



# CHAIR IN DIGITAL ECONOMY

## DIGITAL BUSINESS TOWARDS A VALUE-CENTRIC MATURITY MODEL

**PART B**

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# PREFACE

The business environment is rapidly changing and technology is shaping the way organisations can transform, gain and retain competitive advantage. Digital technologies are enabling new ways of producing goods and offering services; identifying better ways to engage customers, employees and supply chains; improving operational efficiency and fostering innovation. However, not all businesses are performing equally – some are embracing the opportunity, some are emerging, while still others are struggling to cope with the changes. What are the key attributes of a successful digital business and what are the necessary steps to achieve success? Is technology, or perhaps leadership, strategy or culture the starting point? These questions have not been investigated in a systematic manner, especially in the context of verifying and testing them with a combination of academic and practical rigour.

This study provides a solution in the context. Following it will likely not only improve your digital capability, but also help generate higher returns on your investment and allow you to thrive in the digital economy.

The Digital Maturity Model proposed in this report consists of **six digital capability indicators** and **seven digital impact indicators**. The maturity model has been developed through extensive literature review, industry and expert panel consultation with academics and businesses. The model will help organisations run a successful digital transformation to cope with emerging challenges. The model will also help assess organisations' progress in implementing these technologies, and assist management in identifying new pathways for improvement and compare the progress with others.

We hope your organisation will benefit from this maturity model.



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## EMERGENCE OF DIGITAL BUSINESS MATURITY MODEL

As the technological landscape is rapidly changing, organisations must also transform or become victims of ‘digital Darwinism’[1]. This has led to the emergence of the concept of a ‘digital maturity model’ that seeks to guide organisations in digital transformation.

Digital transformation is defined as the process whereby a business becomes increasingly digital over time by leveraging digital technologies to provide new revenue and value-producing opportunities. This involves a complete integration of technology into all aspects of a business to improve performance [2].

A ‘digital maturity model’ can therefore be defined as the extent to which a digital transformation process is explicitly defined, managed, measured and continuously improved. The maturity level can be assessed in terms of measurable target values that can be achieved in incremental steps [3].

Since the early 1990s, a large number of maturity models have evolved [4, 5]. In a systematic mapping, Wendler [5] finds that maturity models are applicable to more than 20 domains. These include software improvement [see, 6, for a review of over 300 articles], business process management [4], knowledge management [7], IT governance [8], IT alignment [9], risk management [10], project management [11] and so forth.

However, most maturity models are domain-specific, considering one or more functional or managerial attributes.

There is a lack of research on organisational overviews of digital maturity models. The gap in knowledge exists at both theoretical and empirical fronts, particularly in evaluating and validating developed ‘digital business maturity models’.

6.

HOW DOES

## A MATURITY MODEL WORK?

Maturity models are based on the assumption of predictable patterns of evolution. Models usually include a sequence of levels (or stages) that together form an anticipated path from an initial state to optimal maturity [12, 13]. Maturity is assessed across several dimensions that together form the object of measurement.

Accordingly, characteristics for each stage and the logical relationships between successive stages need to be explicated. In practice, the maturity levels indicate an organisation's current (or desired) capabilities and provide improvement measures to achieve a greater maturity [14,15].





## HOW ARE MATURITY MODELS USED BY BUSINESS?

Maturity models are used by managers in three key ways:

### DESCRIPTIVE USE

- To assess the 'as-is' state of particular organisational capabilities [12]
- As a diagnostic tool [16]
- To report maturity levels to internal and external stakeholders

### PRESCRIPTIVE USE

- To identify desired maturity level and receive guidance on how to improve from current maturity level [12]
- To follow specific and detailed courses of action [16]

### COMPARATIVE USE

- To compare performance of the organisation through internal or external benchmarking [14, 16]

# DEFINING DIGITAL CONCEPTS AND IMPACTS

The starting point for developing a 'Digital Business Maturity Model' is to define the term 'digital business'.

The concept of the 'digital business' is an evolution of earlier knowledge-based businesses and is considered to be the driver of the Fourth Industrial Era. At its essence, it means to create or derive significant value in business based on digital technologies [1].

In a digital business, information technology is used in internal and external operations to create a competitive advantage [17]. In other words, digital business blurs the digital and physical worlds [18]. Given on the opposite page are some formal definitions/characteristics of a digital business.

## DEFINITIONS OF A DIGITAL BUSINESS

- A digital enterprise is “a company, irrespective of history or industry – whose IT plays a dominant role in the corporate strategy, i.e. where IT is used in internal and external operations to create a competitive advantage.” [17].
- A digital firm is the one “where nearly all of the organisation’s significant business relationships with customers, suppliers and employees are digitally enabled and mediated. Core business processes are accomplished through digital networks spanning the entire organisation or linking multiple organisations.” [19].
- “Digital Masters are companies that use digital technologies to drive significantly higher levels of profit, productivity and performance – these [companies] do exist, but they are rare” [20].
- ‘Digitalisation’ or ‘to digitalise’ can be defined as “the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business” [18].
- “Organisational change through the use of digital technologies and business models to improve performance” [21].
- “The integration of technology into all aspects of business in order to create fundamental changes in how they function and become more valuable to their customers (more than just getting rid of old technologies and adopting new ones)” [22]
- Digital businesses improve customer experience, offer new digital products and services, and digitalise internal processes [23].
- Digital transformation is “a specialised type of business transformation where IT plays a dominant role. In the digital age, new business opportunities arise and enterprises transform their strategy, structure, culture and processes using the potential and power of digital media and the internet” [17].

The definitions above provide important characteristics of a digital business. These characteristics include strategy, digital network, technology capability, digitalised business process, new business model, organisational change, operational change, customer experience, digital products and services, structure, culture and so forth.

The emerging consensus however is that ‘digital business’ is a people issue, where organisational ‘vision’ and ‘innovation culture’ drive digital transformation. We discuss these two aspects briefly over the page.

# VISION AND INNOVATION CULTURE

## IN A DIGITAL BUSINESS

Vision refers to the long-term goal of an organisation, which is the ultimate reference point of success of an organisation [24].

Digital technologies, the pace and prevalence of these, are forcing organisations to re-imagine business models, change process, upgrade technology, and improve products and services [25]. These changes, while bringing plenty of promising opportunities, pose a plethora of challenges to navigate through the transformation process.

A vision is a 'wayfinder' in the context meaning that the transformation requires to be 'purpose driven'. A digitally mature organisation should have a clearly articulated vision and design strategies and courses of actions accordingly to achieve the goal.

Technology is seen as a strong 'driver' and 'enabler' in the transformation, however, unless there is a significant amount of human efforts to understand the core (i.e., purpose) on the changes, nothing can be gained

The second human effort every digitally matured organisation needs is to have a 'culture of innovation'. In the age of intense competition, massive disruption and hyper changes, organisations that are agile can survive and organisations that are innovative can thrive. Innovation can lead the creation of new business models, improve business process or explore new markets [1, 27]. However, in order to achieve innovation

potential, organisations need to invest time and resources to embed an innovative and agile culture – 'the capability of the entire organisation to perceive, think and react to its various environments in a timely manner' [28, 29].

In a digitally mature organisation, both vision and culture sit together to generate value from the transformation process. Digital businesses benefit from a diverse resource base, an innovative culture, a clear vision, and how in the contemporary environment digital technology supports the transformation process.

## DIGITAL BUSINESS EXAMPLES

When we think of digital organisations a number of examples come to mind like Amazon.com, Apple, Facebook, Google and Netflix.



While some of these organisations were born digital (e.g. Facebook & Google), the majority of digital organisations began as analogue and have re-imagined themselves in the digital world.

An example of this is the US company Netflix, which started as a DVD mail rental business in 1997. In 2007, Netflix expanded its business with the introduction of streaming media, while retaining the DVD and Blu-ray rental service. Netflix took its streaming service international in 2010 starting with Canada, and now operates in over 190 countries.

Therefore, in order to be a digitally mature organisation, the business does not necessarily have to be born digital, but must have the ability to reimagine itself in the digital world. This is where vision, innovation and technology support each other.

## REFLECTIONS OF THE OVERALL ECONOMY

So how do examples of digital masters (like Google, Facebook and Apple) fit into the context of other small and medium sized businesses in the new economy?

In the last two years, the Chair in Digital Economy has been working closely with small and Medium Scale Enterprises (SMEs) in Queensland [30]. Our research indicates that while the use of technology varies across SMEs, most successful businesses have the ability to apply technology in an innovative way to provide unique product/service to customers. For example, firms having produced itself either a piece of technology or a distinct application of technology to the production process.

Technologies play a key role in the manufacturing process and the product is therefore different to all similar products because of the distinctive ways in which the manufacturing technology is constructed and applied. As the owner of a successful manufacturing firm puts it, “[in the factory] there’s sensors and belts that turn off and on again...all linked to the computer and phone so [owner 2] can monitor production and change settings to ensure high quality is produced...” [30] p 20].

Similarly, for a successful services firm, the way technology is combined at this firm to create a holistic energy system and customer solution underpins their growth. An engineer at the services firm described it as:

*“...the systems are quite sophisticated with their battery management capabilities: they have data logs, fault logs and all kinds of things like that. We program the system from a huge range of settings and we have the ability to download and see exactly how it has been operating. Every minute is logged so we know exactly what load is being applied as well as how much electricity is being generated at any point in time. So we know more about the performance of the system than the owners do” [30] p 20.”*



What this means is that these firms are able to have useful conversations with their customers and troubleshoot problems quickly and easily.

Successful firms in the digital age are not the firms that are relevant within a digital silo, but the firms who are able to implement digital at the organisational level. Technology can lead firms to success only when a firm has a great product or a compelling problem to solve. Similarly, the culture of the whole organisation is to embrace change and offer better services and products to customers in a timely manner.

Our 'Digital Maturity Model' is likely to help businesses to grow, sustain and leverage opportunities from the transformation process.

We describe Digital Maturity as the process whereby a business becomes increasingly digital over time by leveraging new digital technologies to provide new revenue and value producing opportunities [1, 17, 21, 31].

# PROCESS BEHIND THE CREATION OF THIS DIGITAL MATURITY MODEL

## LITERATURE REVIEW

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A literature review was conducted to understand organisational maturity models, their dimensions and the process that should be undertaken to create a new digital maturity model.

By understanding the intent of other models, we can identify the gap in current research.

## DELPHI WORKSHOP WITH CONTENT MATTER EXPERTS

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The Delphi method is a communication method to get feedback on a questionnaire from a panel of experts.

In this method experts provide feedback on questionnaires and the responses from them are aggregated and shared with the group after each round.

## IDEATION WORKSHOP WITH INDUSTRY

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Industry participation has been pivotal in the co-creation of this digital maturity model.

An ideation workshop was organised with two leading digital consultancies to test the usability and efficacy of the questions which determine digital maturity of an organisation.

# LITERATURE REVIEW

## BUILDING THE FRAMEWORK

The first phase of development was to undertake a comprehensive literature review. The purpose of this review was to provide critical analysis of published sources on maturity model development and answer the following research questions:

1. What is the process for maturity model creation?
2. What are major components of digital transformation?
3. What are the classification criteria of a maturity dimension that should be incorporated in the present model?

This phase was undertaken through desktop research.

### SCOPING

To narrow the scope of the review, the following databases were used for research: Google, Google Scholar and QUT Online Library. Searches were limited to find articles from peer-reviewed journals and books. Figure 1 shows the alternative search terms to find appropriate literature.

## KEY FINDINGS

### MATURITY MODEL DIMENSIONS

Our literature review identifies existing maturity models in the following domains that may be relevant to our model based on the potential digital maturity dimensions listed below (with key references in the parenthesis).

The following maturity models were identified as being relevant:

- Business process management (BPM) [32-34]
- Leadership, Organisational Leadership [20, 34]
- Risk management [35, 36]
- Digital business transformation [1, 17, 37]
- IT functions/IT alignment [9, 38]
- IT governance (organisational leadership & culture)[39, 40]
- Knowledge management/ Innovation management [7, 41, 42]
- Software improvement/Engineering process ([42, 43]
- User experience (UX) [44, 45]

Maturity dimensions are the specific, measureable and independent elements

### LITERATURE REVIEW SEARCH TERMS: FIGURE 1

Define/Defining/Definition Digital  
 Digital organisation  
 Digital organization  
 Digital maturity  
 Digital immaturity  
 Digital company  
 Digital business

Attributes Digital  
 Organisations digital economy  
 Transition to Digital  
 Analog v Digital  
 Digital transformation  
 Maturity Model  
 Maturity Model Development

which reflect the fundamental components of maturity in a given business area (Domain) [14]. Each of these maturity models uses a structured collection of dimensions that describe the characteristics of effective processes at different stages of development. These dimensions have been used in generating a framework for this project.

### MATURITY MODEL ATTRIBUTES

There are different attributes of the existing maturity models. These can be divided into three broad categories: Technology and Integration; People and Management; and Product and Service. These are briefly discussed below.

### TECHNOLOGY AND INTEGRATION

The first aspect of Digital Transformation this model will analyse is Technology and Integration. This refers to an organisation's use and adoption of new digital technologies and their integration with existing legacy systems.

### *Breakthrough Digital Technologies*

Digitisation is driven and enabled by technology breakthroughs [46, 47]. These technologies have an increasingly wide reach and dissemination and are transforming the way industries operate [1, 48]. These technologies are pushing boundaries and leveraging scale to witness “an era unmatched in the history of business innovation and transformation”[1].

These breakthroughs occurs due to Moore's law and Metcalfe's law, suggesting that technology capabilities are evolving at an exponential pace. In order to cope with the changes, Digitally mature organisations can respond effectively and quickly to new technologies [49].

### *Existing Technology/Legacy Technology*

The existence of legacy technology can be a barrier to digital maturity as it can create problems when it takes significant time, energy and expense to change [49]. Legacy technology may be considered a risk factor

TABLE 1 [MATURITY DIMENSIONS AND INITIAL SOURCES]

MATURITY DIMENSIONS	INITIAL SOURCE
Technology Foundation	(Fitzgerald, Kruschwitz, Bonnet, & Welch, 2014) (Soule & Westerman, 2016) (Marchand & Wade, 2014) (Ross et al., 2016) (Kane, Palmer, Phillips, Kiron, & Buckley, 2015) (Gimpel & Röglinger, 2015) (Oswald & Kleinemeier, 2017)
People and Management	(Fitzgerald et al., 2014) (Kane et al., 2015) (Keen & Williams, 2013) (Faeste, Gumsheimer, & Scherer, 2015) (Marshall, 2017) (Marchand & Wade, 2014) (Ross et al., 2016) (Soule & Westerman, 2016) (Kohnke, 2017) (McAfee & Welch, 2013) (McAfee & Welch, 2013; Oswald & Kleinemeier, 2017)
Customer Centricity	(Fitzgerald et al., 2014) (Soule & Westerman, 2016) (Ross et al., 2016) (Berman, 2012) (Oswald & Kleinemeier, 2017)

within the maturity model. The model may also address how well the organisation integrates new technologies with old.

#### *Objects of Digital Technologies [47]*

Digitally 'mature' firms use digital technologies to achieve the following purposes:

- Digitalised Operations (process and work)
- Product and services.
- Business Models

The model should assess where digital technologies are in use in the organisation and how they are being used. Key indicators of technology adoption include funding new technology adequately, effective integration of new and old systems [49], integration of all customer touch-points including the digital and physical channels, digitally enabled supply chains [50] and re-imagine new business models, products or services.

#### *People and Management*

Recent studies highlight the critical importance of a company's 'people and management' for effective digital transformation [51]. These aspects of digital capabilities are found in an organisation's leadership, strategy, processes, people, skills, business models, structure, governance, and culture [1]. A company's digital capabilities are distinct from its digital assets.

#### *Digital Assets versus Digital Capabilities*

Digital technology as a source of competitive advantage encompasses both digital assets (e.g. hardware, software) and digital capabilities (e.g. managerial skills, strategy).

The implementation of tangible digital

assets is not enough on its own to sustain a competitive advantage. Rather, it is an organisation's ability to successfully leverage digital technologies through digital capabilities that is a strategic differentiator [52]. This means that without capabilities supporting the adoption of new technologies, there is no certainty that the shift will create value for an organisation [53].

This is why our maturity model has drawn the single concept of 'Digital Capability' which covers both technology and 'people-centric' elements of the organisation.

#### *Capabilities of Digitally 'Mature' Organisations*

Analysis of the literature reveals that digitally 'mature' organisations tend to have the following digital capabilities (competence areas);

1. A clear, coherent and well developed strategy for how digital will be incorporated into business;
2. Leadership, management and governance that supports its strategy;
3. Investment in digital knowledge, skills and competencies to realise its strategy; and
4. A proactive culture that embraces innovation.

These capabilities complement one another, and in tandem allow a business to achieve the highest level of digital maturity [54].

Each capability may be further broken down into competence categories. Analysis of how each of these competence categories are managed by an organisation will reveal its pathway towards 'people and management' digital maturity.

## PRODUCT AND SERVICE

The final aspect of a maturity model is the outward, 'final product/service' aspect of digital transformation. As consumers are the end beneficiaries of digital transformation [1] an organisation's ability to adapt and respond to their needs is the third crucial aspect of digital maturity [46].

## TECHNOLOGY AS A PRODUCT

The concept of maturity model initiated with the concept of quality management of software process [43, 55, 56], with the Capability Maturity Model (and its derivatives) being a dominant example in the software engineering domain. These models recommend a path to improve the software process capability of an organisation, but the majority of them provide a process centric approach to improvement rather than organisational view of digital maturity.

## TECHNOLOGY AS A SERVICE

Technological advances and more widespread dissemination of data and information have given rise to a more empowered global consumer. Customers now have real-time access to competitive price tags or peer reviews on products that allow them to make informed choices.

Customers expect to be able to access information about the company and its products at any time from any device for any purpose [1]. Digitisation (mobile and social technologies) also gives businesses new opportunities to interact with customers. For example, social networks can be used to listen and to better understand customer opinions.

These technologies can also be used for communicating with customers to provide better customer services[1]. There is a

growing expectation to provide services in real-time manner ( 24/7) or even to deliver service proactively before they ask for the service (knowing that the customers will need it).

Organisations need to understand which of their business models, processes and interactions with customers have to change to be effective in a digital world, and which will continue to be effective [1]. They can do this using tools to understand the implications of digital transformation for different stakeholder groups. These tools include:

- Change impact analysis [57]
- Customer journey map (describes customers' expectations, experiences and reflections as it unfolds over time across multiple stages and touch points while using a product or consuming a service) [58]

Oswald recommends focusing on the customer journey to ground the digital transformation in the practical realities of change by maintaining a strong customer orientation [1] [59]. After mapping the customer journey, organisations can focus on how the rapidly evolving digital technologies can make touch points better, faster and more efficient [59].

To sum up, a digital business maturity model should be comprehensive enough to capture all three attributes, i.e., Technology and Integration; People and Management; Product and Service as discussed above. Existing literature provides guidance to identify capabilities across these attributes.

# DELPHI WORKSHOP

## THEORETICAL CONSENSUS

From the review of the literature we tentatively identified a number of capabilities that could be measured to assess an organisation's progression towards digital maturity (Appendix A, Handout 2). In this phase of research, the Delphi technique was used to verify and challenge these identified capabilities.

The Delphi technique is a widely used and accepted method for consensus-building among a panel of experts. Panelists are selected based upon their expertise, somewhat related backgrounds and experiences concerning the target issue, capable of contributing helpful inputs, and are willing to revise their initial judgements for the purpose of reaching consensus [60, 61].

### THE DELPHI PROCESS

Subject matter experts were selected from a wide range of disciplines and backgrounds including IT, economics, engineering and business. The experts were brought together for a workshop where they were each given a list of 32 business capabilities and definitions. The experts were then asked to individually rate importance of including each of the dimensions in the maturity model. After the experts had completed this activity individually, the group came together to build consensus.

## THE FOLLOWING DISCUSSION POINTS AND CONSENSUSES AROSE IN THE WORKSHOP

### 1. HOW DO WE DEFINE MATURITY?

The discussion began with a general consensus that it is essential to have a sound working definition of maturity.

For example, should maturity be defined as having good returns on investment? If that is the case, then maturity is only achievable with a good understanding of product and customers from the inside and this should be included in the model.

On the other hand, if maturity is measured on a scale from non-digitally native company against digital native company then these businesses will have opposing organisational structures and this will need to be reflected in the model.

### 2. WHAT ARE THE KEY CAPABILITIES OF DIGITALLY MATURE ORGANISATIONS?

There was a general consensus among the panel that digital leadership is one of the most important capabilities of a digitally mature organisation. This implies funding, culture and influence towards digital initiative.

The group also agreed that management, accountability and training are essential capabilities to support leadership. The second most important capability discussed was the ability of the organisation to innovate. The panelists discussed that this would include capabilities such as culture, design thinking, problem handling, governance, risk tolerance/appetite and risk management.

### 3. TECHNOLOGY ALONE IS NOT AN INDICATOR OF MATURITY...

There was a strong consensus among the panelists that technology on its own is not sufficient to be an indicator of digital maturity. The panelists discussed that maturity is more about business awareness of HOW, WHY and WHEN particular technologies should be used. The amount of technology in use in businesses will also vary from sector to sector. The panelists also discussed that knowledge management is crucial in terms of businesses being able to conduct cost/benefit analysis to implement or outsource new technology.

*The insights gained in the Delphi workshop were then used to create a 'Draft' digital maturity model that was tested in the next research phase.*



*Image #1 - Expert panel reaching consensus*

# PILOTING AND TESTING THROUGH ONE-ON-ONE INTERVIEWS WITH INDUSTRY STAKEHOLDERS

## ACTIVITIES

The industry workshop commenced with an introduction to the thinking and literature review that had informed the design and development of the Digital Maturity Model.

### MAPPING THE GAPS - COMPLETE THE QUESTIONNAIRE WITH ROLE PLAY

The thinking behind this activity was for participants to assume the role of their clients to complete the questionnaire from start to finish without assistance. As this was being conducted, participants were asked to write on post-it notes, what doesn't make sense and what gaps exist in the questions and framework.

### IDEATION - SOLVING IDENTIFIED ISSUES

As problems emerged in the first activity, they were captured to be resolved later. These problems with questions, language and discovered framework gaps were brought up for group discussion to expedite resolution.

### HOW DOES THE DMM FIT INTO THE CONTEXT OF THE BROADER CONSULTING WORKFLOW?

The last activity was a discussion about how this framework might be used into the broader consulting workflow for each consultancy.

# INTRODUCING...

## A DIGITAL MATURITY MODEL TO UNLOCK INNOVATION

The following will provide the Digital Maturity Model developed in this study and a brief overview of the digital transformation maturity indicators and concept. The methodological process involving the development of the model is presented in Appendix A.

## HOW TO USE THE MODEL

To use this model, businesses will need to complete a survey to measure the organisational performance of each of the capability and impact indicators. The survey requires businesses to consider a series of statements and rate their own performance on a scale from strongly disagree to strongly agree.

### DIGITAL MATURITY

Organisations reach the highest level of maturity when they have both a strong digital foundation (digital capability indicators) and a good understanding of how to leverage this foundation for a strategic business advantage (digital impact indicators).

Organisations follow four distinct stages to navigate the digital maturity journey. These stages are: Initiate, Competent, Purposeful and Transformative. Each of these stages deals with the company's level of digital maturity and criteria to be met to move to the next stage.

## VALUE PROPOSITION OF OUR DIGITAL MATURITY MODEL

- Allows identification of digital maturity stage across different dimensions.
- Model findings can be used to identify and direct digital maturity activities.
- Facilitates informed decisions about prioritising areas for development.
- Can be applied over time – and supports as a longitudinal study, the measurement of actual progress in digital transformation.
- Allows benchmarking of organisation compared to competitors.

## STAGES OF DIGITAL MATURITY

The Digital Maturity Model proposed in this report consists of four stages. They are: Initiate, Competent, Purposeful and Transformative. The key attributes of businesses related to each of these maturity stages are given in Figure 2.

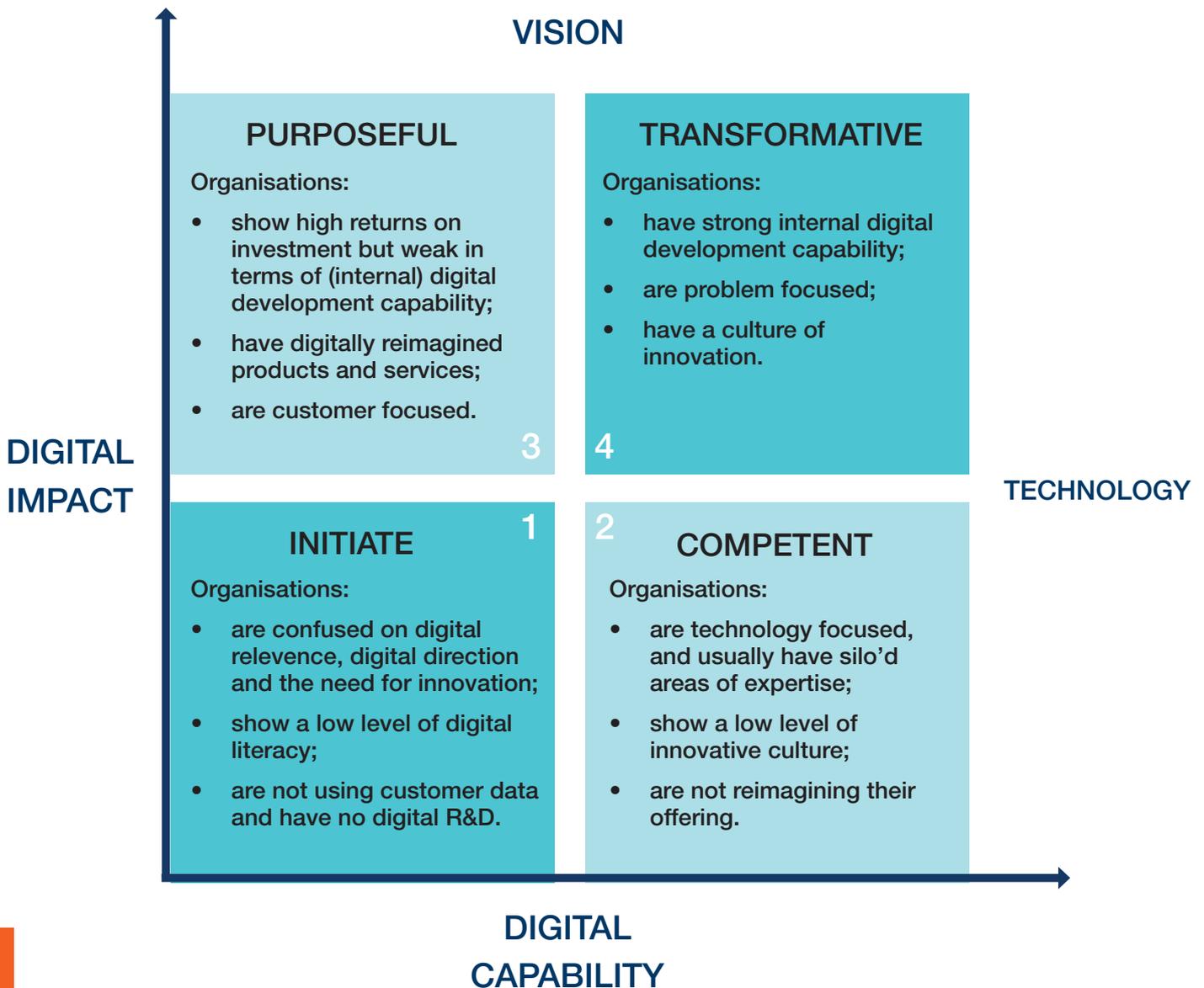


Figure 2. Stages of Digital Maturity and Key Attributes of Businesses in Each Maturity Levels

# INDICATOR DEFINITIONS

The digital business maturity model measures digital maturity across two axes; 'digital capabilities' and 'digital impacts'.

## DIGITAL CAPABILITY INDICATORS

The Digital Capability Indicators measure the ‘strength of the organisation’s digital foundation. This goes beyond physical technology infrastructure and encompasses the aspects of the organisation that allow it to derive value from technology. This includes strategy, talent and skills, risk management and customer experience.

There is a prevailing view that organisations need only to focus on implementing the latest technology trend (e.g., mobile app, cloud, IoT etc) in order to “become digital”. Instead, they should be concerned with developing a culture and practice of continually evaluating and adopting the most relevant technology and integrating it thoroughly into the business in order to exploit opportunities in the market.

- Strategy
- Digital Infrastructure and Platforms
- Risk Management
- Talent and Skills
- Customer Experience Design
- Technology Ecosystem Design

## DIGITAL IMPACT INDICATORS

The Digital Impact Indicators measure how digital technologies are leveraged to respond to consumer demand and changes in the environment through improved product and service offerings. In other words, the demand side of digital maturity is how well the organisation understands the consumer (and the business processes of the consumers’ lives) and positions itself to the consumer through brand, experience and technology.

The systems and processes that drive consumers’ everyday lives are so complex that digital business which are able to use technology to improve the customer experience and re-imagine their own role in this complex context can only expect to make a transformative impact in the market.

- Vision
- Leadership
- Governance
- Innovation Culture
- Value Alignment
- Business Agility
- Revenue Resilience

# DIGITAL CAPABILITY INDICATORS

## STRATEGY

Strategy is the tool an organisation uses to map out the pathway it will take to pursue its goals, taking into account the threats and opportunities it sees in the environment, and its resources/capability constraints [62].

For a successful digital transformation, organisations need to have a clear digital strategy that provides a strong vision [54]. This strategy should essentially outline how digital opportunities will be exploited for new business value [1, 63].

Research shows that digitally mature organisations are nearly twice as likely as less digitally mature organisations to have a single person or group leading the implementation of a digital strategy [54]. This suggests that organisations should allocate clear roles and responsibilities for creating and implementing a digital strategy [63] [54].

Research finds that the more successful digital organisations tend to have digital strategies that focus on transforming the business as a whole as opposed to

transforming operations [54]. Other studies show that successful digital strategies tend to be consumer-focused and realise that consumer value changes over time in response to the environment [1, 64].

To facilitate these requirements, organisations should look at whether there is a close fit and alignment between their digital business strategies and other business strategies (e.g. IT strategy, marketing strategy) to ensure digital business strategy is comprehensive [65].

### *Digital Strategy Checklist*

- A clear strategy outlining steps of digital transformation
- Transforming the whole business rather than one or more operational silos
- Digitisation of productions and services and the information around them

## DIGITAL INFRASTRUCTURE AND PLATFORMS

Infrastructure and platforms refer to the underlying technological assets of an organisation and how these are integrated into business processes.

In the digital transformation literature, technology infrastructure is considered to be the foundation from which digital transformation can occur [23, 50, 66]. Technological assets in this context are the systems and processes that ensure the organisation's core operations are scalable, reliable, predictable and of high quality [67]. These might include hardware, software, data management technology and network technology [18].

In digitally mature organisations, technology infrastructure should be well integrated across all aspects of the business and have scope for improvements to be built upon it. Better integration and scope for improvement allows the organisation to quickly react and adapt to changes (improves business agility).

A potential area of concern would be where there is significant legacy technology (outdated computer systems) within the organisation. This can impede maturity as it creates information silos and can take significant time, expense and energy to change (impeding business agility) [49].

Digitally mature organisations should also be able to respond quickly and effectively to new technologies [49]. They may have processes in place to discover, assess, select and fund the adoption of new technologies in the business and integrate them with other existing technologies where necessary.

## *Digital Infrastructure and Platforms Checklist*

- Fund technology adequately and confidently
- Invest in people and culture
- Integrate new technologies seamlessly with older legacy technologies
- Technology supports real-time customer insights and real-time business decision making
- Data is used for environmental sensing, machine learning and/or predictive analysis

## RISK MANAGEMENT

While digitally mature organisations should have a proactive culture that tolerates risk taking behaviour, they must be equally proactive when it comes to digital risk management [1, 31].

While there are some tensions between risk management and digital innovation, the literature suggests that accurate application of risk management theory combined with strong interaction between leadership and management will effectively enable more and faster innovation [35, 68].

In our model, it is crucial that this process of risk management is embedded within the culture of the organisation. In particular, a digitally mature organisation has a clear awareness of risk factors inherent in a programme of digital transformation (including the risk of not transforming) and fosters a proactive quality culture (and supporting technical systems and processes) to build an environment where innovation can be pursued rapidly with confidence.

Good risk management enables an organisation to innovate faster and with greater confidence.

#### *Risk Management Checklist*

- Services, systems applications and tools protect the organisation from cyber-attacks and other security risks
- Risk factors are assessed when it comes to technology investment
- Scalable technology is used to meet demand
- Risk management is an embedded part of the culture and processes of the organisation

### TALENT AND SKILLS

Organisations should be proactive when it comes to attracting and retaining the digital talent needed to realise the business strategy and ensure all employees are equipped with appropriate digital skills.

Key digital skills required in digital organisations include digital fluency (technology literate employees), the ability to work in interdisciplinary teams, collaboration, resilience, information management, critical thinking, creativity and problem solving [69].

Digital disruption has (and continues to) cause a massive increase in the amount and types of data, information and knowledge that is available to an organisation (for example customer demographics, website visitor analytics, email campaign responses, social media engagement and data from wearable devices.). Besides affecting the power dynamic between different stakeholders, organisations now require experts to interpret and make sense of this data.

Practical skills in specialist areas such as machine learning are rapidly emerging as a key requirement for the modern digital enterprise. Further, effective knowledge management is needed to use this data in a strategic way [7, 70].

#### *Talent and Skills Checklist*

- Employees are skilled at facilitating digitisation or can access people with these skills as needed
- High quality technical staff are attracted to the organisation
- Employees can quickly find solutions to business or customer problems

### CUSTOMER EXPERIENCE DESIGN

Customer experience refers to the entirety of all interactions between an organisation and customer over the duration of their relationship [71].

Technological advances and the more widespread dissemination of data and information have given rise to a more empowered global consumer [1]. Customers now have real-time access to competitive price tags or peer review on products that allow them to make informed purchasing choices, and expect to be able to access information about the company and its products at any time, from any device, for any purpose [1].

Customers may also be internal users, rather than end-user consumers, but are likely to bring similar expectations of end-user experience in terms of performance and usability.

It is critical that digital organisations understand the customer experience to satisfy customer expectations through a

myriad of touch points, channels and media [72]. Organisations should also be looking towards using real-time customer data to customise services and to sense shifts [73].

#### *Customer Experience Checklist*

- User experience research is used to understand customer pain points to design tailored products and services for customers
- Customer experience is fully integrated across all areas of interaction with the organisation
- Customer experience is continuously improved at both the physical and digital levels
- Customers are able to effectively communicate to address complaints and resolve issues

### TECHNOLOGY ECOSYSTEM DESIGN

Digital technology affords organisations with the opportunity to improve engagement and collaboration with suppliers and partners for mutual benefit [1].

Ideally, all elements of the organisation's supply chain should be digitally enabled, effectively integrating digital across the entire enterprise [19, 50]. In particular, organisations should take advantage of API (application programming interface) sharing to improve the success of digital initiatives. APIs provide an interface that allows different programs to communicate with one another [74].

For example, API sharing makes it possible for businesses like Uber to take advantage of data from services like Google Maps and for services like Spotify to allow users to sign in to that service with their Facebook login. In these and many other examples, end users become system integrators,

by choosing which components of the ecosystem they wish to connect together.

Physical devices also play a part in this ecosystem. The emergence of credit-card readers which enable mobile phones to become Point of Sale systems is a simple example. Internet-enabled lights, security cameras and thermostats already integrate with mobile phones for control, monitoring and location sensitive logic, and we expect significant growth in the need for digital businesses to interoperate with a wide range of digitally enabled devices.

#### *Technology Ecosystem Checklist*

- Digital connections with the business network (e.g. through API sharing)
- Technological foundation that optimises collaboration with suppliers and end-users
- Interoperable technology platforms enable the delivery of more efficient outcomes (e.g. through re-use of specialized common services, such as Re-Captcha, or common digital identity services)
- Interoperable technology platforms enable new or highly customisable solutions to be configured by end-users (e.g. automation of physical processes and environments, management of personal health data aggregated from many service providers and wearable devices)

# DIGITAL CAPABILITY INDICATORS

## VISION

Vision is the ultimate reference point of long-term success of an organisation. It reflects either visionary or more pragmatic goal of the organisation and reflects its future state.

A digitally mature organisation should have a clearly articulated vision, design strategies and course of actions to achieve their desired goal.

### *Vision Checklist*

- Digital technology realises the vision of the organisation
- The organisation is customer centric and creates digital value through innovation
- Digital strategy aligns with the overall business strategy
- Digital allows the organisation to achieve desired goals

## LEADERSHIP

The leaders of a digital organisation should have a keen ability to identify and realise

opportunities for business growth and value creation through the use of digital technologies [9]. In realising opportunities, they should be leading transformation and innovation activities in the organisation by creating a proactive culture (where employees are encouraged to express their knowledge for the companies benefit), encouraging team collaboration, allowing risk taking and promoting a mindset of curiosity (i.e. failure is seen as a prerequisite for success) [10].

### *Leadership Checklist*

- Leaders have a compelling long-run vision
- Leaders actively identify and realise new opportunities
- Leadership empower employees to collaborate to achieve objectives

## GOVERNANCE

Transformational governance is the framework an organisation develops for establishing accountability, roles and decision-making authority for the

organisation's digital strategy (that will transform the business) [75].

Governance should be focused on building the organisation's capabilities so that it is able and efficient and dynamic (the organisation is agile and responsive to change) [40, 75].

#### *Governance Checklist*

- Everyone in the organisation has a mandate to think creatively and innovate
- Rigorous and systematic approaches are taken to innovation and change management
- Staff are empowered to work autonomously
- Both small experiments and enterprise initiatives are used to realise innovative ideas

### INNOVATION CULTURE

Organisational culture is the set of shared assumptions an organisation holds that determines how it perceives, thinks about and reacts to its environment.

In digital organisations, it is necessary to create an innovative culture whereby the organisation can continually improve its offering to customers. For this to occur, risk taking should become a cultural norm within the organisation [54]. This allows for greater innovation capacity as companies that are too risk averse often fail to take full advantage of opportunities that may transform the business.

#### *Innovation Culture Checklist*

- Innovation activities are conducted regularly
- Employees are empowered to take

calculated risks

- Employees work collaboratively and are supported in cross-skilling and knowledge sharing

### VALUE ALIGNMENT

Digital affords businesses with the opportunity to collaborate and co-create value with stakeholders (including customers and suppliers).

To enable co-creation, managers should make use of digital tools to promote values and behaviours that are associated with information integrity, transparency, trust and sharing [17]. Managers should also realise the value of collaboration within the business and there should be an effort to break down silos.

#### *Value Alignment Checklist*

- Customers and suppliers effectively communicate with the organisation to co-create value
- All staff work in sync to implement a digital vision and know and understand the digital strategy
- The organisation works as part of a digital ecosystem

### BUSINESS AGILITY

To start with, digital firms should have a good understanding of the technological landscape in which they operate [76]. Firms can improve their awareness by implementing systematic processes for identifying new technology opportunities (for example through technology landscape mapping). Firms should also have effective processes in place to ensure technology awareness is filtered throughout the organisation. Ideally, employees should be continuously in touch with the

latest technological developments and encouraged to investigate how technologies could be used to improve the business [75].

Firms must also be responsive to changes in technology and adapt their business model accordingly to derive a competitive advantage [49]. Responsiveness is the operational capability of the firm to adapt to changed conditions and customer interactions as they occur. This will depend, at least in part, on the adaptability of existing IT infrastructure to allow for technology change throughout the organisation [1].

Digitally mature organisations may respond to environmental changes by frequently updating their processes (for example, by streamlining product cycles, they reserve the ability to add features later into new versions of products) [49]. This allows the company to refine its alignment of product and services with the needs of the ‘right customer’ – and involves a high level of skill in understanding customers [17].

Organisations can become more agile by launching ‘quick wins’ (by rapidly developing digital products and services and improving the customer experience – this gets the product to market quickly, allows it to be refined based on customer feedback, limits investment, time and capital, and develops a mindset of experimentation through trial and error). Successful ‘quick wins’ are ‘scaled up’ in the medium term [23].

#### *Business Agility Checklist*

- The organisation quickly senses, creates and responds to changes in the environment and identifies latent customer needs
- The organisation can pivot based on analysis of customer insight and key performance metrics

- Processes and systems are used to react to rapid business change
- Technology is never a bottleneck

#### REVENUE RESILIENCE

In the age of digitisation, organisations may find that traditional revenue streams are under threat from technological disruption.

Organisations need to have an awareness of how current revenue streams may be under threat from technological disruption and plan accordingly. It is no longer sufficient for organisations to simply focus on optimising current operations and strive for efficiency gains. Revenue resilience is about creating new business models to diversify revenue sources so when an organisation is disrupted it doesn’t fold [77, 78].

An organisation may create revenue resilience, for example, by taking stock of idle assets and thinking about how these could be leveraged to make money.

#### *Revenue Resilience Checklist*

- Business models are expanding
- Digital initiatives are generating value
- There are very few technical issues in delivery of services
- When they do occur, technical issues are easily resolved

# THE DIGITAL MATURITY SCORECARD

To begin the digital transformation journey, it is essential for an organisation to understand its starting point. We have created a questionnaire to assist organisations in understanding their level of digital maturity.

The following tables can be used to self-assess the maturity. Higher scores in each of the digital capabilities indicate a higher position on the X axis of the digital maturity matrix. Higher scores for digital impacts indicate a higher position on the Y axis of the digital maturity matrix.

The higher the cumulative score, the more 'digitally mature' an organisation is. In the questionnaire, each of the questions carries equal weight.

# CAPABILITY INDICATORS QUESTIONS

Answer each question, using a scale 1 to 5

1 = Strongly disagree

3 = Neutral

5 = Strongly Agree

INDICATOR	QUESTION	SCORE
STRATEGY	My organisation has a clear, coherent and actionable strategy that shows the path and steps of digital transformation.	
	Digital strategy in my organisation focuses on transforming the whole business (end-to-end) rather than transforming one or more operations or silos.	
	Digital business strategy in my organisation includes digitisation of products and services and the information around them.	
TALENT AND SKILLS	Employees have skills and competencies to facilitate digitisation or are able to access these skills from partners or suppliers as needed.	
	We find it easy to attract high quality technical staff to our organisation because of our reputation as a leader in digital technologies and ways of working.	
	My organisation continuously invests in developing digital skills of employees.	
	Employees are able to quickly identify the core of a business or customer problem, and self-organise to address the solution timely manner.	
DIGITAL INFRASTRUCTURE AND PLATFORMS	My organisation funds and resources digital transformation adequately.	
	Digital investment considers an organisation-wide approach (people and culture), rather than investing only in technology and/or developers.	
	My organisation is able to effectively integrate new technologies with older 'legacy technologies'.	
	My organisation has the technological infrastructure and corresponding solutions in place to support real-time customer insights.	
	My organisation has systems, applications and tools in place that enable more efficient business processes.	

INDICATOR	QUESTION	SCORE
	My organisation has the technological infrastructure and corresponding solutions in place to support real-time business decision making.	
	My organisation uses automated and integrated tools to support marketing and sales activities.	
	My organisation has established an appropriate business intelligence system to help employees make timely decisions.	
	My organisation has the process in place to understand and learn from a failure.	
	My organisation is data focused and uses data for environmental sensing/machine learning/predictive analysis.	
<b>RISK MANAGEMENT</b>	My organisation has services, systems, applications and tools in place in order to appropriately protect the organisation from cyber-attacks and other security risks.	
	My organisation actively and regularly assesses technical, business and social risk factors when it comes to technology investment.	
	My organisation considers the scalability of digital infrastructure to meet the demand driven by marketing, promotions or legislation requirements.	
	My organisation has embedded a proactive risk management approach within the culture and processes of the organisation.	
	The degree of risk mitigation in a project is varied according to the assessed risk level of the project.	
<b>BUSINESS ECOSYSTEM DESIGN</b>	My organisation has technology foundation in place that enables us to benefit from business networks and optimise collaboration with our suppliers.	
	We connect with our partners digitally. For example, we use modern business system integration platforms, such as API-enabled cloud-based services, to enable efficient business interactions that otherwise would not be possible.	
	My organisation uses technology to deliver more efficient business outcomes, for example by using process automation and hardware virtualisation, cutting out the intermediaries or using data to become more accurate and predictive.	

INDICATOR	QUESTION	SCORE
CUSTOMER EXPERIENCE DESIGN	User Experience research is conducted by my organisation to better understand customer pain points as part of designing better products and services.	
	My organisation has the ability to design and deliver a tailored product to fulfil customers' needs.	
	My organisation provides customers with a fully integrated experience in all areas of interaction including technology and brand.	
	My organisation continuously improves its digital and physical experiences to deliver genuine value to the customer.	
	My customers can effectively communicate with my organisation to address complaints and help resolve issues.	

## IMPACT INDICATORS QUESTIONS

Answer each question, using a scale 1 to 5

1 = Strongly disagree

3 = Neutral

5 = Strongly Agree

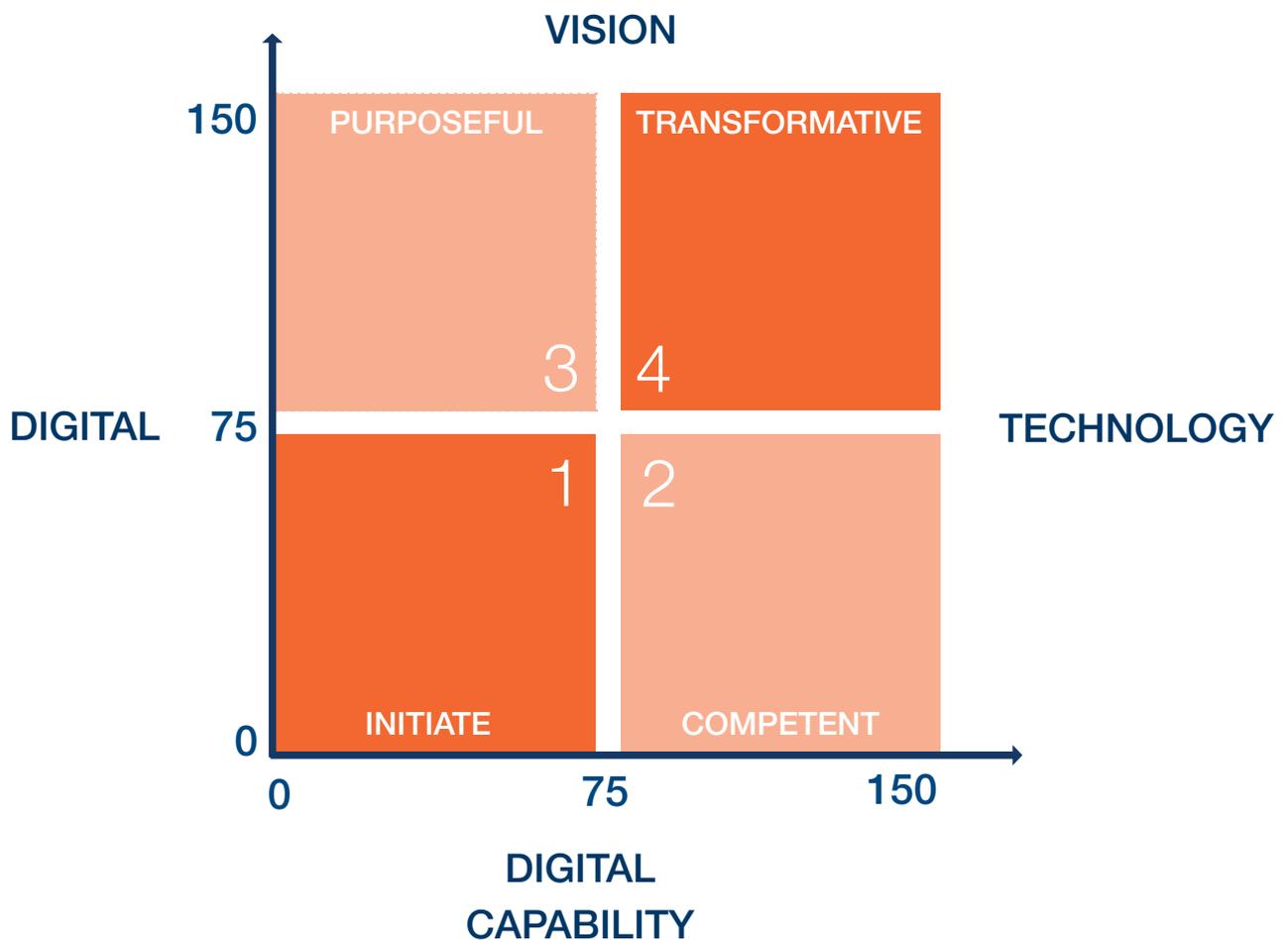
INDICATOR	QUESTION	SCORE
VISION	My organisation has a long-term (e.g. 5 years and beyond) goal that reflects its ultimate point of success.	
	My organisation is customer centric and creates digital value by addressing customers' problem in a new and innovative way.	
	Digital technology is an essential element of realising the vision of my organisation.	
	My organisation utilises digital to reach its full potential in the market (local, national or global) by creating new ways to connect with customers.	
	Digital strategy in my organisation is no different from overall business strategy.	
LEADERSHIP	Leaders in my organisation have a compelling long-term goal for my organisation.	

INDICATOR	QUESTION	SCORE
	Leaders in my organisation have the ability to communicate their future foresight throughout the organisation.	
	Leaders in my organisation actively identify and realise opportunities for digital enabled business growth.	
	Leaders in my organisation have empowered employees to work in cross-functional teams and collaborative environments.	
GOVERNANCE	In my organisation everyone has a mandate to think creatively and innovate.	
	My organisation takes a rigorous and systematic approach to innovation or change management.	
	My organisation empowers staff to work autonomously as required, while providing an appropriate level of vision, guidance and coordination to maintains focus.	
	My organisation conducts both small iterative experiments, and enterprise wide initiatives to realise innovation that has business impact.	
	My organisation conducts innovation activities as a regular task.	
	Employees feel empowered and take calculated risks to be successful.	
	Employees regularly work in interdisciplinary teams and are supported in cross-skilling and knowledge sharing.	
	Teams work collaboratively on projects and share developments all the way through, factoring in feedback and new insights to improve as they go.	
VALUE ALIGNMENT	My customers can effectively communicate with my organisation to co-create value.	
	My supplier can effectively communicate with my organisation to co-create value.	
	All staff (e.g., technology and management) in my organisation work in sync towards implementing our (digital) vision.	

INDICATOR	QUESTION	SCORE
	My organisation fosters an integrated digital ecosystem. For example, we share data and/or provide integration points so that third parties can create value-add services that complement our own, increasing revenue and customer retention.	
	Everyone in the organisation knows of, understands and is able to act on our digital strategy.	
REVENUE RESILIENCE	My organisation's business model is continually expanding capacity and increasing utilisation, and they are increasing over time.	
	There are very few technical issues in the delivery of our digital services.	
	When technical issues do occur in service delivery, we are able to resolve them within an acceptable period of time (i.e. within customer expectations of our industry).	
	My organisation's digital initiatives are currently generating value (e.g. new lines of revenue) and/or efficiencies (e.g. cost reductions), and the impacts are increasing over time.	
BUSINESS AGILITY	My organisation's digital initiatives are currently generating value (e.g. new lines of revenue) and/or efficiencies (e.g. cost reductions), and the impacts are increasing over time.	
	My organisation has a proven ability to identify customer's latent needs.	
	My organisation has demonstrated ability to pivot its purpose, products and service based on analysis of customer insight and key performance metrics.	
	Employees quickly recover from setbacks and reframe their approach.	
	Efficient and agile processes and systems are used to react to rapid business change.	
	Technology is no longer a bottleneck in our organisation. For example, our technical delivery teams can implement services faster than we can generate new service delivery ideas.	

## CALCULATING YOUR OVERALL MATURITY POSITION

QUADRANT	CAPABILITY SCORE	IMPACT SCORE
Initiate	0 - 75	0 - 75
Competent	76 - 150	0 - 75
Purposeful	0 - 75	76 - 150
Transformative	76 - 150	76 - 150



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# APPENDIX A

# DELPHI

# WORKSHOP



46.

## HANDOUT #1

# DIGITAL TRANSFORMATION MATURITY MODEL: EXPERT PANEL WORKSHOP

Time allowed: 1.5 Hours

### AIM

To reach consensus on the capabilities that should be assessed in a digital transformation maturity model.

### PROJECT OUTLINE

The purpose of this project is to create an academically verified digital transformation maturity model.

Maturity models are commonly applied to assess an organisation's 'as is' situation, to derive and prioritise improvement measures, and to control progress [79]. Maturity models typically assess a range of factors (capabilities) relevant to a particular discipline over a series of progressive maturity 'stages' [80].

### WHY HAVE THIS WORKSHOP?

From our reading of the literature we have tentatively identified a number of capabilities that could be measured to assess an organisation's progression towards digital maturity. The Delphi Technique will be used to verify and challenge these identified capabilities.

### THE DELPHI TECHNIQUE

The Delphi technique is a widely used and accepted method for consensus-building among a panel of experts [60, 61]. Panellists are selected based upon their expertise, somewhat related backgrounds and experiences concerning the target issue, capable of contributing helpful inputs, and are willing to revise their initial judgements for the purpose of reaching consensus.

## HANDOUT #2

# BRIEF DEFINITIONS OF MATURITY CAPABILITIES

**ACCOUNTABILITY:** The assignment of responsibility and accountability for digital transformation. This includes the responsibility of an organisation to account for its actions, to accept responsibility for them and to disclose results in a transparent matter.

**AWARENESS:** Awareness of how digital transformation will affect the business/industry/customer.

**COMMUNICATION:** The two-way process of reaching mutual understanding. This includes between organisational levels, departments, employees and with the customer.

**CULTURE:** The values and behaviours that contribute to the unique social and psychological environment of an organisation. In this context it includes a company's approach to digitally driven innovation, and how it empowers employees with digital technology.

**DESIGN THINKING:** Implementation of the design thinking methodology to solve complex problems and find desirable solutions for clients.

**DIGITAL DIVIDENDS:** The higher a company's digital maturity, the better its financial performance is likely to be.

**ENGAGEMENT:** The level of engagement with customers, employees, suppliers and business partners.

**EVALUATION & MEASUREMENT:** Rigorous analysis of completed or ongoing activities that determine or support accountability, effectiveness and efficiency.

**EXPERIENCE:** A company's previous experience of and familiarity with digital technologies.

**EXPERTISE:** The involvement of people with expert knowledge in digital transformation.

**GOVERNANCE:** The framework for establishing accountability roles and decision making authority for digital strategy. This includes the establishment of policies and continuous monitoring of their proper implementation by members of the governing body of an organisation.

**HUMAN RESOURCES:** Recruiting and hiring of new employees, orientation and training of current employees, employee benefits and retention.

**INFORMATION TECHNOLOGY AND SYSTEMS:** The physical technological capabilities of an organisation (e.g. cloud, social media platforms).

**INTEGRATION:** Process of attaining close and seamless coordination between several departments, groups, organisations, systems etc. This includes coordination between new and existing technology, customer touch points, and the integration of digital strategy within the rest of the organisation.

**KNOWLEDGE:** A company's ability to integrate knowledge (for example 'big data' and 'data analytics') into new and existing processes. Includes the ability to integrate knowledge into decision making.

**LEADERSHIP:** The support given to digital transformation by the organisational executive being actively and visibly engaged in the transformation effort (e.g. mature leadership may be evidenced by presence in key meetings, taking responsibility to communicate the vision of the digital transformation with staff/customers).

**MANAGEMENT:** The organisational processes used to support/ deliver digital transformation (e.g. mature management may be evidenced by appropriate levels of accountability for specific roles, regular schedules of activity, progress reporting, budget allocation, etc.).

**METHODS:** The set of tools and techniques that support process management, facilitating the modelling, analysis and improvement of processes.

**MINDSET:** How a company 'thinks' – this is a reflection of culture, leadership awareness and commitment to learning. In this context, whether the organisation has a 'proactive mindset'.

**ORGANISATIONAL STRUCTURE:** The system of institutional rules, policies and hierarchies that outline how work roles and responsibilities are delegated, controlled and coordinated.

**PARTNERSHIP (BETWEEN IT AND THE REST OF BUSINESS):** The relationship between IT and the rest of the organisation. This includes business perception of IT value; role of IT in strategic business planning; shared goals, risk rewards, penalties, IT program management.

**PROBLEM HANDLING:** How the organisation identifies and resolves problems.

**PROCESS:** The sequence of interdependent and linked procedures which, at every stage, consume resources (employee time, energy, machines, money) to convert inputs (data, material, parts etc.) into outputs. These outputs then serve as inputs for the next stage until a known goal or end result is reached.

**PRODUCT/CUSTOMER INSIGHTS:** How well the organisation uses product data and customer feedback to measure success and inform strategy.

**QUALITY IMPROVEMENT:** The systematic approach to reduction or elimination of waste, rework and losses in the production process/How the organisation prevents mistakes or defects in manufactured products/avoids problems when delivering solutions to customers. This includes cost of quality as a percentage of sales, quality improvement actions and summary of company quality posture.

**RISK MANAGEMENT:** The identification, analysis, assessment, control and avoidance, minimisation or elimination of unacceptable risks.

**SCOPE & ARCHITECTURE:** The overall design of a system that unifies its components or elements into a coherent and functional whole.

**SKILLS:** Workforce skills including digital fluency, the ability to work in interdisciplinary teams, resilience, technology skills.

**STRATEGY/ STRATEGIC ALIGNMENT:** The business strategy of how digital will be incorporated into business. This includes the interconnection between strategic planning and organisation processes, enabling effective and efficient action to improve company performance.

**TECHNICAL PERFORMANCE:** The measurement, assessment and actioning of technical performance (e.g. how quickly the digital system responds to requests.)

**TIMING:** The period required to complete one cycle of an operation; or to complete a function, job or task from start to finish.

**TOOLS & AUTOMATION:** Company's use of tools and automation to improve processes.

**TRAINING:** The training provided to employees to improve digital skills/knowledge.

# PwC CHAIR IN DIGITAL ECONOMY

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