the perspectives and comprehension of the concept of innovative collaboration among the participants who were selected from the HDR Team. It provided information on the diversity and complexity of the dynamics of innovative collaboration, as noted by Houtgraaf et al. (2021). However, nine significant features could be identified which effectively encapsulated the participants' understanding of this phenomenon.

These principles collectively form the foundation of the HDR project as an innovative collaboration initiative. According to the participants, these are enablers which effectively harness collective knowledge, skills, and perspectives to drivetransformational change in healthcare data management. Table 1 lists the principles pertaining to Innovative Collaboration, understanding, and its elaboration.

Table 1

The Fundamental Principles to the Understanding of Innovative Collaboration

LIST OF CODES FOR "UNDERSTANDING"	NOTES
1. Diverse Expertise	The HDR project benefits significantly from a diverse range of expertise brought together within the collaborative ecosystem. This diversity encompasses experts from various fields and disciplines, such as medical officers from various medical specialties, statisticians, IT personnel, and administrative officers. The amalgamation of such diverse expertise creates a rich environment for interdisciplinary problem-solving and innovative approaches.

2.	Shared Goals and Purpose	All entities involved in the HDR project are aligned with the same overarching goals and purpose. This shared understanding fosters a collaborative environment where all stakeholders work towards a common objective.
3.	Long Term Relationships	The collaborative relationships formed within the HDR project extend beyond a single project. Partnerships are built based on a commitment to long-term collaboration and shared vision, which leads to future opportunities and a network of reliable partners.
4.	Open Communication	Positive communication flows among the various entities within the collaborative environment, ensuring that concerns are clarified, and any arising issues are addressed promptly. This aids in maintaining transparency and facilitating problem-solving.
5.	Innovative Mindset	Team members of the HDR project exhibit a strong inclination towards experimentation, exploration, and embracing novel approaches. This mindset encourages creative problem-solving and drives innovation within the project.
6.	Interdisciplinary Approach	The diverse backgrounds and expertise of team members from various fields such as medical, statistical, and IT, create an environment conducive to interdisciplinary problem-solving. This cross-pollination of ideas leads to innovative breakthroughs and a more holistic perspective on challenges.
7.	Measurable Impact	The sharing of key performance indicators (KPIs) and milestones across entities contributes to tangible outcomes and solutions. By defining and monitoring these indicators, project progress and challenges are more effectively managed.
8.	Risk Sharing	Shared responsibility and accountability are extended across the collaborative ecosystem. During challenging times and uncertainties, all members of the project team collectively work towards overcoming obstacles and ensuring project progress.
9.	Continuous Learning	A culture of continuous learning is cultivated within the HDR project team. Lessons from different experiences are valued, and individual expertise is appreciated, leading to ongoing improvement and adaptation.

Fundamentally, evidence from the data reveals the existence of a multifaceted understanding of innovative collaboration which underpins the achievements of the HDR initiative and provides a platform for effective partnerships. Within the HDR project, these understandings have ultimately pushed the trajectory of transformational change in the field of healthcare.

Process of Innovative Collaboration in the Health Sector

The second research question is *"How does the process of innovative collaboration unfold in the Malaysian health sector?"* This question aims to elaborate on the process of innovative collaboration by considering not only the steps and stages involved in the process, but also the underlying principles and mechanisms that drive effective collaboration within the context of the HDR initiative.

Building on the detailed exploration of the process involved in innovative collaboration within the HDR project, Figure 1 is a structured representation of the critical elements and their interrelationships that drive effective collaboration in the public health sector synthesizes the key themes which had emerged from the data. This offers a holistic understanding of how different factors interact to influence the success of collaborative efforts.

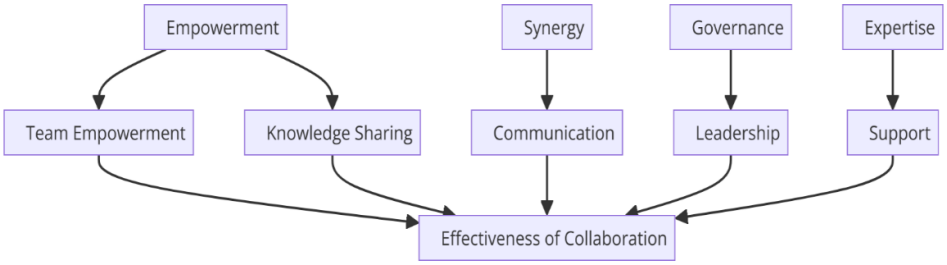

Figure 1: Effective Innovative Collaboration Framework

This framework identifies four key independent variables (IV) which are Empowerment and Knowledge Transfers, Collaborative Strategy, Effective Governance and Leveraging External Expertise. These variables are critical drivers of the collaborative process. The mediating factors include Team Empowerment, Knowledge Sharing Culture, Effective Communication, Leadership Style, and Organizational Support. These factors mediate the relationship between the independent variables and the effectiveness of collaboration. The effectiveness of collaboration is the dependent variable (DV) in this framework, reflecting the overall success of the collaborative effort in achieving the project's goals.

Further analysis posits that central to the collaboration process are the two cornerstones or foundational elements: effective governance and collaborative synergy. Aspects of the innovative collaboration process accentuated by effective governance and collaborative synergy, as illustrated in Table 2 below.

Table 2

Elements within the Cornerstones of Innovative Collaboration Process

Effective Governance	Collaborative Synergy
Equitable Responsibilities and Resources	Iterative Development
Risk Management	Co-design and Co-creation
Formation of Collaborative Partnership	Identifying Common Goals
Ethical and Legal Considerations	Clear Delineation of Roles
Transparency & Accountability	Joint Problem Solving

Within this understanding, effective governance entails overcoming collaborative complexities which mayarise, harmonizing the needs of multiple collaborators, and fostering unwavering commitment in collaborative programs. Nasirin et al (2023) found that collaborative governance practices in public health, including citizen participation, democratic accountability, and procedural legitimacy, significantly impact the success of these initiatives. Within the HDR project, effective governanceencompasses power balance, equitable resource distribution, impact assessment, risk management, collaborative partnerships, and ethical adherence, addressing a multifaceted and intricate aspect of innovative collaboration which is crucial forensuring its success. The project's governance framework is guided through aligningits process with the national health informatics goal, the national agenda, and strategicplans, which ensures not only commitment to goals but also underscores the importance of legislative instruments, policies, and guidelines. The comprehensive approach ensures that the HDR project remains on course and can adapt to the changing needs and challenges of the public healthcare landscape.

Collaborative synergy on the other hand goes beyond simple cooperation that involves collectiveknowledge, ingenuity of effort, and improved decision making. It is an

interdisciplinaryapproach which may service as a starting point for developing ground-breakingtechnologies (Huang, 2020). Collaborative synergy within the HDR project is a dynamic approach to address the complex challenges faced by different entities of collaboration. It involves the process of iterative development, co-creation, identifying common goals, fostering a clear delineation of roles, enabling joint problem solving. It created and maintained environments for collaboration to design innovative solutions (Waardenburg et al, 2020). The finding suggests that collaborative synergy goes beyond simple cooperation that involves collective knowledge, ingenuity of effort, andimproved decision making. By combining the strengths of internal and externalpartners, the HDR project managed a harmonious and effective collaboration that meets the needs of the stakeholders, advances the national healthcare informatics goals, and contributed towards a robust and responsive healthcare system in the country. Figure 2 lists the different elements of the collaboration process, effective governance, and collaborative synergy.

Accordingly, effective governance is described as a mechanism for overcoming collaborative complexities while collaborative synergy is characterized as goingbeyond simple cooperation. These key themes effectively suggest an exploration of how both are associated with virtues that consciously guide the design environment to explain, as illustrated in Figure 2, how these concepts best influence the known conditions for effective collaboration.

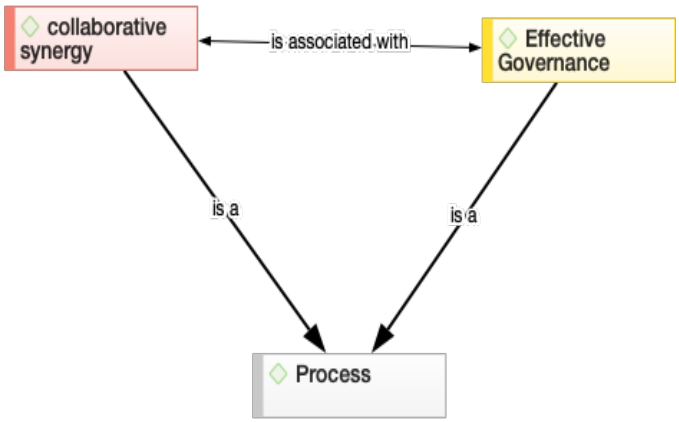

Figure 2: Innovative Collaboration Process Cornerstones

Effective Governance Virtues (Trust, Integrity, and Collaboration)

Effective governance fosters trust among collaborators. When there is atransparent and reliable governance framework in place, team members trust that decisions are made in the best interest of the collaboration. Effective governance upholds the integrity of the collaborative effort. Integrity ensures that actions and decisions align with the shared goals and values of collaboration, reducing the risk of conflict or hidden agendas. At its core, effective governance is a collaborative process. It encourages open communication and collective decision-making, enabling diverse perspectives to contribute to the collaboration's success.

Collaborative Synergy Virtues (Creativity, Respect andEmpowerment)

Collaborative synergy sparks creativity within the team. When individuals from different backgrounds and expertise areas come together, theybring unique ideas and approaches to problem-solving, resulting in innovative solutions. Collaborative synergy is built with respect for each team member's contributions. It values diversity and ensures that all voices are heard and respected, creating a harmonious and inclusive environment. Collaborative Synergy empowers team members

to take ownership of their roles and responsibilities. Collaborative synergy promotes a sense of ownership and accountability, making team members feel invested in the success of the collaboration.

Furthermore, the finding of innovative collaboration concepts uncovers a dynamic context in which the constructs of virtue epistemology come to life. These constructs encompass intellectual virtues such as trust, integrity, empowerment, and respect, providing a framework to better understand and explain innovative collaboration. The interplay of creativity and collaboration enhances these constructs to help forms the mental frameworks that guide our understanding of the collaborative process. Within the HDR project, the team members are guided by creativity and collaboration in the pursuant of epistemic goods. Figure 3 illustrates how these virtues are connected to the cornerstones of Innovative Collaboration.

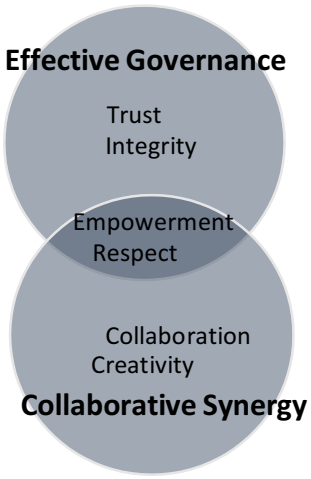

Figure 3: Connecting Virtues to Cornerstones of Innovative Collaboration Process

Barriers and Challenges of Innovative Collaboration

The third research question is *"What are the barriers and challenges faced by the healthcare sector in implementing the innovative collaboration process"*. According to E. Cinar et al. (2019), identifying the nature of barriers and challenges is complex but crucial. These challenges which are contextual and may differ depending on the types of process and innovation involved, with interaction-specific barriers emerging during collaborative innovation. According to Leite et al (2024), in a complex healthcare ecosystem, the journey continues to be hindered by these contextual barriers. Moreover, these barriers often demonstrate interrelations throughout the process.

In the realm of innovative collaboration, "challenges" and "barriers" are distinct terms often used to describe obstacles or difficulties that individuals or groups encounter while trying to achieve a certain goal or overcome a particular situation. While they are related, there are subtle differences in their meaning. In this study on the HDR innovative collaboration initiative, challenges are understood as difficult tasks or situations which may foster growth and improvement of the project, while barriers are obstacles that threaten the progress of the HDR project and often require significant effort to overcome. The distinction lies in the underlying connotation where challenges imply an opportunity for growth, while barriers imply a need to remove an impediment.

Table 3

Internal and External Adversities of Innovative Collaboration

Internal	External
Opportunities for Skill Enhancement	Technological Gap: Disparity and Acceptance
Preserving Institutional Knowledge	Legal Gap: Balancing Data Privacy and Data Potential
Navigating Operational Challenges	Expectation Gap: Navigating Perspectives
	The Role of Technology Provider and Enabler

4.3.1 Interpretive Perspective of Barriers and Challenges of the HDRProject

It can be concluded from the findings that barriers and challenges are not isolated incidents but are intertwined with the complex web of organisational cultures, motivations, and evolving technological landscapes, as illustrated in Figure 4. This perspective provides insights into how individuals involved with the HDR project perceive and make sense of these challenges.

With a deeper understanding of barriers and challenges, it is interesting to learn that the longer the diverse actors collaborate, the more likely they are to overcome the barriers of institutional diversity and find effective modes of collaboration for knowledge transfer and innovation (Brunetta et al, 2020). According to Haug, (2023), public service providers play crucial role in this process by micromanaging or facilitating collaboration, empowering service users, and translating the result back into the organization.

For example, the shortage of technical expertise is understood not just as a matter of lack of skills but also as a reflection of the ever-evolving landscape of technology and the need for continuous adaptation. Furthermore, as Sweileh, W. (2024) indicates, technology plays a key role in overcoming certain barriers. Similarly, the bureaucratic nature of procedures is not merely a set of rules but a reflection of the public service ethos, emphasizing principles such as transparency and fairness. Collaboration, as suggested by Helden & Steccolini (2024), suggests an alternative or complementary set of administrative values that necessitate the development of concrete tools and practices over time.

Interpretive insights also shed light on the cultural and organisational aspects of these challenges. The resistance to certain technologies is not just a matter of inconvenience but reflects the practical realities and motivations of healthcare professionals on the ground. Additionally, the role of technology providers like MIMOS is not merely about delivering systems; it involves complex considerations of competition, collaboration, and democratisation. Armed with this deeper understanding of barriers and challenges, it is interesting to note Brunetta et al.'s (2020) finding that the longer diverse actors collaborate, the more likely they are to overcome the barriers of institutional diversity and find effective modes of collaboration for knowledge transfer and innovation.

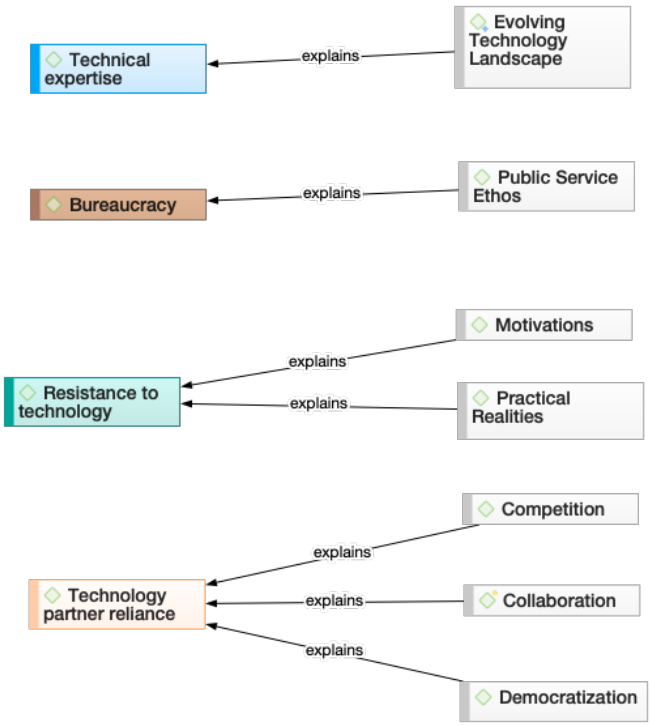

Figure 4: Interpretive Perspective of Barriers and Challenges of the HDR project

Approaches to Improve Existing Innovative Collaboration

The following research question is *"What are the suitable approaches to improving existing innovative collaborations in the Malaysian health sector?"* It aimed to continue the exploration of the strategies employed within the HDR project to overcome the obstacles encountered in their pursuit of innovative collaboration.

Empowerment and participation

The empowerment and participation approach has made the Informatics Section (IS) of the HDR project an inclusive and dynamic workspace where every team member's potential is recognized and harnessed. Sometimes this was achieved through non-deliberately and organic manners through collaborative work of a wide range of actors (Mayaka et al, 2020). By empowering team members to independently seek training and knowledge, the HDR project has created an inclusive learning environment. With empowerment through training and upskilling, it creates inclusivity ensures that every team member, regardless of their starting point in terms of their level of knowledge or experience, can grow and contribute to the project's success.

Transformational leadership – Open communication

Transformational leadership within the HDR project, characterised by open communication and a balanced management style, directly addressed the challenges of navigating differing perspectives and motivations within the project. This leadership approach mitigates potential conflicts stemming from cultural and organisational differences by encouraging team members to freely express their opinions and by being receptive to diverse viewpoints. According to the research by Hlongwa and Rispel (2021), desired outcomes can only be achieved with a set of enablers; they include visionary leadership. Transformational

leadership within the HDR project, characterised by open communication and a balanced management style, directly addressed the challenges of navigating differing perspectives and motivations within the project. This leadership approach mitigates potential conflicts stemming from cultural and organisational differences by encouraging team members to freely express their opinions and by being receptive to diverse viewpoints.

Leveraging Expertise and External Input

By collaborating with multiple organisations and stakeholders, the HDR project tapped into a broader pool of knowledge and resources. Aflatoony and Lee (2020) suggested that expert knowledge can create a whole greater than the sum of isolated skills, knowledge, and expertise, resulting in novel and advanced solutions. This helps bridge the technological disparities within the healthcare landscape, ensuring that the project benefits from a wide range of expertise.

The HDR project recognises the intrinsic link between leveraging expertise and external input and achieving design-led, sustainable development. This approach ensures that the HDR System is not driven solely by internal perspectives but also enriched by broader external insights. As Vlachokostas (2020) argued, collaborative efforts provide a foundation for decision support that leads to sustainable development and foster interactions that pave the way for synergies at all levels. Figure 5 captures the key outcomes of each approach within the HDR project that contributed to the innovative collaboration.

Figure 5: Key outcomes of HDR project contribute to Innovative Collaboration

Perspective in the Public Health Sector on Embarking on Innovative Collaboration

The final research question is "*How suitable are the approaches to innovative collaboration in the Malaysian public health sector for application in other public service agencies?"*. This research question sought to explore the assess the degree of transferability of innovative collaboration approaches utilised within the HDR project in the public health sector to other organisational contexts, particularly other public service agencies in Malaysia. It is essential to emphasise how understanding of the unique organisational culture and challenges within each organisation influences the efficacy of these practices and principles.

Evidently, the approaches connected to the interpretive stance adopted throughout the research provide valuable insights and guidance for other public service agencies. By considering the context-specific nuances of the public health sector and how these

approaches were tailored to address the HDR project's challenges, it becomes possible to extract more universal principles that are applicable and fitting in other settings. It serves as a roadmap for other organisations seeking to embark on innovative collaboration, thereby enhancing their ability to navigate challenges, build effective teams, and produce impactful outcomes. As illustrated in Figure 6, this includes addressing gaps in expertise, mitigating bureaucracy, addressing resistance to technology, and managing reliance on technology partners.

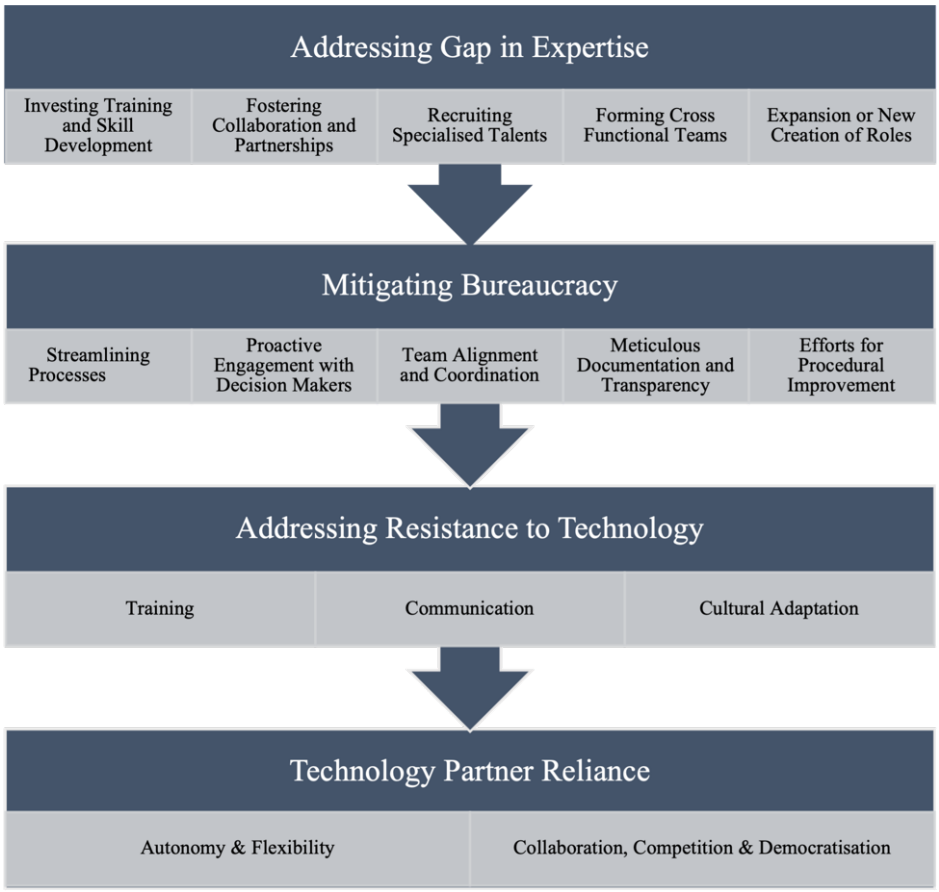

Figure 6: Roadmap for Innovative Collaboration

The HDR project's strategy show potentiality for broader applicability in other sectors. These approaches as illustrated in Diagram 6, including empowerment and participation, transformational leadership, leveraging external expertise, and evolving roles, showcase their applicability beyond the healthcare sector.

This study demonstrates potential transferability to various public services with complex issues such as environment, agriculture, or transportation. It highlights innovative collaboration concepts which provide valuable lessons for agencies seeking to embark on innovative collaboration initiatives. The introduced framework provides a structured approach for understanding and enhancing innovative collaboration in healthcare, as evidenced by the HDR Project.

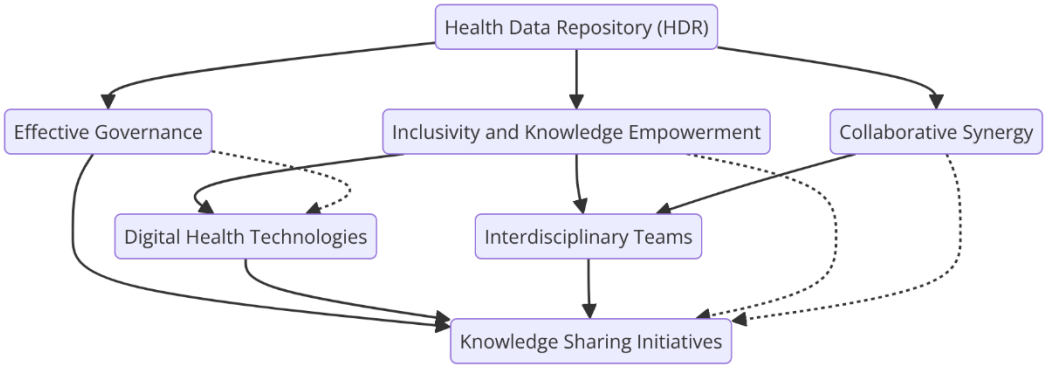

Figure 7: Framework for Innovative Collaboration in Public Healthcare: The HDR

Discussion & Conclusion

The study of HDR projects offers a unique perspective on innovative collaboration in healthcare informatics. In this exploration to address multiple research objectives, it delves into public service dynamics, implementation process, challenges and suggests practical approaches of innovative collaboration future initiative. These approaches carry the potential to transform the way public service agencies operate through actionable collaborative initiatives.

Firstly, it reveals that innovative collaboration transcends merely technical processes. It encompasses a multitude of diverse perceptions, values, and experiences, thus contributing significantly to the understanding of public service dynamics within the health sector. Secondly, it details a comprehensive understanding of the intricacies involved in implementing innovative collaboration, offering practical insights beyond theoretical models. Thirdly, the examination of the barriers and challenges highlights a spectrum of internal and external factors, that exist due to institutional and environmental factors, including lack of technical expertise, bureaucratic obstacles, resistance to technology adoption, and reliance on technology partners. Drawing from these experiences, the study suggests a set of pragmatic approaches like empowerment and participation, fostering transformational leadership, and leveraging external experts. Collectively, these strategies offer a comprehensive framework for enhancing innovative collaboration in public services.

The research emphasis the integration of collaborative synergy and the role of hybridization, showcasing their importance in optimizing project outcomes. In essence, the findings provide a holistic perspective on innovative collaboration within the health sector, addressing complexities, challenges and emphasizing the essential roles of effective governance, collaborative synergy, and role of interdisciplinary collaboration.

Public health offers unique contributions from its individual programmatic areas which can cohere to realize the broader aim of the promotion of other areas within public service (Smith et al, 2019). While the challenges themselves may not be uniqueto this domain, beyond the health sector, these approaches demonstrate versatility and potential impact for other public service agencies across various contexts. The emphasis on empowerment and knowledge transfer promotes a culture of continuous learning, which can be applied in diverse sectors such as agriculture, education, and the environment. Collaborative synergy and effective governance establish the foundation for transparent and accountable collaboration, which is essential in any public service context. Leveraging external expertise can enhance knowledge sharing partnerships, benefiting agencies across various domains. Figure 8 outlines several steps to shift mindsets and foster a commitment to a culture of

collaboration and innovation. These suggestions are grounded in the key strategies and practices that have been proven effective within the HDR project. Thus, these approaches may be beneficial and noteworthy for their practicality and sustainability beyond the healthcare sector.

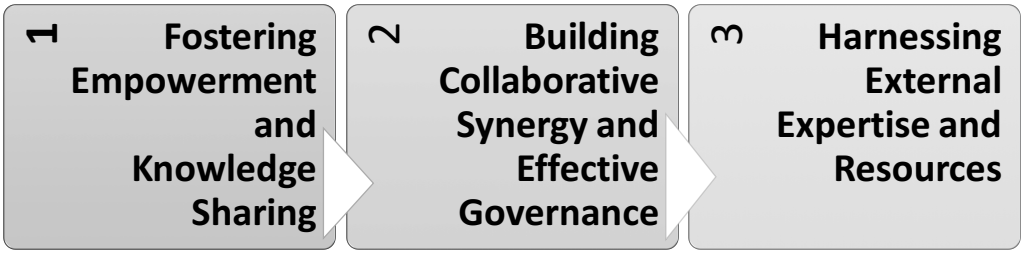

Figure 8: Suitable Approaches to Enhance Innovative Collaboration

Figure 9 illustrates actionable outcomes for fostering effective innovative collaboration. In short, these practical implications, rooted in 1) enriching collaboration and 2) reimagining governance, can guide practitioners, policymakers, and stakeholders in future efforts of collaborative initiatives. They address common challenges while promoting a culture of innovation, inclusivity, and effective governance.

Figure 9: Actionable Directions in Fostering Innovative Collaboration

Furthermore, the findings of this study call for a shift in perspective from viewing innovative collaboration as a static, predefined process to understanding it as a dynamic and evolving journey. This shift within current models can more accurately capture the ever-evolving nature of collaborative efforts. Consequently, the interpretive approach has added layers of

depth to the theoretical underpinnings of the research, resulting in a more robust and holistic expanded model, as depicted in Figure 10.

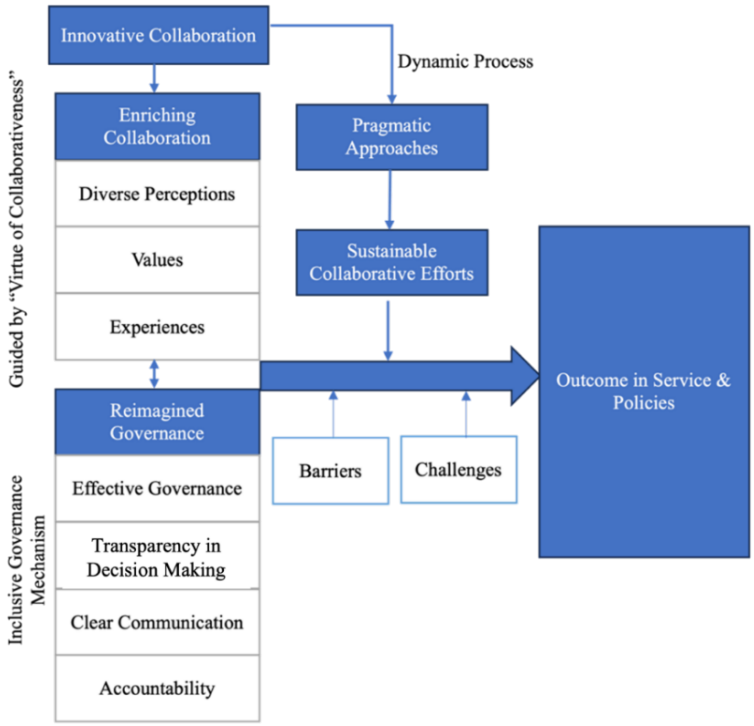

Figure 10: The Expanded Model for the Implementation of Innovative Collaboration

Implication of the Study

Through the lens of public service management and innovative collaboration, this study explored to achieve several research objectives. The findings of this study have significant implications for the current literature, theory, and practice by offering a unique perspective on the intricate the realm of public health sector.

First, this study enriches the existing body of knowledge by providing a detailed exploration of innovative collaboration within the context of Malaysia's public healthcare sector. It highlights the complexities and dynamics involved in such collaborations, particularly through the case study of the HDR project. By identifying key principles such as diverse expertise, shared goals, long-term relationships, open communication, and continuous learning, the study offers a nuanced understanding of the mechanisms that underpin successful collaborative efforts. This detailed analysis fills a gap in the literature by providing empirical evidence from a developing country's perspective, thereby broadening the scope of research in public health informatics and collaboration.

Next, the study advances theoretical frameworks related to innovative collaboration and public service management. The proposed Effective Innovative Collaboration Framework (Figure 1) delineates the critical elements and their interrelationships that drive effective collaboration. This model provides a comprehensive theoretical model that can be applied to other public service domains, enhancing our understanding of the factors that contribute to successful collaborative initiatives.

Furthermore, the insights gained from this study offer actionable strategies to overcome barriers and enhance their collaborative efforts especially for practitioners. The emphasis on effective governance and collaborative synergy provides a practical roadmap

for managing complex collaborative projects. Additionally, the findings have important implications for policymakers to leverage the provided insights.

The success of the HDR project demonstrates the value of investing in digital health infrastructure and fostering cross-sectoral collaborations through policy design and implementation that promote innovative collaboration, enhance interoperability, and address the digital divide in healthcare. By prioritizing the development of robust governance frameworks and supporting the integration of diverse expertise, policymakers can create an enabling environment that facilitates transformative change in public healthcare delivery.

In conclusion, this study provides a comprehensive framework for understanding and implementing innovative collaboration in public service management. By highlighting the critical factors that drive successful collaboration, this research paves the way for more effective and inclusive approaches to addressing contemporary challenges in the public healthcare sector.

Limitations and Future Directions

The primary limitations of this research are the small sample size, potential selection bias, and limitations in generalizability. The study primarily focused on the HDR project within the health sector. This focus might restrict the extent to which the findings can be broadly applied, especially when considering their applicability to other public service agencies that may have dissimilar structures or capacities. To enhance generalisability, the sample size limitation can be improved in future studies to include a larger and more diverse set of public service agencies.

Future research endeavours should consider investigating several aspects. Firstly, exploring the nuances of governance structures could shed light on their influence on collaborative efforts. Secondly, the specific impacts of knowledge sharing on innovation outcomes deserve an in-depth examination, as they could provide valuable insights for practitioners. Thirdly, investigating the role of technology adoption in collaborative efforts, especially in this era of rapid digital transformation, will be valuable. Additionally, future research could focus on validating the proposed framework by exploring different public sectors to generalise its applicability and impact while also including topics that include establishing impact measurements of collaborative initiatives, investigating ethical and legal frameworks, and examining the influence of digital transformation on innovative collaboration. Future researchers are encouraged to consider the prospects of global collaboration, where public agencies collaborate on a global scale to address worldwide challenges such as climate change. Such exploration could further expand and enrich existing models to generate a vibrant discourse and inspire future studies on global collaborative efforts.

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