

# Leveraging IT Capabilities to Accelerate Business Value Impact from Electronic Medical Record Adoption

Electronic Medical Record (EMR) adoption can be challenging for many hospitals, and CIOs are often tasked to lead - with agility - the adoption of such technologies. To aid CIOs and senior IT decision-makers achieve this goal - Intel Corporation, HIMSS Analytics and Innovation Value Institute have created a holistic approach for hospitals to strategize, implement and run electronic medical record (EMR) and general IT services. It involves the joint tracking of EMR adoption levels and maturity of IT organisational capabilities. This allows hospital IT organisations to identify the next step in EMR adoption, together with the necessary IT organisational capabilities to plan, implement and run EMR services. Results highlight IT organisational capabilities relating to Governance, Strategic Planning, Supplier Management, Demand and Supply Management, Enterprise Architecture, and Relationship Management are of paramount importance for hospitals to achieve and effectively run higher levels of EMR adoption. Additionally, a hospital's ability to leverage emerging technologies to address challenges in IT Security, Mobile Healthcare, and Integrated Care Delivery contribute towards achieving higher levels of EMR adoption.

Using this programme, we were able to objectively prioritise and systematically enhance IT capabilities by identifying IT organisational capabilities necessary to deliver our Hospital's ehealth imperatives

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Chairman of the New England Healthcare Exchange Network (NEHEN),  
Co-Chair of the HIT Standards Committee,  
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Despite the economic slowdown in many countries recently, spending on healthcare continues to rise. This could be considered an unsustainable trend given the state of global healthcare finances and an increasingly aging population. Healthcare Information Technology (HIT) is often touted as a common denominator of many healthcare reform plans to reduce cost and improve quality from healthcare expenditure. Many countries are beginning to take proactive steps to encourage greater levels of healthcare IT adoption. In North America for example, Health Information Technology for Economic and Clinical Health (HITECH) Act is making available substantial government financial incentives to adopt certified electronic health records and use them effectively in the course of patient care. For these North American Hospitals, moving up electronic medical record (EMR) adoption stages will assist meeting the obligations of Meaningful Use requirements under the HITECH Act.

In healthcare, patient information is not optional, it is essential - placing strong emphasis on how healthcare IT systems record; store; access; distribute; and analyse patient

information. The U.S. Department of Health and Human Services states:

Health information technology [HIT] allows comprehensive management of medical information and its secure exchange between health care consumers and providers. Broad use of HIT has the potential to improve health care quality, prevent medical errors, increase the efficiency of care provision and reduce unnecessary health care costs, increase administrative efficiencies, decrease paperwork, expand access to affordable care, and improve population health [<http://healthit.hhs.gov/>].

However, frustration with achieving HIT benefits remains a problem and a barrier to maximising the full potential of HIT. Complexity is compounded further when one considers the life and death nature of the subject, sensitivity of personal healthcare information, regulatory requirements, and the multidisciplinary and hierarchical nature of healthcare profession.

Investing in IT alone is necessary but rarely sufficient. A healthcare IT organisation cannot focus exclusively on technology acquisition alone to increase efficiency and effectiveness.

How the IT function is managed, in terms of organisational effectiveness and management activities to plan, build and run those HIT services can be an important variable to enabling better patient care.

After the expense of implementation, the next most commonly cited barriers to adopting HIT

are often a lack of confidence to run patient care and other processes uninterrupted while implementing new systems, lack of technical expertise within the IT organisation, and potential negative reaction to using new systems and processes from doctors and other clinicians.

The enormous opportunity for HIT to positively impact the quality and cost of providing healthcare is (more than) matched by the challenges of doing so.

## Healthcare Information Technology Maturity Model<sup>SM</sup> (HIT-MM<sup>SM</sup>) Programme

In response, Intel Corporation, HIMSS Analytics USA/Europe and Innovation Value Institute have come together to create an industry leading programme for hospitals to enhance their IT organisational capabilities towards achieving better eHealth outcomes. The Healthcare IT Maturity Model<sup>SM</sup> (HIT-MM<sup>SM</sup>) is aimed at CIOs and senior IT decision-makers responsible for delivering

and running clinical eHealth systems as well as more traditional IT systems. The results of the programme provide a solid foundation to trigger senior level decisions within the hospital in relation to improving constrained IT organisational capabilities, which are considered essential for delivering and running better healthcare information systems (IS) and services.

The programme enables hospitals to map the maturity of their healthcare IT services and the maturity of the organisational capabilities to deliver and run those services within IT.

This unified approach reveals dependencies that may constrain the strategizing, deployment and running of clinical IT

‘The EMRAM identifies what stage your hospital is at for healthcare IT, IT-CMF assists with managing the organisational development through the stages.’

Uwe Buddrus,  
Managing Director, HIMSS Analytics Europe

European EMR Adoption Model	
STAGE	CUMULATIVE CAPABILITIES
Stage 7	Complete EMR, CCD transactions to share data, Data warehousing feeding outcomes reports, quality assurance, and business intelligence; Data continuity with ED, ambulatory, OP.
Stage 6	Physician documentation interaction with full CDSS (structured templates related to clinical protocols trigger variance & compliance alerts) and Closed loop medication administration.
Stage 5	Full complement of PACS displaces all film-based images.
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Stage 1	Ancillaries - Lab, Radiology, Pharmacy - All installed OR processing LIS, RIS, PHIS data output online from external service providers.
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IT capabilities required to increase EMR adoption level

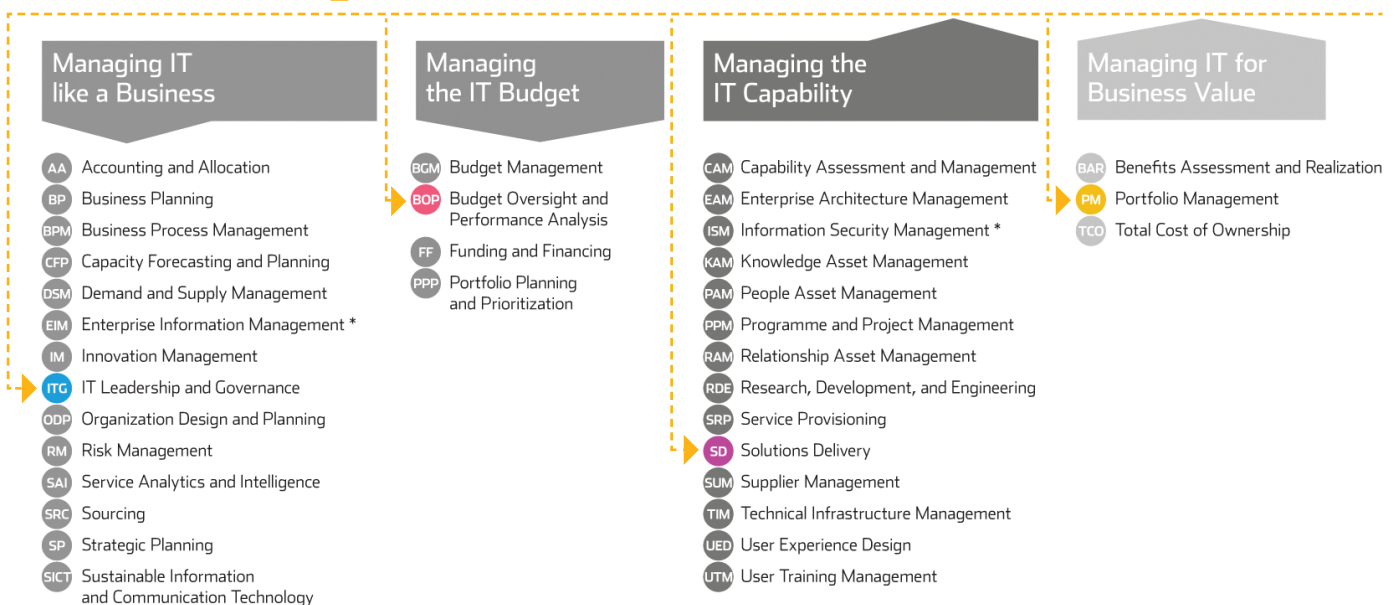


Figure 1: Unified use of EMRAM and IT-CMF - illustrated example of a hospital seeking to move from EMRAM Level 2 to Level 3. The IT-CMF highlights underlying IT organisational capabilities considered necessary by the hospital's IS management team to assist with achieving the next level on EMR technology adoption

services, through tracking levels of EMR adoption (via the Electronic Medical Record Adoption Model™ - EMRAM™ identifies levels of EMR adoption ranging from limited ancillary department systems through to a paperless EMR environment) with underlying IT organisational capabilities (via the IT Capability Maturity Framework™ - IT-CMF™ identifies maturity of IT organisational capabilities from ad-hoc to optimising).

Additionally, adoption case-studies of emerging technologies in healthcare IT,

provided by Intel Corporation, allowed IT organisations to examine the boundaries of what is achievable with the latest healthcare technologies. The aim is to enable hospitals to respectively understand the next step of EMR technology implementation and in parallel close gaps in IT organisational capabilities to deliver and run better EMR and general IS services. (Refer to side-bar for more detail on the approaches mentioned from Intel, IVI and HIMSS Analytics.)

The first step of the HIT-MM programme is a workshop (virtual, 2.5 hours) with the CIO/IT-Director plus a selection of IT staff to complete the IT Capability Maturity Framework assessment (typically 4-8 participants, however can be more). Participants completed questions individually during the webinar, with the facilitator available to assist with clarifications as they arose.





	<b>IT Capability Scoring Webinar</b> (max 2.5 hrs)	<ul style="list-style-type: none"> <li>- Overview &amp; maturity scoring coaching</li> <li>- Assessment survey completion + Q&amp;A</li> </ul>
	<b>1:1 Validation Interview</b> (max 1 hr pp.)	<ul style="list-style-type: none"> <li>- Collect hospital context, subset of webinar group</li> </ul>
	<b>EMR Adoption Profile</b> (max 0.5-3 hrs 1 person)	<ul style="list-style-type: none"> <li>- Update or collect first-time inputs, 1 hospital person</li> </ul>
	<b>Report Out</b> (Max 1.5 hrs)	<ul style="list-style-type: none"> <li>- Part A: Individual hospital analysis</li> <li>- Part B: Cross hospital analysis</li> </ul>

Figure 2: HIT Maturity Model hospital participation process

Follow-up individual interviews (virtual, 1 hour) for a selected subset of workshop participants were conducted to augment additional insights with the IT-CMF data collected in the webinar. In parallel, the hospital completed (or updated) the Electronic Medical Record Adoption Model (virtual, typically 0.5-3 hours for one individual). Analysis of the hospital's IT capability, and actionable improvement roadmaps were presented back to each hospital.

While many only need to attend the 2.5 hour webinar to give their input, the whole process can involve as little as five hours for a typical participant. Considering the potential benefits and insights to be reaped from participation, this can represent a good return on time invested.

**“To support healthcare services and be an important part of a hospital’s strategy – many IT departments are maturing towards professional and holistic IT service organisations. The Healthcare IT Maturity Model programme is ideal for Hospital CIOs and senior IT decision-makers seeking to enhance their hospital’s IT capability and value from IT. Using this programme, we were able to objectively prioritise and systematically enhance IT. The programme can generate a common understanding across the IT department and offer actionable insights on how to address issues to improve business value impact of healthcare IT to the hospital.”**

Henning Schneider,  
Chief Information Officer,  
University Medical Center Hamburg-Eppendorf (UKE), Hamburg, Germany

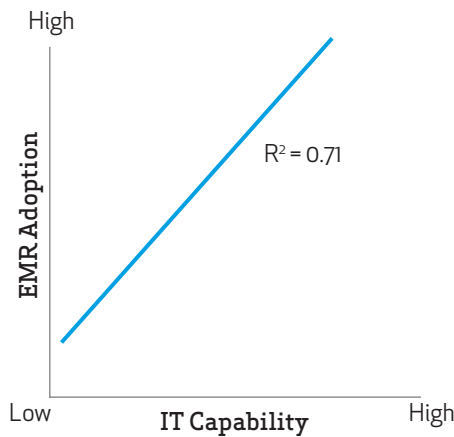
## Programme Insights and Benefits

The initial phase of this programme examines sixteen hospitals, covering 15,000+ hospital beds. More than 30% of participating hospitals have 500+ beds and approximately 30% of hospitals have an EMRAM score of 6 or better. For the vast majority, this programme highlights reasonably strong correlations between the overall maturity of a hospital's IT organisational capability (IT-CMF) and their electronic medical record adoption score (EMRAM), see **Figure 3**. Low

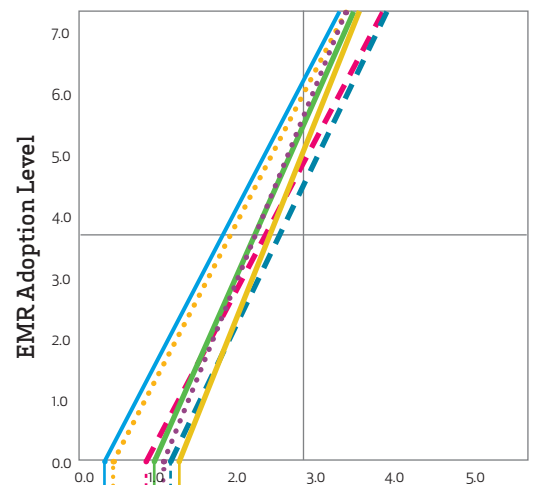
EMRAM scores correspond with low scores for the hospital's IT organisational capability to plan-build-run clinical and general IT services. The opposite also applies, hospitals' IT organisational capabilities tend to be high when their EMR adoption levels are high.

While an individual IT capability maturity profile for a hospital's IT organisation is typically determined by individual circumstances, recurring patterns are evident

between maturity of specific IT organisational capabilities and a hospital's EMRAM scores. For example, as hospitals progress towards higher EMR levels, correspondingly higher maturities in IT Governance and Strategic Planning capabilities are found. Similar relationships are found regarding EMR levels and IT organisational capabilities for Supplier Management, Demand and Supply Management, Enterprise Architecture, and Relationship Management, see **Figure 4**.



**Figure 3:** More mature IT capabilities correspond to higher levels of EMR adoption<sup>1</sup>



- Capacity, Forecasting & Planning ( $R^2 = 0.70$ )
- Demand & Supply Management ( $R^2 = 0.61$ )
- Relationship Asset Management ( $R^2 = 0.64$ )
- Strategic Planning ( $R^2 = 0.86$ )
- Business Process Management ( $R^2 = 0.65$ )
- Enterprise Architecture Management ( $R^2 = 0.65$ )
- IT Leadership & Governance ( $R^2 = 0.80$ )

### IT-CMF – Critical Capability Maturity

**Figure 4:** Correlations between maturity of selected IT-CMF critical capabilities and EMR adoption levels<sup>1</sup>

[<sup>1</sup>R-square can range between 0 and 1, with values closer to 1 indicating greater correlation between variables.]

**To improve healthcare delivery, CIOs and senior decision-makers can now target specific IT capabilities to accelerate healthcare IT adoption – achieving superior hospital and patient outcomes**

**Prof Martin G Curley,**  
Vice President, Intel Labs, Director, Intel Labs Europe and  
Senior Principal Engineer, Intel Corporation,  
Co-Director, Innovation Value Institute

In addition to understanding which IT organisational capabilities mature in tandem with EMR adoption, it is useful to understand what prioritisation is being attached to specific IT-CMF critical capabilities at different levels of EMR adoption. Perhaps not surprisingly, Strategic Planning has significant importance for hospitals who are achieving higher levels on both EMR adoption and IT capability generally, refer to **Figure 5**. While

for hospitals who are lower on both levels of EMR adoption and IT capability maturity, IT Leadership & Governance and Business Process Management are characteristically top priorities. By contrast, hospitals that possess a high level of EMR adoption but a low IT capability maturity typically prioritise Service Provisioning capabilities.

Hospitals with combined higher scores on EMR adoption and IT organisational

capabilities typically scored better at leveraging emerging technologies in healthcare IT Security, Mobile Healthcare, and Integrated Care Delivery, refer to **Figure 6**. The Healthcare IT best-practice reference library from Intel provides reference case studies for hospitals wishing to explore the potential benefits of emerging healthcare technologies and leverage proven implementation blueprints.

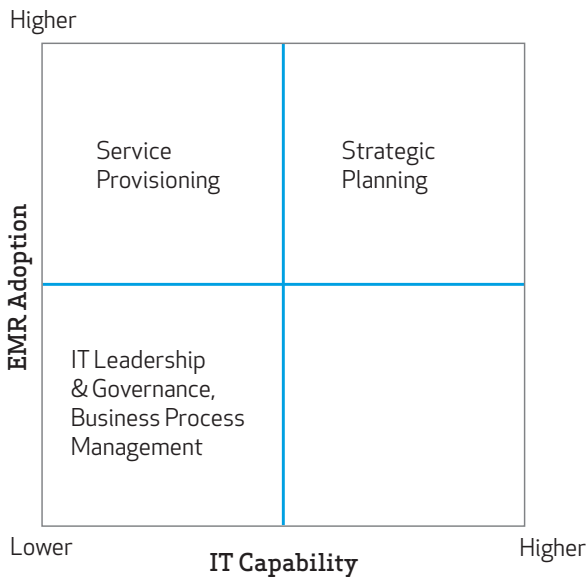


Figure 5: Organisational importance attached to critical capabilities of the IT-CMF based on level of EMR adoption and IT capability maturity

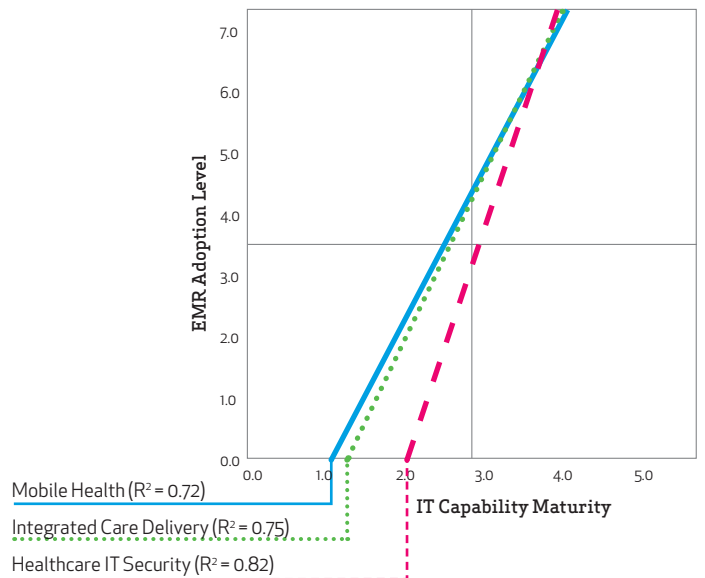


Figure 6: Proficiency to leverage emerging Healthcare technologies based on level of EMR adoption and IT capability maturity<sup>2</sup>  
 [²R-square can range between 0 and 1, with values closer to 1 indicating greater correlation between variables.]

These trends suggest hospitals with lower EMR adoption scores typically prioritise more technical and service orientated IT organisational capabilities. Correspondingly, hospitals at more advanced EMR adoption levels typically broaden their focus to include more 'business' orientated IT organisational capabilities. Intuitively, this is perhaps a reasonable relationship to expect: at lower levels of EMR adoption the IT organisational focus may often be on the implementation and running of discrete (often considered 'back-of-house' or platform) healthcare systems. Whereas the focus moves to management of a wider scope of external stakeholders and organisational change as cross-system integration and point-of-care

systems become more prevalent in the hospital environment, signifying progress to higher EMR adoption levels.

Hospital executives should give consideration to understanding which IT organisational capabilities will accelerate the achievement of higher levels of EMR adoption for their hospitals. The emerging patterns outlined here can provide input, however individual context will often determine the appropriate set of IT capabilities for a hospital to focus on maturing. A formal evaluation using both EMRAM and IT-CMF is recommended for a customised evaluation of appropriate IT capabilities to target for your hospital.

**“An effective Healthcare IT maturity helps hospitals manage their IT capabilities to specify and run holistic solutions with superior value results”**

Mark Blatt, MD,  
 WorldWide Medical Director,  
 Intel Corporation

## Accelerate Business Value Impact from Healthcare IT

Being aware of the requisite IT organisational capabilities can accelerate the achievement of higher levels of EMR adoption and optimise resulting benefits. The HIT-MM programme can assist your hospital's IT organisation to

systematically strategize how to accelerate value impact from HIT systems and services. Under a single umbrella programme, hospitals can increase their IT organisational capability to plan-build-run clinical and general IT

services. If you would like your hospital to achieve such outcomes, please contact the Innovation Value Institute at [IVI@nuim.ie](mailto:IVI@nuim.ie) or +353 (0)1 708 6931.

# IT Capability Maturity Framework™ (IT-CMF™)

IT-CMF is an IT management framework that facilitates continuous performance improvement across the entire IT organisation. It closes IT organisational capability gaps, via a toolset that contains maturity profiling methods and organisational improvement roadmaps, which collectively target improved ability to deploy and run IS services for more value and innovation. The origins of IT-CMF can be traced back to research at Intel. Since then, the Innovation Value Institute (IVI - a not-for-profit entity) and its international consortium, drawn from across industry and academia, have built upon Intel's original

IT-CMF work, enabling public and private sector organisations around the world systemically improve how they manage IT for business value and innovation.

Utilising IT-CMF as part of a continuous IT capability improvement programme is associated with improved IT performance including lower IT costs, and higher business value returns.

More information:  
<http://ivi.nuim.ie/it-cmf>



Figure 7: IT-CMF provides a map of critical capability areas to target, together with recommended improvement roadmaps \* Under Development

“To leverage IT more effectively in healthcare - Intel Corporation, HIMSS Analytics and IVI have designed the Healthcare IT Maturity Model programme as a rapid improvement platform for evolving healthcare IT services in a holistic and robust manner.”

Martin Delaney,  
 General Manager and Technology Leader,  
 Innovation Value Institute

## Electronic Medical Record (EMR™) Adoption Model™ (EMRAM)

HIMSS Analytics' Electronic Medical Record (EMR™) Adoption Model™ (EMRAM) identifies levels of EMR capabilities ranging from the initial clinical data repository (CDR) environment through to an EMR environment where paper charts are no longer used to deliver patient care and all care processes are supported with electronic documentation. EMRAM is an eight-stage model (Stages 0 to 7) that classifies an institution's level of IT adoption. Stage 7 is a fully digitised, virtually paperless environment with a broad range of interoperability and data exchange capabilities with other organisations.

Research data suggests that hospitals at a high level on the EMRAM model are more likely to demonstrate higher performance on both patient care through clinical measures, and efficient hospital performance.

More information:

<http://www.himssanalytics.eu/emr.asp> ;

<http://www.himssanalytics.org/emram/index.aspx>

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US EMR Adoption Model <sup>SM</sup>	
STAGE	CUMULATIVE CAPABILITIES
Stage 7	Complete EMR; CCD transactions to share data; Data warehousing; Data continuity with ED, ambulatory, OP
Stage 6	Physician documentation (structured templates) full CDSS (variance & compliance), full R-PACS
Stage 5	Closed loop medication administration
Stage 4	CPOE Clinical Decision Support (clinical protocols)
Stage 3	Nursing/clinical documentation (flow sheets); CDSS (error checking), PACS available outside Radiology
Stage 2	CDR, Controlled Medical Vocabulary, CDS, may have Document Imaging; (HIE) capable
Stage 1	Ancillaries - Lab, Radiology, Pharmacy - All installed
Stage 0	All Three Ancillaries Not installed

Figure 8: EMRAM provides insights on the level of electronic medical record (EMR) capabilities in acute hospitals, with a focus on technology implementation roadmaps to achieve increased levels of EMR and participation in an electronic health record (EHR)

## Intel Healthcare IT Best-Practice Reference Library

In addition to the unified usage of IT-CMF and EMRAM approaches, Intel Corporation offers healthcare IT adoption proof-points on emerging technologies such as Mobile Health, Security, Cloud and Integrated Care Delivery. This additional layer allows a hospital's IS management to consider how best to leverage emerging technologies that can enhance clinical IS

services, via reference to a best-practice library of how other hospitals have overcome similar challenges and realised benefits.

More information:

<http://www.intel.com/healthcare>

## Contributing Authors

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