

Digital Transformation: A Foundational Capability Building Block Perspective on Maturing the IT Capability

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Abstract: The enterprise-wide scope of an organisation's IT capability in sustainably leveraging technology for business value is well-researched, and the level of maturity of this capability is a key determinant of an organisation's success. IT capability maturity has become more critical as technological developments continue at an accelerated pace and as whole industries are being disrupted by digital developments. Maturity in terms of IT leadership, IT processes, IT infrastructure, and a myriad of other supporting organisation-wide capabilities is required. Since the 1980s, maturity models in the literature have focused on specialist niche areas, with few adopting a holistic perspective. Across these models, a lack of consensus is evident on the key capabilities that should be matured and on what the important sub elements or building blocks of these capabilities are. How does the organisation achieve an adequate level of maturity if the required capabilities are unclear? As one of the most holistic IT capability maturity models identified, this paper undertakes a systematic analysis of the 36 IT capabilities within IT Capability Maturity Framework (IT-CMF) and the 315 sub elements (Capability Building Blocks (CBBs)) that comprise these capabilities. This research aims to identify the common sub elements or building blocks inherent across the 36 capabilities, which we will refer to as Foundational Capability Building Blocks (FCBBs), and a high-level definition of these FCBBs abstracted from the relevant sub elements and discussed in terms of their recognised importance to effecting successful digital transformations. From an academic perspective, the research provides deeper insight on common themes that are pertinent to IT capability improvement. From an industry practitioner perspective, it breaks down the complexities of IT capability maturity with a focus on a manageable number of considerations.

Keywords: IT/digital capability, maturity model, IT/digital maturity, digital transformation, foundational capability building blocks

1. Introduction

Research indicates that IT capability maturity is a key determinant of an organisation's success and a key consideration in digital transformation. Developing IT capability necessitates, firstly, understanding the broad spectrum of capabilities that require organisational focus, and secondly, determining how mature these capabilities should be. Across the literature, a lack of consensus is evident on the key capabilities that should be matured (Carcary et al, 2016). Throughout the course of this research, only one model was identified that presents a comprehensive view of the broad range of IT capabilities (IT Capability Maturity Framework (IT-CMF)) (Curley et al, 2016); this model identifies 36 distinct IT capabilities and 315 sub elements or building blocks. Singularly, this demonstrates the expansive scope of an organisation's IT capability and the potential challenges organisations may face in planning a capability improvement programme.

This paper seeks to increase clarity on the process of maturing the overall IT capability through investigating whether there are recurring themes across the different capabilities' sub elements or building blocks. Identification of recurring themes would help simplify IT capability development through enabling organisations focus on a manageable number of areas that are generically applicable to overall IT capability improvement. The research question is as follows: To what extent do common sub elements or building blocks exist across the broad spectrum of IT capabilities? To answer this question, this study undertakes a concept-centric examination of IT-CMF in order to distil and conceptualise any recurring building blocks and their focus areas. It outlines core learnings on the identified areas, enabling practitioners to break down the complexities of beginning to design an overall IT capability improvement programme.

The paper is organised as follows. Section 2 discusses the pertinent literature around capability and maturity model research. Section 3 details the research methodology while section 4 presents results of the research analysis, outlining a concept matrix of what we term 'Foundational Capability Building Blocks' (FCBBs) and their associated definitions and areas of focus. Sections 5 presents a discussion of the research findings in light of the existing literature on digital transformation, while section 6 highlights avenues for future research and draws the paper to a conclusion.

2. Literature review

2.1 Capabilities and IT capabilities

Organisational capabilities reflect an organisation's capacity to *'perform a set of co-ordinated tasks, utilising organisational resources, for the purposes of achieving a particular end result'* (Helfat and Peteraf, 2003). According to Curley et al (2016), *'collectively, capabilities coordinate the activities of individuals and groups – linking individual actions into seamless chains of actions, leading to repeatable patterns of interaction that become more efficient and effective as they are practised and internalised'*. To stay competitive, organisations must not only develop these capabilities, but must innovatively manipulate and re-configure them to respond to environmental changes. This makes them difficult to replicate by other organisations. Termed *'dynamic capabilities'* (Eisenhardt and Martin, 2000; Yeow et al, 2017), difficult to replicate capabilities support the continuous creation, extension, upgrading, protection, and relevance of the organisation's asset base (Teece, 2007) and are associated with improved capacity for organisational learning (Curley et al, 2016).

Within the context of IT, the importance of developing an effective capability cannot be understated. Without a (dynamic) capability to react to the accelerated development of innovative technologies, any advantage held by an organisation can be quickly eroded. The work of Peppard and Ward (2004) was foundational in re-orienting organisations towards a capability centric view of how to optimise value from their IT investments. Such value realisation is contingent on the creation and deployment of unique IT capabilities and the related IT-enabled business changes that are supported (Pavlou and El Sawy, 2011). Drnevich and Croson (2013) define IT capability as the organisation's *'ability to mobilise and deploy its IT-based resources, creating value in combination with other resources and capabilities, and the firm-specific IT-enabled knowledge and routines that improve the value of non-IT resources'*. Li and Chan (2019) expand current research to define the concept of dynamic IT capability and highlight its constituent components.

However, developing an organisation's (dynamic) IT capability is a multifaceted challenge. An organisation must understand the enterprise-wide scope of IT and its impact on every aspect of the business ecosystem in value co-creation activities, identify new strategic opportunities that are enabled by technological innovations, and manage the significant complexities associated with IT-enabled business change (Carcary et al, 2016; Li and Chan, 2019). In the era of digital transformations, technology is at the forefront of how a business operates and how it seizes advantage; hence technology must be considered in tandem with the broader organisational capabilities needed to leverage the technologies successfully.

Two of the most pertinent challenges organisations face include:

- *Understanding what IT capabilities are required*: The overall IT capability reflects a plethora of different capabilities and those required to deliver business value may differ depending on the industry sector, the business context, and the organisation's specific requirements (Carcary et al, 2016). While hundreds of IT frameworks/management tools exist, a lack of consensus is evident on the key capabilities that should be matured and on their inherent sub elements or building blocks.
- *Adequately developing the required capabilities*: Research indicates that when organisations possess superior IT capabilities, they perform above average (Santhanam and Hartono, 2003; Mithas et al, 2011). However, the maturity of different IT capabilities may differ greatly within the organisation and from that of industry benchmarks. The use of maturity models to assess capability maturity and develop improvement plans has received expansive treatment in the literature, however, many maturity models focus on niche areas as opposed to holistically focusing on the overall IT capability.

In section 2.2, we discuss the importance of the maturity model concept as a mechanism to support organisations in maturing the IT capability, and hone in on one maturity model that adopts a holistic perspective on the overall IT capability.

2.2 Maturity models

Maturity models are *'conceptual models that outline anticipated, typical, logical and desired evolution paths towards maturity'* (Becker et al, 2010), where maturity denotes *'an evolutionary progress in the demonstration of a specific ability'* (Mettler, 2010). Maturity models detail the criteria associated with different maturity levels; they provide the basis for an organisation to determine their *'as is'* and desired *'to be'* maturity state (Carcary, 2011) and serve as a tool to define an improvement path in alignment with best known practices (Proença, 2016;

Aguiar et al, 2018). Since the 1980s, maturity models have attracted considerable interest from the research community (Achi et al, 2016; Pereira and Serrano, 2020). Many models reported in the literature are applicable to IT but they adopt a narrow focus, concentrating on specialist niches or specific aspects of IT management (Table 1).

Table 1: Maturity model examples in specialist IT niches

Maturity Model	Source
Data analytics/management	Carvalho et al (2018), Grossman (2018).
Information governance	Proença et al (2017).
Knowledge management	Serna (2015).
Business process management	Cleven et al (2014).
Risk management	Carcary (2011), Rae et al (2014).
Information security management	Proença and Borbinha (2018).
Incident management	Aguiar et al (2018).
Supply chain management	Mendes et al (2016).
IT service management	Nord et al (2016), Mazarolo et al (2015).
Virtual/augmented reality	Hammerschmid (2018).

Only some of those maturity models adopt a capability perspective, with many focusing on the narrower process view. From an industry practitioner’s perspective there are inefficiencies and complexities from using so many tools to advance the IT capability (Curley et al, 2012). One maturity model that provides comprehensive coverage of IT management domains from a capability perspective is the IT Capability Maturity Framework (IT-CMF). This framework provides a ‘single integrated enterprise IT approach’ and is designed ‘to cover the range of IT capabilities needed in an IT function to deliver agility, innovation, and value for the organisation’ (Curley et al, 2016).

IT-CMF is developed by the Innovation Value Institute (IVI), leveraging the principles of open innovation (Chesbrough, 2003) and design science research (Helfert and Curley, 2012). A comprehensive body of knowledge guide to this framework was published in 2016 (Curley et al, 2016) and this serves as the basis for analysis undertaken in this paper. IT-CMF comprises a modular library of 36 IT Critical Capabilities (CCs). In line with research by Savaneviciene et al (2021), each IT-CMF CC is broken into a number of sub elements which are termed ‘Capability Building Blocks (CBBs)’ (315 in total). For each CBB IT-CMF defines what maturity looks like across five incremental levels and provides a series of assessment questions to determine the maturity state. To enable improvement, IT-CMF provides a set of ‘practices, outcomes, and metrics (POMs)’ – practices to drive maturity progression, business outcomes anticipated from implementing those practices, and metrics to measure progress.

2.3 Breaking down the complexities? In search of common building blocks...

Given the breadth of IT capability domains (as detailed in IT-CMF), it is evident the extensive effort required by organisations to ensure an adequate IT capability maturity. The challenge is amplified by the need to not just develop those capabilities but to reconfigure those capabilities to adapt to changing business circumstances. Given the challenges organisations face in digitally transforming (Carcary et al, 2016; Sousa-Zomer et al, 2020), can the process of IT capability development be streamlined in some way? The authors assert it is worth considering the extent to which common building blocks exist across the full spectrum of IT capabilities. Identification of recurring themes would help break down the complexities for practitioners by providing visibility of common focus areas that are pertinent to advancing the overall IT capability. In other words, even if an organisation is focused on improving a specific IT capability domain such as risk management, there may be building blocks of this capability that are generically applicable to improving the overall IT capability. Hence, identification of recurring building blocks would provide practitioners with a manageable number of considerations, around which they can begin to design an overall IT capability improvement programme.

3. Research Methodology

This study involved a concept-centric examination of IT-CMF to identify recurring building blocks across different IT capabilities. The IT-CMF body of knowledge (Curley et al, 2016) was analysed with the aid of Computer Aided Qualitative Data Analysis Software (CAQDAS), specifically N-vivo. CAQDAS supported data coding of concepts, hierarchical structuring of concepts into higher order categories, memo creation, model development, and the ongoing exploration of relationships between concepts (Jackson and Bazeley, 2019; O’Kane, 2020). Relevant material associated with each IT-CMF capability was initially imported into N-vivo as textual documents. This

included details on the contextual background of each capability; the capability scope including its definition and CBBs; maturity at the CC and CBB level; capability evaluation assessment questions; improvement POMs; and management artefacts to support capability improvement. Each of the 36 capability documents was examined in two stages. In stage one, analysis focused on the CC and CBB definitions to identify all inherent building blocks. The concepts identified were coded using N-vivo’s free node structure as in vivo codes or in vitro codes (Strauss, 1987). In stage two, analysis was extended to the remaining artefacts in order to expand on the building blocks identified in stage one. As coding progressed the concepts were categorised into a taxonomy of higher order categories. Memos were created to clarify the emerging categories and record the authors’ reflections on this categorisation.

Seven higher order categories were extracted from the data. These represent recurring building blocks across the majority of capabilities; we refer to these as Foundational Capability Building Blocks (FCBBs). N-vivo’s visualisation tools enabled qualitative cross tabulation of these FCBBs with each IT-CMF capability, providing the foundation for development of a concept matrix (Webster and Watson, 2002) (see Table 2). Closer analysis of the FCBB nodes in N-Vivo facilitated greater understanding of the scope of each FCBB and enabled abstraction of the key focus areas applicable to each FCBB, expressed in generic terms (Table 3).

4. Foundational capability building blocks (FCBBs)

Table 2 presents the FCBB concept matrix, detailing the IT-CMF capabilities from which they derive. In Table 3, a high-level definition of each is abstracted, detailing in generic terms the focus areas an organisation needs to invest in to improve FCBB maturity.

Table 2: Concept matrix of FCBBs identified across IT-CMF capabilities

	Foundational Capability Building Blocks						
	Governance	Resourcing	Roles, responsibilities, & accountabilities	Skills and competence development	Culture	Stakeholder management	Communication
IT-CMF capabilities							
Accounting and Allocation (AA)	X					X	X
Benefits Assessment and Realisation (BAR)	X	X	X		X	X	X
Budget Management (BGM)	X		X			X	X
Budget Oversight and Performance Analysis (BOP)	X						X
Business Planning (BP)	X	X	X			X	X
Business Process Management (BPM)	X	X	X	X		X	X
Capability Assessment Management (CAM)		X			X	X	X
Capacity Forecasting and Planning (CFP)							X
Demand and Supply Management (DSM)				X			
Enterprise Architecture Management (EAM)	X	X	X	X		X	X
Enterprise Information Management (EIM)	X			X			X
Funding and Financing (FF)	X	X				X	X
Green IT (GIT)							X
Information Security Management (ISM)			X	X			X
Innovation Management (IM)		X	X	X	X	X	X
IT Leadership and Governance (ITG)	X		X		X	X	X
Knowledge Asset Management (KAM)			X	X	X		X
Organisation Design and Planning (ODP)	X		X			X	X
People Asset Management (PAM)		X	X	X	X		X
Personal Data Protection (PDP)	X		X	X			X
Portfolio Management (PM)	X	X					X
Portfolio Planning and Prioritisation (PPP)		X				X	
Programme and Project Management (PPM)	X		X	X		X	
Relationship Management (REM)	X		X	X	X	X	X
Research, Development and Engineering (RDE)	X	X			X		
Risk Management (RM)	X		X	X	X	X	X
Service Analytics and Intelligence (SAI)						X	X
Service Provisioning (SRP)							
Solutions Delivery (SD)							
Sourcing (SRC)	X	X			X		X
Strategic Planning (SP)		X	X			X	X
Supplier Management (SUM)			X			X	X
Technical Infrastructure Management (TIM)		X		X			
Total Cost of Ownership (TCO)						X	X
User Experience Design (UED)							X
User Training Management (UTM)		X		X			

Table 3: Definition of FCBBs

FCBB	Definition
Governance	Establish governance structures (e.g. matrixed, line of business). Outline the composition and scope of governance bodies, decision rights, and authorisation. Identify and establish reporting arrangements, issue escalation protocols, roles in complying with obligations and overseeing governance activities, and rules to govern (e.g. evaluate, direct, monitor) and control the application of authority within the organisation.
Resourcing	Establish the human, financial, and technical resource requirements to achieve objectives. Consider resource availability and suitability for deployment to new activities. Coordinate the allocation of resources accordingly and monitor resource utilisation.
Roles, responsibilities, and accountabilities	Complete job and business process designs to identify the required roles for the identified tasks. Assign employees with the requisite knowledge and experience to the identified roles. Define and allocate the associated responsibilities/obligations, and assign accountabilities to those who will be answerable for the achievement of objectives.
Skills and competence development	Identify the enabling knowledge base, and define the requisite employee skills and competences to complete task assignments and achieve objectives. Establish and make available a training curriculum and other employee developmental mechanisms (e.g. education programmes, developmental job assignments, mentoring, coaching). Record employee participation in training and developmental initiatives, and recognise and acknowledge their achievements (e.g. courses completed, certifications, skills and competence levels acquired).
Culture	Establish a culture that enables the organisation to pursue its strategic objectives and business operations (e.g. foster a work environment that instils principles of mutual respect and trust, positivity, accountability, collaboration, and teamwork into how employees think and work). Embed and sustain the customs and social behaviours required to support achievement of objectives.
Stakeholder management	Identify relevant stakeholders and through engagement, determine a path to achieving desired objectives. Establish and apply approaches that are effective in motivating and securing stakeholder support, buy-in, commitment, and ownership of key initiatives (e.g. by providing visible sponsorship, empowering stakeholder interactions, collaborations and involvement in decisions, managing expectations, providing incentives, responding to stakeholder feedback).
Communication	Establish a communication plan, and agree the communication channels (e.g. emails, reports, briefing papers, and forums) based on the target stakeholders and message criticality and sensitivity. Inform stakeholders of key developments (e.g. strategic decisions, goals and objectives, plans, policies and principles, activities and progress, outcomes, key lessons, and opportunities) to build, foster, and maintain a shared understanding and awareness of how they can contribute to the realisation of key objectives. Manage any bi-directional information exchange and respond to/action stakeholder feedback.

5. Discussion

The importance of the seven FCBBs for overall IT capability improvement is firmly grounded in the literature. In this section, we discuss key insights pertaining to those FCBBs, with a particular emphasis on their importance to organisational digital transformation.

Governance: Research indicates a correlation between effective IT governance and enhanced organisational performance (Wu et al, 2015). In the digital context, temporal, structural, and procedural dimensions of IT governance require consideration. To promote accelerated decisions, the locus of decision-making lies at lower hierarchical levels (Vaia et al, 2022). Decision-making rules and a transparent record of decision rights, delegated authority, and decision boundaries are required, as well as mechanisms to hold individuals to account. The process of IT governance centres on evaluating how IT currently supports and enables the organisation’s objectives; directing development and implementation of strategies to realise the desired future state use of IT; and monitoring IT performance and progress against plans. Appropriate reporting, exception handling, escalation and audit practices are required to track the impact of the transformation programme and oversee compliance with internal and external obligations (ISO 2015).

Resourcing: Digital transformations are resource intensive. From a finance perspective, traditional funding models do not effectively support digital service delivery (Bender-Samuel, 2018; Clanton and Waters, 2019); a shift is evident towards dynamic financial management practices leveraging pay-for use models or service-based cost models (Sebastian et al, 2017). From a technical perspective, investment is required in a stable operational backbone to enable efficiency, scalability, and operational excellence, and a digital services platform to foster business agility and rapid innovation (Sebastian et al, 2017). In terms of human resources, the organisation needs to consider how to attract, recruit, develop, and retain individuals in a landscape where there is a digital talent shortage (Carcary et al, 2016). The organisation requires ongoing visibility of resource availability, suitability, and utilisation, and capability to adjust resource allocation to optimise resource usage (Curley et al, 2016).

Roles, responsibilities, and accountabilities: New or expanded job roles are characteristic of digital transformation; these include, for example, chief digital officers, data analysts, data scientists, security and risk managers, compliance specialists, and so on. As demand for digital talent is rapidly outpacing its supply (Feijao et al, 2021), organisations are adopting more inventive approaches to finding such talent. These include leveraging external communities of expertise, social network referrals, expertise location software, internal venture funds, and crowdsourcing new digital business ideas (Carcary et al, 2016). Clear role responsibilities need to be defined and accountabilities assigned to those who will be answerable for IT-related decisions and performance. Such individuals need to be empowered to act with autonomy and responsiveness to changing environmental circumstances (ISO, 2015).

Skills and competence development: This importance of employee digital skills was amplified during the Covid-19 pandemic with the expansive transition to virtual work and commerce (Feijao et al, 2021). For digital transformations, skills are required in areas such as artificial intelligence, augmented/virtual reality, analytics and data science, cloud, internet of things, blockchain, cybersecurity, customer experience, and agile development (RedHat, 2021). In a recent survey of IT decision-makers, skillset gaps were the top barrier to successful digital transformation (RedHat, 2021), highlighting the importance of training curriculums and employee development mechanisms. Technology skills training was the top non-technology funding priority for 2022, followed by people and process skills training (RedHat, 2021). Upskilling and reskilling initiatives, industry experience opportunities, lifelong learning programmes, and cross-cutting stakeholder partnerships are suggested approaches to building a resilient, digitally savvy workforce (Feijao et al, 2021).

Culture: In a study of 40 digital transformations, 80% of organisations that addressed cultural change realised sustained improved performance (Hemerling et al, 2018). Cultural change, particularly in the context of digital transformation, requires a 'tectonic change' from long standing practices, as a more traditional culture based on hierarchical power structures, decision-making authority, and resource competition between functions is antithetical to a digital culture that emphasises delegation and collaboration (Hemerling et al, 2018). Digital organisations require a capability to sense and respond, embrace ambiguity and uncertainty, take risks, experiment, and continuously innovate without fear of failure (Hemerling et al, 2018). Employee autonomy, teamwork, and collaboration require greater emphasis, as facilitated through engagement and community sharing in learning networks and co-developing with business ecosystem partners (Catlin et al, 2015). The required customs and social behaviours need to be scaled at all organisational levels, for example, by embedding the practice of disruptive idea generation into strategic planning or incorporating DevOps/agile continuous iteration approaches at a tactical level.

Stakeholder management: Research indicates that capability to work with stakeholders is an indicator of organisational performance (Johnson and Filippini, 2013). Stakeholder theory emphasises the criticality of considering stakeholder interests in key organisation decisions (Barrane et al, 2021), cognisant that stakeholder importance is a function of their degree of power, legitimacy, and urgency (Mitchell et al, 1997). Critical to securing stakeholder support and 'psychological ownership' of digital initiatives is trust-building (Barrane et al, 2021), as it enhances multi-stakeholder co-operation and buy-in, and helps alleviate problems caused by stakeholders with alternative agendas (Zafari et al, 2020). Co-operation of and collaboration with stakeholders become more critical in the digital landscape to promote effective responses to technological change. Attention is increasingly focused on synchronised internal and external collaboration (Jagtap and Kamble, 2019) to promote innovation and value co-creation through the sharing of complementary knowledge, resources, and capabilities (Ndubisi et al, 2019).

Communication: Establishing and executing a communication plan provides transparency of digital transformation initiatives. Open and frequent communication keeps stakeholders abreast of ‘the big picture’ and the goals, objectives, and anticipated business impact of digital initiatives, builds mutual stakeholder understanding of what change is expected, and promotes trust to foster proactive, collaborative partnerships. Informal conversations between those leading a digital transformation and other stakeholders are also important, promoting ‘*collegiality, bonding, rapport building and a spirit of camaraderie*’ (Barrane et al, 2021). Bi-directional information exchange needs to be effectively managed – one instance is listening and responding to stakeholder feedback, thereby demonstrating respect and increasing trust; a further instance is validating all stakeholders share a similar understanding of the project vision and aims (Barrane et al, 2021).

6. Conclusion and further research

This paper has highlighted the expansive scope of an organisation’s overall IT capability – it is reflective of the maturity of several distinct capabilities each of which can be decomposed into building blocks and described in terms of a particular maturity state. Considering the scope of the IT capability can be overwhelming when planning a capability improvement programme or considering digital transformation. This paper has distilled seven FCBBs that recur across the spectrum of IT capabilities. It takes a step towards simplifying IT capability development through enabling organisations focus on a manageable number of areas that are generically applicable to maturing the overall IT capability. The importance of the FCBBs distilled is firmly grounded in the literature and it can be argued, perhaps, that they should be afforded a heightened importance in the current era of digital transformation and disruption.

The authors assert that maturity in these FCBBs is critical to enabling continuous improvement of the overall IT capability in the digital context. Mature FCBBs would help to institutionalise the required improvement practices and provide greater visibility to organisations of their capacity to drive improvement. As a useful avenue of further research, the authors recommend the development of a generic maturity framework pertaining to those FCBBs. For each FCBB, the framework should include a set of maturity assessment questions and responses, and a set of improvement practices, outcomes, and metrics to support capability improvement planning and monitoring. Testing and refinement of this framework in the organisational context, including firms that are undertaking digital transformations, would enhance its utility and credibility.

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