TOGAF® Series Guide

Digital Technology Adoption:
A Guide to Readiness Assessment and Roadmap Development

Prepared by The Open Group Architecture Forum Technology Trends Work Stream

THE *Open* GROUP

Contents

Preface

The Open Group

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The TOGAF® Standard, a Standard of The Open Group

The TOGAF Standard is a proven enterprise methodology and framework used by the world's leading organizations to improve business efficiency.

This Document

This document is a TOGAF® Series Guide to Digital Technology Adoption: A Guide to Readiness Assessment and Roadmap Development. It has been developed and approved by The Open Group.

More information is available, along with a number of tools, guides, and other resources, at www.opengroup.org/architecture.

This document is organized as follows:

- Chapter 1 describes the scope of the provided adoption guidance

- Chapter 2 introduces the concept of digital technology readiness by describing the problem statement being addressed, a summary of the currently published literature, motivation and drivers to adopt digital technologies, and focus and goals of this document

- Chapter 3 elaborates on the impact and benefits of a readiness assessment to organizations, and also addresses the key question of "why" organizations should administer a readiness assessment

- Chapter 4 lists and describes the factors that influence the adoption of digital technologies to enable a progressive adoption; the factors are categorized as follows:

  — Foundational factors: factors that organizations must have to establish the minimum acceptable readiness to adopt digital technologies

  — Impact factors: factors that enhance or amplify the effectiveness of the foundational factors by providing supporting conditions

  — Sustaining factors: factors that enable the institutionalization of the adoption of digital technologies for sustained long-term benefits

- Chapter 5 elaborates the steps that organizations are intended to take to effectuate a structured way to plan, adopt, evaluate, and evolve the adoption of digital technologies

- Chapter 6 provides guidance on how the factors of digital technology adoption could be addressed as organizations traverse the TOGAF® Architecture Development Method (ADM)

  The intention of this chapter is to set the stage for digital technology adoption and integrate the journey into the process of Enterprise Architecture.

- Chapter 7 summarizes all the chapters, and furthermore establishes the conditions for organizations to embark on their respective adoption journeys with the aim of eventually raising the maturity of adoption

- Appendix A contains the complete questionnaire along with scoring guidelines as a ready-to-use tool for organizations to rapidly kickstart their respective journeys

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The TOGAF® Series Guides are expected to be the most rapidly developing part of the TOGAF Standard and are positioned as the guidance part of the standard. While the TOGAF Fundamental Content is expected to be long-lived and stable, guidance on the use of the TOGAF Standard can be industry, architectural style, purpose, and problem-specific. For example, the stakeholders, concerns, views, and supporting models required to support the transformation of an extended enterprise may be significantly different than those used to support the transition of an in-house IT environment to the cloud; both will use the Architecture Development Method (ADM), start with an Architecture Vision, and develop a Target Architecture on the way to an Implementation and Migration Plan. The TOGAF Fundamental Content remains the essential scaffolding across industry, domain, and style.

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1 Introduction

1.1 Overview

Digital Transformation is shaping up to be the latest industry challenge. This is being exacerbated by the convergence of several trends, further magnified by society's reliance on digital technology to work, live, and connect, without any geographical constraints. It is transforming the way interactions are occurring and services are being delivered. Enterprises can no longer rely on old habits and practices to play this new digital game, and this is causing disruption across all industries. Industries are changing at a rapid pace and will no longer be as they used to be. It is already apparent that better prepared organizations are riding the wave while many, including new-age companies and their over-hyped business models, are biting the dust. Five profound changes we are witnessing are:

1. Digital Transformation is becoming an ongoing imperative across the board.

2. Disruptors are being disrupted, and the rate of disruption is getting faster.

3. Enterprises are fully committing to digital governance to drive sustained success.

4. Enterprises are discovering new value propositions to survive and thrive.

5. Harnessing digital technologies is becoming a ubiquitous organizational capability.

The adoption of digital technology is increasingly becoming a critical success factor to accelerate transformation. Enterprises are aiming to differentiate themselves from their competition based on how smartly they can harness digital technology to realize business outcomes. "Digital virtuosity" is a construct that has come to be a critical part of the organizational fabric.

This document covers the critical tenets of digital technology adoption for any organization. The application of this document is technology-neutral by design. The readers of this document will get a defined roadmap that could be leveraged for adopting digital technology. It is imperative to note that this document covers the roadmap for digital technology adoption. In other words, this document focuses on pre-adoption aspects rather than digital maturity after the adoption is made (i.e., post-adoption digital mastery). The intent of the document is to facilitate readers with a readiness assessment which is to be used as a toolkit. The assessment has been created keeping the holistic view of an organization in consideration.

1.2 Objective

The objectives of this document are to:

- Describe how enterprises adopt digital technologies

- Identify, organize, and explain the factors that can be used to assess the readiness of enterprises for digital technologies

- Elaborate how the factors are instrumental to better prepare for Digital Transformation

- Facilitate enterprises in crafting an effective roadmap to adoption

The document is intended for business and technology leaders. It is developed in a way that the tools and techniques provided can be readily put to use. It promotes the use of a well-thought-out and a proactive approach to digital technology adoption, rather than a haphazard way of stitching together various technologies simply because they are available. Enterprise Architects are expected to play a key role in leading and guiding the process of assessment, administering the questionnaire, validating the responses by way of their expertise, and enabling alignment to the process of architecture development and implementation as digital technologies become part of the organizational fabric and narrative. In short, in using this document, Enterprise Architects are expected to select the right digital technology, for the right reasons, at the right time, and craft the right environment in the organization to derive full benefits and long-term value.

1.3 Current Literature

In the main body of digital technology literature, there is a dearth of work on how enterprises adopt these technologies, what factors influence adoption, and what mechanisms are put in place to effectuate successful adoption. In general, the focus is more on the efficacy of emerging technologies. Current literature reveals trends in digital technology and how these trends change based on various dynamics. Also, there have been studies and research conducted on adoption factors about technology in silos; for instance, organization-related factors that lead to the adoption of particular technology like Artificial Intelligence (AI) or the Internet of Things (IoT), etc.

Studies have been conducted to understand the challenges that act as a constraint to the adoption of a particular technology. Additionally, researchers have identified various drivers of technology diffusion and the macroeconomic consequence of such diffusion. This includes analyzing the adoption lag across technologies. There has been extensive work done on the role of communication channels and other agents for technology adoption. Previous work has developed certain models having applications in various fields. The Technology Adoption Model (TAM) [1] and the Unified Theory of Acceptance and Use of Technology (UTAUT) [2] are most widely applied. These models underscore the factors from the end-user side of technology for its adoption. There are certain approaches and models defined in the literature. A few of the models researched are: Innovation Diffusion Theory (IDT) and Diffusion of Innovations (DoI) [3], and Functionality, Availability, Complexity, Cost (FACC) [4]. All of these cover "technology" as a broad generic construct, rather than specifically addressing digital technologies. Furthermore, few other adoption models are proprietary in nature.

One thread of current work shows the evolving role of Enterprise Architects on Agile innovation teams. The need for Enterprise Architects to have a holistic approach in the digital landscape is brought forth. This requires a detailed multi-stakeholder approach and contextual awareness for the delivery of solution architecture. In the digital role, Enterprise Architects act as a facilitator for decision-making towards the development of new digital products and services. Enterprise Architects are seen to be enabling the digitization of customer journeys and the processes and operations. These digital interventions contribute to the optimization of value chains. In this new role to create digital enterprises, Enterprise Architects create all-inclusive transparency and line-of-sight across all the layers of architecture. This facilitates finding the right digital technology and its solution design.

Current studies confirm that a comprehensive IT strategy is paramount for digital technology. This has resulted in the successful implementation of digital technologies and has helped shorten the duration for the Proof of Concept (PoC). Tools like the Innovation Interaction Framework have been developed that describe the interplay between the operational process to adopt emerging technology, personal leadership of the CIO, and the organization's business needs. These frameworks help to evaluate and benchmark organizational readiness. Multiple studies have also put forth the reasons for the failures of digital technology-enabled transformation initiatives, and most tend to suggest strategies to address these reasons. It is clear that these reasons are repeated so often they are now even being termed "anti-patterns", highlighting their wide degree of existence.

Studies have shown that visible trust gaps for emerging technologies impede its adoption. There is a case of 'black-box' when it comes to the understanding of the digital technology. It is pivotal for decision-makers and leadership of organizations to understand what the adoption of digital technology could mean and the best approach for adoption.

Analysis of the current literature points to the need to have a technology-neutral Digital Technology Readiness Assessment (DTRA). There has been a great deal of technology-based research carried out in silos. In the digital technology era, the need for having a technology-neutral toolkit for readiness assessment is imperative with the ever-evolving digital technology stack. Thus, the requirement for a readiness assessment as a toolkit will benefit in assessing digital technology across the identified critical factors. The process of selecting the adoption approach, performing a readiness assessment, analyzing the implication of missing factors, and integrating the factors with the TOGAF ADM [5] is critical for a comprehensive strategy for the adoption of digital technology. This need is consistent with the developing role of Enterprise Architects to bring in the right stakeholders early in the digital technology adoption process.

There are techniques available to evaluate the organizational readiness to undergo a business transformation. It is vital to understand the value proposition of the business transformation readiness assessment *vis à vis* the DTRA:

- Firstly, the DTRA captures the factors specifically targeted to digital technologies as a common construct, but not limited to any specific technology *per se*

- Secondly, the DTRA highlights the implications of missing factors to help stakeholders strategize their approach considering the primary consequences of the missing factors

- Lastly, the DTRA is encompassed with steps that need to be followed for successful digital technology adoption by an enterprise

This document addresses the gap as evidenced in the current literature by covering an area that is becoming increasingly more relevant in light of the transformation initiatives being undertaken across the board. Digital technologies are here to stay, grow, and evolve. Therefore, it is only natural for this document to make adoption as seamless as possible by enabling preparation adequately, and keeping in view that by failing to prepare, enterprises prepare to fail.

2 What is a Digital Technology Readiness Assessment?

2.1 Overview

Most of the enterprises that have already onboarded the Digital Transformation journey are working on key aspects of leveraging the latest technologies to offer business services in a digital form. Enterprises undergoing Digital Transformation must eventually adopt digital technologies while keeping Information Technology (IT) as the foundation. As per the Digital Practitioner Body of Knowledge™ Standard, also known as the DPBoK™ Standard [6], digital technology is defined as: *"information technology in the form of a product or service that is digitally consumable to create or enable business value"*.

Traditionally, IT is used by an enterprise to enable the operations of employees and businesses to function in terms of hardware and software. Commonly, the IT department would run everything (or manage the contracts with third parties who delivered part or all of the service).

Enterprises, as part of their Digital Transformation, also tend to adopt various strategies like social, mobile, analytics, and cloud. All these are treated in isolation, which does not provide for end-to-end digital technology adoption. Again, substituting physical resources with digital equivalents does not equate to Digital Transformation. The DPBoK Standard defines digital enterprise as: *"an enterprise characterized by the creation of digitalized products or services that are either delivered fully digitally (e.g., digital medial or online banking), or where physical products and services are obtained by the customer by digital means"*.

A few things to better understand digital technology include:

- The nature of digital technologies like cloud, IoT, mobile, social media, analytics, AI/Machine Learning (ML) is different; these technologies complement each other instead of competing with existing systems and information enabling more leverage with less disruption

- Digital technologies and the strategies associated with them bring together digital and physical resources, enabling business innovation instead of disruption

- Digital technologies are leveraged to concentrate on specific business outcomes rather than just trying to implement large strategies that have no clear focus and visibility of the magnitude of effort required

2.2 Problem Statement

Every enterprise that has decided to embark on an enterprise-wide Digital Transformation needs to assess how prepared it is for the transformation journey. A readiness assessment needs to be performed to get a view of how ready the enterprise is for a big change. A readiness assessment is a measurement of the preparedness of enterprises to undergo a large transformation. Enterprises do not want to start a big transformation without knowing if they have the resources to accomplish the evolution effectively and derive the full benefits sustainably.

The DTRA gives decision-makers the knowledge and assurance that their company's proposed endeavor will be successful if they decide to go ahead and do it. It also saves the company's reputation by avoiding a potentially high-profile failure by engaging in a transformation that the enterprise is not ready to complete.

A readiness assessment usually assesses the following at a high level:

- Transformation goals and objectives

- Expectations and concerns, and potential value

- Leadership support for the program

- Ability to adapt to change

- Ways to minimize potential transformation failure

- Transformation governance and decision-making

- Internal capability to make the transformation happen

- Other critical program needs like process management and governance

2.3   Current Landscape

A staggering 70% of transformation programs fail [7] and, similarly, 70% of Digital Transformation programs fail [8]. Although most companies and executives know how crucial it is to evolve with technology and create digital processes and solutions, putting it into action is a different story. Many companies have embarked on Digital Transformations only to hit roadblocks and give up. Understanding what went wrong with the following three examples provides critical insights and guidelines of things to avoid, to point future Digital Transformations in the right direction:

- A global multi-national created a new digital business unit but was focused on size instead of quality; too large an organization to transform all at once especially without a true business vision of what it was trying to achieve

- A major car manufacturer started a new digital service that was separate from the rest of the company instead of integrating digital solutions

- A multi-national consumer goods corporation failed to consider the competition or impending economic crash; it failed to look at what was going on in the industry – to see if it was already ahead of competitors – and what was going on with the economy

  A Digital Transformation for transformation's sake only is not effective; it must, rather, consider all outside factors and be tightly tied to strategy.

Such missteps can spell doom for Digital Transformation, but all three companies managed to try again with better success.

2.4   Motivation and Drivers

Therefore, this makes the DTRA an imperative; the consideration of all the key factors well in advance to have the risk and mitigation strategies, preparedness, and appetite for change planned

as part of the roadmap for transition. This makes a readiness assessment a prerequisite for onboarding or moving forward in digital technology adoption.

Some factors that are driving the adoption of digital technology adoption for enterprises are:

- **The evolution of business models**

  Digital technologies enable radically new go-to-market approaches and product/service combinations. Entire value chains are impacted, creating new customer value propositions and monetization paths. Business model changes enabled by technology are causing disruption across all sectors of the global economy. Established businesses must recognize these changes and transform their organizations to mitigate new threats and take advantage of new opportunities created by digital technologies.

- **The modernization of business channels and the need to increase customer reach**

  Digital Transformation is the integration of digital technology into all areas of a business, resulting in fundamental changes to how a business operates and the value it delivers to its customers. Put simply, it is about changing the way a business interacts with its customers and how they provide their customers with a consistent experience whenever and wherever they need it. In fact, when asked about factors that influence a business decision to implement a Digital Transformation strategy, nearly half of all organizations cited customer experience and customer satisfaction as their leading influences.

- **Ever-increasing computing power on the cloud**

  Ever-increasing computing power and maturity of the cloud has enabled the exploration of new innovative ideas at scale. This also enables enterprises to fail fast and improve or do it right the first time in an iterative, Minimum Viable Product (MVP)-based approach.

- **The ubiquity of the Internet as a platform**

  The ubiquity of the Internet as a platform enables connected things to be a reality. This opens up new avenues for exploring an enormous amount of data collected to create insights driving the Digital Transformation.

- **The emergence of open-source software**

  Open-source software is driving Digital Transformation through the co-creation of software. Community-based crowd-sourced development of new digital technologies and maturing existing open-source software creates positive disruption through the engagement of both customers and employees, encouraging collaboration and improved productivity. Open-source software comes in handy to quickly prototype ideas, experiment with trending technologies, and build on these trends.

- **The emergence of technopreneurs**

  Technopreneurs are on the rise and are creating successful startups through digital technologies. Technopreneurs come up with an idea and bring in disruption by thinking out of the box with different ideas that challenge the *status quo*. They create products or solutions using digital technologies on the rise, to change the traditional ways of doing business. This is only possible due to the ease of access to digital technologies that is in turn powered by ever-increasing computing power, inexpensive hardware, the ubiquity of the Internet as a platform, and an ever-maturing and advancing broadband speed.

- **The rise of digital enterprises as market disruptors**

    Digital Transformation is all about the positive disruption of standard practices of doing business using technology, people, and processes to radically change business performance and outcomes. It is about the transformation of organizational decision-making enabled through technological advancement. Organizations can work in a more Agile way and scale their business to become more competitive through new ways of thinking and transforming standard business-as-usual processes. Digital technologies play an integral role in helping organizations transform these processes. Digital technologies enable organizations to drive higher levels of innovation and to easily reengineer business processes. For organizations looking to kickstart organizational Digital Transformation, it is important to focus on what is not changing to help speed adoption and reduce the resistance to change. Digital technologies help organizations to take the next step by automating processes, leaving their employees to focus on high-level tasks.

2.5   Focus and Goals

This document focuses exclusively on identifying, elaborating, and structuring the factors for conducting a readiness assessment concerning adoption of digital technologies. An assessment tool (in the form of a questionnaire) is provided for ready-use. The content in this document and in the tool are domain, sector, industry, and technology-agnostic. In other words, it can be used by any kind of organization.

The goals of this document are to:

- Raise awareness of the risks associated with the adoption of digital technologies, which includes the ability to understand the full spectrum of risks associated with the adoption of digital technologies, and how these risks can impact the adoption and derail transformation programs

- Provide a generic tool for evaluating the degree of readiness to adopt digital technologies, not limited to the current set of technologies but also with applicability for future yet-to-be available digital technologies

- Provide insights into the impact of the DTRA by introducing factors that enterprises need to be cognizant of in order to plan their strategy and execution plan

3 The Impact and Benefits of Readiness Assessment

The impact and benefits of conducting a DTRA is multi-faceted. The DTRA provides an opportunity to analyze the as-is state pertaining to the digital technology of an enterprise. It helps to evaluate the organization circumventing certain key factors – what the organization is doing well, what needs improvement, and how to prioritize their transformation/adoption strategy.

This is an empowering tool for Enterprise Architects. With the DTRA as a toolkit, Enterprise Architects can leverage the learning for designing processes to overcome the barriers for digital technology adoption.

It is pertinent to mention that with the evolving role of the Enterprise Architect in the field of emerging technology, architects are now expected to transcend boundaries and become holistic in nature. In this regard, the DTRA can help to identify gaps in non-architecture areas as well – and by highlighting the gaps within the factors identified, it is possible to help businesses understand the consequences and remedy the gaps. The DTRA can help to identify potential barriers to digital technology adoption. The coherent view being brought by the DTRA would lead to timely buy-in from senior management and leadership. For instance, a weak understanding of vision or scope or lack of sponsorship may indicate that the organization has not given enough thought to technology adoption.

The five key benefits of conducting the DTRA are as follows:

Solidifies goals related to digital technology and expectations

Taking the assessment and utilizing the findings could mitigate the risk of a big-bang failure in digital technology adoption

Identifies stakeholders early and positions them in a stakeholder map (power *versus* interest)

Prepares leadership and other stakeholders for managing the complexity of the process

Gives a head start to prepare for digital technology-related governance and decision-making structures

Figure 1: Benefits of DTRA

4   Factors Impacting Digital Technology Adoption

Foundational factors: factors that organizations must have to establish the minimum acceptable readiness to adopt digital technologies.

Impact factors: factors that enhance or amplify the effectiveness of primary factors by providing supporting conditions.

Sustaining factors: factors that enable the institutionalization of the adoption of digital technologies for sustained long-term benefits.

Table 1: Factor Categorization

Foundational Factors	Impact Factors	Sustaining Factors
Vision	Business Model Adaptability	Value Realization
Sponsorship and Direction	Skills and Competence	Policy and Regulations
IT Capability	Technology Maturity	Funding and Resources
Culture	Ecosystem	
Scope and Scale	Governance and Compliance	
Business Rationale		
Implementation Approach		

In Table 1, factors are arranged in each category. To map the relations amongst the factors, a factor dependency diagram is created (see Figure 2). This diagram highlights how these factors are inter-dependent, depicting only the strong and dominant relationships among the factors. The subsequent chapters describe the factors along with short case contexts in practical settings to enable deeper thinking and reflection.
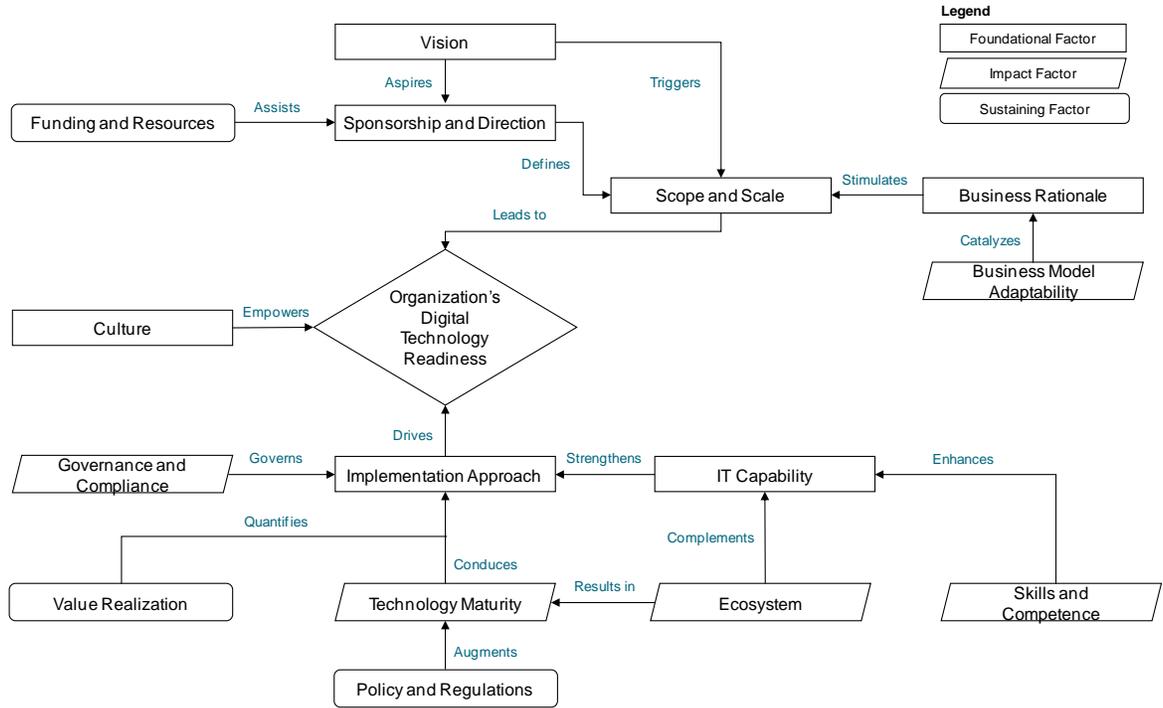
Figure 2: Factor Dependency Diagram

4.1 Foundational Factors Description

4.1.1 Vision

The vision for adopting a specific digital technology is the organization's desire to grow, progress, or become more efficient in sustainability or in competition by using specific digital technology. In general, it expresses the willingness or propensity of the organization to experiment, adopt, or adapt new technology for its benefit toward the overall vision, mission, or strategy of the organization. It also lays out the desired outcome and the timeline required to achieve it. The existence of such a vision shows the commitment of the organization to the technology adoption, and the clarity of its actions.

Here, the existence of the vision, motivation, and organization's commitment to technology adoption is validated.

Clarity of vision helps to identify the right sponsor(s), set the right direction for the due course, and define the scope and scale that the organization wants to achieve. Hence "Vision" impacts "Sponsorship and Direction" and "Scope and Scale" factors.

A large bank, a leader in many corporate banking products, wants to adopt new technologies in order to provide a better service and compete with the smaller, more technologically-savvy banks. The current customers are long-standing, and they value the relationship but find that the systems are old and inefficient; anything *ad hoc*/on-demand is currently not being met. As customers scale up their own technology, and want their banking partner to reciprocate, the bank decides to go "new tech".

Does the bank have clarity on what they want to achieve? Does the bank have a vision of where they want to be?

4.1.2   Sponsorship and Direction

The vision for technology adoption needs to be supported by the identification of strong sponsorship by executives and senior leaders of the organization. The identification of a sponsor (an individual or a department) sets accountability and provides authority. The sponsor defines the mission and the strategy to fulfill the vision. They define a high-level roadmap, key stakeholders, and a budget to carry out the initiative(s) or program(s). The sponsor's interest, influence to drive the vision and objectives in the organization, risk appetite (the level of risk that an individual is prepared to accept in the pursuit of an objective), and organizational alignment defines the assertiveness and aggression of the execution. The depth of understanding of the vision and the enthusiasm to achieve are key to the success of the adoption roadmap.

Here, the availability of the sponsor(s), awareness of the sponsor about digital technology, the manifestation of strategy and roadmap, risk appetite, sponsor's influence impact, and their commitment of the funds are confirmed. Further, the preparedness of the sponsor(s) and supporting teams, such as top-down champions and change managers, greatly define successive actions and their success.

The identification of a sponsor and the direction set by them influences the "Scope and Scale" factor of the initiative by defining what to achieve and by when. Funds set aside by sponsors also impact the scope and scale.

The bank decided to form a committee to perform an as-is review and determine the way forward. A representation of CIO, COO, CFO, and CRO under the leadership of the CEO and MD was formed. The committee was first tasked with evaluating how much of the current technology can be protected and in what way, with little extra work, effort, and money, the desired outcome can be achieved. The CIO will provide all the technical inputs required and the COO will give the business inputs for the CFO to approve the business case and recommend a budget to the CEO/MD. The CFO does not have an appreciation of current technology and certainly not on the new technology proposed.

Does the bank have a clear sponsor and single owner who can take decisions and drive the initiative? What do you recommend as the appropriate sponsorship model?

4.1.3   IT Capability

Ownership for the deployment of digital technology generally lies with the IT department of the organization. Many organizations keep struggling with technical debt, deep-rooted legacy

applications, and obsolete technologies. Adopting digital technologies could help to answer this struggle. On one hand, it helps to embark on newer technologies to improve the technology footprint, it also helps to create a more open information ecosystem for better interoperability, improve the user experience, and attract a new workforce with modern skills. The IT strategy and technology roadmap will drive the motivation of actions in the adoption of new digital technology. The current IT infrastructure, in-house capabilities, and application landscape are key to the better deployment of newer technologies. The maturity of the Architecture Board,[1] the adoption of the IT4IT™ Reference Architecture [9] for aligning and managing a digital enterprise, and focused architecture governance practice help in the adoption of digital technologies in an effective, efficient, and sustained manner.

Here, the new technology adoption strategy, technology roadmap, infrastructure footprint, application ecosystem, architecture governance maturity, and in-house capabilities are validated. The aspirational to-be (target) state (of IT and business; i.e., technology-driven service offerings) and the IT role in business growth (enabler *versus* support function) also play a vital role, hence the need to be validated. Overall policies on security such as buy *versus* build, in-house *versus* outsource, information ownership, upgrade, and cloud adoption will also be important aspects to validate.

"IT Capability" is impacted by "Skills and Competence" and "Ecosystem". The availability of in-house skills and competency helps a rapid PoC or pilot and eventually adoption. It helps organizations to define the support model for a new technology and its applications. It also involves the availability of such skills and services available in the ecosystem-wide industry, third-party vendors, and product vendors. "IT Capability" impacts "Implementation Approach", based on in-house readiness and maturity.

> **Case Context with practical learnings for your thoughts**
>
> The bank has legacy systems in use for the critical processes and, while there has been functionality added on and upgrades made from time to time, no attempt has been made for the technical debt to be retired until the management decided to implement the new IT strategy using an emerging technology.
>
> What is your advice to the bank and its CIO and CEO? Should they first draw a roadmap to move to the new technology in a structured way (they want to preserve their investment in legacy systems to the extent possible) or implement emerging technology for the business processes and figure out the best way to map post that?

4.1.4 Culture

The organization's overall culture plays a vital role in any change in the organization's way of working. As per the theory of Diffusion of Innovations by Everett Rogers [3], organizations can be classified as innovators, early adopters, early majority, late majority, and laggards. This also can differ based on the vision or focus of the organization; for example, a retail organization may readily invest in a social platform to interact with consumers as compared to oil and gas or mining organizations, who may readily invest in safe operation technology. Changes in smaller organizations can be driven by cohesive/inclusive change processes, while larger organizations might see a challenge without effective communication and a network of change agents. Larger organizations may also have multiple power centers or geographical centers that vary in culture

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[1] Refer to: https://pubs.opengroup.org/architecture/togaf9-doc/arch/chap41.html.

to each other. The culture of the organization defines their reaction to FOMO (Fear of Missing Out), FOJI (Fear of Joining In), and JOMO (Joy of Missing Out).

Here, organization culture, its influence network, risk appetite, and readiness to change are confirmed. Other factors that may impact the adoption of change, such as in-flight projects or ongoing (or recently completed) re-organization, are also validated. The maturity of organization change management should also be validated.

Case Context with practical learnings for your thoughts

Once the bank decided to go ahead with the new technology strategy, the CIO prepared a comprehensive plan for upskilling the employees. A Learning Management System (LMS) was integrated, and external agencies and Massive Open Online Courses (MOOCs) were put in place. However, while there was readiness in terms of quality content, the transparency of the strategy approach as well as the granular details involved in this migration have not been communicated to all and limited to a hierarchy below CIO.

How should an enterprise map its upskilling initiative with organization culture to get a result-oriented outcome?

4.1.5   Scope and Scale

Typically, the scope of digital technology adoption is to be expressed in terms of enterprise scope, time period, and degree of adoption. Once the organizational scope is defined and understood, the roadmap, scale, constraints, and risks should be defined. With an Agile approach to digital technology adoption, defining the scope and scale of each sprint becomes salient.

Here, the existence of a defined scope and expectations from the use of digital technology is validated. The business context and existence for Statement of Work/Project Charter/Program Vision are also validated. So, too, are incremental value-add, time horizon, scale and spread, and stakeholders and risks. Additionally, programs, projects, and initiatives are checked for approval and funds secured. If this digital technology adoption is part of any larger program, then fitment in the roadmap of the larger program should also be validated and the impact of the termination of the larger program should be ascertained and understood.

"Scope and Scale" is impacted by "Vision", "Sponsorship and Direction", and "Business Rationale". The organization vision for adopting digital technology defines the area of scope. Similarly, sponsors set the direction for the area, and the depth of the adoption thus sets the scale. "Business Rationale" will drive clarity in the scope, especially in setting expectations for the outcome.

The bank has planned to implement digital technology across all of its functions. While the scope is clear in terms of coverage, the implementation approach has been to start with customer onboarding, Know Your Customer (KYC), and then proceed to product risk assessment and sales, product onboarding, and customer off-boarding. The mandate is to seek out digitally-enabled tools across the customer journey. This is expected to coexist with the current technology, which will be decommissioned once the new technologies have been user accepted.

Can you suggest a better way to scope and scale the project?

4.1.6 Business Rationale

Often organizations take decisions that either consider the future plan, changing winds of trade, growth strategy, competitive advantage, emerging governing trends, and policies, or that improve the efficiency and effectiveness of the workforce. Digital technology adoption decisions can be driven based on any such factor. Understanding the business rationale behind such decisions is of great help in understanding the management perspective in greater detail. The business rationale also provides insight on the desired business value. This sets the context for the scope, scale, timeline, and outcome. Clarity on business rationale and desired business benefits provides energy and motivation for stakeholders.

Here, the key drivers for the decision, the motive, the expected value, and the target business state are confirmed. An understanding of the business rationale helps validate other factors such as "Vision" and "Scope and Scale".

"Business Rationale" is impacted by "Business Model Adaptability"; the organization's flexibility to respond and adjust services to changes in industry, product ecosystem, government regulations, compliance policies, and competitors' services are major factors. Such changes play a major part in defining business rationale and set the urgency for adoption.

The bank wants to penetrate further into corporate banking offers to large organizations and make a template for medium enterprises with the knowledge acquired from large organizations. In parallel, they would like to leverage digital technology to offer "surround" services to their existing customers and gradually expand the range of offerings.

Is this an adequate and an appropriate business rationale for implementing a digital technology-enabled platform? What could the bank have done differently?

4.1.7 Implementation Approach

Any change needs to be implemented in a controlled manner and aligned with the organization culture, ongoing economic situation, and governing policies. Many times, technological changes bring discomfort and insecurity in the people who are impacted by them. This nervousness can become a resistance factor for the implementation of digital technology. Similarly, there are groups of people who are highly motivated and optimistic in using new technologies and are always ready to experiment and innovate. The overall expectation and enthusiasm for both the groups should be controlled and managed. Organization change management plays a vital role in

an organization-wide rollout and change control. Similarly, technology projects need integration with business processes and existing systems/applications. An implementation approach encompasses various styles, like Agile delivery and DevOps, and the approach could vary depending on the context.

Here, the integration points of the new technology and the potential impact on the existing ecosystem, business processes, and various stakeholders are understood. The maturity of the IT change management process and business change management process to manage the change is validated. The implementation approach, consisting of PoC, pilot, parallel rollout, or big-bang rollout, should be thought through to align with organization change readiness, impacted system, processes, and stakeholders.

"Implementation Approach" is impacted by "IT Capability" and "Governance and Compliance". "IT Capability" defines the roadmap and process by which implementation is done. "Governance and Compliance" sets the urgency for the way in which digital technology should be implemented.

Case Context with practical learnings for your thoughts

The bank wants to protect its current technology investments (does not want to consider any legacy platform as technical debt) and intends to integrate those with the new technology platforms. This is both to save cost and to benefit from business processes captured in the legacy systems. The key focus of the implementation is the integration.

Is this the correct approach to take while implementing new tech, and what would be your advice to them?

4.2 Impact Factors Description

4.2.1 Business Model Adaptability

Continual adaptation to change is the need of the hour for any business model. It is paramount to re-evaluate the business model time and again to align it with customer expectations and demands. The demands of the customer are changing. These trigger the requirement of having an Agile model and innovative financing to embrace rapid changes in the market. The nine major categories of the Business Model Canvas (BMC), as depicted in the DPBoK Standard and the TOGAF® Series Guide: Business Models [10], often need to be analyzed to describe the business model. Digital technologies play an enormous role and act as a catalyst in each of the categories of the BMC.

It is paramount to evaluate the agility of the business model. The presence of strategic toolkits to embrace evolving customer requirements is key. The frequency of market research, data-driven analysis of the business outlook, and readiness to evolve toward a "blue ocean" from a "red ocean" approach is imperative today more than ever before.

This factor reinforces "Business Rationale", and the impact is both short-term as well as long-term. Organizations that have flexible business models leverage the agility to strengthen the business rationale across various frontiers.

The bank has a host of legacy systems which are assigned to and owned by various functional units. The functions align and use IT as an enabler for executing their business strategy. Based on granular customer requirements and their need to have an end-to-end process, the bank does align its organization structure; but the underlying systems and application ownership remain as-is, which influences the customer service and turnaround time adversely. This is one of the reasons why the bank has not been able to compete effectively against new and younger banks that do not have the burden of legacy systems.

What is your advice to the bank? How would you like them to leverage technology to get the best out of the BMC?

4.2.2 Skills and Competence

In the adoption of digital technology, human resource plays an integral part. There are technology-specific skills that need to be nurtured within the organization. The capacity-building activities are a continuous process of learning and keep evolving as technology progresses.

Through this factor, the intention is to measure the organization's capability in terms of resource skills and competency. The placement of the Learning Management System (LMS) and the partnership with digital technology content players play a key role in the journey. An organization strategy to mitigate skill-gaps while moving toward enhancing the digital service portfolio is another ingredient that leads to new technology adoption.

This factor directly amplifies the "IT Capability" of any organization. The importance of this factor becomes more evident when there is a supply-demand gap, wherein the demand is more for personnel with digital technology skills, but the supply is below demand.

One of the pivotal tasks of the committee was to assess current skill sets across multiple technology teams to see if they can "understand and adapt" new technologies. The skill set inventory showed that most of the teams are good in maintenance of the current applications on legacy platforms. Only some are engaged in acquiring new skill sets as a part of development goals and none have even a basic understanding in User Experience (UX) and design, which is a prerequisite for implementing new technologies. There is a headcount freeze and the CIO cannot recruit anyone with the desired new skill sets. He cannot exchange either (let go of redundant technology resources in favor of new technology) and has not yet determined the training priorities for his teams. Training priority is a product of training gap and the immediate need of the skill set for the organization.

Is the organization ready to start its journey in new technology? What is your advice to them?

4.2.3 Technology Maturity

For the adoption of digital technology, organizations often feel the urge to analyze the maturity of the technology. The approach differs from organization to organization. While some are early adopters, others are late movers. Late movers generally leverage the technology when the technology is in a matured state. The relative advantage that the new technology brings compared to the existing technology is critical. Organizations grapple with the trade-off between

the urge for creating a first-mover advantage and the risk of failure during the process of adoption. Since organizations have recognized that the combined use of digital technology is more beneficial than using technologies in isolation, assessing technology maturity is critical in this digital era.

An organization must evaluate its risk appetite and find a sweet spot for the adoption of digital technology at every stage of technology maturity. The need to understand the maturity level of technology to suit the industry domain is pivotal. At the same time, it is paramount to understand the underlying principles, cost, and complexities related to technology.

Technology maturity drives the implementation approach in the real world. Few organizations try to get themselves involved in emerging technology at a nascent stage. Others adopt a wait-and-watch style of incorporation taking cues from the attempts made by other organizations. Another approach is to embrace digital technology with low-hanging fruit in a sandbox style before a major rollout.

To assess the maturity of technology, the Technology Readiness Levels (TRLs) could be leveraged. TRLs distinguish the progress of a technology from its basic principles to fully functional mission operations on a 9-point scale [11]. Organizations might suitably tailor this TRL scale to meet their requirements.

> **Case Context with practical learnings for your thoughts**
>
> The bank realizes there are very few benchmarks or reference points on technology maturity as very few banks have implemented any, and those who have done so have not shared best practices, lessons, and learnings.
>
> Keeping technology maturity awareness in consideration, what would you advise the bank about their adoption approach?
>
> Note: Refer to the "ABCD" framework for adoption approach; see Figure 4.

4.2.4 Ecosystem

Organizations do not work in isolation; rather, they thrive in an ecosystem. An ecosystem typically includes customers, partners, suppliers, regulators, and other players. An ecosystem enhances awareness, partnerships, participation levels (PoC phase to full implementation), and community engagement for organizations. Enough adoption of complete solutions within the value chain brings trust and confidence. The availability of standards, an open-source development community, and protocols for the technology all form the basis for a comprehensive association within the ecosystem, which, for the organizations, lays the foundation for taking advantage of cross-dimensional synergies.

The intention is to measure the awareness of other players and standards in the market. Another ingredient of this factor is to evaluate the relationship with probable partners in the ecosystem. The availability of community for open-source developments is a critical aspect.

The presence of a resilient and growing "Ecosystem" enhances the organization's decision support system in terms of implementation approach. It further enhances the organization's "IT Capability".

Most of the bank's technology third parties (where they outsource part of the development work for reducing cost) are not familiar with new technologies. Some of them have been trained online and have certifications but do not have hands-on implementation knowledge. They have, however, expressed confidence in co-implementing the new technologies. The regulator does not have inspectors who have the expertise to analyze the new technology, but they are supportive of the bank in implementing it. The bank has given assurances that they will train the regulator representatives on the technology, post-implementation.

What is your recommendation to the bank?

4.2.5 Governance and Compliance

For the adoption of digital technology, an organization needs to have a rulebook for governance. With data becoming the central theme in technology, the impetus towards compliance cannot be discounted. A well-articulated governing body within the organization that has clear demarcation of accountability and ownership for activities is paramount. The governing mechanism must cater to the security (Confidentiality, Integrity, and Availability (CIA)) aspect of technology; the challenges tagged with technology are vital. Digital technologies often come with their own set of challenges; for instance, AI adoption needs to be governed holistically for ethical implications, transparency, fairness, trust, and legislation.

From the assessment perspective, the intention is to measure the awareness and planning with "Governance and Compliance" procedures before the digital technology adoption. The need to have structured governance measures, agreements, and evolving compliance needs with partner ecosystems is vital for digital technology. The steps towards catering to privacy requirements with Personal Identifiable Information (PII) is another aspect requiring management attention.

The current technology governance framework focuses on *ex post-facto* KPIs, including downtime, patches applied, access violations and conflicts, disaster recovery readiness, etc. Emerging technologies need pre-emptive and proactive monitoring of metrics, including the efficiency of algorithms, sustainability and scalability, and iterative and changing test results. There are also requirements for compliance with respect to PII, which can vary from one geography to other.

What is the journey that the bank needs to take to become proactive in its governance framework?

4.3 Sustaining Factors Description

4.3.1 Value Realization

Value realization in terms of time, customer acquisition, and quantification of the business benefits derived from the adoption of digital technology underscores future pathways. It is critical to measure value realization and establish the mechanisms for measuring it early in the lifecycle.

Organizations often face challenges in quantifying the Return on Investment (ROI) attributable to digital technology. It is paramount to use the right assumptions for calculating the envisaged value, and also to look at the positive externalities of such digital interventions. For instance, organizations that embrace digital technologies are relatively in a better position to deal with uncertain situations characterized by volatility, uncertainty, complexity, and ambiguity. Encashment time is another parameter to measure the value realization. This is the time to show the results in terms of the top-line and bottom-line of the organization.

A high-impact value realization acts as a sustaining factor that enhances the implementation approach. It is imperative that digital technology with a quick adaption and short encashment time attracts decision-makers (CXOs) and acts as a catalyst for motivation. Thus, "Value Realization" as a factor helps prioritize the implementation approach for the adoption of digital technology.

Case Context with practical learnings for your thoughts

The bank currently generates KPIs based on existing legacy system priorities, such as processing time, turnaround time, down time, High Availability/Disaster Recovery (HA/DR), resilience, and security/patch metrics. They expect similar KPIs in new technology, too, as business priorities have not changed.

What is your recommendation to the bank, and how is the value best realized out of emerging technologies?

4.3.2   Policy and Regulations

Policy and regulations can act as a catalyst for digital technology adoption, but at times may do the opposite. The innovative business models often are under regulatory pressure because of frequent changes in the technology-related stance. The policies and regulations often vary with geography as well. Startups tend to disrupt the market and challenge the *status quo*. It is well known that startups have experienced adverse reactions from regulators.

Organizations must learn to adapt to changing regulations and anticipate any policy move by governments. Participation in consulting and discussion papers is an exciting way to present the thoughts for consideration. A pro-business policy environment could create a sustained impact in the long run. In such a case, businesses must steer the way towards the adoption of digital technology to create economic opportunities for citizens.

In the assessment, the task is to understand how encouraging the regulatory steps are for the organization to adopt. Another aspect is to gauge the reaction time of the government for any policy-related technology interventions. With emerging technologies, it is paramount for organizations to do an in-depth study of the technology and the ethical implications associated with it, and also to anticipate the sentiment from policymakers.

The CIO discussed the emerging technology implementation with regulators. The regulators were supportive as the bank promised to enhance and put more rigor into key processes, including KYC, credit risk, and Non-Performing Asset (NPA) tracking, while providing a better service to customers. The bank has promised to conform to all central regulations, reveal the architecture, and train the central bank inspectors post-implementation.

Should the bank be conforming first on all the regulatory guidelines, and should they collaborate with the regulator before commercializing the digital product/service?

4.3.3 Funding and Resources

For organizations to continuously thrive, funding and resources are key factors. While funding relates to financial support, resources cover a vast umbrella; for example, resources could include an incubation hub and studio labs for incubating technology startups.

There could be budget constraints and issues like cost overrun, which could impede the adoption of digital technology. For startups and Micro, Small, and Medium Enterprises (MSMEs), Venture Capitalists (VCs) and angel investor sentiments play a key role in the sustainability of business.

For CXOs, effective sponsorship and direction toward technology modernization and digital adoption, funding, and resources are pivotal factors. A continual infusion of funds creates a sustainable environment for organizations to perfect the use-cases of digital technology adoption. Often organizations incorporate a sandbox style of testing for digital technology. This style of technology adoption methodology requires backing with funding and resources.

The CIO and CFO were engaged in discussions with various business leads regarding funding and the allocation per business unit to the new technology (depending on relevance and ROI to the business). The arguments ranged from the current turnover of business, profitability, speed-to-market, etc. and how the adoption of digital technology enabled each of these factors to do better. Accordingly, the funds were carved out and technology resources assigned from the common pool to the new technology team.

What is your advice to the CIO and CFO, and is there a better way to assign funds?

5   Charting the Course for Digital Technology Adoption

This chapter gives an overview of the four steps that need to be followed for a comprehensive approach to digital technology adoption. The four steps are highlighted in Figure 3 and then explained in more detail in the text that follows.

Step 4: Address Shortcomings and Initiate Digital Technology Adoption

Step 3: Identify Factors Needing Management Attention

Step 2: Perform Digital Technology Readiness Assessment

Step 1: Select the Adoption Approach
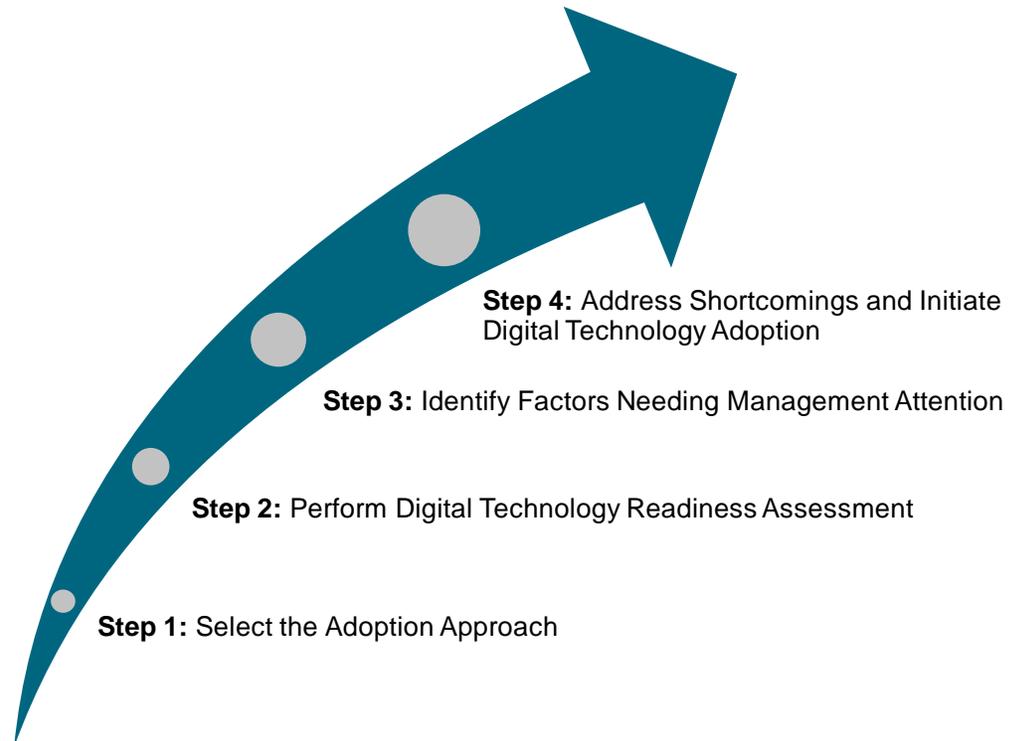
Figure 3: Four-Step Roadmap for Digital Technology Adoption

5.1   Step 1: Select the Adoption Approach

The organization must select the adoption approach for the digital technology it desires to adopt. The "ABCD" framework comprises the fitment of all types of organization with respect to their digital technology adoption strategy.

The x-axis of the framework depicts the **ubiquity** of digital technology adoption wherein it refers to the breadth/extensiveness of digital implementation. The y-axis depicts the envisaged **velocity** of adoption – a function of time. It is imperative that this step is supported with strong justification as to why a specific approach is preferred over others. Clarity on "why" a specific approach is selected encourages insight, oversight, and foresight.
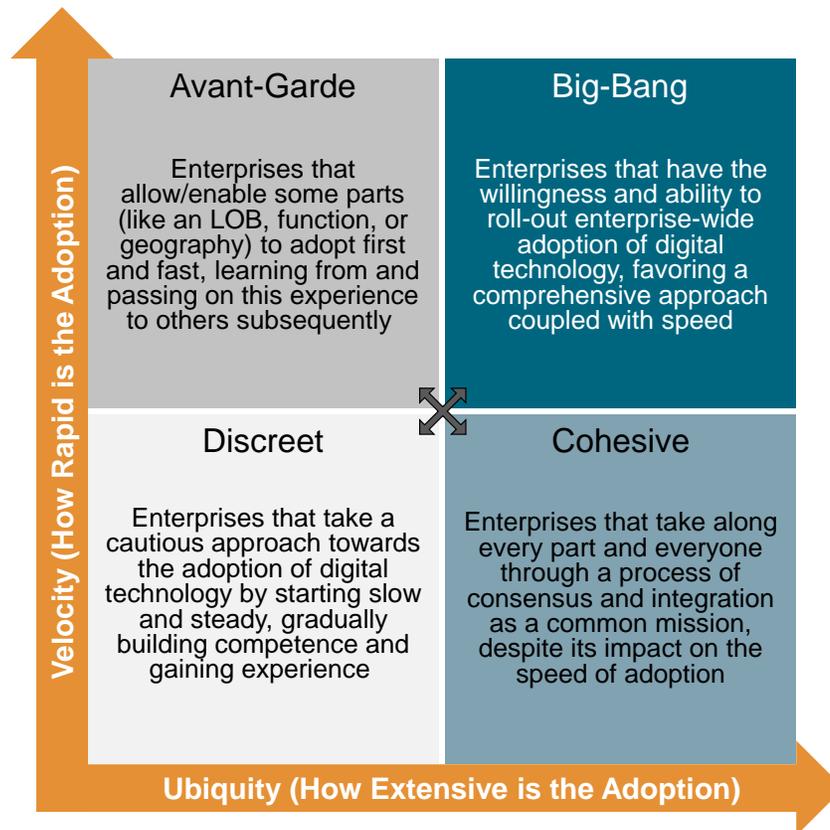
Figure 4: "ABCD" Framework for Digital Technology Adoption

Based on the ABCD framework, the four quadrants represent the following adoption approach:

- **Avant-Garde** (low ubiquity, high velocity): enterprises that allow or enable some parts (like a Line of Business (LOB), function, geography, department) to adopt first and pass on this experience to others

- **Big-Bang** (high ubiquity, high velocity): enterprises that have the willingness and ability to roll out an enterprise-wide adoption of digital technology, favoring an all-at-once approach

- **Cohesive** (high ubiquity, low velocity): enterprises that take along every part of the organization through a process of consensus as a common mission, even if it impacts the speed of adoption

- **Discreet** (low ubiquity, low velocity): enterprises that take a cautious approach toward the adoption of digital technology by starting slow and steady, building competence gradually

Note: The four quadrants merely represent the four categories (or types) of approaches the enterprise could choose. The quadrants do not depict any type of ranking or statement of evaluation (i.e., B is not better than A, and C is not better than B, and so on).

5.2 Step 2: Perform Digital Technology Readiness Assessment

The DTRA assessment, comprising all the identified factors, is to be considered as a toolkit to inspect the readiness of the organization against the various critical factors identified in this document. The factors, as explained in Chapter 4, are categorized into foundational, impact, and sustaining types. The availability of a conducive environment which fulfills the factor requirements is antecedent to the adoption of digital technology.

The questionnaire is provided in Appendix A of this document.

Who Should Take this Assessment?

The DTRA is designed for enterprises that are ready to adopt digital technologies for the reasons explained earlier in this document. The assessment (either self or third-party) requires the active involvement of key leaders engaged through a process of dialog and consensus. This is critical, as missing factors have the potential to decelerate and even derail transformation initiatives and addressing them requires their focused attention and commitment. The DTRA brings forth and magnifies the weak spots so that they can be plugged, and a field-tested adoption roadmap developed.

5.3 Step 3: Identify Factors Needing Management Attention

The next step in the process is to analyze the output of the readiness assessment. There might be certain factors that are not as per expectations and the organization is falling short in parameters. It is paramount to understand the implications of missing factors. Hence, the following matrix (see Figure 5) could be leveraged to understand the implications of the missing factors.

The "Primary Consequences", as depicted in Figure 5, capture the crux and implication of missing factors for the organization.

How to Read the Table – the Consequence of Missing Factors

Each row of the table depicts a possible missing factor (shown in white), and the final column captures the primary consequence of the missing factor.

For instance, in the fourth row, if the result of the readiness assessment shows that the organization is lagging in "Implementation Approach", it means that the consequence could lead to a likelihood of missed opportunities due to a trial and error-based approach.

Organizations may have more than one missing factor and, therefore, the primary consequence of all the factors needs to be understood collectively without any prejudice and bias. Another important point to note is that the consequences also generally tend to reinforce each other in certain ways; refer to Figure 2.

FOUNDATIONAL FACTORS							IMPACT FACTORS					SUSTAINING FACTORS			PRIMARY CONSEQUENCES
Vision	Sponsorship & Direction	IT Capability	Implementation Approach	Culture	Scope & Scale	Business Rationale	Governance & Compliance	Skills & Competence	Business Model Adaptability	Technology/Maturity	Ecosystem	Value Realization	Policy & Regulation	Funding & Resources	
Vision	Sponsorship & Direction	IT Capability	Implementation Approach	Culture	Scope & Scale	Business Rationale	Governance & Compliance	Skills & Competence	Business Model Adaptability	Technology/Maturity	Ecosystem	Value Realization	Policy & Regulation	Funding & Resources	Inability to foresee, anticipate DT-enabled change and prepare for it
Vision	*Sponsorship & Direction*	IT Capability	Implementation Approach	Culture	Scope & Scale	Business Rationale	Governance & Compliance	Skills & Competence	Business Model Adaptability	Technology/Maturity	Ecosystem	Value Realization	Policy & Regulation	Funding & Resources	Lack of focus and ambition to embrace DT-enabled change narrative
Vision	Sponsorship & Direction	*IT Capability*	Implementation Approach	Culture	Scope & Scale	Business Rationale	Governance & Compliance	Skills & Competence	Business Model Adaptability	Technology/Maturity	Ecosystem	Value Realization	Policy & Regulation	Funding & Resources	Inability to chart the course and take full benefit resulting from DT
Vision	Sponsorship & Direction	IT Capability	*Implementation Approach*	Culture	Scope & Scale	Business Rationale	Governance & Compliance	Skills & Competence	Business Model Adaptability	Technology/Maturity	Ecosystem	Value Realization	Policy & Regulation	Funding & Resources	High likelihood of missed opportunities due to trial and error-based approach
Vision	Sponsorship & Direction	IT Capability	Implementation Approach	*Culture*	Scope & Scale	Business Rationale	Governance & Compliance	Skills & Competence	Business Model Adaptability	Technology/Maturity	Ecosystem	Value Realization	Policy & Regulation	Funding & Resources	Inability to internalize the new normal and create a virtuous wave
Vision	Sponsorship & Direction	IT Capability	Implementation Approach	Culture	*Scope & Scale*	Business Rationale	Governance & Compliance	Skills & Competence	Business Model Adaptability	Technology/Maturity	Ecosystem	Value Realization	Policy & Regulation	Funding & Resources	Lack of momentum to institutionalize change brought about by DT
Vision	Sponsorship & Direction	IT Capability	Implementation Approach	Culture	Scope & Scale	*Business Rationale*	Governance & Compliance	Skills & Competence	Business Model Adaptability	Technology/Maturity	Ecosystem	Value Realization	Policy & Regulation	Funding & Resources	Inability to justify and secure organization-wide support for DT
Vision	Sponsorship & Direction	IT Capability	Implementation Approach	Culture	Scope & Scale	Business Rationale	*Governance & Compliance*	Skills & Competence	Business Model Adaptability	Technology/Maturity	Ecosystem	Value Realization	Policy & Regulation	Funding & Resources	Lack of ownership and tentativeness in decisions taken to catalyze success
Vision	Sponsorship & Direction	IT Capability	Implementation Approach	Culture	Scope & Scale	Business Rationale	Governance & Compliance	*Skills & Competence*	Business Model Adaptability	Technology/Maturity	Ecosystem	Value Realization	Policy & Regulation	Funding & Resources	Steep learning curve with high likelihood of mistakes and their amplified impact
Vision	Sponsorship & Direction	IT Capability	Implementation Approach	Culture	Scope & Scale	Business Rationale	Governance & Compliance	Skills & Competence	*Business Model Adaptability*	Technology/Maturity	Ecosystem	Value Realization	Policy & Regulation	Funding & Resources	Inability to harness DT-enabled capabilities and solidify gains
Vision	Sponsorship & Direction	IT Capability	Implementation Approach	Culture	Scope & Scale	Business Rationale	Governance & Compliance	Skills & Competence	Business Model Adaptability	*Technology/Maturity*	Ecosystem	Value Realization	Policy & Regulation	Funding & Resources	Inability to exploit DT as a resource at scale and unlock full efficiencies
Vision	Sponsorship & Direction	IT Capability	Implementation Approach	Culture	Scope & Scale	Business Rationale	Governance & Compliance	Skills & Competence	Business Model Adaptability	Technology/Maturity	*Ecosystem*	Value Realization	Policy & Regulation	Funding & Resources	Lack of environmental support in creating a shared goal and common results
Vision	Sponsorship & Direction	IT Capability	Implementation Approach	Culture	Scope & Scale	Business Rationale	Governance & Compliance	Skills & Competence	Business Model Adaptability	Technology/Maturity	Ecosystem	*Value Realization*	Policy & Regulation	Funding & Resources	Inability to gain traction, and avoid apathy and indifference subsequently
Vision	Sponsorship & Direction	IT Capability	Implementation Approach	Culture	Scope & Scale	Business Rationale	Governance & Compliance	Skills & Competence	Business Model Adaptability	Technology/Maturity	Ecosystem	Value Realization	*Policy & Regulation*	Funding & Resources	Lack of posturing mechanisms to foster sustained systemic change
Vision	Sponsorship & Direction	IT Capability	Implementation Approach	Culture	Scope & Scale	Business Rationale	Governance & Compliance	Skills & Competence	Business Model Adaptability	Technology/Maturity	Ecosystem	Value Realization	Policy & Regulation	*Funding & Resources*	Lack of organizational commitment and resolve to succeed

Figure 5: Consequence of Missing Factors on the Adoption of Digital Technology

5.4 Step 4: Address Shortcomings and Initiate Digital Technology Adoption

This step in the journey is to prepare and address shortcomings (plug the gaps) based on the primary consequences identified in the previous step.

As shown in Figure 6, there are three categories of organizations based on the assessment:

- Type 1: Enterprises that fulfill foundational factors only

- Type 2: Those that fulfill foundational and impact factors

- Type 3: Those that fulfill foundational, impact, and sustaining factors

If the organization does not meet the requirements of the foundational factors, it is futile to evaluate for impact and sustaining factors. Hence, it is paramount that enterprises adopt a progressive (step-wise) and Agile approach to mitigate the shortcomings. For this, the factor progression could be leveraged to initiate digital technology adoption.
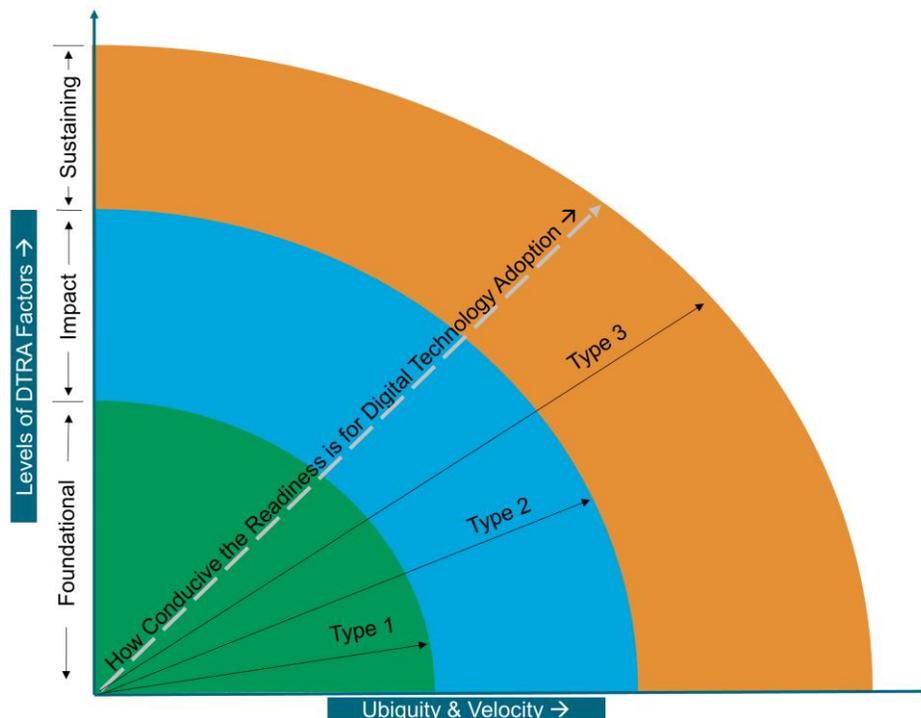
Figure 6: Factor Progression

If the enterprise is evaluated to be at Type 3; i.e., there is sufficient readiness across all three levels of factors, the readiness of the enterprise is more conducive to start the digital technology adoption than an enterprise evaluated to be at Type 2 or Type 1.

The adoption approach (Step 3) and factor progression (Step 4) are not mutually-exclusive. An organization can choose the *avant-garde* approach and then, for the selected LOB, the factor progression can be leveraged.

In this step, during the adoption of digital technology, the ADM cycle could be leveraged considering the right adoption approach (Step 1), DTRA conducted across factors (Step 2), and

strategy to mitigate the consequences of missing factor(s) (Step 3). The as-is state and target state is to be analyzed corresponding to the factors marked in various phases of the ADM cycle in the next chapter.

Note: It is recommended to follow the progressive and Agile path; i.e., foundational followed by impact, followed by sustaining factors. However, for practical reasons, the adoption might be a mixed approach and it would depend on the contextual understanding of the enterprise. In such a case, Figure 5 could be used for informed decision-making.

6 Architectural Implication and Alignment to the TOGAF ADM

Whenever the aspirational (target) state is related to digital technologies, the factors identified need to be analyzed and captured.

For maximizing the impact of DTRA, it should initiate the Architecture Vision phase of the ADM cycle to understand where the organization currently stands. Based on the outcome of the assessment, and in each phase of the ADM cycle, the as-is state and the to-be (target) state of business is analyzed, keeping relevant factors in consideration. Assessment can be a handy tool to use to re-evaluate, either at the end of the ADM cycle or vision of the next cycle to understand where the organization stands and the next steps to be undertaken.
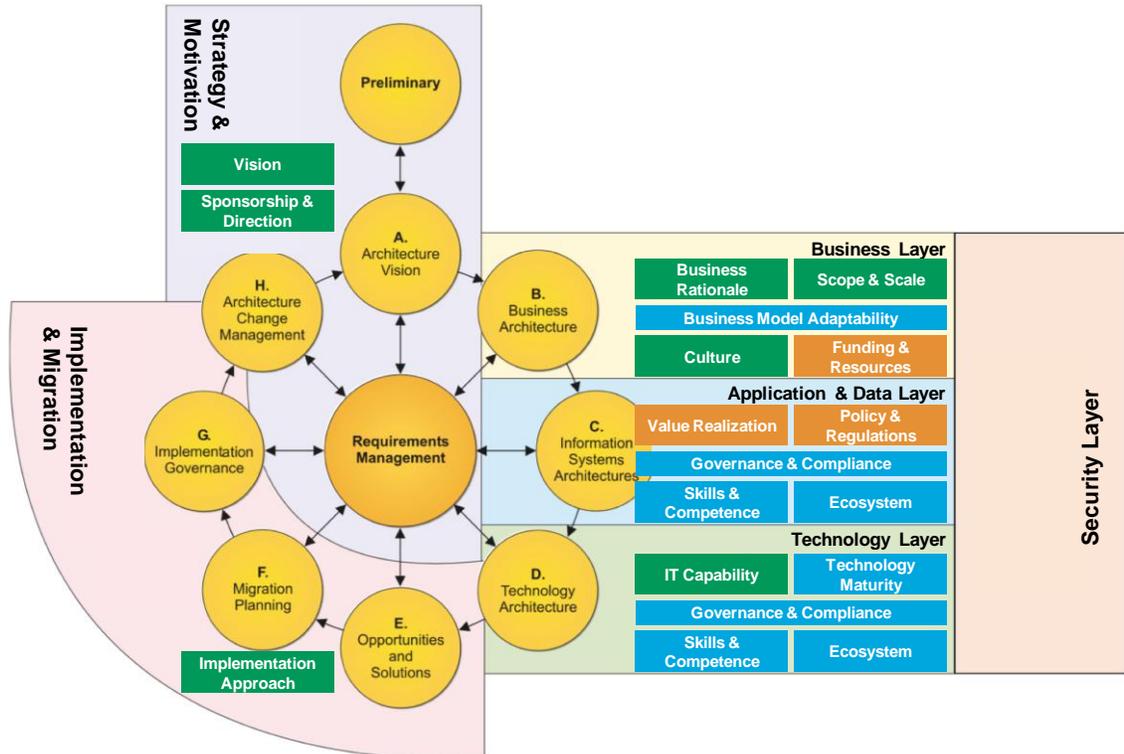
Figure 7: Mapping Factors to the TOGAF ADM

Table 2: Architectural Implications

ADM Cycle Stages	Implications
Preliminary	This phase includes the understanding of enterprise capabilities, architecture frameworks used, and the governance framework for the factors driving the digital technology adoption. It is imperative that such details are identified and analyzed to understand the capabilities better as this defines the model for such an adoption. Also, architecture principles must be defined for developing strategic plans. With an emphasis on the DTRA, the objective in this phase is to determine the architecture capability desired by the organization with a focus on digital technology.
Phase A: Architecture Vision	**Vision** **Sponsorship & Direction** During this phase, the high-level vision for the aspirational state shall be captured. The identification of stakeholders to understand business drivers and concerns, including carrying out readiness assessment, is an important step in this phase. On the basis of the assessment output, appropriate architecture paths can be selected.
Phase B: Business Architecture	**Business Rationale** **Scope & Scale** **Funding & Resources** **Business Model Adaptability** **Culture** The development of the Target Business Architecture for the strategic vision laid out in Phase A needs to be undertaken in this phase. A detailed capability assessment, analysis of business drivers and goals, along with capability assessment are important to ensure the architecture is well-defined in the subsequent phases.
Phase C: Information Systems Architecture	**Value Realization** **Skills & Competence[1]** **Policy & Regulations** **Governance & Compliance[1]** **Ecosystem[1]** As in Phase B, Phase C would include similar steps for Application and Data Architectures. The development of the Target Data and Application Architectures for the strategic vision laid out in Phase A needs to be undertaken in this phase. A detailed capability assessment, analysis of Data and Application Architecture drivers, gap analysis, and a communication plan are essential to ensure data and application components are appropriately addressed in the architecture. [1] Factor-wise, the focus is on the organization capability in terms of data and application-related prowess.
Phase D: Technology Architecture	**IT Capability** **Technology Maturity** **Skills & Competence[2]** **Governance & Compliance[2]** **Ecosystem[2]** Phase D would involve an understanding of gaps and analysis for the Technology Architecture; using technology principles to ensure the Technology Architecture is aligned to the digital adoption being undertaken by the enterprise. [2] Factors mentioned are focused on the technical prowess of the organization.

ADM Cycle Stages	Implications
Phase E: Opportunities and Solutions	Apart from gaps identified across the Business, Data, Application, and Technology domains, there is a need to find the current state of the organization holistically for digital technology adoption. Factors identified in this document are pivotal for digital technology adoption. Enterprise Architects must analyze and provide a solutioning approach towards the readiness of these factors for digital technology adoption. The gap identified in key factors identified shall help derive the intermittent and target states with precision.
Phase F: Migration Planning	**Implementation Approach** During this phase of the ADM in the digital adoption, steps need to be undertaken to ensure implementation and migration planning are aligned with the enterprise's approach and vision for the Digital Transformation. The implementation and migration strategy along with the breakdown of the implementation plan is crucial to ensure business value is delivered via proper implementation.
Phase G: Implementation Governance	Ensuring conformance of the expected target state, the Target Architecture, is a key objective of this phase. For the digital adoption being undertaken, adherence to the implementation plan is ensured via compliance and reviews. Note: Governance here implies the appropriateness of the implementation approach. This is not to be confused with the factor "Governance and Compliance" which caters to the Application, Data, and Technology Architecture phases of the ADM.
Phase H: Architecture Change Management	With any digital adoption there are bound to be changes expected to the architecture as the maturity and landscape evolve. It is paramount to ensure that the architecture change cycle is maintained for meeting changing requirements in any enterprise. Management of this change is an essential step for any successful digital technology adoption.
Requirements Management	For digital adoption, requirements management needs to be sustained and operated across all ADM phases. Changes in requirements need to be addressed with requirements impact statements. Furthermore, the changes shall be implemented in the relevant ADM phase in the next cycle.

7 Conclusion

An important first step when embarking on a digital technology adoption journey is to assess the readiness of the organization. Measuring readiness is a systematic analysis of an organization's ability to undertake a transformational process or change. Organizations need to assess the readiness of people, processes, ecosystem, technology, and systems. Likewise, organizational leadership should be evaluated based on their ability to adapt and implement digital technology. A readiness assessment identifies the potential challenges that might arise when implementing new procedures, structures, and processes within the current organizational context. Furthermore, through the identification of the gaps within the existing organization, the readiness assessment offers the opportunity to remedy these gaps either before or as part of the implementation plan.

The DTRA provides a view of how ready the enterprise is for the changes related to digital technology adoption through the lens of experience-derived foundational factors, impact factors, and sustaining factors. This provides a quantifiable measurement for the preparedness of organizations to undergo a large transformation and identify gaps to be addressed. Organizations may not want to start a big transformation initiative without knowing if they have the right resources and conditions to accomplish the evolution effectively and derive the full benefits sustainably.

Digital technologies and the transformation they bring provide a compelling opportunity to maximize the benefits to deliver value and attain growth. The DTRA helps to evaluate the current state of the organization for the respective factors. Based on industry experience, the impact of the gaps is also recommended in this document. The DTRA considers factors that apply to industries and domains across the board. The decision-maker may want to consider additional factors pertaining to the domain, industry, and organization. Similarly, the decision-maker can use the assessment questionnaire provided in a way they find beneficial in as-is form or along with additional questions that may help to gain better insight for the purpose. We recommend that you review factors where the score is other than "Strongly Agree" or "Agree", with a view to taking appropriate measures to reduce any adverse impact and to improve the probability of success. Organizations may decide their course of action based on the potential of the opportunity, the impact of failure, and the risk of disruptive changes in the ecosystem. However, it is the responsibility of the decision-maker to make informed decisions and create a meaningful roadmap based on the DTRA outcome for the next steps in order to control the impact and guide the value realization with strong governance.

A   Ready-to-Use Assessment Questionnaire

A.1   Explanation of the Scale Used

The questionnaire is to be answered using the Likert scale provided in Figure 8, where each term of the Likert scale has a distinct meaning which is explained through the illustration. For instance, the readiness of an enterprise would be marked "neutral" if the characteristic corresponding to a question is defined, validated, and understood without any commitment, dissemination, and evolution path.

Strongly Agree	Agree	Somewhat Agree	Neutral	Somewhat Disagree	Disagree	Strongly Disagree
Evolve	Evolve	Evolve	Evolve	Evolve	Evolve	Evolve
Disseminate	Disseminate	Disseminate	Disseminate	Disseminate	Disseminate	Disseminate
Commit	Commit	Commit	Commit	Commit	Commit	Commit
Understand	Understand	Understand	Understand	Understand	Understand	Understand
Validate	Validate	Validate	Validate	Validate	Validate	Validate
Define	Define	Define	Define	Define	Define	Define

Legend: Existent/Fulfilled   Nonexistent/Not Fulfilled

Figure 8: The Likert Scale

A.2   Digital Technology Readiness Assessment – Questionnaire

Foundational Factors

1	Vision
A	The organization has clarity on how the digital technology adoption will enable growth and provide a sustained competitive edge. ○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree

B	The organization has defined a time period in which to achieve the desired state with the adoption of digital technology.
	◯ Strongly Agree ◯ Agree ◯ Somewhat Agree ◯ Neutral ◯ Somewhat Disagree ◯ Disagree ◯ Strongly Disagree

C	The organization fully understands the consequence of not adopting digital technology.
	◯ Strongly Agree ◯ Agree ◯ Somewhat Agree ◯ Neutral ◯ Somewhat Disagree ◯ Disagree ◯ Strongly Disagree

2	**Sponsorship and Direction**

A	The organization has identified and onboarded the executive sponsor/sponsoring department and other key stakeholders.
	◯ Strongly Agree ◯ Agree ◯ Somewhat Agree ◯ Neutral ◯ Somewhat Disagree ◯ Disagree ◯ Strongly Disagree

B	The benefits of digital technology are understood by the executive sponsor and other key stakeholders.
	◯ Strongly Agree ◯ Agree ◯ Somewhat Agree ◯ Neutral ◯ Somewhat Disagree ◯ Disagree ◯ Strongly Disagree

C	The organization has defined the strategy, built an adoption roadmap, and secured a funding commitment.
	◯ Strongly Agree ◯ Agree ◯ Somewhat Agree ◯ Neutral ◯ Somewhat Disagree ◯ Disagree ◯ Strongly Disagree

3	**IT Capability**

A	The IT department has the independent ability to assess the digital technology fitment, utilization, and adoption process through the architecture board.
	◯ Strongly Agree ◯ Agree ◯ Somewhat Agree ◯ Neutral ◯ Somewhat Disagree ◯ Disagree ◯ Strongly Disagree

B	The IT department has the internal skills to drive a Proof of Concept (PoC) and pilot followed by the organization-wide adoption of the digital technology. ○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree
C	New digital technology helps the organization to align with the technology roadmap defined by the IT strategy. ○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree
4	**Culture**
A	The organization plans and experiments with emerging technologies regularly. ○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree
B	The organization embraces change with minimal resistance to tackle obsolescence. ○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree
C	The organization has a structured organization change management process. ○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree
5	**Scope and Scale**
A	The organization has a clearly-defined scope for digital technology adoption. ○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree

B	The organization has a clear understanding of areas where new technology should be adopted and areas where it may impact positively.

Strongly Agree   Agree   Somewhat Agree   Neutral   Somewhat Disagree   Disagree   Strongly Disagree

C	The organization has a clear understanding of the expected outcomes and ways to achieve them with the defined scope.

Strongly Agree   Agree   Somewhat Agree   Neutral   Somewhat Disagree   Disagree   Strongly Disagree

6 Business Rationale

A	The organization has a clear understanding of key drivers for embarking on the new digital technology adoption journey.

Strongly Agree   Agree   Somewhat Agree   Neutral   Somewhat Disagree   Disagree   Strongly Disagree

B	The organization has a vision of the expected benefits.

Strongly Agree   Agree   Somewhat Agree   Neutral   Somewhat Disagree   Disagree   Strongly Disagree

C	The organization has clarity on the competitive advantage that the adoption of digital technology would bring.

Strongly Agree   Agree   Somewhat Agree   Neutral   Somewhat Disagree   Disagree   Strongly Disagree

7 Implementation Approach

A	The impact of digital technology on the existing ecosystem is outlined; integration points and outcome-based objectives are clearly defined.

Strongly Agree   Agree   Somewhat Agree   Neutral   Somewhat Disagree   Disagree   Strongly Disagree

B	The organization has well-defined business and IT change management processes that are followed with discipline and governed by the respective change assessment board.
	○ ○ ○ ○ ○ ○ ○ Strongly Agree Agree Somewhat Agree Neutral Somewhat Disagree Disagree Strongly Disagree
C	The organization has a well-defined way of experimentation or implementation for any given digital technology.
	○ ○ ○ ○ ○ ○ ○ Strongly Agree Agree Somewhat Agree Neutral Somewhat Disagree Disagree Strongly Disagree

Impact Factors

8	**Business Model Adaptability**
A	The business model and services are flexible and able to adopt new digital technology to gain business benefits.
	○ ○ ○ ○ ○ ○ ○ Strongly Agree Agree Somewhat Agree Neutral Somewhat Disagree Disagree Strongly Disagree
B	The organization has the turnaround time advantage to acclimatize and enhance the business model according to changing customer demands.
	○ ○ ○ ○ ○ ○ ○ Strongly Agree Agree Somewhat Agree Neutral Somewhat Disagree Disagree Strongly Disagree
C	New digital technology helps to modify or define the organization business model and services that can provide growth and competitive advantages.
	○ ○ ○ ○ ○ ○ ○ Strongly Agree Agree Somewhat Agree Neutral Somewhat Disagree Disagree Strongly Disagree
9	**Skills and Competence**
A	The organization has the right skills and competence to negotiate the steep learning curve needed for adoption.
	○ ○ ○ ○ ○ ○ ○ Strongly Agree Agree Somewhat Agree Neutral Somewhat Disagree Disagree Strongly Disagree

B	The organization's management understands the vision and has the competence to enable the journey towards Digital Transformation.
	◯ Strongly Agree　◯ Agree　◯ Somewhat Agree　◯ Neutral　◯ Somewhat Disagree　◯ Disagree　◯ Strongly Disagree

C	The digital technology skill is readily available in the market to allow organizations to quickly ramp-up and raise the capability.
	◯ Strongly Agree　◯ Agree　◯ Somewhat Agree　◯ Neutral　◯ Somewhat Disagree　◯ Disagree　◯ Strongly Disagree

10	**Technology Maturity**

A	The technology is at an acceptable maturity level and curve that can be adopted at scale by the organization.
	◯ Strongly Agree　◯ Agree　◯ Somewhat Agree　◯ Neutral　◯ Somewhat Disagree　◯ Disagree　◯ Strongly Disagree

B	The technology has clearly-stated principles and clear use-cases which will drive adoption and usage in enterprises.
	◯ Strongly Agree　◯ Agree　◯ Somewhat Agree　◯ Neutral　◯ Somewhat Disagree　◯ Disagree　◯ Strongly Disagree

11	**Ecosystem**

A	There is an availability of an ecosystem and partners (in the value chain) who support the adoption.
	◯ Strongly Agree　◯ Agree　◯ Somewhat Agree　◯ Neutral　◯ Somewhat Disagree　◯ Disagree　◯ Strongly Disagree

B	The ecosystem is matured enough with respect to standards, protocols, open source availability, and completeness of solution.
	◯ Strongly Agree　◯ Agree　◯ Somewhat Agree　◯ Neutral　◯ Somewhat Disagree　◯ Disagree　◯ Strongly Disagree

12	**Governance and Compliance**
A	The organization has planned the accountability and ownership with partners with respect to digital technology. ○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree
B	The organization meets all the regulatory and geographical compliances for the intended use-cases. ○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree
C	The organization has a well-defined process to govern security and technology-specific challenges to fully utilize the digital technology capability. ○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree
D	The organization has well-defined, formulated, tested, and practical approaches on regulating the adoption of new digital technology. ○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree

Sustaining Factors

13	**Value Realization**
A	The organization has a clear understanding of the target user to create a positive impact with digital adoption. ○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree
B	The organization has an outlined methodology to understand the way to quantify Return on Investment (ROI). ○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree

C	The organization has outlined clear Key Performance Indicators (KPIs) to effectively measure the value coming out of the new digital technology.
	○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree

14	**Policy and Regulations**

A	The government regulations are conducive for the organization to adopt the digital technology.
	○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree

B	Policies by the government would act as a catalyst for the adoption and create a positive chain reaction in the ecosystem.
	○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree

15	**Funding and Resources**

A	The organization has the right funding and budgets allocated for the Digital Transformation program and subsequent rollouts.
	○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree

B	The organization has top-down funding/investors and support for the planned digital adoption.
	○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree

C	The organization has resources (time, material, people, etc.) to enable the digital technology adoption.
	○ Strongly Agree ○ Agree ○ Somewhat Agree ○ Neutral ○ Somewhat Disagree ○ Disagree ○ Strongly Disagree

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