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## Perspectives Brief

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# Digital maturity models for primary health care

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## Executive Summary

Digital technologies are now increasingly seen as an essential resource in primary care. While many health care providers across Australia have responded positively to the potential of digital technology and information systems, it is known that digital adoption and integration have considerable variability across the services.

Likewise, there is significant variation in digital adoption amongst Primary Health Care (PHC) providers. The varying levels of adoption amongst its providers, and variable access to it amongst its consumers, raises the potential for “digital divide”.

It is considered imperative for PHC stakeholders and funders to assess PHC providers' digital infrastructure maturity.

Digital maturity assessment requires a tool that can comprehensively evaluate the steps being taken by the providers to achieve digital health maturity. To identify a suitable model that meets the needs of PHC, we identified popular digital maturity models including:

- HIMSS Electronic Medical Record Adoption Model (EMRAM),
- Victorian Digital Health Maturity Model (VDHMM); and the
- Gippsland PHN co-developed Digital Health Maturity Assessment (DHMA).

We have also identified that PHC has specific distinct components. PHC has a whole of government and whole of society approach, and three pillars underpin it:

- multi-sectoral policy and action,
- public health functions and
- empowered communities.

Therefore, any digital health intervention in PHC and subsequent assessment requires taking these pillars into account.

Of the existing digital maturity models, many models either are oriented to hospital environments or lack consideration of the PHC context, quality improvement processes, and empowerment of clients. We recommend three options for PHC providers to consider.

The first option is to consider the VDHMM, as it has a comprehensive maturity assessment framework and has a broader focus than hospitals.

The second option is to utilise the Gippsland PHN co-developed DHMA, a tool contextualised to the PHC and available as a web-based assessment.

The third option, a new model, the Digital Maturity Assessment of Primary Care Providers (DMAPP), which aligns with the WHO endorsed PHC pillars of multi-sectoral policy and action, public health functions and empowered communities.

DMAPP presents three main components: Capacity, Change and Transformation. DMAPP envisages providers need to achieve or have the specific capacity and undertake changes to achieve the digital transformation required. DMAPP outlines the relevant outcomes to mark the shift. In the case of DMAPP, maturity levels are denoted by five levels. As the PHC provider progresses through the capacity, change and transformation components, they achieve various maturity levels. It is envisaged that DMAPP will help assess the provider's digital maturity and support the provider's progress to digital maturity.

## Background

Digital information, when used appropriately, has the potential to transform the quality and sustainability of health and healthcare services (Biggs et al., 2019; Pagliari, 2021). Digital technologies are now increasingly seen as an essential resource in primary care, with common uses being in clinical decision support systems, quality of care, tracking of medical supplies and infectious disease surveillance (Dzenowagis, 2018).

The Australian government has made efforts to facilitate digital health integration in the healthcare system while supporting innovation and collaboration in digital health (ADHA, 2017). Various health organisations funded by the Australian government have now been directed to establish digital health integration and innovation as a priority target.

While many health care providers across Australia have responded positively to the potential of digital technology and information systems, it is known that digital adoption and integration have considerable variability across Primary Health Care (PHC) providers (Azar, 2020; Biggs et al., 2019). The varied adoption amongst its providers and variable access to it amongst its consumers can potentially be a barrier for PHC stakeholder objectives and exacerbate existing disparities. Therefore, it becomes important to assess the maturity of digital capabilities including policies, practices, and technologies (collectively referred to as infrastructure) of PHC providers.

While digital technologies have positive potential, the rapidity at which they are becoming available in PHC and the blurred boundaries between them, and traditional

healthcare provision has brought complexities and raised concerns (Neve et al., 2020).

To ensure the adequate preparation for and consequent adoption of digital technologies amongst its primary health care providers, there must be an understanding and assessment of their digital health maturity (Liaw et al., 2021). This assessment requires a tool that can comprehensively assess the steps being taken by the providers to achieve digital health maturity. This report reviews relevant digital health maturity assessment models and presents recommendations for a suitable model.

### Primary Healthcare

PHC intends to equitably maximise the distribution of health and well-being drawing upon three interrelated and complementary pillars:

- 1) Multisectoral policy and action,
- 2) Integrated health services and
- 3) Empowered people and communities.

Integrated healthcare has an emphasis on public health and primary care functions in delivering preventative care; multisectoral policy and action is required to systematically address determinants of health and empowered communities means people can be co-developers of health services. Through the combination of these components, PHC enables a foundation for the achievement of universal health coverage and sustainable development goals. However, to realise these components, certain levers are required. The UNICEF/WHO outline the essential strategic and operational levers that underpin these pillars (Table 1) (UNICEF, 2022).

Primary health care levers	
Strategic	Operational
Political commitment and leadership	Models of care
Governance and policy frameworks	Workforce
Funding and allocation of resources	Infrastructure
Engagement of community and other stakeholders	Medicines and other health products
	Engagement with private sector
	Purchasing and payment systems
	Digital technologies
	Systems for improving quality of care
	Primary healthcare-oriented research
	Monitoring and evaluation

*Table 1. Primary health care levers (Adapted from WHO, 2022).*

These strategic and operational levers not only outline the distinct aspects of PHC delivery, but also consider those aspects which need to be leveraged to achieve PHC objectives. The three pillars (Integrated health services; multisectoral policy and action; empowered people and communities), underpinned by these levers, are necessary for PHC to provide universal and comprehensive care with priority given to those most in need.

### Digital Health in Primary Health Care

The UNICEF/WHO state digital technologies are a key operational lever for PHC, especially for improving how services are provided, and empowering communities to manage their own health (UNICEF, 2022). Digital technologies that can support identified objectives include communication technologies, telemedicine, big data, and information innovations (Pagliari, 2021).

The adoption of digital technologies in PHC is increasing, with its integration in a range of support functions and essential public health functions. For example, digital technologies in PHC include electronic health records (EHR) to capture information about individual's health

and treatment history; telemedicine to provide routine and emergency care; mobile health and wearable devices to promote health amongst consumers; big data and artificial intelligence to support complex clinical decision-making; point of care diagnostic testing to perform rapid analysis; and innovations like 3-D printing to enable manufacture of prosthetics and medical equipment (Dzenowagis, 2018).

Digital technologies also provide the necessary means to reach the public through targeted health campaigns and text reminders via mobile phones. Access to digital technologies is not just useful for the patient community, but also to the PHC workforce as they can use the technologies to be more effective, flexible and autonomous in their work.

While there are many benefits associated with the use of digital technologies in PHC, there are associated risks too (Neve et al., 2020). For example, variable digital literacy amongst the healthcare workforce and patient community, whereby limited or no digital literacy can lead to isolation or marginalisation of intended end users, and consequently affect the adoption of

digital health (Neve et al., 2020; Pagliari, 2021) and contribute to health inequalities.

Many digital technologies and applications lack clear regulation, a strong evidence base and thorough assessment leading to questions about their efficacy. There has also been increasing concerns raised about privacy and data ownership/sharing as the use of digital technologies in healthcare have increased. To ensure there is accountability and monitoring of the use of digital technologies in PHC, the WHO has recommended some indicators to be considered by stakeholders (Table 2) (UNICEF, 2022).

Sample digital technology indicators for primary health care (WHO)
Percentage of centres using comprehensive patient records
Functional practice information systems
Regular system of population-based health surveys
Existence of effective surveillance systems

*Table 2. Select indicators for digital technologies in primary health care (Adapted from WHO, 2022).*

While monitoring already implemented digital health infrastructure is one matter, assessment of the capability of the various organisations with regards to their digital health maturity is another.

### Digital Maturity Assessment

It has been estimated that nearly 80 per cent of digital technology projects in healthcare fail because of uncertainty, abandonment, and the unwillingness of many organisations to adopt digital health interventions (often due to difficulties with existing inflexible work practices or legacy systems that cannot be easily migrated or integrated) (Cresswell et al., 2019). It is therefore critical that organisations

understand their capabilities and maturity to adopt and implement digital technologies. By understanding digital health maturity, organisations can mobilise their knowledge and resources, and plan for implementation and scale-up of digital health interventions, and subsequently transformation of their healthcare delivery (Biggs et al., 2019; Liaw et al., 2021).

Digital health maturity assessment in the PHC context is focused on understanding the technical, cultural and change readiness of general practices to adopt, implement and scale-up digital health interventions. Another element that is assessed is the presence of standards-based interoperable digital platforms that can support and sustain organisational objectives.

Evaluation of digital maturity will be critical to inform the provider's digital health strategy. Accordingly, maturity assessment must comprehensively assess technical, cultural and change readiness to inform stakeholders of maturity regarding digital health.

In modern healthcare organisations, improved clinical and business processes and health service outcomes are achieved through efficient information systems and flows (Biggs et al., 2019; Williams et al., 2019). To understand information flows an assessment of the digital infrastructure is required.

### Maturity Assessment Models

To assess the capability and maturity of digital infrastructure, maturity assessment models are utilised. These maturity assessment models are a set of structured levels that outline organisational behaviours and activities that reliably contribute to required digital health outcomes (Liaw et al., 2021).

They measure the ability of the organisation to continuously improve in certain areas until they achieve the expected level of maturity.

Features that contribute to the achievement of reliable interoperable information systems are recognised and quantified for each maturity level. They are then assessed and monitored for improvement in maturity.

Through this process, maturity assessment models act as road maps narrating how certain features and processes can lead to better outcomes progressing from one level to another.

The most widely used digital health maturity assessment model globally is the Healthcare Information and Management Systems Society (HIMSS) which developed the Electronic Medical Record Adoption Model (EMRAM) (HIMSS, 2023a). The EMRAM model, as the name suggests, exclusively focuses on electronic health record (also called electronic medical record) adoption and utilisation.

The model has seven levels with the highest level indicating no use of paper charts, and use of Computerised Provider Order Entry (CPOE) and clinical decision support systems (CDSS) in hospitals assessed. To cater to all areas of the hospital, HIMSS developed an out-patient specific EMRAM, which assesses digitalisation of records in the outpatient setting at various levels (Table 3) (HIMSS, 2023b).

Level	
7	Complete EMR
6	Advanced CDSS
5	Personal Health Record
4	CPOE
3	Electronic messaging
2	Clinical data repository
1	Desktop access
0	Paper chart based

EMR: Electronic Medical record; CDSS: Clinical Decision Support System; CPOE: Computerised Provider Order Entry.

*Table 3. Outpatient Electronic Medical Record (Adapted from HIMSS, 2023b)*

Achievement of level six or seven, either with inpatients or outpatients, is uncommon despite the drive to use electronic health records in hospitals. A critical limitation of the model for PHC setting, however, is its hospital and technology focus that largely ignores the human and public health components pertinent to PHC.

In Australia, the Victorian Department of Health, requiring a comprehensive model to assess their clinical Information and Communication Technology (ICT) and guide their ICT investment decisions, developed a framework termed 'Victoria's Digital Health Maturity Model (VDHMM)' (Health, 2022).

Considering many international models have a focus on hospitals and international contexts, a locally developed model and self-assessment tool applicable to a wide range of health care settings was considered essential.

The VDHMM has nine pillars with 'Governance and Stewardship' sitting across all pillars (Figure 1).



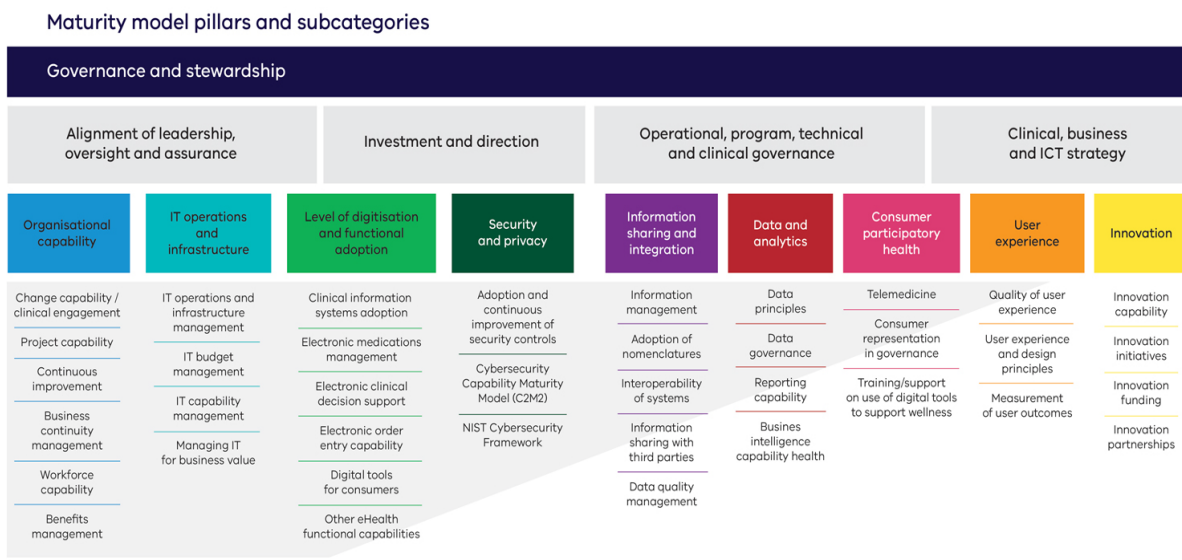


Figure 1. Victoria's Digital Health Maturity Model (EY, 2021)

The VDMM has four domains aligned to the nine pillars:

- leadership, oversight, and assurance.
- investment and direction.
- operational program, technical and clinical governance; and
- clinical, business and ICT strategy.

The model has five maturity levels (Table 4) and is accompanied by 40 targeted questions, which collect approximately 730 data points, to assess maturity levels.

Level		
5	Transformative	Coordinated and planned initiatives form part of a continuous improvement loop
4	Established	Coordinated approach to continuous improvement and measurement
3	Developing	Some desired outcomes achieved via strategic decision making
2	Basic	Desired outcomes identified and some initiatives commenced
1	Initial	Unpredictable, reactive, and poorly controlled outcomes

Table 4 VDMM Maturity Levels (Adapted from EY, 2021)

While the VDHMM has a much more comprehensive assessment approach than the EMRAM model, wider appeal to the health sector than just hospitals, and takes into consideration consumer participatory health, user experience, information sharing and integration, and innovation as key elements to be assessed, it does have drawbacks when it needs to be applied to the PHC context.

That is, the model lacks an emphasis on quality improvement, and does not take into consideration the MyHealthRecord, the PHC pillars of integrated healthcare and multi-sectoral policy, and the critical element in the success of digital interventions - user adoption. It is also oriented around the needs of acute care public hospitals.

While the model does mention interoperability, nuances like external, internal, semantic, and syntactic interoperability are missing. In addition, the model does not take the presence of national infrastructure into account in assessing capabilities.

Globally, there are limited number of digital health maturity assessment models developed exclusively for the PHC context and this applies to Australia too. Very few PHC oriented models can be found on the web.

One such available model is a web-based Digital Health Maturity Assessment (DHMA) model co-developed by the Gippsland Primary Health Network (PHN) with Semantic Consulting (Azar, 2020; WestVicPHN, 2023). The assessment model was developed to improve the understanding of the technical, cultural, and change readiness of general practices in their region. The findings from the assessment would assist the PHN in supporting general practices to implement innovative models of care.

The assessment consists of 47 questions with the questions divided into five categories:

- practice context,
- infrastructure,
- capabilities,
- readiness, and
- willingness.

Questions are completed through self-assessment and where appropriate scored. The model has three maturity levels (Table 5).

Maturity Level		Score	Description
1	Foundational	<56.9	General practices have a limited level of digital health infrastructure and capability and/or willingness to change
2	Intermediate	57-73.2	General practices have demonstrated a moderate level of digital health infrastructure and capability and/or willingness to change
3	Advanced	>73.2	General practices have demonstrated a strong level of digital health infrastructure and capability and/or willingness to change

Table 5. Gippsland PHN DHMA Maturity Levels (Adapted form Azar et al., 2020)

In 2020, a total of 74 practices in the Gippsland region participated in the DHMA undertaken by the PHN. The results presented an average score of 65.1 and practices scored the highest on the infrastructure category (74.5) and lowest on capabilities (52.0).

It was found, through the assessment, barriers to achieving digital maturity included technology usage patterns, electronic health records-which were used widely but not deeply, and telehealth usage-which remained immature. Currently, the tool is being used in 10 Primary Health Networks across Australia.

Considering the evidence of its implementation and its PHC orientation, the DHMA presents obvious benefits, but it does have some drawbacks. The model lacks the comprehensiveness of other maturity assessment models and, just like the VDHMM, fails to incorporate quality improvement, integrated health, and interoperability related assessment.

Hunter New England and Central Coast PHN have also utilised the tool that assesses digital health readiness of practices (PHN, 2020).

Areas assessed include quality improvement, information systems and data, general practice systems, person centred care, and digital health practice team.

While incorporating novel features like quality improvement, person-centred care and workforce readiness checks, the PHN tool is not a maturity model in the conventional sense.

Another notable PHC maturity model is the Digital Primary Care Maturity Assurance (DPCMA) model developed by the NHS England (NHS, 2019); which has allowed Clinical Commissioning Groups and General Practices to review their current levels of digital maturity across general practice, against available IT guidelines.

The model also helped general practices in the UK to provide assurance to the NHS that they are meeting the requirements of IT policies, and assist the NHS in identifying areas for investment in general practice IT. The DPCMA also helped to support the development of local road maps and sustainability and transformation plans.

While the DPCMA is now retired, it has strong alignment with the NHS IT operating model meaning it is relevant to the Australian context (Table 6).

Maturity Model	Focus	Maturity Levels	Geography
HIMMS EMRAM	Electronic Health Record Adoption	7	Global but developed with US hospitals in mind
VDHMM	ICT maturity assessment and ICT investment decision making	5	Victoria, Australia
Gippsland PHN DHMA	Digital Health readiness of general practices	3	Gippsland, Victoria
NHS DPC MA	Alignment of General Practice IT with NHS IT policy	Not available	England, UK

Table 6. Digital Health Maturity Models and their focus areas relevant to the Australian context.

While there are a number of other maturity models such as [Informatics Capability Maturity Model](#), [Global Digital Health Index](#), [Healthcare Analytics Adoption Model](#), [HIMSS Continuity of Care Model](#), and [Telemedicine Service Maturity Model](#) none of these are directly relevant to requirements for a model that can inform a digital health strategy and the maturity of its PHC providers.

## Digital Health Maturity Assessment Models: some options

We provide three options for the PHC stakeholders across Australia to consider.

### Option 1:

That stakeholders consider using the [VDHMM](#), the comprehensive digital health maturity model developed by the Victorian Department of Health to cater to the public health service providers. This model has been [evaluated](#) by Deakin University for its validity, usefulness, and applicability (Nguyen et al, 2023). Amongst the available models, this is very comprehensive and is accompanied by a questionnaire and maturity roadmap.

However, the limitation with this option is the model does not incorporate PHC pillars and important aspects like quality improvement.

### Option 2:

The [Gippsland DHMA model](#), which been developed specifically to assess the digital readiness and maturity of general practices. The model has also been implemented in the Gippsland region and other PHNs yielding useful information to inform the PHN's digital health strategy and investment (Azar et al, 2020; WestVicPHN, 2023). The model is

web-based allowing adaptability or shared use by PHC providers.

The limitation with this option, however, is that this model is simplistic and unlikely to comprehensively assess the digital maturity of PHC providers.

### Option 3:

We also present a de novo model, the Digital Maturity Assessment of Primary Care Providers (DMAPP) which is grounded in a PHC context, acknowledging the WHO guidance for digital health assessment in these environments.

## The DMAPP model

The Digital Maturity Assessment of Primary Healthcare Providers (DMAPP) was developed by researchers from Deakin University in consultation with Western Victoria PHN to assess pertinent aspects of digital health infrastructure and intervention within the PHC environment.

The model utilises an evaluation framework termed 'Integrated Model of Evaluation (IMoE)' (Reddy et al., 2019); which incorporates critical elements of traditional 'method-focused' and 'theory-driven' evaluation practices, while aiming to be a practical evaluation approach that can be implemented in realistic time frames.

The main components of the IMoE are (Fig 2):

- Program Theory,
- Context,
- Intervention,
- Change, and
- Outcomes.

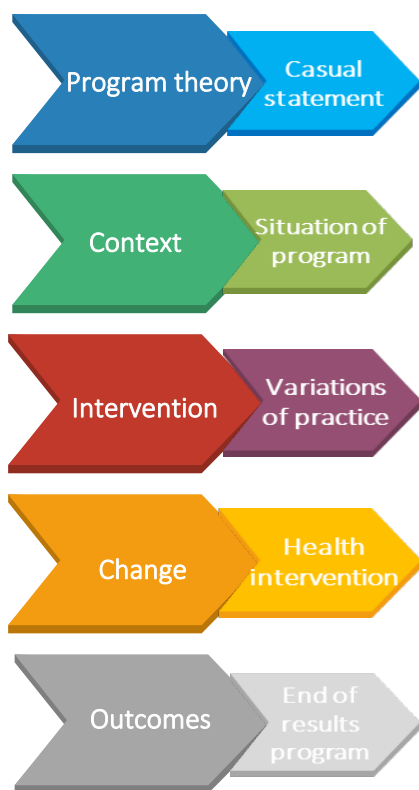


Figure 2. Integrated Model of Evaluation (Reddy et al., 2019)

IMoE also considers the change factors that lead to transformational outcomes and the indicators to measure them (Reddy et al., 2019). In turn, DMAPP incorporates critical components from current maturity models and addition of missing details.

Considering a maturity model is intended to be a structured roadmap for providers to accomplish digital health maturity, DMAPP is organised accordingly. DMAPP envisages providers need to achieve or have certain capacity and undertake changes to achieve the digital transformation required. The transformation is marked by certain outcomes.

As the PHC provider progresses through the transformation of organisation culture and infrastructure, they achieve various levels of maturity. These include:

### Capacity Components

Capacity is defined as the ability to undertake something. In the context of digital maturity assessment, it is the assessment of providers infrastructural readiness to accomplish digital maturity. Therefore, the provider's infrastructure, resources and training activities are considered for assessment.

### IT Infrastructure

Here the provider's information technology foundations in place are assessed. Infrastructure to support provider business, operational and clinical functions including fax machines, appointment booking services, electronic health records, practice information systems, budget management, and messaging services amongst others. Checking for these technologies allows for an understanding of the digital foundation in place to improve efficiencies in healthcare delivery and scale up to achieve digital maturity.

### Business and Organisation Context

PHC provider context such as location, longevity of operation, workforce enablement, business continuity, change management process, bulk billing practices are assessed in this component. Also, assessed are business functions like benefits realisation and funding partnerships. Further the strategic levers like political context, policy framework and funding mechanisms and how providers have considered them in their planning can be assessed here.

### Security and Privacy

Cyber security and patient privacy have become critical in the digital operations of healthcare services. Therefore, in this component the provider's cyber security framework, continuous improvement of security controls, use of personal health

information accurately and securely, and unique identifiers for individuals and the provider are assessed.

#### Change Process

Change in healthcare is constant and, managed in the right manner, can lead to quality improvement and even transformation of healthcare. Digital technologies have become both cause and effect of change. Certain factors enable technologies to be used effectively in the organisation and support transformation and not add to the complexity of healthcare management. A maturity assessment exercise must consider these components in its review.

#### Digital Adoption

This assesses the readiness and willingness of the providers to adopt various digital technologies. The component also considers level of existing digital adoption both technical and functional. The range of digital technologies that will be considered here include electronic health records, administrative systems, and patient registries. Also considered are the providers initiatives to improve the digital literacy of its workforce and clients through provision of education and training.

#### Multi-sectoral Policy

This feature considers the providers endeavours to address broader determinants of health and client behaviours through evidence informed activities. The assessment considers how the provider engages in these activities and how digital technologies are being utilised for this purpose.

#### Quality Improvement

Quality improvement initiatives engaged by the provider including continuous quality improvement cycle, audit and evaluation and monitoring processes are assessed. Also,

considered if the quality improvement activities cover digital systems and interventions. By assessing this, an understanding of the providers willingness to change policies and operations to improve efficiencies in care will be derived.

#### Information Sharing and Interoperability

In this assessment, the readiness of the provider to share information and its capability through enterprise architecture, standards, regulations, and guidelines are reviewed. Also assessed is the provider's interoperability readiness including nomenclature and interoperability standards adoption. Further, aspects of interoperability like semantic, syntactic, and external interoperability need to be evaluated. In addition, the provider's process of data quality management will be reviewed. In addition, the data governance policy and framework of the providers are assessed to ensure there is appropriate data management, storage, and analysis that leads to effective use in service planning and delivery.

#### Transformation Outcomes

The rationale for digital technology adoption in healthcare is not only to transform the planning and provision of healthcare but also improve the health outcomes for clients and the community. In the end, adoption of digital technology in healthcare provision without meaningful end outcomes is a wasteful endeavour. Therefore, an assessment of whether digital technology adoption and integration by the provider is leading to PHC outcomes like community empowerment and enhanced user experience is required.

#### Community/Client Empowerment

There is a strong emphasis on patient empowerment in PHC. Therefore, DMAPP



considers how the provider is utilising digital technologies to empower its clients and the community. Research has outlined how digital health can help with health promotion, client participation, and empowerment Pagliari, 2021. Included in the assessment will be the provider’s initiatives to include clients in governance arrangements and supporting the access of their health information to promote wellness.

**User Experience**

However, sound a digital technology is, if it does not enhance the quality of users experience or presents obstacles to the workflow, it is unlikely to get adopted. Therefore, this component assesses the quality of user experience in relation to digital technologies used by the provider.

Here the users refer to provider workforce including clinical practitioners and administrative staff. If digital technologies were extended to patients, their experience is also to be assessed.

**Maturity Levels**

In the case of DMAPP, maturity levels are denoted by five capability levels. Deliberately, a label has not been attached to the levels, like *basic, developing...* to avoid negative branding of providers and to recognise their inherent potential to achieve maturity when suitable resources are provided. However, each level identifies the state of their journey ranging from nascent capability to an optimised capability (Table 7).

Capability Level	Capability
5	The provider has an optimised capability and organisational culture to utilise IT infrastructure and organisational resources to transform healthcare delivery to achieve relevant public health and clinical outcomes and coordinate with multi-sectoral agencies to empower communities to improve health outcomes
4	The provider has institutional capability to utilise IT infrastructure and organisational resources to achieve digital maturity and contribute to multi-sectoral policy to improve community health outcomes.
3	The provider has established capability to utilise IT infrastructure and organisational resources to achieve digital maturity and empower clients to improve their health outcomes
2	The provider has emerging capability to utilise IT infrastructure and organisational resources to achieve digital maturity
1	The provider has a nascent digital foundation with minimal IT infrastructure and organisational resources to achieve digital maturity

Table 7. DMAPP capabilities

### Scoring Mechanism

The scoring mechanism for DMAPP is based on the provider’s self-assessment responses to the online questionnaire. Each DMAPP component (Capacity, Change and Transformation) have questions determining capabilities that are mapped to the components and scores. These are then compiled to determine maturity level of the provider (Table 8).

DMAPP, while at this stage a conceptual framework, has a more comprehensive and contextualised approach (Table 9) compared to existing models (Table 10). Further work is being undertaken to finalise and validate DMAPP.

Category	Score	Maturity Level
Capacity + Change = Transformation	80-100	Capability Level 5
	60-79	Capability Level 4
	40-59	Capability Level 3
	20-39	Capability Level 2
	0-19	Capability Level 1

Table 8. DMAPP scoring mechanism.

Maturity levels	Capacity components +	Change process =	Transformation outcomes
Capability level 1	<ul style="list-style-type: none"> <li>IT infrastructure</li> <li>Business organisation context</li> <li>Security and Privacy</li> </ul>	<ul style="list-style-type: none"> <li>Digital adoption</li> <li>Multi-sector policy</li> <li>Quality improvement</li> <li>Information sharing and interoperability</li> </ul>	<ul style="list-style-type: none"> <li>Community/client empowerment</li> <li>User experience</li> </ul>
Capability level 2			
Capability level 3			
Capability level 4			
Capability level 5			

Table 9. DMAPP overview (Reddy et al, 2023)



Frame-works	WHO						IMoE				
	Integrated health services	Multisectoral policy and action	Empowered people and communities	Strategic levels	Operational levers	Digital Technology Indicators	Context (PHC)	Capacity (Including infrastructure)	Change (Quality improvement)	Change (data analytics and data governance)	Outcomes (Empowerment of clients/community)
HIMSS EMRAM					👍	👍		👍		👍	
VDHMM				👍	👍	👍		👍		👍	👍
DHMA					👍	👍	👍	👍			
DMAPP	👍	👍	👍	👍	👍	👍	👍	👍	👍	👍	👍

HIMSS EMRAM-Electronic Medical Record Adoption Model; VDHMM-Victorian Digital Health Maturity Model; DHMA-Gippsland PHN Digital Health Maturity Assessment; DMAPP- Digital Maturity Assessment of Primary Care Providers.

Table 10. Comparison of DMAPP features with other Digital Maturity Model

## Conclusion

There is considerable variability in digital adoption amongst PHC providers. As the importance of digital technologies in delivering healthcare grows, the variability can present uncertainty and complications for strategy and investment by funders. Therefore, an understanding of the readiness and willingness of providers to adopt and integrated digital technologies in the provision of healthcare is critical. Maturity models can help with this assessment.

While there are many digital maturity models available very few have been developed for the PHC environment. In this context, it was deemed a customised digital maturity model, now termed DMAPP, was necessary. DMAPP incorporates the three PHC pillars, emphasised by the WHO, while including essential components from popular digital maturity models (Figure 3). It is envisaged that DMAPP will not only help with the assessment of provider digital maturity but also support the provider's progress to digital maturity.

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